



U.S. Department of Defense  
Legacy Resource Management Program

Tri-Services Cultural Resources Research Center  
USACERL Special Report 97/100  
1997



U.S. Army Corps of Engineers  
Construction Engineering Research  
Laboratory

# Archeology and Bioarcheology of the Northern Woodlands

by Elizabeth D. Benchley, Blane Nansel, Clark A. Dobbs, Susan M. Thurston Myster,  
and Barbara H. O'Connell

A Volume in the Central and Northern Plains Archeological Overview  
Arkansas Archeological Survey Research Series No. 52  
1997

Arkansas Archeological Survey  
Fayetteville, Arkansas  
1997

Library of Congress Cataloging-in-Publication Data

Archeology and bioarcheology of the Northern Woodlands / by  
Elizabeth D. Benchley . . . [et al.].

p. cm. -- (Arkansas Archeological Survey research series: no. 52)

"A volume in the Central and Northern Plains archeological overview."

Includes bibliographical references and index.

ISBN: 1-56349-083-8 (alk. paper)

1. Indians of North America—Middle West—Antiquities. 2. Indians of  
North America—Anthropometry—Middle West. 3. Excavations  
(Archaeology)—Middle West. 4. Middle West—Antiquities.

I. Benchley, Elizabeth D. II. Series.

E78.M67A75 1997

977'.01--dc21

97-24766

CIP

Abstract

The archeological overview of the Northern Woodlands portion of the Central and Northern Plains region was conducted by regional experts in archeology and bioarcheology as a Department of Defense Legacy Resource Management project for the U.S. Army Corps of Engineers through contracts with the Arkansas Archeological Survey. The goal of the research was to provide a summary of what is known about the archeology of Wisconsin, Iowa, and Minnesota as an aide to researchers and cultural resource managers. The overview study reveals a considerable diversity of cultures and adaptations across this environmentally variable region through time. After reviewing the physical setting, culture history, and bioarcheology of the region by state, a final integrative chapter proposes a series of adaptation types which crosscut traditional political and temporal boundaries.

Series Editor: Hester A. Davis

Cover Design: M. Jane Kellett

(after a Sioux buffalo robe, Museum fur Völkerkunde, Berlin)

Production: Mary Lynn Kennedy

Offset: Action Printing, Fond du Lac, Wisconsin

# Contents

Figures and Tables	iv
Foreword	v
Acknowledgments	vi
1 Introduction, by Elizabeth D. Benchley	1
2 Physical Setting, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	3
3 History of Research by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	39
4 The Paleoindian Period by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	59
5 The Archaic Period by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	71
6 The Woodland Period by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	87
7 The Late Prehistoric Period by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	136
8 The Historic Period by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	180
9 Bioarcheology by Susan M. Thurston Myster and Barbara O'Connell	215
10 Human Adaptation Types by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs	303
References Cited	313
Index	367

## Figures

1 The Northeastern Woodlands	1
2 Major lakes and waterways	3
3 Glacial landforms	5
4 Premodern vegetation	6
5 Relief map of Minnesota	28
6 Physiography of Minnesota	29
7 Monthly temperature and precipitation	33
8 Monthly temperature variation	33
9 Total annual precipitation	33
10 Mean annual temperature	33
11 Mean annual temperature and precipitation	33
12 Paleoindian sites and areas	59
13 Archaic sites and areas	71
14 Early Woodland sites	88
15 Early Woodland phases	88
16 Middle Woodland sites	94
17 Middle Woodland phases	94
18 Late Woodland sites	103
19 Late Woodland phases	103
20 Late Prehistoric sites	137
21 Late Prehistoric phases	137
22 Oneota phases and ceramics	144
23 Environmental zones	303

## Tables

1 Glacial and postglacial lakes in Wisconsin	18
2 Points recovered in Minnesota	67
3 Selected Archaic chronologies	78
4 Paleoindian remains	217
5 Iowa sites with Archaic mortuary components	218
6 Iowa Archaic demography	219
7 Woodland burials from Keyes/Orr survey	224
8 Museum collections of Effigy Mounds	225
9 Woodland sites reported by Wedel	225
10 Iowa sites with Early Woodland burials	225
11 Iowa sites with Middle Woodland burials	226
12 Iowa sites with Late Woodland burials	228
13 Iowa sites with Woodland mortuary components	229
14 Iowa Woodland demography	230
15 Iowa sites with Great Oasis burials	232
16 Iowa Great Oasis demography	233
17 Iowa Glenwood burials	234
18 Mills County Glenwood burials	234
19 Iowa Mill Creek burials	235
20 Iowa Mill Creek demography	236
21 Iowa Oneota burials	239
22 Iowa Historic/Post-Contact burials	243
23 Archeological periods of Iowa burial sites	244
24 Wisconsin sites with Archaic burials	246
25 Age and sex distribution, Reigh site	248
26 Wisconsin sites with Early Woodland burials	251
27 Wisconsin site with Middle Woodland burials	252
28 Age and sex distribution, Rehbein site	253
29 Age and sex distribution, Outlet site	254
30 Age and sex distribution, Cyrus Thomas site	255
31 Age and sex distribution, Altern site	255
32 Specific skeletal pathology, Altern site	255
33 Wisconsin sites with Late Woodland burials	256
34 Age and sex distribution, Robinson site	257
35 Wisconsin Effigy Mound culture burials	259
36 Age and sex distributions from mound groups	259
37 Wisconsin Oneota burials	261
38 Age and sex distribution of a combined site group	263
39 Subsistence-related pathologies, Oneota	263
40 Age and sex distribution, Gunderson Clinic	265
41 Age and sex distribution, OT site	267
42 Middle Mississippian burial sites in Wisconsin	268
43 Age and sex distribution, Aztalan	269
44 Nonmortuary features from Aztalan	269
45 Wisconsin sites with Historic burials	272
46 Minnesota sites with Archaic burials	278
47 Minnesota sites with Woodland burials	280
48 Minnesota sites with Middle Woodland burials	281
49 Age and sex distribution, Alton Anderson site	282
50 Age and sex distribution, three sites	283
51 Age and sex distribution, Malmo site	284
52 Minnesota sites with Late Woodland burials	287
53 Oneota burial sites in Minnesota	294
54 Age and sex distribution, Hogback site	296
55 Minnesota sites with Middle Missouri component	296
56 Historic burial sites in Minnesota	297
57 Archeological periods	301



## Foreword

This research was coordinated by the Arkansas Archeological Survey under the Department of Defense Legacy Resource Management Program. The contracts were administered by the Tri-Services Cultural Resources Research Center at the U.S. Army Construction Engineering Research Laboratories (USACERL), Champaign, IL. The contract manager and Principal Investigator was Dr. John S. Isaacson. Col. James T. Scott is Commander and Dr. Michael J. O'Connor is Director of USACERL. Mr. Larry Banks, formerly U.S. Army Corps of Engineers Southwestern Division archeologist, consulted extensively on the project.

The Central and Northern Plains Archeological Overview project includes four studies: the northern Great Plains (the Rockies east to the Minnesota River), the northern woodlands (the Minnesota River east to the Great Lakes), the central Great Plains, and the central prairie-timberlands of Missouri. Using the concept of human adaptation, these overviews place cultural resources within cohesive environmental and cultural areas rather than arbitrary political boundaries such as states. These syntheses make clear why properties are significant, where there are gaps in archeological and bioarcheological knowledge, and what the future directions are for cultural resources planning by Department of Defense installations, the U.S. Army Corps of Engineers, and other federal agencies. In addition to the four archeological volumes, all citations are being entered in the National Archeological Citation Data Base. Other volumes included as part of this project are management guidelines, an executive summary, the bioarcheological sections of each area combined into a single volume, and a citations CD. Taken together with the volumes from the Southwestern Division of the U.S. Army Corps of Engineers Overviews (Arkansas Archeological Series Nos. 31-38), there are now syntheses of the current archeological record for almost one-half of the United States.

The Legacy Resource Management Program was established by the Congress of the United States in 1991 to provide the Department of Defense with an opportunity to enhance the management of stewardship resources on over 25 million acres of land under DoD jurisdiction.

Legacy allows DoD to determine how to better integrate the conservation of irreplaceable biological, cultural, and geophysical resources with the dynamic requirements of military missions. To achieve this goal, DoD gives high priority to inventorying, protecting, and restoring biological, cultural, and geophysical resources in a comprehensive, cost-effective manner, in partnership with Federal, State, and local agencies, and private groups.

Legacy activities help to ensure that DoD personnel better understand the need for protection and conservation of natural and cultural resources, and that the management of these resources will be fully integrated with, and support, DoD mission activities and the public interest. Through the combined efforts of the DoD components, Legacy seeks to achieve its legislative purposes with cooperation, industry, and creativity, to make the DoD the Federal environmental leader.

## Acknowledgments

The authors are indebted to a series of archeological researchers and institutions who unfortunately are too numerous to name here. Although the authors each have considerable personal knowledge about the archeological resources of the study area, this overview is necessarily based on basic research performed by many other investigators. Many archeologists and institutions responded positively to our requests for references, copies of limited distribution reports, and in the case of the bioarcheologists, access to collections. Merrill Mechler-Hickson of the University of Wisconsin-Milwaukee Archeological Research Laboratory prepared the figures using Adobe Illustrator®. Kim Breakey, Institute for Minnesota Archaeology, and Ricardo Fernandez, University of Wisconsin-Milwaukee, updated the NADB bibliographic data base. The two Arkansas Archeological Survey project managers, Charles R. Ewen and Thomas Green, exhibited admirable patience and management skills in bringing this research to a conclusion. The efforts of Mary Lynn Kennedy in the technical production of the volume are also greatly appreciated.

Barbara O'Connell and Susan Myster acknowledge the extraordinary assistance of former and current Hamline students Matthew Crary, Lori Jahnke, Ann Kakalouras, Andrea Neisen and Andrew Scherer. They also gratefully acknowledge the patience and support of Douglas Owsley and Mary Lynn Kennedy in facilitating the completion of this bioarcheological study.

# 1 Introduction, by Elizabeth D. Benchley

The present overview of the archeological resources of the Northern Woodlands portion of the Central and Northern Plains Overview project covers the states of Iowa, Wisconsin, and Minnesota. The study area was originally conceived of as the Northwestern Woodlands, named after the Old Northwest Territory from the initial American settlement era, and included only the woodland portions of Wisconsin and Minnesota. The extent of the region was expanded during initial project planning, however, and Iowa and the rest of Minnesota were added to our study area (Figure 1). The region includes both wooded and prairie areas and is substantially different environmentally and culturally from other portions of the Plains.

Given the diversity of the area's resources and our research team's backgrounds, it was decided to summarize and evaluate the archeological record of each state. Elizabeth D. Benchley, Ph.D.,

served as the project director and researched the Wisconsin archeological resources. Benchley was Conservation Archaeologist at the University of Wisconsin-Milwaukee (UWM), and has directed both prehistoric and historic archeological projects in Wisconsin, Illinois, and Michigan for over 25 years. She has recently moved to the Archaeology Institute at the University of West Florida. Blane H. Nansel, M.S., ABD, compiled the Iowa section of the report. Nansel has conducted archeological research in Iowa for 20 years and also conducted fieldwork in Wisconsin while he was a Ph.D. student at UWM. Clark A. Dobbs, Ph.D., of the Institute for Minnesota Archaeology, has directed archeological research projects in Minnesota and Wisconsin for 20 years and prepared the Minnesota overview. Portions of his chapters have appeared elsewhere (Dobbs n.d.). The research team worked together to design the overall research approach and summarize the region in the final chapter on adaptation



Figure 1. The Northern Woodlands portion of the Central and Northern Plains overview.

types. The bioarcheology chapter was prepared by Susan Myster and Barbara O'Connell from Hamline University.

The opportunity to use a cohesive research approach such as Fitzhugh's adaptation types (Fitzhugh 1975) was seen as a positive step in producing an overview of the archeology of the region. Although Fitzhugh's models were proposed in a region of environmental extremes, we anticipated that the contrasts might not be dissimilar to those found in the Plains between the well watered river valleys, and the higher dry prairies. In the moister woodland and prairie areas of the project area, however, we expected the picture to be more complex.

Portions of the present study area are included in what John Douglas (1976) termed the Woodfordian Northeast, a region affected by the last Pleistocene glaciation. Here the youthful and well-watered landscape creates a mosaic of patchy natural resources. The extreme temperatures of the region's cold season impose additional limits to resource availability. The resource patchiness, combined with seasonal fluctuations, encouraged human groups to be technologically and socially flexible. In many eras social groups appear to have formed and reformed seasonally, moving frequently across the varied landscape. One consequence of this flexibility for archeological research is that standard Midwestern and Plains artifact types and chronological markers are not recognizable for most eras. In many portions of the recently glaciated sections it is difficult to precisely identify cultural groups and boundaries, and to relate them to better known cultures which inhabited the older landscapes of the Midwest and Plains.

The classification systems used by archeologists across the three-state study area are also variable, in part as a consequence of the prehistoric situation and also because of the differing history of archeological research in each state. We make no attempt to rectify these differences within or between states. As a result, the reader may find terms such as component, focus, phase, variant, culture, tradition, horizon, stage, and period used in a variety of ways depending on the original author's terminology and traditional regional usage.

There is also variation in the way radiocarbon dates are reported across the region. Many dates referenced in this study were reported before dendrochronological calibration tables and programs were available. We have not attempted to calibrate or correct any dates and have used the radiocarbon dates as reported in the literature. For the most part, Paleoindian and Archaic period dates are presented as years before present (B.P.) (actually before 1950, the radiocarbon baseline). Woodland, Late Prehistoric, and Historic period dates are presented as B.C. (before Christ) or A.D. (*anno domini*), following standard archeological practice.

In the chapters to follow we present the physical setting of the study area followed by a summary of the history of archeological research for each state. The culture history chapters are presented chronologically and include the Paleoindian, Archaic, Woodland, Late Prehistoric, and Historic periods. The bioarcheology is also presented chronologically within each state. A final chapter integrates the three state regions through a discussion of environmental zones and adaptation types.

## 2 Physical Setting, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

The Northeast Woodlands of the Northern Plains encompasses a three-state region which is generally well watered in the north, and well drained in the south (Figure 2). The Mississippi River drains the center of the region and the Red and Missouri rivers form its western boundary. The Rainy River and Lake Superior mark the northern limit of the region, and Lake Michigan marks the eastern edge. The states of Illinois and Missouri bound the region to the south. The numerous large and small lakes in the north reflect the recent glacial history of the region, and the drier, riverine areas to the south conform generally to an older glacial or unglaciated landscape. The end moraines of the Woodfordian glaciation are found in fingerlike lobes extending south into Iowa and southern Wisconsin (Figure 3). These landscape features include the Des Moines Lobe in Iowa and Minnesota, the Lake Superior lobes in Minnesota and Wisconsin, and the Green Bay and Lake Michigan lobes in Wisconsin. At the time of European settlement the region included three broad vegetation areas (Figure 4). These bands were the conifer/hardwood forest in northern Wisconsin and Minnesota, the deciduous forest in southern Wisconsin and eastern Minnesota and Iowa, and the prairie in western Minnesota and most of Iowa. Details on the environmental history and physical setting for each state are presented below.

### Iowa

The State of Iowa is located near the center of the continental United States in the Central Lowlands Province (Fenneman 1938). It is bounded on the north by a line approximating Latitude 43°30' north, and on the south by a line arrived at by treaty with the State of Missouri approximating 40°35' north. The Mississippi River forms the state's eastern boundary, and the Missouri and Big Sioux rivers form its western boundary. It is bounded to the north by the Minnesota, to the east by Wisconsin and Illinois, to the south by the Missouri, and to the west by the Nebraska and South Dakota.

### Climate

Iowa's present climate can be described as continental, featuring hot summers, cold winters, and variable rainfall patterns. There is a general trend from cooler and drier conditions in the north and west to warmer and moister conditions in the south and east. In Lyon County, in northwestern Iowa, the mean annual temperature is 46° F (8° C), ranging from over 100° F (38° C) in the summer to -20° F (-29° C) in the winter. Precipitation averages around 25 in. (635 mm) per year, with most of it falling between the months of April and August

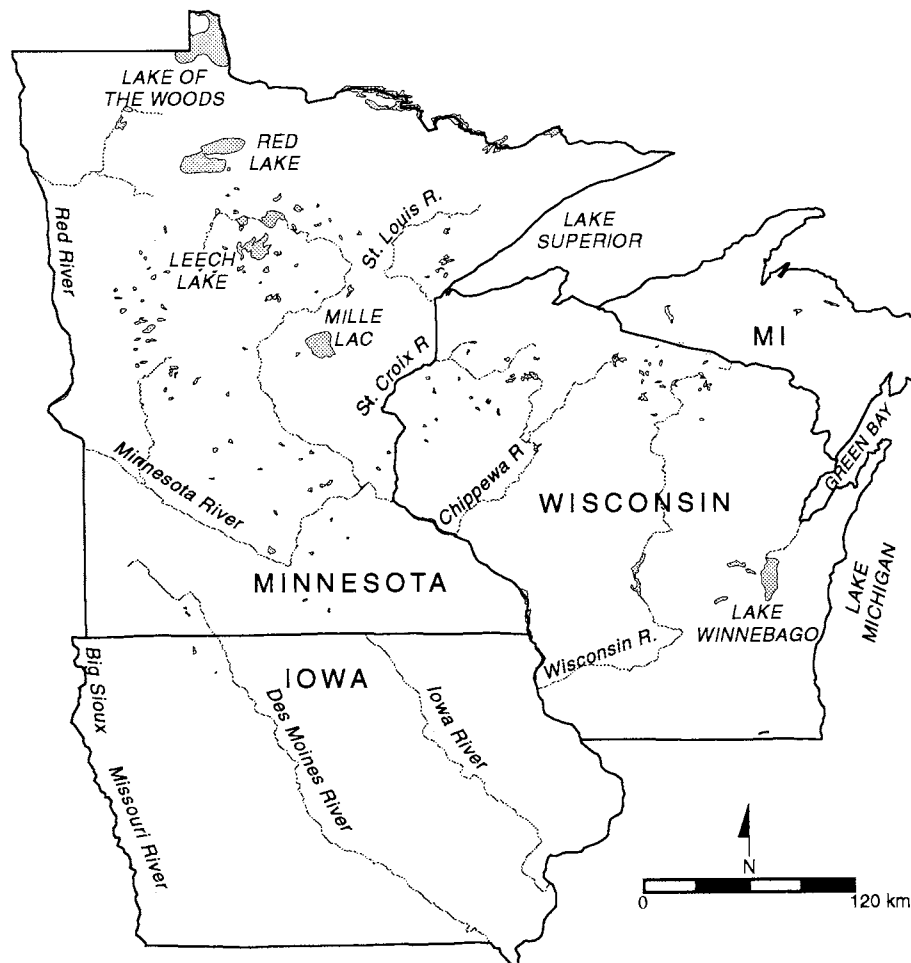


Figure 2. Major lakes and waterways of Iowa, Wisconsin, and Minnesota.

(Dankert and Hanson 1978). In Fremont County, in southwestern Iowa, annual temperature averages around 52° F (11° C), with a similar range of variation to that of northwestern Iowa. Here, annual precipitation averages around 31 in (787 mm), with the bulk, once again, falling between April and August (Clark and Nixon 1975). Clayton County, in northeastern Iowa has a mean annual temperature of 48° F (9° C), with a mean annual precipitation of around 32 in (813 mm), similarly distributed to other regions of the state (Keuhl 1982), while Lee County, in southeastern Iowa has a mean annual temperature of 51° F (10° C), and a mean annual precipitation of around 34 in (864 mm), with most falling during the summer months (Lockridge 1979). Winter snowfalls can be highly variable over all parts of the state, and occasional blizzards occur during the winter months.

## Water Resources

Unlike its neighbors to the north and east, Iowa is not blessed with abundant water resources. Since most of the state has not been glaciated since pre-Illinoian times, drainage systems are well developed, and the landscape is well drained. Only along the moraines of the Des Moines Lobe in northwest Iowa, are natural lakes common. Similarly, wetlands are largely restricted to this landform region, and to the Paleozoic Plateau of northeast Iowa.

The divide between the Mississippi and Missouri River drainages cuts across Iowa from southeast to northwest, with most of the state falling into the Mississippi River drainage system. Far northwestern Iowa is drained by the Big Sioux River, which forms the state's western border in the far northwest. For management purposes, Iowa has been divided into a number of different drainage basins. The Big Sioux River basin contains the drainage areas of those streams entering the Big Sioux River. The Rock River is the major stream in this drainage. The Western Iowa Rivers basin includes areas drained by streams that enter the Missouri River within Iowa. Major streams in this basin are the Floyd, Little Sioux, Maple, Soldier, Boyer, and the East and West Nishnabotna rivers.

The Southern Iowa Rivers basin contains streams that enter the Missouri River in Missouri. The major rivers in this basin are the Nodaway, Platte, Thompson, and Chariton rivers. The Rathbun Reservoir is a large artificial lake on the Chariton River. The Des Moines River basin includes all regions in Iowa Drained by the Des Moines River and its tributaries. These include the Boone River, East and West Forks of the Des Moines, the North and Middle Racoon rivers, and the Middle River. The Des Moines River basin contains two large artificial lakes, the Saylorville, and Red Rock reservoirs. The Skunk River basin is north and east of the Des Moines basin, and consists mainly of the North and South Skunk rivers.

To the north and east of the Skunk drainage lies the Iowa-Cedar Rivers basin, including all tributaries of the Iowa and Cedar rivers. These include the Shell Rock River, the West Fork of the Cedar River, and the English River. Coralville Reservoir, just north of Iowa City, is a large artificial lake on the Iowa River. And finally, the Northeast Iowa Rivers basin, for the most part, contains smaller streams that originate within Iowa, and flow into the Mississippi directly. Major streams within this basin include the Wapsipinicon, Maquoketa, Volga, Turkey, Yellow, and Upper Iowa rivers. Several of these rivers basins

have been used as the basis for archeological management studies (Cook 1975a; 1975b; Division of Historic Preservation 1975; Gourley 1983a; 1984; Benn 1986)

## Geology

Structurally, Iowa occupies a portion of the Stable Interior of the United States. Bedrock in this region consists of layers of flat-lying sedimentary rocks showing little deformation. However, Iowa occupies a portion of a basinlike structure termed the Forest City basin, which also extends into Missouri, Nebraska, and Kansas, and the various bedrock strata dip to the south and west, generally exposing older sediments in the northeastern part of the state and younger sediments to the south and west (W. Anderson 1983). A major exception to this general trend is that the dipping Paleozoic strata are unconformably overlain by Jurassic and Cretaceous rocks in northwestern Iowa. Two other, much smaller exceptions to this trend also exist. One is the outcropping of the Precambrian Sioux Quartzite in the extreme northwestern corner of the state, and the other is the upwelling of Precambrian basement rocks at the Manson Disturbed Area in southeastern Pocahontas County. This zone consists of a crater caused by a meteorite impact some 66 million years ago (Prior 1991). With the exception of the Paleozoic Plateau region of northeastern Iowa and the Sioux Quartzite outcrops in Lyon County, the bedrock of the state is overlain by many feet of glacial, aeolian, and alluvial unconsolidated sediments and outcrops only in deep stream valleys.

### Precambrian (4.5 Billion-570 Million Years Ago)

Sioux Quartzite of extreme northwestern Iowa is the only Precambrian rock that outcrops on the surface in the state. It consists of fine to coarse grained quartz sand that has been cemented together by silicon dioxide. In Minnesota, Sioux Quartzite contains conglomerate and red mudstone, known as Catlinite, which has been used as pipestone by Native Americans for centuries. These sediments were likely deposited in a shallow, subsiding basin from a landmass somewhere to the north of the formation. They were later metamorphosed (or diagenized) by heat and pressure into their present condition (W. Anderson 1983).

### Cambrian (570 Million-475 Million Years Ago)

Cambrian rocks are only exposed along the Mississippi and Upper Iowa (or Oneota) River Valleys in Allamakee and Clayton counties, in extreme northeastern Iowa. These formations are all members of the St. Croixan series, and consist predominately of sandstone, along with some dolostone, siltstone and shale. During Cambrian times, Iowa and the rest of the midcontinent occupied a low-lying land mass which gradually sank and was submerged under a shallow inland sea. The St. Croixan Series comprises the Mt. Simon, the Eau Claire, the Wonewoc, the Lone Rock (Called Franconia in earlier literature), the St. Lawrence, and the Jordan, from oldest to youngest. The Mt. Simon and Eau Claire formations are only known from borings in Iowa, and are nowhere exposed on the surface. Only the upper portion of the Wonewoc formation outcrops in Iowa. All three of these formations are widely exposed in southwestern Wisconsin and together make up the Dresbach Group (W. Anderson 1983).

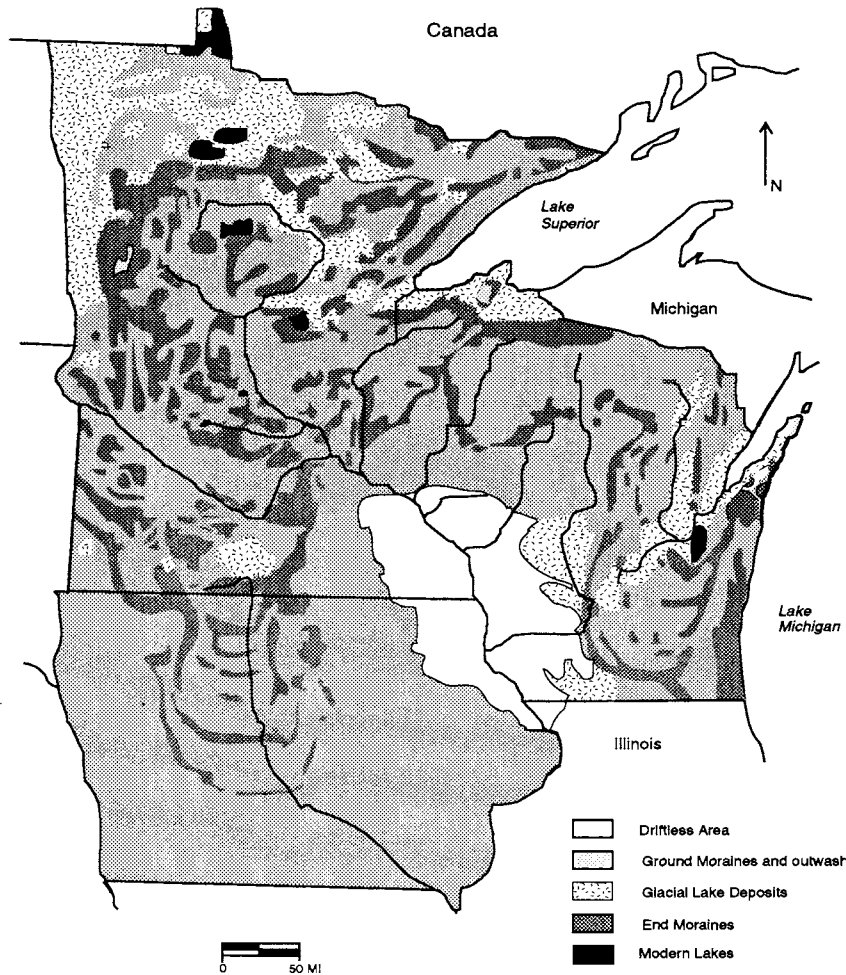


Figure 3. Glacial landforms of Iowa, Minnesota, and Wisconsin.

#### Ordovician (475 Million-425 Million Years Ago)

Ordovician age rocks are exposed in stream valleys over a much wider area of northeastern Iowa than are sediments of Cambrian age. Smaller areas of these sediments also appear in northern Winnebago and Kossuth counties in north-central Iowa, and in two small areas in Clay and Palo Alto counties in northwestern Iowa. During most of Ordovician time, Iowa was submerged under a warm, shallow, inland sea, and deposits of this time period are marine in origin (W. Anderson 1983). Ordovician age sediments in Iowa include the Prairie du Chien Group, the St. Peter Formation, the Platteville Formation, the Decorah Formation, the Galena Formation, and the Maquoketa Formation (referred to as the Richmond Formation in earlier literature), from oldest to youngest (W. Anderson 1983). These formations contain primarily carbonate rocks and shales, with the exception of the St. Peter Sandstone.

The Prairie du Chien Group contains two formations. The lower of the two is the Oneota, and the upper is the Shakopee. The Oneota Formation consists of gray, thick bedded dolostone with oolitic and cherty layers (Martin 1965). According to Morrow (1984), Oneota chert is light and medium gray to cream colored, with common mottling, and is often oolitic. Heat treating causes a satiny luster and a pinkish to reddish tint. The upper surface of the Oneota Formation is truncated by an erosion surface caused by a shift in the shoreline of

the inland sea and is overlain by the New Richmond Member of the Shakopee Formation (W. Anderson 1983). The New Richmond Member consists of sandstone and is overlain by the Willow River Member, which consists of light gray, thin bedded dolostone (Martin 1965). Morrow (1984) recognized Shakopee Chert as originating in the New Richmond dolostone. This chert is light to medium gray, coarse to medium fine grained, and oolitic. Heat treating causes a pinkish gray color and a satiny luster. The top of the Shakopee Formation is truncated by an erosion surface and is overlain by the St. Peter Sandstone.

The overlying Platteville Formation contains three members, Glenwood Shale, Pecatonica Dolostone, and McGregor limestone. The Decorah Formation comprises three members, the Spechts Ferry, the Guttenberg, and the Ion, from oldest to youngest. The Spechts Ferry Member consists of a greenish gray shale, with thin layers of altered volcanic ash known as bentonite, as well as numerous brachiopod and bryozoa fossils. The Guttenberg Member is fossiliferous limestone with phosphatic nodules and two bentonite layers. Overlying the Guttenberg Member is the Ion Member. The Ion Member is made up of interbedded argillaceous limestones and fossiliferous shales, with abundant bryozoa fossils. It contains much zinc ore and was heavily mined in the zinc mining region of southwestern Wisconsin (W. Anderson 1983).

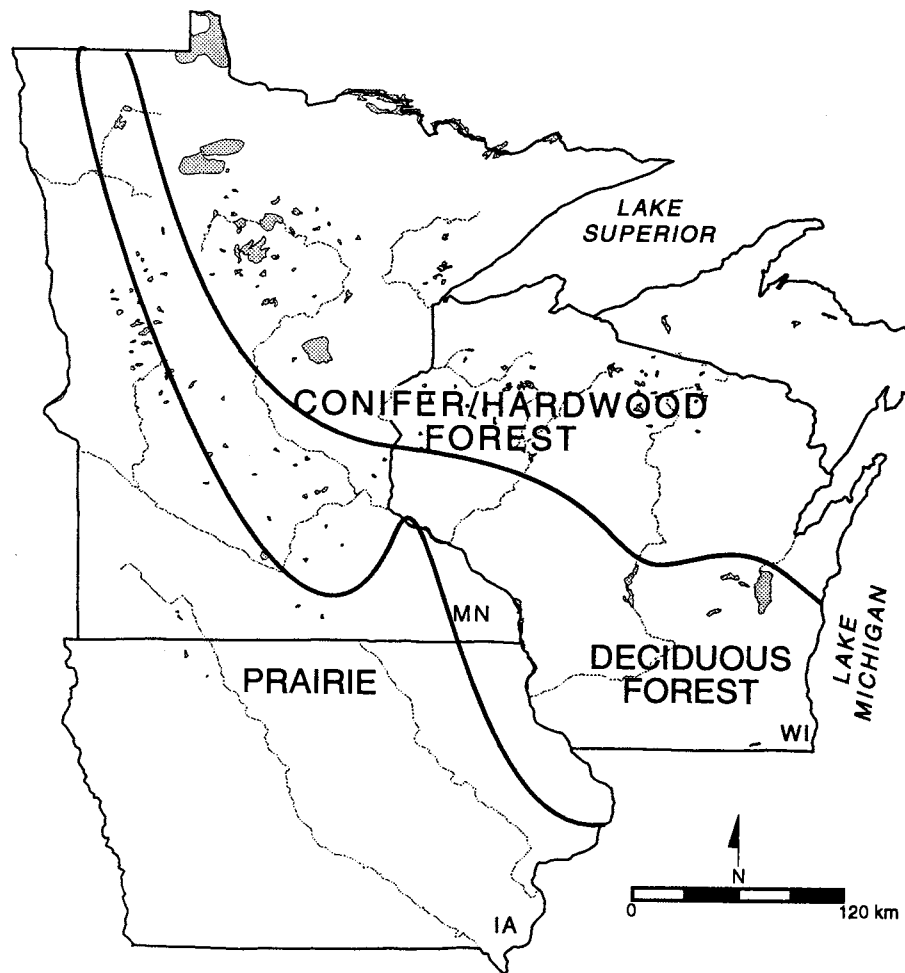


Figure 4. Premodern vegetation of Iowa, Minnesota, and Wisconsin.

The Galena Formation contains three members, the Prosser, the Stewartville, and the Dubuque, from lower to upper. The Prosser Member consists of gray, buff-weathering cherty dolomitic limestone. Morrow (1984) describes Galena chert as light gray to tan, with a dull chalky appearance, often containing crushed white fossil bits and dark fossil worm borings. Heat treatment results in a satiny luster and a gray to pinkish or reddish color. The Stewartville Member is a similar dolomitic limestone but lacks the chert, while the Dubuque Member consists of interbedded dolostone and shale. The Galena Formation is susceptible to solution, and sinkholes and caves are common features of the formation. Its rich lead ore deposits fueled the early economy of the lead mining region of southwest Wisconsin, northwest Illinois, and the Dubuque area of Iowa (W. Anderson 1983, Martin 1965).

The youngest Ordovician sediments exposed in Iowa are those of the Maquoketa Formation (sometimes referred to as the Richmond Formation in the earlier literature). The formation consists of four members, the Elgin, the Clermont, the Ft. Atkinson, and the Brainard. The Elgin Member consists of gray to blue and brown shale and argillaceous dolostone, with phosphatic beds. The Clermont Member is shale, the Ft. Atkinson Member varies from a cherty carbonate to a shale, and the Brainard Member consists of a thick sequence of shale. Red shales with numerous hematite and limonite concretions are found at or near the top of the Maquoketa Formation. This is called the Neda zone. Some consider this to be a zone of the Brainard Member, while others consider it to be a separate member of the

Maquoketa Formation (W. Anderson 1983). In Illinois but not in Iowa, the Neda contains deposits of pipestone, which were widely utilized by Native Americans during Middle Woodland times (William Green, personal communication 1993).

#### Silurian (425 Million-410 Million Years Ago)

Sediments of Silurian age outcrop in stream valleys over a large area of east-central Iowa. These deposits consist mainly of dolostones and fossil coral reefs, deposited in warm, shallow seas. These deposits unconformably overlie the Brainard Member of the Maquoketa Formation and are unconformably overlain by the Middle Devonian Wapsipinicon Formation (W. Anderson 1983). Silurian deposits in the United States were previously divided into the Alexandrian Series, the Niagaran Series, and the Cayugan Series, from oldest to youngest. More recent work, however, has allowed geologists to correlate North American sections with British type sections, and the terms Llandoveryan, Wenlockian, and Ludlovian are now applied to these series (W. Anderson 1983).

The Silurian deposits in Iowa have traditionally been divided into four formations, the Edgewood, the Kankakee, the Hopkinton, and the Gower. However, recent work has shown that deposits called the Edgewood Formation in Iowa actually correlates with Mosalem (lower) and Tete des Mortes (Upper) beds of Illinois, and not with the discredited Edgewood Formation type section in Missouri. It seems likely that these names will soon replace Edgewood in the geological



literature (W. Anderson 1983). In addition, it has recently been shown that deposits called Kankakee in Iowa do not correlate with those in the Kankakee type locality in eastern Illinois, but that they do correlate with the Blanding Formation of Illinois. Hence, the name Blanding is replacing Kankakee in the Iowa geological literature (W. Anderson 1983).

The Kankakee (Blanding) Formation is also a yellowish gray dolostone, with interbedded white chert layers (W. Anderson 1983). Morrow (1984) describes Blanding (Kankakee) Chert as being white to cream to light gray colored, often with a streaked or mottled appearance. Heat treating produces a dull to satiny luster and a pinkish tint. The main source area is in Dubuque County. The Hopkinton Formation is a thickly bedded, light yellowish brown dolostone with many fossils and bioherms. Karst topography is common in this formation (W. Anderson 1983). This formation also produces chert, and Morrow (1984) describes Hopkinton Chert as being a patchy off-white to light gray or cream colored, moderate quality material. Heat treating results in a pinkish color. Its main source area is in Delaware County.

#### Devonian (410 Million-355 Million Years Ago)

Devonian age deposits outcrop in stream valleys over a large area of eastern Iowa, extending from Winnebago and Kossuth counties in north-central Iowa to Louisa and Des Moines counties in southeastern Iowa. During early Devonian time, the inland sea retreated from the midcontinent, and warping and erosion took place on pre-Devonian deposits exposed on the land surface. Hence, there are no deposits of early Devonian age present in Iowa (W. Anderson 1983). During Middle Devonian time, the sea once again returned to the midcontinent, and marine sediments form the Middle and Late Devonian deposits found in Iowa. During this time period, the sea must have been very shallow or Iowa must have been located near a shoreline, as evaporite deposits are common in Devonian strata in Iowa (W. Anderson 1983).

The Middle Devonian in Iowa is represented by two formations, the Wapsipinicon, and the Cedar Valley (although the Cedar Valley Formation has recently been demonstrated to contain deposits of Upper Devonian age as well), from older to younger (W. Anderson 1983). Upper Devonian formations include the Shell Rock, the Lime Creek, and the Yellow Spring Group, from oldest to youngest. The Yellow Spring Group includes the Sheffield, the Aplington, the Maple Mill, and the English River, from oldest to youngest (W. Anderson 1983).

The Coggon Member of the Wapsipinicon Formation is a cherty dolostone containing brachiopod fossils. Morrow (1984) describes this Wapsipinicon chert as being light to medium gray to cream and brown, often mottled to speckled, with small brachiopod fossils. Heat treatment may or may not alter the material to a pinkish tint. The Otis Member is a fine grained limestone. The Kenwood Member is mostly shale, except in southeast Iowa, where it consists of argillaceous limestone and evaporites (W. Anderson 1983). The Spring Grove Member is primarily dolostone, although gypsum is present in this member as well. The Davenport Member consists primarily of brecciated limestone, although it also contains anhydrite and gypsum (W. Anderson 1983).

The Cedar Valley Formation is currently divided into three members, from oldest to youngest, the Solon, the Rapid, and the Coralville. The Solon Member contains fossiliferous limestone, but

breccia and evaporites are also present. The Rapid Member is more argillaceous than the Solon Member. In east-central Iowa, this member is argillaceous limestone, while in north-central Iowa it is composed of argillaceous dolomite, with a significant amount of anhydrite reported in central Iowa (W. Anderson 1983). Morrow (1984) reports Rapid Chert occurring in this member. This chert is described as off white to gray and tan and very fossiliferous. Heat treating results in a pinkish, reddish, or purplish tint. The Coralville Member consists of very fine grained limestone, which has been dolomitized in northern Iowa

The Upper Devonian Shell Rock Formation only occurs in Worth, Mitchell, Cerro Gordo, Floyd, and Butler counties in north-central Iowa. The formation has been divided into three members, the Mason City, the Rock Grove, and the Nora, from oldest to youngest (W. Anderson 1983). The Mason City Member unconformably overlies the Cedar Valley Formation and consists of a fine grained limestone containing a wide variety of fossils. The Rock Grove Member contains argillaceous limestone, shale, and dolostone, and is less fossiliferous than the underlying Mason City Member. The Nora Member consists of two massive stromatoporoid biostromes, separated by a shale interval (W. Anderson 1983).

The Lime Creek Formation overlies the Shell Rock Formation where it is present, and the Cedar Valley Formation elsewhere. The formation is divided into three members in north-central Iowa, but elsewhere in the state no separate members are distinguished. The north-central Iowa members are the Juniper Hill, the Cerro Gordo, and the Owen, from oldest to youngest (W. Anderson 1983). The Juniper Hill Member is blue gray shale with conodont and other marine microfossils. The Cerro Gordo Member consists of an interbedded sequence of shale and argillaceous limestone with abundant fossils, while the Owen Member is dolostone and dolomitic limestone. This formation is equivalent to the Sweetland Creek Shale that overlies the Cedar Valley Formation in southeast Iowa, and shales equivalent to the Lime Creek Formation also occur in scattered areas of eastern Iowa. These eastern Iowa shales are sometimes referred to as the Independence Shale (W. Anderson 1983).

The Yellow Spring Group, once thought to be Mississippian in age, are now known to date to Late Devonian times. The complete sequence of its four formations is nowhere exposed in one place. Beds of this group outcrop in two widely separated areas. The Sheffield and Aplington formations are exposed in Butler, Cerro Gordo, and Franklin counties in north-central Iowa, and the English River and the upper part of the Maple Mill formations are exposed in Des Moines and Washington counties in southeast Iowa (W. Anderson 1983).

The Sheffield Formation consists of gray shale with some dolostone, while the Aplington Formation is primarily argillaceous dolostone that grades into shale. The formation contains discontinuous bands of chert, which are not described by Morrow (1984). The Maple Mill Formation is light gray to greenish shale, calcareous in places, and containing scattered siltstone beds. It contains conodont fossils and fish remains. The English River Formation is thin dolomitic siltstone. Some think that this formation contains Mississippian age conodont fossils, while others think these specimens are nondiagnostic. It is possible that this formation spans the Devonian-Mississippian boundary, but, for the present time, the entire formation is assigned to the Devonian time period (W. Anderson 1983).

### Mississippian (355 Million-310 Million Years Ago)

Mississippian age deposits are exposed along a band extending from Pocahontas County in north-central Iowa to Lee County in extreme southeast Iowa. Iowa was covered by a warm, shallow, inland sea throughout the lower and middle Mississippian time period but was exposed as an erosional surface during Upper Mississippian time. Limestone is the most prevalent deposit from this time period, however, minor quantities of shale, siltstone, and sandstone were also deposited. The Mississippian in Iowa is divided into three series, the Kinderhookian, the Osagean, and the Meramecian, from oldest to youngest (W. Anderson 1983).

The Osagean Series comprises four formations in Iowa, the Hampton Formation, the Gilmore City Formation, the Burlington Formation, and the Keokuk Formation, from oldest to youngest. The Maynes Creek Member of the Hampton Formation is composed of cherty dolostone. Morrow (1984) recognizes five varieties of Maynes Creek Chert that outcrop over a wide area of central Iowa. Maynes Creek Cream Chert is light gray to cream colored. Heat treating results in a satiny to waxy luster and a pink to pinkish gray color. Maynes Creek Speckled Chert is light gray to cream in color, and has randomly spaced to banded speckles of darker gray or cream. Heat treating results in a satiny to waxy luster, and a light gray to cream color, with gray to reddish gray speckles. Maynes Creek Fossiliferous Chert is light gray to cream, filled with crushed bits of fossils. Heat treating results in a satiny to waxy luster and a pinkish gray color. Maynes Creek Gray Chert is light to medium gray, with chalky mottles or streaks. Heat treating results in a satiny or waxy luster and a pinkish or purplish brown tint. Maynes Creek Green Chert is light gray to cream colored, with mottles or streaks of pale grayish green. Heat treating results in a satiny luster (Morrow 1984). The Wassonville Member of southeast Iowa is apparently the equivalent of the Maynes Creek Member as it has a similar lithology and fossil content. Morrow (1984) recognizes two types of Wassonville Chert, outcropping in portions of Washington and Louisa counties in southeast Iowa. Wassonville Fossiliferous Chert is cream to light and medium gray, and filled with bits of fossils. Heat treating results in a satiny luster and an occasional pinkish tint. Wassonville Mottled Chert is light gray to cream colored with patches, speckles, or streaks of darker cream or gray. Heat treatment results in a pinkish tint and a satiny luster.

The Burlington Formation has long been famous for its chert deposits. The area was widely known as a chert source for Native American people at the time of Euro-American colonization, and until 1834, the region around the city of Burlington was known as Flint Hills (W. Anderson 1983). The Burlington Formation has three members, the Dolbee Creek Member, the Haight Creek Member, and the Cedar Fork Member, from oldest to youngest. The Dolbee Creek Member is coarse, crinoidal limestone with a small amount of chert. The Haight Creek member contains both limestone and dolostone beds, and is highly cherty. Morrow (1984) recognizes three modal types of Burlington Chert. Burlington Mottled White Chert is the typical chert of the formation. It is a high quality white to very light gray chert that may have mottled bands of light gray or crinoid, bryozoan, or brachiopod fossils. Heat treatment results in a pinkish tint. Burlington Mottled Gray and Tan Chert is light gray to tan, with streaks of orangish tan. Heat treating results in a pinkish to reddish tint and satiny to waxy luster. Burlington Fossiliferous Chert is off white to light gray to tan, and contains numerous tiny fossil bits. Heat treating results in an occasional pinkish tint and satiny luster (Morrow

1984). The Cedar Fork Member is primarily fairly pure limestone, but does contain some glauconite and chert (W. Anderson 1983).

The Keokuk Formation is made up of cherty limestones, fossiliferous limestones, and fossiliferous shales. Before locks and dams were constructed on the Mississippi River, the resistant rocks of the Keokuk Formation caused the treacherous Des Moines Rapids in the river from the mouth of the Des Moines River to the town of Montrose (W. Anderson 1983). The lower part of the Keokuk is highly cherty, while the upper portion of the formation becomes progressively argillaceous, and grades upward into the argillaceous shales and dolostones of the overlying Warsaw Formation. Morrow (1984) describes Keokuk Chert as light gray, light blue gray, and medium gray to cream and tan and often fossiliferous. Heat treating results in a satiny luster and an occasional pinkish or reddish tint.

The Merameccian Series in Iowa comprises the Warsaw, the Spergen (Salem), the St. Louis, and the Ste. Genevieve. The Warsaw Formation consists of shale and argillaceous dolostone and also contains geodes and chert layers (W. Anderson 1983). Morrow (1984) recognizes three varieties of Warsaw Chert. Warsaw Chalcedonic Chert is the most common variety found in this formation. It forms as nodules, and displays concentric banding and a waxy appearance. It is white, blue white, light gray, medium gray, yellow, orange, and pink. Heat treating may or may not alter the color. Warsaw Tabular Chert is only common in southeastern Iowa and adjacent Illinois. It is found in flat, regular plates 0.6 to 5 cm thick, separated by a thin, chalky, cream colored cortex. Heat treating rarely changes the color of the chert, but produces a reddish tint to the cortex. Warsaw Banded Chert is off white to cream colored with horizontal bands of light gray. Heat treating results in a satiny luster and pinkish tint (Morrow 1984).

The Spergen Formation consists of dolomitic limestone, with some areas of sandstone and shale. This formation is recognized only in southeastern Iowa, and also contains chert. Morrow (1984) describes Spergen Chert as forming small nodules, with occasional tabular pieces also being found. It is medium gray to yellowish tan to brown and may display concentric banding. Heat treating results in a red color, but tan tabular pieces turn maroon with an off white cortex. The St. Louis Formation consists of fine grained limestone and sandy dolostone. Its upper portion is often shaley (W. Anderson 1983). Brecciated carbonates are common in this formation. The overlying Ste. Genevieve Formation is sometimes called the Pella Formation in Iowa. It consists of alternating beds of sandstone, siltstone, carbonaceous shale, fine grained limestone, oolitic limestone, fossiliferous limestone, and argillaceous limestone. A major unconformity separates the Ste. Genevieve Formation from the overlying Middle Pennsylvanian rocks, as the inland sea regressed during Late Mississippian and Early Pennsylvanian times, leaving the Middle Mississippi sediments exposed as an erosion surface (W. Anderson 1983).

### Pennsylvanian (310 Million-265 Million Years Ago)

Pennsylvanian age sediments outcrop over the widest area of Iowa of any age of sediments. During Middle Pennsylvanian times, the inland sea once again inundated the midcontinent. Throughout the Middle and Upper Pennsylvanian, a series of transgressions and regressions caused Iowa to be in alternately marine, deltaic, and non marine settings (W. Anderson 1983). Middle Pennsylvanian rocks generally unconformably overlie Middle Mississippian age deposits in Iowa, but in eastern Iowa they overlie Devonian and Silurian deposits.

Pennsylvanian sediments in Iowa are divided into three series, the Desmoinesian (Middle Pennsylvanian), the Missourian (Upper Pennsylvanian), and the Virgilian (Upper Pennsylvanian) (W. Anderson 1983). Over 70 formations are defined within the Pennsylvanian rock record in Iowa, indicating an extremely varied and complex depositional history during Pennsylvanian time.

The Desmoinesian Series comprises two groups of formations, the older Cherokee Group, and the younger Marmaton Group. The Cherokee Group contains mainly dark carbonaceous shale, clay, and siltstone, with some sandstone, minor, thin limestone beds, and several thick coal beds. These coal beds were important economic resources in the late nineteenth and early twentieth centuries in Iowa. The Marmaton Group is made up of alternating beds of shale and limestone, with some sandstone and shale (W. Anderson 1983).

The Missourian Series contains the Pleasanton, the Kansas City, and the Lansing, from earliest to latest. This series was deposited in a primarily marine environment. The Pleasanton Group is primarily shale, with some sandstone and thin limestone beds, with minor coal seams. The Kansas City Group consists of cyclical deposits of limestones and shales. Several of the limestone formations and members of this group also contain chert. Morrow (1984) refers to the cherts of this group collectively as fusulinid cherts because of the abundant, tiny fusulinid fossils they contain. Hertha Chert is found in the Hertha Limestone Formation and is medium gray to grayish tan, filled with bits of fossils. Heat treating has little effect on this chert (Morrow 1984). Bethany Falls Chert comes from the Bethany Falls Limestone Member of the Swope Formation and is medium gray, filled with small bits of fossils. Heat treating has little effect on this chert either. Winterset Chert forms in the Winterset Member of the Dennis Formation and is medium grayish brown, and filled with bits of fossils. Heat treating produces a satiny luster. Argentine Chert forms in the Argentine Member of the Wyandotte Formation and is very dark gray to nearly black, with cream colored bits of fossils. Heat treating has little effect on this material (Morrow 1984). The overlying Lansing Group consists of two limestones and an intervening shale bed (W. Anderson 1983).

The Virgilian Series comprises the Douglas, the Shawnee, and the Wabauunsee, from oldest to youngest. The Douglas Group consists of silty shales and siltstones. The Shawnee Group is made up of relatively thick limestones and minor shale beds (W. Anderson 1983). The Plattsmouth Limestone Member of the Oread Formation of this group produces Plattsmouth Chert, which is dark grayish brown to nearly black, with many white to off white fusulinid fossils. Heat treatment has little effect on this material (Morrow 1984). The Wabauunsee Group consists primarily of shale, with some siltstone, sandstone, limestone and coal. The Nodaway coal was an important economic resource in Adams, Page, and Taylor counties during the late nineteenth and early twentieth centuries (W. Anderson 1983).

#### Jurassic (185 Million-130 Million Years Ago)

During Permian and Triassic times, Iowa was exposed above sea level as an erosional surface. Therefore, there are no sediments present in Iowa dating to those time periods (W. Anderson 1983). Iowa's Paleozoic deposits are unconformably overlain by Jurassic deposits only in a very small area near Fort Dodge, in Webster County, although they undoubtedly originally covered a much larger area and were later eroded (W. Anderson 1983). During the Jurassic, embayments of an inland sea extended into central Iowa, where the

arid climate (similar to North Africa of today) resulted in the formation of evaporite deposits (W. Anderson 1983). Today, the only Jurassic deposits remaining in Iowa are those of the Fort Dodge Formation. This formation consists of gypsum, shale, and a small amount of sandstone and conglomerate. The gypsum deposits have been and continue to be an important economic resource in the Fort Dodge area (W. Anderson 1983). In an interesting sidelight, the Cardiff Giant, of P. T. Barnum fame, was carved out of Fort Dodge Gypsum (W. Anderson 1983).

#### Cretaceous (130 Million-65 Million Years Ago)

During Middle Cretaceous times, the upper Midwest was once again inundated by an inland sea. Cretaceous deposits are currently largely restricted to northwestern Iowa, with a few small outliers in Allamakee County, in northeastern Iowa. Outliers also occur in southwestern Wisconsin, southeastern Minnesota, and western Illinois. These outliers suggest that Cretaceous deposits once covered a much larger area and have been eroded away during post Cretaceous times (W. Anderson 1983).

Three Cretaceous units are currently recognized in Iowa, the Dakota Group of northwestern Iowa, its probable equivalent, the Windrow Formation of northeast Iowa, southwest Wisconsin, and southeast Minnesota, and the later Colorado Group of northwest Iowa (W. Anderson 1983). No formations are named within the Dakota Group, but it is composed of alternating beds, primarily of sandstone, with some shale and lignite, as well as silicified wood and angiosperm leaves. The equivalent Windrow Formation is discontinuous and is divided into a lower Iron Hill Member, and an upper East Bluff Member (called the Ostrander Member in Minnesota) (W. Anderson 1983). The Iron Hill Member contains masses of limonite. This limonite has been sporadically processed as Iron ore in northeast Iowa and southeast Minnesota.

#### Pleistocene (2.5 Million -10,000 Years Ago)

The Pleistocene (or Ice-Age) in North America has traditionally been divided into four major glacial stages, along with intervening interglacials. These are the Nebraskan, Kansan, Illinoian, and Wisconsinan, separated by the Aftonian, Yarmouth, and Sangamon interglacials. However, more recent work in Iowa, Nebraska, and South Dakota have demonstrated that miscorrelations have been extensively made on the basis of the type sections of Nebraskan and Kansan tills, and that the pre-Illinoian glacial history of North America is much more complicated than previously thought. In fact, several older till units were found to underlie the type section for the Nebraskan advance in southwest Iowa, and it has been recommended that the terms Nebraskan and Kansan be dropped from the geological literature (Hallberg and Boellsdorff 1978; Hallberg 1980; 1986). Therefore, the term pre-Illinoian will be used to describe all materials older than the Yarmouth interglacial in age.

Pre-Illinoian deposits cover cover nearly the entire state of Iowa, except for a small region of extreme northeast Iowa. This area is contiguous with the so-called Driftless Area of southwestern Wisconsin, and was once believed not to have been glaciated during the Pleistocene. However, isolated patches of pre-Illinoian drift are present in the Iowa portion of this region, as well as in extreme western Wisconsin, but most has been removed by erosion since the time of its deposition (W. Anderson 1983; Attig et al. 1988). Pre-Illinoian sediments form the substrate for upland regions over most

of the state, but are buried by Illinoian deposits in the extreme southeast, and by Wisconsinan deposits on the Des Moines Lobe in north-central Iowa. A thin mantle of Wisconsinan loess overlies these materials over the rest of the state (W. Anderson 1983; Prior 1991). Pre-Illinoian deposition appears to have begun around 2.2 million years ago, and to have ended by 500,000 years ago (Bettis 1988). Till formations deposited during pre-Illinoian times include the older Alburnett and the Younger Wolf Creek. Members have not been differentiated for the Alburnett Formation, but Wolf Creek comprises the Winthrop Till, the Aurora Till, and the Hickory Hills Till (Bettis 1988). A well-developed paleosol formed on these deposits during Yarmouth-Sangamon times, and underlies the Wisconsinan loess on upland surfaces over most of southern Iowa. This paleosol outcrops on hillslopes over most of the region where the uplands have been extensively cultivated (Ruhe 1969; Prior 1991).

In a small area of southeastern Iowa from Scott County in the north to Lee County in the south, the Illinoian glacial advance entered the state, depositing the Kellerville Till Member of the Glasford Formation (Bettis 1988; Prior 1991). This advance appears to have occurred between 300,000, and 130,000 years ago (Prior 1991). During Sangamon times, a paleosol developed on these deposits as well.

During Wisconsinan times, ca. 30,000-10,000 years ago, glacial ice once again entered Iowa, this time from the north and west. This lobe of the Wisconsinan ice sheet is known as the Des Moines Lobe and covered north-central Iowa from the Minnesota border to near the present-day city of Des Moines (Prior 1991). The Wisconsinan Stage along the Des Moines Lobe in Iowa is divided into two major advances, or substages. The earlier of these is known as the Tazewell substage (29,000-21,000 years ago), and the later is known as the Cary substage (14,000-12,500 years ago) (Ruhe 1969; W. Anderson 1983; Prior 1991). In Illinois and Wisconsin, the Tazewell and Cary substages are subsumed under the single Woodfordian substage (22,000-12,500 years ago), with the Early Woodfordian referring to Iowan deposits, Tazewell deposits, and the earliest Cary moraines, Middle Woodfordian referring to the rest of the Cary moraines, and Late Woodfordian referring to the Mankato substage of Minnesota (Frye et al. 1965). But, as Ruhe (1969:66) puts it, "Now, the name Cary has been changed in many places, including the type area near Chicago, Illinois. But in Iowa we remain old-fashioned and stubborn; the name remains here." Loess, outwash, and aeolian sand deposition took place throughout the state as well throughout the entire Wisconsinan. Deposits of the Tazewell substage, known as the Sheldon Creek Formation, both bury and are buried by Wisconsinan loess (Ruhe 1969). These deposits occur over most of north-central Iowa but are buried by later deposits of the Cary advance in most of the Des Moines Lobe area. Only in the western portion of the Des Moines Lobe is the Sheldon Creek Formation a near-surface deposit beneath a thin loess cover (Prior 1991). Tazewell drifts in northwestern Iowa and pre-Illinoian drifts in northeastern Iowa were deflated following their deposition, between 30,000 and 16,500 years ago (Benn 1986; Prior 1991). A prominent stone line marks this erosion surface throughout both northeastern Iowa and northwestern Iowa along the pre-Illinoian and Tazewell surfaces. These erosional surfaces were once thought to have been the result of a third substage of the Wisconsinan, known as the Iowan substage, hence, these surfaces are referred to as the Iowan Erosion surface (W. Anderson 1983; Prior 1991). Loess deposition occurred before, during, and after the Tazewell advance, covering all existing landforms with a thin blanket of windblown silt. These deposits are

thickest in the Loess Hills region of extreme western Iowa, where loess thicknesses can exceed 100 feet, and they gradually thin to the east (Prior 1991). Another major event took place during this time period that had a great impact on the current appearance of the state of Iowa. Around 20,000 years ago, Woodfordian ice of the Lake Michigan Lobe in western Illinois blocked the Mississippi River along its previous course through the present-day Illinois River Valley. As glacial Lake Milan grew, it overtopped the divide between the ancient Mississippi River Valley and the ancient Iowa-Cedar River Valley, where it had flowed during Illinoian time, cutting the Andalusia Gorge and assuming its present-day course (Bettis 1988).

Around 14,000 years ago, Des Moines Lobe ice of the Cary substage entered Iowa, depositing the Dows Formation of glacial drift (Prior 1991). Loess deposition had ceased by this time, and all Cary deposits in Iowa lack loess cover (W. Anderson 1983). Four major moraines are apparent on the Des Moines Lobe in Iowa. These are the Bemis, Altamont, Humboldt, and Algona, from oldest to youngest. Several other minor moraines are also discernable (W. Anderson 1983; Prior 1991). The Bemis Moraine is the terminal moraine and represents the farthest southward advance of the Des Moines Lobe. The ice sheet had reached this position by 14,000 years ago, but by 13,500 years ago it had retreated to the Altamont Moraine (Bettis and Hoyer 1986). At 12,300 years ago, the ice had retreated and readvanced to the location of the Algona Moraine, and by around 12,000 years ago, the ice had retreated from Iowa entirely (Bettis and Hoyer 1986; Prior 1991).

#### Holocene (10,000 Years Ago-Present)

By the end of the Pleistocene, each of the various landform regions of Iowa had attained their basic modern-day landscape characteristics. Upland regions have formed erosional surfaces since that time, and landscape evolution has largely focused on the large and small valley systems in the region. Following on the work of Daniels and Jordan (1966), Thompson and Bettis (1980, 1981; Bettis and Thompson 1981) were able to recognize equivalent depositional units within the large and small valley systems of western Iowa. Wisconsinan-aged alluvial fills throughout the state have recently been grouped within the Noah Creek Formation, while Holocene alluvial fills are grouped into the DeForest Formation (Bettis and Littke 1987). The DeForest Formation is most fully expressed in western Iowa, because of more easily erodible soils and the generally sparser vegetation of the region, causing greater erosion during violent weather, while in the rest of the state the formation tends to be less silty and thinner (Bettis and Littke 1987). In western Iowa, the DeForest Formation comprises six member, the Watkins, the Corrington, the Hatcher, the Mullinix, the Turton, and the Camp Creek, from oldest to youngest (Thompson and Bettis 1980). An older, Soetmelk Member was originally assigned to the DeForest Formation (Daniels and Jordan 1966) but has since been discovered to be late Wisconsinan in age and reassigned to the Noah Creek Formation. Aside from Wisconsinan terraces in large valleys, Soetmelk alluvium generally represents the oldest alluvium remaining in the stream valleys in western Iowa. This member is not recognized in the rest of the state, and pre-Holocene alluvium is simply described as such (Bettis and Littke 1987). The Turton, Mullinix, Hatcher and Watkins members are also only recognized in western Iowa, while the Corrington and Camp Creek members are found across the state. The Camp Creek Member represents historic alluvium resulting from Euro-American

deforestation and agriculture (Bettis and Littke 1987). In the remainder of Iowa, two other members of the DeForest Formation are recognized, the older Gunder, and the younger Roberts Creek. Analogous, less well expressed deposits are present in the Des Moines Lobe Region but are currently not well correlated with individual members of the DeForest Formation (Bettis and Hoyer 1986).

Much of the following discussion follows Benn (1986), who provides an excellent description of the depositional history of the Western Iowa rivers basin.

The Late Wisconsinan in this region saw loess deposition taking place on uplands, while valleys were periodically scoured and filled with glacial outwash sediments. Some remnants of these deposits remain as loess-capped terrace remnants along the valley walls. Most of these earlier loess-capped terraces were removed by outwash during the final melting away of the Des Moines Lobe. By this time, both large and small valleys had downcut to a level lower than that of today. In western Iowa, the Soetmelk fill is the earliest alluvial fill in the scoured out stream valleys and, having been deeply buried by later deposits, is seldom exposed.

With decreased water flows during the early Holocene (10,500-8000 B.P.), less sediment was flushed out of the small stream valleys. The Watkins Member of the DeForest Formation seems to have accumulated during this time period. There is also some evidence for terrace formation in larger valleys during this time as well. Paleoindian sites could well be preserved in these deposits where they are present.

During the mid-Holocene (8500-3500 B.P.), the Altithermal (Hypsithermal) was characterized by increased heat and dryness, which fostered the replacement of forest by prairie throughout the region. Prairie fires were more frequent, and periodic heavy rainfall caused rapid downcutting and erosion in the small valleys of the region. This massive erosion has resulted in a stratigraphic hiatus, known as the DeForest Gap, spanning the mid-Holocene. Thus, finding evidence for human occupation during this time period in small valleys is unlikely, as much of the Watkins alluvium was removed.

As the sediment-laden waters emptied out of the small valleys of the region and entered the large valleys, they slowed, and discharged much of their sediment loads in the form of alluvial fans and river terraces. These landforms make up the Corrington Member of the DeForest Formation. Buried archeological sites are known from both fan and terrace formations. Since the formations accumulated rapidly in semicatastrophic events, they have a great potential for containing extremely well preserved cultural remains of the Early and Middle Archaic time periods.

The Late Holocene (3500 B.P.-150 B.P.), with its numerous and better preserved sediments, paints a more complicated picture. During this time period, three episodes of accretion and erosion with accompanying fill units can be discerned. In small valleys, the earliest of these fills, the Hatcher Member, dates between 3500 and 1800 B.P., while in the larger valleys, it can date as early as 7000 B.P. Hatcher alluvium could well contain sites of Late Archaic through Middle Woodland times. The Hatcher Member began eroding extensively around 1800 B.P. After this erosion had incised the Hatcher Member, Mullinix fill accumulated in the resulting gullies. In larger valleys, this fill began accumulating as early as 3000 B.P. This filling ended by 1000 B.P., as another erosional cycle began. Mullinix alluvium could well contain sites of the Late Woodland through Late Prehistoric time periods. Between 750 and 150 B.P., Turton fill accumulated in the

stream channels formed by the downcutting episode. Turton fill could only contain archeological deposits of the Late Prehistoric time period. In larger valleys, these various fills are represented as terrace formations within the meander belt and have been shown to contain buried archeological deposits (Benn 1986).

Following the start of colonization by Euro-Americans 150 years ago, increased cultivation, as well as channelization of major drainages, has caused greater runoff and erosion of the uplands. This has resulted in the accumulation of a great deal of historic alluvium throughout the fluvial systems of Iowa. This alluvium is known as the Camp Creek Member of the DeForest Formation and is continually burying potentially culture-bearing members.

In eastern Iowa, the DeForest Formation comprises four members, Gunder, Corrington, Roberts Creek, and Camp Creek, from oldest to youngest (Bettis and Littke 1987). Between 10,500 and 4000 B.P. prairies expanded over eastern Iowa as a result of warming and drying trend. Flood frequency was reduced, but occasional high magnitude floods were common (Bettis and Littke 1987). This caused episodic aggradation in stream valleys, and both Gunder and Corrington members developed during this time, the Corrington Member as alluvial fans, and the Gunder Member as terraces and valley fill in the small valleys of the region. As a result, both the Gunder Member and Corrington Member have a high potential for containing buried deposits of Paleoindian and Archaic occupation sites, and a somewhat lower potential for containing buried Early Woodland occupation sites. Corrington Member fans experienced their major accumulation between 8500 and 2500 B.P., while the Gunder Member accumulated between 11,000 and 4000 B.P. (Bettis and Littke 1987).

After 4000 B.P., streams began to downcut and constructed lower floodplains, forming the Roberts Creek Member of the DeForest Formation, which continued developing until ca. 450 B.P. Hence, the Roberts Creek Member could only contain buried archeological deposits of Woodland and Late Prehistoric ages. Finally, starting as early as 450 B.P., and greatly accelerated by Euro-American modifications to the landscape, the Camp Creek Member began accumulating and is continuing to bury early members to this day (Bettis and Littke 1987).

## Soils

The soils that form on a particular landscape are influenced by five factors, the climate, living organisms, topography, parent materials, and time. The soils that have formed in different regions of Iowa reflect all these factors. The primary parent materials upon which Iowa's soils developed are glacial till, loess, and alluvium. These are materials that are all weathered before they are transported and deposited. Till and loess form the parent material for approximately 40% of Iowa's soils each. As a result, most soils in Iowa are silt loams, or silty clay loams, with loams predominating on the Des Moines Lobe. Around 5% of Iowa's soils formed on bedrock of limestone, dolostone, and shale. These soils are largely restricted to the Paleozoic Plateau Region of northeastern Iowa and to the deepest river valleys (W. Anderson 1983). Since the climate is relatively uniform across the state, it has played only a minor role in the differentiation of Iowa's soils. The type of vegetation growing on a landscape is the third major factor influence affecting soil development. Since most of Iowa has been covered by prairie vegetation throughout the Holocene, Mollisols tend to be the predominate soil type. Eastern Iowa, and stream valleys that contained gallery forests have produced Alfisols on their

landscapes, and floodplains, especially where the Camp Creek Member forms the surface deposit, contain Entisols and Inceptisols. Histosols have formed in a few bog and fen areas on the Des Moines Lobe.

Topography is the fourth principal factor in soil development. Soils on slopes tend to be thin, as erosion outstrips pedogenic development, while alluvial soils tend to be much deeper, often with overthickened A Horizons, as new parent material is constantly being added to the solum. The final major factor influencing soil development is time. The longer the soil has to develop, the more time there is for leaching and development of well expressed horization. Therefore, the most developed soils are found on the Iowan Erosion Surface in northeast Iowa, followed by those of the Southern Iowa Drift Plain, with the youngest soils being found on the Des Moines Lobe and in alluvial areas of eastern and western Iowa (W. Anderson 1983).

## Vegetation

Iowa is located in the heart of the Prairie Peninsula, a finger of tall grass prairie extending eastward into the central portion of the eastern woodlands. At the time of Euro-American colonization of the region, prairie was the predominate vegetation over most of the state. Figure 4 shows the vegetation of Iowa at the time of Euro-American encroachment, as reconstructed from the original General Land Office surveys of the state. As can be seen, forest, mostly oak-elm, with some hickory, was largely restricted to gallery forests along river valleys, and the Paleozoic Plateau Region of northeast Iowa. Another large area of forest was present in southeast Iowa. These forest areas consisted largely of oak savanna, with many clearings, and a general parkland appearance. The rest of the state was largely covered by upland prairie, with oak savanna on sideslopes, and gallery forests and lowland prairies in the stream valleys (W. Anderson 1983, Prior 1991).

## Landform Regions

Iowa can be divided into seven landform regions on the basis of its Pleistocene history and landform development. These are the Northwest Iowa Plains, The Des Moines Lobe, the Iowan Erosion Surface, the Paleozoic Plateau, the Loess Hills, the Southern Iowa Drift Plain, and the Missouri and Mississippi River Alluvial Plains. And interesting feature known as the Lake Calvin basin is included in the Mississippi River Alluvial Plain (Prior 1991).

### Northwest Iowa Plains

The Northwest Iowa Plains consist of loess mantled, gently rolling erosional surfaces formed on glacial till during early Wisconsinan times. In the western half of the region, pre-Illinoian till forms the substrate of uplands, while the eastern half is underlain by till deposited by the early Wisconsinan Tazewell advance of the Des Moines Lobe. Following this deposition, however, during the coldest part of the Wisconsinan (16,500-21,000 B. P.), the same erosive forces that formed the Iowan Erosion Surface to the east of the Des Moines Lobe acted on these deposits, leveling them into a gently rolling plain of swells and swales, drained by a well integrated dendritic drainage network (Prior 1991). During later Wisconsinan time, a relatively thick mantle of loess was deposited over the region, thinning from around 16 feet in the west to around 4 feet in the east. This loess deposition, and prairie vegetation as opposed to mixed woodland, serve to distinguish

this landscape region from its analogous region on the east of the Des Moines Lobe, the Iowan Erosion Surface (Prior 1991). The Northwest Iowa Plains are also uniformly higher than other land surfaces in Iowa, and the state's highest elevation is recorded in this region.

### Des Moines Lobe

The Des Moines Lobe is Iowa's youngest landform region and consists of the till plain and end moraine systems left in the wake of the Des Moines Lobe's intrusion into north-central Iowa during Late Wisconsinan (Cary) times, ca. 12,000 to 14,000 B.P. The land surface in this region consists of glacial till, unmantled by loess. Topography is generally level, and, because of the youth of the landscape, drainage is poorly developed. Numerous wetlands, fens, and kettle lakes occur in this region. Indeed, nearly all of Iowa's natural lakes are located on the Des Moines Lobe (Prior 1991). Kames and eskers are also present on this young land surface, as well as prominent moraine systems. The Des Moines River forms the primary drainage for this region and is one of the few deeply incised streams.

### Iowan Erosion Surface

Much like the Northwest Iowa Plains, the Iowan Erosion Surface is a result of intensive wind and water erosion during the heart of the Wisconsinan. Originally considered to represent a pre-Tazewell glacial advance, known as the Iowan, this region is now recognized to represent heavily eroded pre-Illinoian till, formed between 16,500 and 21,000 B.P. The resulting region is one of subtle topography, with gently swells and swales. Although loess deposition was taking place during the time of the formation of this surface, the intense erosion overwhelmed deposition, and the surface generally lacks loess cover. This is an important characteristic in distinguishing between this landform region and the Northwest Iowa Plains (Prior 1991). The pre-Illinoian deposits also tend to be much thinner in this region, and bedrock is found much closer to the ground surface. A prominent stone line is apparent in the deposits of this region, marking the erosion surface, and scattered remnants of loess-capped uneroded sediments called paha ridges occur in the southern portion of the region and are aligned from northwest to southeast, indicating the direction of the prevailing winds of the time (Prior 1991). Glacial erratics are also quite common in this region. In the northern portion of this region, the bedrock is especially shallow, and karst features, especially sinkholes, are quite common due to the solubility of the underlying Devonian bedrock (Prior 1991).

### Paleozoic Plateau

The Paleozoic Plateau is a unique region within Iowa. Aside from isolated patches of pre-Illinoian till, the landscape is not affected by Pleistocene glaciation. Here, bedrock lies near the surface, and streams are deeply incised into it as they seek the base level of the Mississippi River (Prior 1991). In this region, bedrock is in nearly complete control of the topography, and drainage is largely structurally controlled. More resistant layers of bedrock form ledges, cliffs, and pinnacles. The most visible of these is the Silurian Escarpment, which is the leading edge (cuesta) of Silurian dolostone that dips to the south and west. This was formerly known as the Niagaran Escarpment and is the same feature that forms Niagara Falls (Prior 1991). The bulge in Iowa's eastern border is caused by deflection of the Mississippi River by the



resistant rocks of the Silurian escarpment as they cross it. To the northeast of the Silurian Escarpment, the durable Galena and Prairie du Chien groups also form escarpments as they cap softer underlying rock layers. Sinkholes and springs and ice caves are also common to this region of the state (Prior 1991). Major rivers of the region are the Upper Iowa (Oneota), the Yellow River, the Turkey River, and the Volga River. These rivers exhibit steep, narrow, incised valleys as they seek the Mississippi River base level.

#### Loess Hills

On the other end of the state, just to the east of the Missouri River Alluvial Plain, is another region unique to the state, the Loess Hills. These steeply sloping hills are formed of thick deposits of wind blown silt of Illinoian and Wisconsinan ages. These silts were blown up from the Missouri River floodplain when it was acting as an outwash channel for glacial meltwater. During winters, when water levels were lower, large expanses of loose silty sediments were exposed to the prevailing westerly winds. These winds raised huge clouds of dust, which dropped along the eastern Missouri River Valley wall. There, a thick blanket of loess, as much as 200 feet thick in places, was deposited from Middle to Late Pleistocene times, mostly before ca. 14,000 B.P. Minor loess deposition, widespread hillslope erosion, and extensive cutting and filling in stream valleys since 14,000 B.P. have created a distinctive, rugged terrain (Prior 1991). The topography of this region is very sharp, with peaks and saddles that form narrow, crooked ridge crests. Drainage is dense and forms closed-in hollows, narrow ravines, and steep-sided gullies. The fine texture of the sediments gives them distinctive landscape-forming capabilities, and they are able to maintain a vertical face and form slabs, columns, and vertical tunnels, called pipes, when they erode (Prior 1991). The loess also buries and contains several layers of volcanic ash, providing an important correlative tool and historic record of volcanism in the western United States (Prior 1991).

#### Southern Iowa Drift Plain

Moving eastward, the loess thins rapidly, and we find ourselves in Iowa's largest landform region, the Southern Iowa Drift Plain. The Southern Iowa Drift Plain is a dissected plain of pre-Illinoian till mantled by Illinoian and Wisconsinan loess. In extreme eastern Iowa, this surface was formed on Illinoian till. "The topography of this region is best described as one of steeply rolling hills interspersed with areas of uniformly level upland divides and level alluvial lowlands" (Prior 1976:45). Erosional forces in post-Illinoian time have created an integrated, well drained landscape blanketed by a moderate to thick loess cover. Pre-Illinoian and Illinoian till and underlying sedimentary bedrock are exposed in the deeper stream valleys. A paleosol developed during Yarmouth-Sangamon times on the underlying till and is often exposed on hillslopes in the region.

#### Alluvial Plains

The final landform region in Iowa is not really a region at all, but are topographic localities spread throughout the state. This region consists of the floodplain deposits of Iowa's major and minor streams and rivers, the two most prominent of which are the Missouri and the Mississippi. These are relatively level landscapes adjacent to waterways. Lateral accretion has resulted in the construction of a ridge and swale topography, with oxbow lakes, cutbanks, and point bar deposits. Thick layers of alluvium form the substrate of these

landforms, and overlie earlier deposits of glacial till, outwash, or bedrock (Prior 1991). Floodplains generally represent the youngest deposits of the state and continue to evolve, ever changing as the rivers and streams continue their meandering ways. Earlier, higher floodplain levels may be represented as benches and terraces inset within each other, gradually stepping down from the uplands to the modern floodplain level. An interesting feature contained within this region is the Lake Calvin basin in Louisa, Johnson, and Muscatine counties. This broad flat area along the Iowa River Channel was once thought to be the remains of a glacial lake formed as Illinoian ice blocked the flow of the Iowa-Cedar rivers. Recent research has demonstrated that the deposits are Wisconsinan in age, however, and fluvial in origin. It seems likely that the Lake Calvin deposits are a result of a complex alluvial history during Wisconsinan times (Prior 1991).

#### Iowa's Holocene Vegetational Change

During the 12,000 years since the last of the glaciers left the state, Iowa has experienced a number of changes in the types of vegetation covering its landscapes. As the Des Moines Lobe reached its maximum advance, moist and very cool conditions prevailed across the state, and a mixed coniferous, boreal forest of spruce and larch covered most of the state (W. Anderson 1983). Some areas of tundra may have existed in the immediate periglacial region (Webb, Cushing and Wright 1983). As the Des Moines Lobe rapidly retreated northward, the climate ameliorated, and the boreal forests followed it to the north. By around 11,000 B.P., there is a decline in spruce and larch pollen, and an increase in birch and alder, indicating a shift to northern deciduous forest species (Kim 1986; Van Zant 1979). In central Iowa, spruce disappears entirely by 10,200 B.P. (Kim 1986), however, it appears to remain dominant until nearly 9000 B.P. in northeastern Iowa (Chumbley 1988; Chumbley et al. 1990). As the climate continued to warm, oak-elm deciduous forest gradually replaced the more northerly species across the landscape. This shift occurred around 11,000 years ago in northwestern Iowa (Van Zant 1979), around 10,000 B.P. in southeastern Iowa (Baker and Whelan 1992), and as late as 9100 B.P. in northeastern Iowa (Chumbley et al. 1990). Around 10,000 B.P., hickory moved into eastern Iowa and has remained as a minor constituent of the deciduous forest of the region.

During the middle of the Holocene, a climatic optimum occurred, with warmer and drier conditions than today prevailing across the central United States. This period is referred to as the Hypsithermal or Altithermal period. During this warm dry period, prairies expanded beyond their modern day ranges at the expense of deciduous forests, and the prairies first spread throughout Iowa during this time (Webb, Cushing and Wright 1983). The shift to prairie began around 9000 B.P. in northwestern Iowa (Van Zant 1979), around 8300 B.P. in central Iowa (Kim 1986), 7600 B.P. in southeastern Iowa (Baker and Whelan 1992), and, perhaps as late as 5400 B.P. in northeastern Iowa (Chumbley et al. 1990). The prairie persisted until around 3500 B.P., when cooler, more moist conditions returned. Since that time, deciduous forest and prairie savanna similar to the vegetational cover at the time of Euro-American colonization of the state have dominated the landscape.

This three part division of the Holocene is generally accepted, and some have argued that it is the most appropriate way of understanding Holocene climatic change (Wright 1976). Others, however, have argued that although Holocene climatic fluctuations

were not as dramatic as those of the Pleistocene, a more complex series of environmental fluctuations can be discerned, and that the Holocene can be subdivided into many intervals of distinctive climatic regimes. Baerreis and Bryson (1965; Bryson et al. 1970) have proposed subdividing the Holocene into 10 climatic episodes. A short description of each of these episodes follows.

**Pre-Boreal (10,500-9650 B.P.) and Boreal (9650-8450 B.P.):** Around 10,500 B.P., pollen profiles show a sudden shift from the species represented in late glacial assemblages. This shift is interpreted as representing a shift in atmospheric circulation patterns from late glacial times. Steppe vegetation replaced spruce forest over much of the Northern Plains, and deciduous forest began replacing spruce larch forest over much of Iowa. By around 9650 B.P., retreating ice on the Northern Great Plains created a corridor for cold arctic air to flow southward into the midcontinent. This change marked the beginning of the Boreal episode (Hoffman and Jones 1970) and created an increasingly continental climate, with colder winters and warmer summers than the preceding Pre-Boreal episode. A wedge of dry air, maintained by prevailing westerly winds, would have spread eastward through Manitoba, Minnesota, Wisconsin, and Illinois (Hoffman and Jones 1970).

**Atlantic (8450-4680 B.P.):** As the continental glaciers continued their rapid melting, the southward corridor widened, allowing stronger and stronger flows of arctic air to the south. The prevailing westerlies strengthened, and pushed the Prairie Peninsula eastward of its present boundaries, as far as Indiana. This eastward maximum was attained sometime around 7000 B.P. (Hoffman and Jones 1970). During this time period, nearly all of Iowa was covered by prairie vegetation. The warmer conditions also allowed coniferous and deciduous forests to move northward beyond their present boundaries. This period corresponds with the Hypsithermal or Altithermal climatic optimum of the tripartite division of the Holocene.

**Sub-Boreal (4680-2890 B.P.):** By the beginning of this episode, the Prairie Peninsula occupied approximately its present position. A shift to the south of the summer and winter arctic frontal zones would have had a cooling effect on the climate from its Atlantic optimum, and, by the end of this episode, the climate may have been much like the modern climate of the region (Hoffman and Knox 1970).

**Sub-Atlantic (2890-1690 B.P.):** During this episode, it is suggested that upper air shifts resulted in a colder, wetter climate (Baerreis and Bryson 1965).

**Scandic (1690-1050 B.P.):** The Scandic episode represented an amelioration of the Sub-Atlantic climate, and warmer, drier conditions are suggested to have obtained in the central United States (Baerreis and Bryson 1965).

**Neo-Atlantic (1050-760 B.P.):** During this episode, the warming trend begun during Scandic times continued, but abundant summer rainfall returned to the central United States. Glaciers retreated in the Rocky Mountains, and the Arctic was devoid of permanent sea ice (Baerreis and Bryson 1965).

**Pacific (760-410 B.P.):** Around A.D. 1250, there appears to have been an atmospheric shift from predominately meridional to zonal flow. Such atmospheric flow patterns result in drier conditions in Iowa, and caused the Prairie Peninsula to again shift eastward from its present location (Baerreis and Bryson 1965).

**Neo-Boreal (410-115 B.P.):** This episode has often been referred to as the Little Ice Age. The polar storm track shifted to the south,

and the climate became much cooler and moister. Glaciers advanced in mountain ranges, growing seasons were shortened, and summers were cooler in the Upper Midwest. This climatic episode is well documented from historic records from both Europe and the United States. This episode seems to have ended with the shift to the Recent climatic episode, beginning around 1880 (Baerreis and Bryson 1965).

Although the cool, wet Little Ice Age is a well documented climatic phenomenon, the other subdivisions are not universally recognized or accepted. Indeed, some feel that these subdivisions are more fine grained than the data can support (Wright 1976). However, recent work on alluvial responses to climatic fluctuations (Knox 1983; Thompson and Bettis 1980; Bettis and Thompson 1981), tend to support the subdivision of the Holocene into more than three categories. As Knox (1983) points out, the tripartite division gives the false impression that the early Holocene and the late Holocene were similar climatically, while atmospheric circulation patterns were quite different during the two periods, producing quite different results in the river systems of the United States. Only further, detailed studies will be able to refine our understanding of Holocene climatic change.

## Wisconsin

The State of Wisconsin is located in the northeast corner of the study area and at the northeast edge of the prairie. It is situated between 42° 30' and 47° North latitude. Its northern boundary is formed by Lake Superior and the southwest edge of Michigan's Upper Peninsula. On the south Wisconsin is bordered by Illinois. Minnesota lies to the west of Wisconsin and their border is formed by the Mississippi and St. Croix rivers. Lake Michigan forms the eastern border of Wisconsin.

## Climate

Wisconsin presently has a temperate, continental climate. Its winter and summer temperature extremes are somewhat ameliorated by the presence of two Great Lakes at its northern and eastern borders. Its weather is presently controlled by the prevailing westerlies, and variations in temperatures and storm patterns are tied to the fluctuating position of the jet stream. The mean annual temperature is 43° F., but this ranges from over 47° in the south to under 39 in the north (Martin 1965). Temperature extremes range from summer highs over 110° to winter lows below -50°. The mean annual precipitation is 31 inches ranging from 27 to 34 inches (Martin 1965). Precipitation is in the form of snow in winter and rainfall in summer. The humid climate and relatively even distribution of rainfall during the warm season supports a woodland vegetation cover and results in balanced runoff and minimal erosion.

## Water Resources

Wisconsin has abundant water resources which reflect its Pleistocene and Holocene history. Its water resources include two Great Lakes, several large glacial lakes, and thousands of small glacial lakes. Numerous large and small wetlands dot the glaciated landscape. Land areas are drained by streams and rivers into the Mississippi River or Great Lakes drainage basins.

Two of the Upper Great Lakes contribute to Wisconsin's northern and eastern borders. Lake Superior on the north is particularly deep



and clear. Although most of the south shore of Lake Superior is part of Michigan's Upper Peninsula, Wisconsin's Bayfield Peninsula extends into the west end of the Lake. The Apostle Islands extend into Lake Superior off the tip of the Peninsula. Lake Michigan forms the state's eastern boundary. The Door Peninsula extends into the northeast portion of Lake Michigan and a chain of islands extend from its tip to the Garden Peninsula of Michigan's Upper Peninsula. The portion of Lake Michigan lying west of the Door Peninsula is called Green Bay.

Most of Wisconsin's major rivers flow eventually to the Mississippi River which forms the western boundary of the state. The Wisconsin River has its headwaters in the north-central glaciated area and drains to the south and west entering the Mississippi River at Prairie du Chien. Northwest of the Wisconsin River, the Black, Chippewa, and St. Croix rivers also drain from the Northern Highlands south and southwest into the Mississippi. The St. Croix River forms the state's northwestern boundary. In the southeastern part of the state, the Rock River drains south into Illinois, eventually joining the Mississippi River across from Davenport, Iowa. The northeast is drained by the Menominee, Wolf, and Fox rivers into Lake Michigan. The Menominee River forms part of the northeast border of the state. Several short rivers drain into Lake Michigan along the east side of the state and into Lake Superior along the northwest side.

## Geology

Wisconsin includes portions of two major physical provinces: the Canadian Shield and the Stable Interior. A southern extension of the Canadian Shield known as the Superior Upland underlies the north-central third of Wisconsin. Bedrock in the Superior Upland is composed of metamorphic and igneous rocks dating to Precambrian times. These rocks have been intensely folded, faulted, erupted, and eroded over their long existence, and their history is poorly understood. The Central Lowlands section of the Stable Interior underlies the southern two-thirds of Wisconsin. Here bedrock consists of nearly level sedimentary deposits that are Paleozoic or younger in age. During the Paleozoic, as inland seas formed new sedimentary deposits across the state, subsidence occurred to the east, south, and west. The gradual subsidence created the Michigan, Illinois, and Forest City basins and left the Wisconsin Arch as higher land across northern and central Wisconsin. The Paleozoic sediments have tilted into their basins, and their eroded margins now form concentric bands of sedimentary rocks along the eastern, southern and western margins of the state. Resistant units formed ridges and cuestas. In most areas of the state, the bedrock is overlain by glacial deposits dating to the Pleistocene. Although most of the southwestern part of the state was not glaciated, its landscape has been modified by substantial loess deposition associated with glacial events and deglaciation.

### Precambrian

The Precambrian geologic history of Wisconsin is complex and incompletely understood because most of the deposits are deeply buried. Outcrops of Precambrian rock are found along the Superior Syncline at the north edge of the state. Precambrian bedrock also directly underlies the glacial drift across the Superior Upland.

The earliest Early Precambrian rocks of the region include shales, lava flows, and igneous intrusives that were metamorphosed during later mountain building events. After an erosional period, Middle Precambrian Animikean sedimentary rocks were deposited, uplifted,

eroded, and intruded by igneous events. Animikean rocks are exposed in extreme northeastern Wisconsin and contain iron ores which were mined extensively in the nineteenth and twentieth centuries.

Around 1.6 billion year ago, the northern Wisconsin region was uplifted by the Penokean mountain-building episode which produced complexly folded and faulted formations that included metamorphic and igneous rock. The Penokean Mountains extended east-west across northern Wisconsin and the Upper Peninsula. During the late Precambrian, the northern edge of the area began to subside forming the Lake Superior Syncline, and the Penokean Mountains were eroded. Around this time the quartzites and granites of north-central Wisconsin may have been forming (Paull and Paull 1977:32). Subsequently the Portage Lake lava flows were deposited in the Superior Syncline from a volcanic belt that extended from Michigan across northern Wisconsin and into Minnesota and Kansas. At about 1.1 billion years ago, volcanic activity ceased and conglomerates and shales were deposited in the syncline. Copper minerals formed and were deposited within the igneous and sedimentary rocks of the region. These deposits were mined first by American Indians during the Middle to Late Archaic periods, and probably by subsequent prehistoric groups. The copper deposits were also extensively mined during the nineteenth and twentieth centuries by Euro-Americans. The final Precambrian deposit is the Freda sandstone. The Lake Superior Syncline accumulated up to 40,000 feet of lava, sandstone, and conglomerate during the Precambrian (Paull and Paull 1977:25-33).

Several varieties of Precambrian rocks were important to prehistoric peoples as raw materials for making chipped stone tools. Metamorphic quartzites including Barron Quartzite, Baraboo Quartzite, and Waterloo Quartzite were quarried across the Superior Upland (Morrow and Behm 1986). Quartz outcrops associated with igneous intrusions through Precambrian rock were quarried in northeast Wisconsin and probably elsewhere (Van Dyke 1985; Benchley and Whitman 1989). Quartz also was abundant in the glacial tills of the region. Quartz was a particularly important raw material in northern Wisconsin during Late Woodland times (Salzer 1969, 1974). Rhyolite, also an igneous component of Precambrian formations, was quarried at localized outcrops in east-central Wisconsin (Dirst 1985; Behm 1988) and probably in northern Wisconsin (Salzer 1969; Brazeau et al. 1990). Rhyolite was used to make projectile points and chipped stone adzes during the Late Paleoindian period in northern and eastern Wisconsin (Salzer 1969; Dirst 1985; Behm 1988; Clark 1993). As previously mentioned, Precambrian copper-bearing formations also provided important raw material for the manufacture of various copper tools and ornaments from Middle Archaic through Historic times. There are no Precambrian chertbearing deposits in Wisconsin that were used by prehistoric peoples.

### Cambrian

The Cambrian is also not well known, in part because erosion may have removed much of the geologic record. A quartz-rich, nonfossiliferous sandstone was deposited in northwest Wisconsin apparently during the Lower to Middle Cambrian. The age of this Bayfield Group (called Hinckley Sandstone and Fond du Lac formation in Minnesota) alternatively may date to the late Precambrian (Paull and Paull 1977:34). During the Upper Cambrian, the region was intermittently under sea water and sandstones were deposited across the state. Subsequent formation of the Wisconsin Arch by subsidence

of surrounding regions resulted in sediments being eroded from north and central Wisconsin. Cambrian sandstone, shaley sandstone, and sandy dolostone underlie glacial deposits in central and western Wisconsin and outcrop as spectacular rock formations in the unglaciated area of the southwest.

A localized exposure of Upper Cambrian silicified sandstone was a particularly important source for the distinctive Hixton Silicified Sandstone (Hixton Quartzite, Sugar Quartz) in west-central Wisconsin (Porter 1961; Paull and Paull 1980; Morrow and Behm 1986). Hixton was used to make chipped stone tools from Paleoindian through Mississippian times. It is particularly common at Late Paleoindian sites. Hixton points are also common at some Oneota sites and have been found as far south as the Cahokia site in Illinois during Middle Mississippian times. Alma Silicified Sandstone (Alma Quartzite) is a similar, but lesser quality raw material found in west-central Wisconsin along the Mississippi River trench (Morrow and Behm 1986; Penman 1981).

### Ordovician

During the Ordovician, the cyclic transgression and regression of the seas from the surrounding basins onto the emerging Wisconsin Arch continued from the Upper Cambrian. Sandstone beds alternate with dolostone and limestone formations and shales. These rock types reflect the seascape positions and lifeforms present during deposition. Unconformities between layers indicate a period when the seas regressed, and the exposed rocks were subjected to erosion. Ordovician age rocks are exposed in concentric rings on the east, south, and west sides of the Wisconsin Arch. Ordovician age sediments in Wisconsin include the Prairie du Chien Group, St. Peter Formation, Platteville-Galena Formation, and Maquoketa Formation from oldest to youngest (Paull and Paull 1977).

The Lower Ordovician Prairie du Chien Group is composed of the Oneota Dolostone, the New Richmond Sandstone, and the Willow River Dolostone, from oldest to youngest. The New Richmond Sandstone and Willow River Dolostone are lumped together as the Shakopee Formation, which is separated from the underlying Oneota formation by an unconformity. The Prairie du Chien Group forms the more resistant cap rock for the erodable underlying Cambrian sandstones in southern and western Wisconsin. The Lower Ordovician Au Train Formation of northern Michigan is a similar caprock over Cambrian sandstones along the northern margin of the Wisconsin Arch (Paull and Paull 1977).

The dolostones of the Prairie du Chien Group contain abundant chert used in the manufacture of stone tools prehistorically. According to Morrow and Behm (1986) Prairie du Chien nodular cherts are commonly oolitic and often have marbled and swirled patterns. The cherts are gray to tan in color and also have a distinctive orange color phase. In southern Wisconsin, the cherts from the Oneota and Shakopee formations cannot be consistently distinguished based on oolites or color (Morrow and Behm 1986:15-16).

The Middle Ordovician follows a regional uplift with a regression of the seas and an erosion interval at the end of the early Ordovician. The Middle Ordovician includes the St. Peter Sandstone, the Glenwood Formation, and the Platteville-Decorah-Galena formations, from oldest to youngest. The St. Peter Sandstone was deposited during a

transgression episode. The formation is a well sorted, distinctively white quartz sandstone which is underlain by a basal conglomerate in Wisconsin (Paull and Paull 1977). The St. Peter Sandstone grades up into the dolostone, sandstone, and shale of the Glenwood Formation. A continuation of the same transgression formed the overlying Platteville-Galena dolostones. The Platteville Formation is composed of dolostone and limestone members. It is overlain by the Decorah formation which consists of shale, volcanic ash, limestone, and fossiliferous shale layers. The uppermost member contains zinc ore which was mined in southwest Wisconsin during the nineteenth century. The Galena Formation consists of dolomitic limestones, bedded dolostones, and shales.

The massive Galena Dolostone contains important rock and mineral resources. The Galena Chert is found in eastern, southern, and southwestern Wisconsin and along the southern margin of the Upper Peninsula (Morrow and Behm 1986). The nodular chert is often found in beds in the Galena Formation. It is light gray in color with mottles or wavy banding. Small broken white pieces of fossils are often present, as are dark fossil borings. Lead ore is also present in the Galena Formation and was intensively mined during the early to mid-nineteenth century in southwestern Wisconsin, northwest Illinois, and eastern Iowa (Paull and Paull 1980).

The Late Ordovician begins after an unconformity with the deposition of the Maquoketa Shale which is composed of muds from the uplifted and erosion of the Appalachians (Paull and Paull 1977). The Maquoketa Shale is exposed as a basal member along the Niagara Escarpment in eastern Wisconsin. Above the Maquoketa Shale lies the Neda Formation which could be terminal Ordovician or early Silurian in age (Paull and Paull 1977). The Neda Formation contains an unusual sedimentary iron ore which was mined in eastern Wisconsin during the late nineteenth and early twentieth centuries (Paull and Paull 1977).

### Silurian

The Silurian is characterized by a major transgression during which 400 to 600 feet of dolomites were deposited. The dolomites outcrop across eastern Wisconsin and a few outliers are present in western Wisconsin. The erosion-resistant dolomites slope gently toward the Michigan basin, and the formation edge forms the Niagara Escarpment. Silurian dolomites form the Door Peninsula of Wisconsin which extends northeast into Lake Michigan. In southeast Wisconsin and northeast Illinois are a series of Silurian reefs which formed at the edge of the inland sea. The reefs are visible as dolomite outcrops, and many were mined for the production of lime during the late nineteenth century (Benchley 1989).

Two varieties of Silurian cherts have been identified in Wisconsin. Cherts from the Lower Silurian occur in nodules or nodular bands. They are light colored (white to pale pink) and may have very small crinoid, brachiopod, or coral fossil inclusions. The chert sources are found in northeast Iowa and northwest Illinois and in eastern Wisconsin and northeast Illinois (Morrow and Behm 1986).

The second Silurian chert variety is found in the Door Peninsula and is a nodular chert. Its color ranges include light gray, blue gray, greenish gray, and brown. It may often exhibit banding, particularly in the gray to green color series (Morrow and Behm 1986).

## Devonian

The only Devonian deposits remaining in Wisconsin are found in the extreme southeastern part of the state. Middle to Upper Devonian rocks in the Milwaukee area include dolomite, limestone, and shale (Paull and Paull 1977). There are no Devonian chert sources in Wisconsin.

## Mississippian and Pennsylvanian (355 Million-265 Million)

Although Mississippian seas probably extended across much of Wisconsin, subsequent uplifting following the Lower Mississippian and extended erosion periods have eliminated Mississippian deposits from the landscape (Paull and Paull 1977). Mississippian and the later Pennsylvanian deposits in Illinois and Iowa include many high quality cherts (Morrow 1984), which were probably obtained through trade and used by some Wisconsin peoples. The Pennsylvanian coal deposits so abundant in Iowa and Illinois are absent from Wisconsin.

## Mesozoic and Cenozoic (230 Million-2 Million)

Wisconsin appears to have been predominantly eroding, exposed land following the Upper Mississippian since no later marine or swamp deposits are present. Nonmarine Cretaceous sediments are found in patches in the unglaciated section of southwest Wisconsin. The deposits of the Windrow Formation are iron-rich clays and gravel deposits. The gravels suggest a fluvial origin, and petrified wood in the deposits indicates a dry land context. These data suggest a landscape setting similar to the modern environment (Paull and Paull 1977).

## Quaternary (Pleistocene and Holocene)

Although much of Wisconsin was covered with glacial ice throughout the Pleistocene, the early drift was subsequently scoured or buried by later glacial advances and retreats. Today Wisconsin-age drift blankets most of the state. The southwestern part of Wisconsin, known as the Driftless Area, appears to have been unglaciated throughout the Pleistocene (Mickelson et al. 1982). Pre-Wisconsinan tills and lacustrine deposits have been identified in river valleys along the north and west margins of the Driftless Area (Attig et al. 1988), and in buried contexts elsewhere in the state.

During the Wisconsinan stage, Laurentide glacial ice entered Wisconsin from the north in several lobes of ice. On the east, the Lake Michigan Lobe moved down the Lake Michigan basin from the northeast and may have extended as far west as Rock County during the Early Wisconsinan (Schneider 1983; Attig et al. 1988). Northeast and east-central Wisconsin were covered by the Green Bay Lobe which entered the region from the northeast. The Superior, Chippewa, and Ontonagon/Wisconsin Valley lobes entered the region from the north and northeast and covered the northern part of the state. The Wisconsinan ice entered and retreated in numerous pulses which varied in their areal extent and timing. Surficial deposits of till, outwash, and glacial lake beds provide a complex record of the final episodes of glaciation and deglaciation.

Five time-stratigraphic substages have been identified during the Wisconsinan (Paull and Paull 1977; Schneider 1983; Evenson et al. 1976): the Altonian, Farmdalian, Woodfordian, Two Creeks, and Greatlakean. The Altonian, Woodfordian, and Greatlakean are glacial advances, and the Farmdalian and Two Creeks are periods of glacial retreat. The episodes date from before 40,000 B.P. to approximately 11,000 B.P. A final Marquette glacial advance dating to approximately

9,800 B.P. has been identified for the Lake Superior basin (Farrand and Drexler 1985).

Pre-Woodfordian tills in southeast Wisconsin were deposited by the Lake Michigan Lobe and have been identified in several units in Rock and Walworth counties. The units include the Mid-Altonian Walworth Formation and Late Altonian Capron Member of the Zenda Formation (Schneider 1983). In northern Wisconsin, the southernmost ground moraines are pre-Wisconsinan or Early Wisconsin in age and lie as far south as Pierce, Eau Claire and Portage counties. These early formations include the Pierce Formation of the Northwest Lobes, the Marathon and Lincoln formations of the Chippewa Lobe, and the River Falls Formation of the Superior and Chippewa lobes (Attig et al. 1988). The Keene Member of the Horicon Formation of the Green Bay Lobe also may be early Wisconsinan or older.

Late Woodfordian tills blanket most of the glaciated portions of the state and their end moraines form distinctive ridges on the landscape. In northern Wisconsin, terminal moraines of the Superior, Chippewa, and Wisconsin Valley Lobes are found from St. Croix County east through Chippewa, and Taylor counties to Langlade County and mark the Cary substages (13,500-14,000 B.P.) of the later Woodfordian (Attig et al. 1988; Hansel et al. 1985). The subsequent Port Huron Advance (12,000-13,000 B.P.) is marked by end moraines which extend west to east from Douglas to Vilas counties (Attig et al. 1988; Anonymous 1964). Following the Two Creeks retreat (11,800 B.P.), the Greatlakean ice extended south beyond Duluth and across northern Wisconsin from Douglas through Iron counties (Farrand and Drexler 1985). A final Marquette Readvance (9,800 B.P.) is marked by tills near Duluth, in northern Bayfield and Iron counties, and across the Upper Peninsula of Michigan (Drexler 1981; Hansel et al. 1985). Glacial and preglacial lakes were probably associated with all these advances and retreats, but evidence for them in northern Wisconsin has been obscured by the final Marquette Advance and Post-Duluth lakes (Farrand and Drexler 1985).

In eastern Wisconsin early Woodfordian tills associated with the Tazewell Advance are evidenced in western Walworth County. The distinctive pinkish sandy till dates to 18,000-20,000 B.P. and is associated with the Lake Michigan Lobe (Schneider 1983). The end moraines of the late Woodfordian Lake Michigan Lobe parallel the modern Lake Michigan shoreline from Chicago north to the Door Peninsula. The Cary advances (16,000-14,000 B.P.) created the sandy gravel ground moraine of the New Berlin Formation across Walworth, Waukesha, and Washington counties and the later illite tills of the Oak Creek Formation of Kenosha, Racine, and Milwaukee counties (Schneider 1983). Following the Cary-Port Huron Retreat, the Port Huron advances (13,200-12,200 B.P.) produced the red clayey tills of the Kewaunee Formation. The red clays suggest that materials from the Lake Superior basin had been introduced into the Lake Michigan Lobe. The short-lived Two Creeks Retreat (12,200-11,800 B.P.) allowed for the establishment of spruce forest in eastern Wisconsin which was flooded and buried by subsequent glaciation. The subsequent Two Rivers Advance (11,800-11,200 B.P.) also introduced red clayey tills into eastern Wisconsin as far south as Manitowoc County. The Two Rivers Advance marks the beginning of the Greatlakean glacial substage and is the final glaciation in the Lake Michigan basin (Evenson et al. 1976).

End moraines of the late Woodfordian Green Bay Lobe extend in large U shaped arcs across most of the eastern half of the state. The

Cary advances produced ground and terminal moraines of the Horicon Formation (16,000-13,500 B.P.) which extend as far south as Rock County and west to Sauk and Marathon counties and cover much of eastern Wisconsin (Schneider 1983). Thousands of drumlins are associated with the Horicon formation. Glacial Lake Wisconsin formed along the western margin of the Green Bay Lobe in Adams County when the ice blocked the Wisconsin River outlet through the Baraboo Range (Paull and Paull 1977). Following the Cary-Port Huron Retreat, red clay tills associated with the Kewaunee Formation were deposited north of Lake Winnebago during the Port Huron advances (13,200-12,200 B.P.). After the Two Creeks retreat ended at 11,800 B.P., the Two Rivers ice extended as far south as Brown and Outagamie counties and glacial Lake Oshkosh formed at the ice margin (Attig et al. 1988; Hansel et al. 1985).

Meltwaters from various glacial episodes and deglaciation produced significant landscape changes in the form of preglacial lakes and rivers. The major preglacial lakes were associated with the current Lake Superior and Lake Michigan basins. The expansion and contraction of the various glacial and modern lakes during the Late Wisconsinan and Holocene are tied to a series of interrelated factors including meltwater volume, availability of outlets, isostatic rebound, lake levels, climate, and precipitation (Larsen 1985a, 1987). These factors along with vegetation cover also contribute to the fluvial dynamics of meltwater and modern river systems (Knox 1983). A detailed discussion of these variables is beyond the scope of this presentation.

A series of glacial and postglacial lakes occupied the Lake Michigan basin (Hansel et al. 1985). Glacial Lake Chicago was present between 15,000 B.P. and 11,000 B.P. During this period the Glenwood I lake level was initially higher than the modern level with the outlet at Chicago, and then fell to a low phase as water drained to the north through the Indian River lowland of lower Michigan around 13,000 B.P. The Glenwood II lake level rose again during the Port Huron Advance (12,800 B.P.) and drained through the Chicago outlet. Then during the Two Creeks retreat (12,200-11,800 B.P.), the lake level fell as water drained through the Indian River lowland to the north. The Two Rivers Advance (11,800-11,200 B.P.) closed the northern outlets and lake levels rose to the Calumet High. Glacial Lake Oshkosh also formed at this time. Lake levels dropped slightly during the Kirkfield phase (10,700 B.P.) as the ice receded and the lake drained through the Straights of Mackinac. At this time it appears that the Lake Michigan basin was confluent with Lake Superior and Lake Algonquin in the Lake Huron basin. The Chippewa Low phase (9800 B.P.) was created by the deglaciation of the North Bay outlet. This extreme low in the Lake Michigan basin began at the same time as the Marquette Advance in the Lake Superior basin. The Chippewa Low lasted until about 5500 B.P. by which time isostatic rebound had raised the North Bay outlet sufficiently that drainage shifted to the Chicago and Port Huron outlets and postglacial Lake Nipissing formed.

Postglacial lakes in the Michigan basin have been identified as the Nipissing (5500-3800 B.P.), Algoma (3800-2500 B.P.), and Michigan (2500 B.P.-present) (Hough 1963; Hansel et al. 1985). The Nipissing transgression affected water levels in the Huron, Michigan, and Superior basins. The water level rose above the present level around 5500 B.P. and reached a maximum level around 4500 B.P. A second Nipissing High occurred around 4000 B.P., and an Algoma High occurred around 3200 B.P. Lake level fluctuations from Nipissing through modern times have been suggested to be dynamic responses

to climatic fluctuations and variations in regional rainfall, as well to gradual shifts in outlet altitudes and incision (Hansel et al. 1985; Larsen 1985a).

The history of glacial and postglacial lakes in the Superior basin is complex due to the episodic presence of ice late in the sequence, outlets at both the east and west ends of the basin, uplift of the eastern outlets, and influx of surges of water from the Lake Agassiz basin to the west (Farrand and Drexler 1985). Table 1 compares the glacial and postglacial lake sequences for the Lake Michigan and Lake Superior basins. Evidence for early glacial lakes has been erased by later glaciations and high water levels associated with deglaciation of the region. In the western Superior basin there is evidence for a series of ice-margin lakes associated with the Two Rivers Advance around 11,800 B.P. These Duluth lakes discharged to the Mississippi River via the St. Croix River through the Brule and Portage spillways. At the same time, the east end of the Superior basin was covered by ice and the waters of Lake Algonquin. By around 10,700 B.P. and the retreat of the Greatlakean ice, a large Post-Algonquin/Lake Superior glacial lake formed across both basins which was fed both by glacial meltwaters and by discharges from Lake Agassiz to the west. Around 10,000 B.P. the Marquette Readvance again filled the Superior basin with ice. Ice margin lakes included Duluth/Ontonagon on the west and Minong on the east. The retreat of the Marquette ice led to the expansion of Lake Minong until it filled the Superior basin about 9500 B.P. The ice retreat also exposed a series of Lake Agassiz outlets which sent pulses of meltwaters surging through the Superior basin. Erosion of moraines and downcutting of outlets at the east end of the basin led to the gradual fall of lake levels to the Houghton low level after 9500 B.P. By approximately 7000 B.P. the lake levels of the Michigan, Superior, and Huron basins were confluent due to rebounding of the eastern outlets. Uplift of the outlets continued to produce higher lake levels until the Nipissing maximum around 4500 B.P. Incision of outlets led to gradual decline of lake levels to the Algoma and later levels. Variable precipitation associated with climatic shifts also probably contributed to fluctuating lake levels up to the present (Larsen 1985a).

Table 1: Glacial and postglacial lakes of Wisconsin (adapted from Farrand and Drexler 1985; Hansel et al. 1985).

B.P.	Lake Superior		Lake Michigan
	West	East	
2200		Sault	
3200		Algoma	Algoma
4500		Nipissing	Nipissing
		Houghton (low)	
9500		Minong	
9900	Duluth ice	Minong	Chippewa (low)
10,700	Superior	Post-Algonquin	Post-Algonquin
11,000	Duluth ice	Algonquin	Algonquin
pre-11,500		ice	Chicago

The positioning and dynamics of glacial ice and glacial lakes and meltwaters are important for understanding the early prehistory of the region, since human occupation began at this time. While we would not expect to find sites under glacial ice, we might expect to find evidence for human exploitation of ice margins and along glacial lakes and river terraces. It is therefore important to understand the relationship of high beaches and terraces to the presence of ice and water in the early Holocene. Furthermore, finding human settlements dating to the mid-Holocene along lakeshores may be difficult since these landscapes are now inundated by higher lake levels. In some

contexts, we may expect to find even late Holocene settlements preserved under lake deposits (Larsen 1985b).

## Soils

Wisconsin soils have developed over varying parent materials and have been modified by climate, slope, and vegetation (Hole 1976). In the unglaciated area of the state, the upland soils have developed in silts from Pleistocene loess deposition. The silts cap clays and sands that derived from the limestone and sandstone bedrock. Soils of the valleys in the unglaciated area have developed in alluvial and lacustrine clay and sand deposits. In the glaciated portions of the state, soils also are variable. The clayey and stoney tills capped with a thin loess deposit produce silty clay loams over much of the area. Sandy loams have developed over outwash and ice contact deposits. Glacial lake basin soils are clayey and poorly drained. Wetland soils, peats, and mucks are present in most low lying areas throughout the glaciated portions of the state.

## Vegetation

Premodern vegetation distributions in Wisconsin basically consist of a northern mixed conifer-hardwood forest and a southern hardwood forest with scattered prairie openings. The boundary or ecotone between these floristic provinces is called the tension zone and trends from southeast to northwest across Wisconsin (Curtis 1971). The tension zone includes a mixture of plants from both regions and has high biotic diversity. The position of the tension zone corresponds to a steepening in the gradient of growing-degree-days (McCann 1979 cited in Webb et al. 1983:144). The location and composition of the tension zone, as well as the northern and southern floristic provinces, has fluctuated through time reflecting major climatic shifts and changing weather patterns (Webb et al. 1983; Jacobsen et al. 1987). An east-west floristic gradient extends across Wisconsin and is represented by the distributions of beech, hemlock, and yellow birch. Beech does not grow westward of eastern Wisconsin, and hemlock and yellow birch are uncommon beyond western Wisconsin (Webb et al. 1983:144; Davis 1983:174-175). The east-west gradient may represent variations in precipitation and soil moisture and/or the frequency of forest fires (Webb et al. 1983:144).

The distribution of plant communities prior to disturbance by modern development has been reconstructed from the mid-nineteenth century General Land Office surveys by various investigators (Curtis 1971; Finley 1976). Six plant community groupings can be derived from the detailed reconstructions.

Plant communities north of the tension zone include the Boreal Forest, Northern Mesic Forest, Pine Forest/Barrens, and Wetlands. The Boreal Forest is located along the south shore of Lake Superior in northwest Wisconsin. The overstory plants of the Boreal Forest include white spruce, balsam fir, white birch, and aspen. The Northern Mesic Forest covers most of the northern half of Wisconsin. It is a mixed conifer and hardwood forest which includes hemlock, yellow birch, aspen, sugar maple, beech, and red oak. The Pine Forest/Barrens occurs on well drained glacial lake and outwash soils throughout the northern half of the state. Tree types include jack, red, and white pine, aspen, white birch, red maple, and white oak. The Pine Barrens are particularly dry and include an understory of abundant blueberries. Wetlands in the northern part of the state

include tamarack bogs and cedar swamps. Wetlands are common in the more recently glaciated areas.

Plant communities south of the tension zone include the Oak Savanna, Southern Mesic Forest, and Wetlands. The Oak Savanna extends over most of the southern half of the state. It includes areas of oak forest and prairie grasses as well as oak openings. The main trees are white, red, black, and bur oak. Prairie grasses include big bluestem and Indian grass, along with composites, gramineae, legumes, and flowers. The prairie areas are most common in the southwest part of the state, but extend in patches as far east as Lake Michigan and as far northwest as St. Croix County. The Southern Mesic forest occurs in patches south of the tension zone. It includes sugar maple, basswood, beech, elm, red oak, and hickory. The wetlands of southern Wisconsin include hardwood and conifer swamps, sedge meadows, and marshes (Goldstein and Kind 1987). Wetlands are particularly abundant in the more recently glaciated areas of southeastern Wisconsin.

## Holocene Vegetation History

The terminal Pleistocene and Holocene vegetation of Wisconsin and the Midwest changed along north-south and east west gradients in response to several major environmental changes. The changes were initiated by variations in the earth's orbit which produced increasing solar radiation to the northern hemisphere in July and decreasing solar radiation in January (Ruddiman and Wright 1987a; Kutzbach 1987; Wright 1987). The solar radiation changes resulted in the recession of glacial ice and concomitant shifts in airmass patterns which produced varying temperature and rainfall regimes across the Midwest. Shifts in vegetation distributions in response to climatic fluctuations and other factors have been documented through analysis of pollen from bogs across the Midwest (Webb et al. 1983; Jacobson, et al. 1987; Winkler et al. 1986; Baker et al. 1992; Wright 1992).

The composition of the late Pleistocene forests in Wisconsin differed from modern conditions. The spruce dominated boreal forest included both tundra and deciduous genera such as ash, and possibly oak (Huber and Rapp 1992; King 1981; Webb et al. 1983). As spruce retreated to the north, oak forest moved into Wisconsin from the south and pine forests moved in from the east (Webb et al. 1983:160), producing an unusual mixed forest of spruce, pine, and various northern hardwood taxa. The major Wisconsin vegetation provinces of boreal forest, mixed pine and hardwood, elm, and oak forest were established between 10,000 and 8,000 B.P., although their boundaries were located south of their modern positions. Subsequent changes consisted of shifts in the boundaries between the major forest and grassland zones, along with changes in forest composition.

The spruce-dominated boreal forest of southern Wisconsin at 12,000 B.P. was an open woodland with park tundra and small amounts of pine, and possibly oak (Huber and Rapp 1992; Webb et al. 1983). Between 12,250 B.P. and 10,650 B.P. arboreal pollen increased indicating a closing spruce forest with increasing pine and deciduous species such as oak, ash, elm, and birch. After 10,650 B.P. the forest composition reflects a warming environment with the presence of pine, balsam, birch, elm, oak, aspen, hickory, and maple, along with possible grassland openings in southern Wisconsin and northern Illinois (Huber and Rapp 1992; King 1981). Pollen studies demonstrate that by 10,000 B.P. the spruce forest was in north-central Wisconsin and by 8,000 B.P. spruce had retreated to north of Lake Superior (Webb

et al 1983:160). The rapid northward movement is probably related to the warming associated with deglaciation. The return of spruce and the boreal forest to extreme northern Wisconsin dates to within the last 1,000 years (Webb et al. 1983:147) and appears to be related to cooler, wetter conditions of the Late Holocene.

Pine is a major component of the mixed northern conifer-hardwood forest today. Pine moved into Wisconsin from the east about 10,000 B.P. replacing spruce and ash (Jacobson et al. 1987:281). Pine pollen was found across all but extreme southwest Wisconsin by 10,000 B.P. The southern margin of the pine forest shifted to the north and east until 6,000 B.P. as oak moved up from the south and prairie vegetation expanded from the west. After 6,000 B.P., the southern margin of pine shifted gradually to the west into southern Minnesota (Webb et al 1983:155). By 6,000 B.P. the pine forest also included maple as well as birch.

The oak forest was located along the Gulf Coastal Plain during the Late Pleistocene and spread northward along with hickory into the Midwest by 10,000 B.P. At this time oak was present in southwest Wisconsin and by 6,000 B.P. it extended across central and eastern Wisconsin. Elm, ironwood, and in some areas ash and maple were also part of the deciduous forest (Jacobsen et al. 1987: maps). Elm was a particularly important part of the mesic deciduous forest during the Early Holocene in Wisconsin, but became only a minor element following the Mid-Holocene warming period when drier conditions produced an oak dominated forest (Wright 1992). Subsequently, the northern edge of the oak forest and savanna shifted south to south-central Wisconsin (Jacobsen et al. 1987). Changes in forest composition and species distributions can be attributed to changes in insolation and the decreasing effects of the glacial ice on various air masses which bring warmer or cooler and drier or wetter conditions to the midcontinent (Wright 1992).

The prairie is an important element of the vegetation in southern and western Wisconsin where it is a part of the oak savanna. Prairie forbs entered Wisconsin from the west beginning about 9,000 B.P., and remained a stable 5% of the pollen assemblage in eastern Wisconsin through the Holocene (Webb et al. 1983:152). During much of the Mid-Holocene, Wisconsin was dominated by moist, warm airmasses in contrast to western Minnesota and Iowa (Wright 1992). Consequently, during the Mid-Holocene warming period when the prairie was expanding rapidly eastward through Minnesota, Iowa, and Illinois, a mesic deciduous forest covered southern Wisconsin and northeast Iowa (Baker et al. 1992; Winkler et al. 1986). Dry conditions did not begin in Wisconsin until 5500 B.P. and lasted until about 3400 B.P. During this time the more xeric oak forest, possibly with prairie openings, dominated the southern part of the state (Baker et al. 1992; Winkler et al. 1986). While the prairie undoubtedly formed and expanded due to increasingly warm and dry conditions brought about by changing westerly airflows following deglaciation, it was also clearly maintained by fires, some of which were regulated by human beings.

The plant associations and distributions across the Midwest for the late Pleistocene and early Holocene indicate that there are few modern analogs for environmental conditions during this time. The mammalian faunal distributions also indicate environmental conditions unlike today (Graham and Mead 1987). The floral and faunal evidence suggest that seasonal variations in temperature and precipitation may have been particularly important. While glacial ice was still present, the climate seems to have been cooler overall, but more equable with no extremes of cold or heat. The glacial ice may have deflected arctic

winds to the north, and buffered the periglacial zones. The reduction in glacial effects and increase in radiation produced a rapid increase in seasonal extremes (Wright 1983). The new seasonal extremes affected the distribution of vegetation and may have caused the terminal Pleistocene mammalian extinctions (Graham and Mead 1987). The large mammal extinctions may also have been assisted by increased hunting pressure from Native Americans.

The most recent climatic fluctuation, known as the Little Ice Age (A.D. 1200-1850) produced a long, cooler and wetter period that affected ecotone positions between prairie and Woodland. It also may have affected the growing season for corn agriculture to varying degrees in parts of the Midwest.

## Landforms

There are four major physical provinces in Wisconsin which have been defined from bedrock geology and surface topography (Martin 1965, Paull and Paull 1977). The four provinces are: the Northern Highland, the Western Upland, the Central Plain, and the Eastern Ridges and Lowlands.

### The Northern Highland

The Northern Highland is part of the Canadian Shield and its bedrock is composed of Precambrian igneous and metamorphic deposits. The domed highland is ringed by later Paleozoic sedimentary rocks which slope downward to the Michigan and Illinois basins. The Northern Highland was covered by many episodes of glacial ice which scoured out several hundred feet of bedrock. The Lake Superior basin was formed by glacial action along the north edge of the Highland. Glacial drift of varying age blankets the Northern Highland and provides the matrix for the region's soils and drainage systems. The oldest drift is Early Wisconsinian (Altonian) and is exposed along the southwest edge of the area. The older drift is more eroded and better drained than younger drifts. The later Wisconsinian (Woodfordian) advances did not extend as far south as the Altonian. The Woodfordian drifts include prominent terminal moraines and ice contact deposits which produce a rugged landscape. The younger drifts are poorly drained and are dotted with small lakes and extensive wetlands. The region serves as the headwaters for several major Wisconsin rivers which flow in three directions: north to Lake Superior, west to the Mississippi River, or east to Lake Michigan. The Northern Highlands was the source for much of the copper exploited by prehistoric peoples. In addition, the iron and copper deposits along Lake Superior were mined by Euro-Americans beginning in the nineteenth century. The pine and hardwood forests of the Northern Forests were also targeted for intensive harvest by late nineteenth and early twentieth century loggers and industrialists.

### The Central Plain

The Central Plain is a small, crescent shaped lowland located south of the Northern Highland in the center of Wisconsin. It developed on eroded Cambrian Sandstones and is bordered by more resistant dolostones of the Western Uplands and Eastern Ridges and Lowlands. The Central Plain is generally level to rolling with marked relief only along the recently glaciated area to the east. Much of the Central Plain was unglaciated and is part of Wisconsin's Driftless Area. Isolated outcrops, known as mounds, of Precambrian quartzites and Cambrian Sandstones produce notably rugged terrain in the Driftless Area. The



level portions of the region are formed in eroded sandstones, glacial outwash, and glacial lakes. Glacial Lake Wisconsin, which covers over 1800 square miles, formed at the western edge of the Green Bay Lobe. Glacial Lake Oshkosh, formed as the Green Bay Lobe, retreated during the Greatlakean glaciation, is located at the east edge of the region. These former lake beds contribute to the level and poorly drained nature of much of the Central Plain. Drainage of much of the region is by way of rivers that arise in the Northern Highland and cross through the area on their way to the Mississippi River or Lake Michigan. The river route from Lake Michigan via Green Bay, up the Fox River, across small land area at Portage, into the Wisconsin River, and down the Wisconsin to its mouth on the Mississippi River was extremely important during exploration, early settlement, and into the late nineteenth century canal period. The riverine route may also have been important to prehistoric peoples as well. The predominant vegetation of the region is wetlands including bogs, marshes, and conifer swamps.

### The Western Uplands

The Western Uplands province is a highly dissected region bordering the Mississippi River. The bedrock of the uplands is composed of a series of paleozoic sedimentary units which slope from the Central Plains to the south and southwest. The cuesta margins of these units form notable topographic breaks between the Lower and Middle Ordovician and Silurian units. The Middle Ordovician Platteville-Galena Group is noted for its lead and zinc deposits. The Western Uplands comprise the major portion of Wisconsin's unglaciated Driftless Area. Because most of the region was never glaciated, the sedimentary units are highly eroded, and deep stream valleys with narrow, flat topped interfluvies have formed. Loess deposited during the Wisconsinian caps the uplands and increase the rugged appearance of the region particularly along the Mississippi River trench. Glacial outwash and glacial lake deposits are also present. The major drainage feature of the province is the Mississippi River which has a wide valley bordering the west side of the state. The Wisconsin River, which flows from the Northern Highland through the Central Plains, empties into the Mississippi River at Prairie du Chien in the Western Highland Province. Several smaller rivers also drain into the Mississippi from the Western Upland. The province has numerous interesting natural features including large rock hills or mounds capped with resistant Silurian deposits, caves and sinkholes, Precambrian quartzite outcrops, and Wisconsin's lead and zinc mining district. The lead, zinc, and copper deposits of the western upland were a very important resource historically for Wisconsin. Lead mining was conducted prehistorically in the region by native peoples (Walthall 1980) and also in early historic times. Initial Euro-American settlement in the state also targeted the mineral resources of the district where mines were opened as early as the 1820s. The premodern vegetation of the region included prairie on the level uplands and Mississippi River terraces, along with oak openings and oak forest.

### Eastern Ridges and Lowlands

The Eastern Ridges and Lowlands province lies along the eastern side of the state and is noted for its glacial features. Bedrock for the region consists of Paleozoic sedimentary rocks which slope to the south and east. Two erosion-resistant dolostone cuestas run north-south through the region. Wisconsinian glacial scour and deposits

levelled and filled the bedrock landscape and produced a rolling topography. Topography in the terminal and interlobate moraines of the Green Bay and Lake Michigan lobes is rugged, and series of glacial lakes and kettles is present. Thousands of drumlins are scattered across the ground moraine of the Green Bay Lobe. Because of the recent glaciation, the drainage of the region is poorly developed, and wetlands are abundant. Large river systems include the Fox River which drains into Lake Winnebago and then to Green Bay, the Milwaukee River which drains from the interlobate moraine east into Lake Michigan, and the Rock River which drains from the extensive Horicon Marsh through southern Wisconsin and into Illinois where it joins the Mississippi River. A series of smaller rivers drain into Lake Michigan on the east, or southward into Illinois. Premodern vegetation of the region included oak savanna, southern mesic forest, and extensive wetlands. Euro-American settlement of the region was attracted by the good harbors along Lake Michigan and riverine transportation routes to the interior, and by productive farmland.

## Minnesota

Minnesota may be characterized as a land of contrasts and extremes. Stretching more than 390 miles from the Iowa border north to Canada and more than 290 miles west from the Dakota's to Lake Superior, the state encompasses some 84,068 square miles. Topography in Minnesota varies from flat and almost featureless glacial lake plains to rugged, deeply incised river valleys and steep moraines. Climate of the state is equally variable. Temperature usually fall well below zero during the winter and, when wind chill is considered, temperatures as low as -60° F are not uncommon. In the summers, temperatures rise well into the 80s and 90s. Large and sometimes violent storm systems during both the summer and winter months, moving into the state from the high plains, are relatively common.

Minnesota is also a land of frontiers and boundaries, both natural and cultural. Perhaps the most striking of these is the prairie-forest border, which extends from the northwestern portion of the state southeastward to the Iowa border. Less obvious but equally important is the boundary between the deciduous forests of the southeastern portion of the state and the vast expanses of mixed coniferous and hardwood forests of the central and northern portions of Minnesota.

The major river systems of the state serve as transportation corridors and, on occasion, as boundaries as well. Although the majority of streams and lakes in the state drain into the Mississippi, there is a continental divide within the state and a significant number of streams drain into three other drainage systems. Streams in the northern part of the state may drain north into Hudson Bay (e.g., the Red River) or east into Lake Superior and the St. Lawrence (e.g., the St. Louis River). Streams in the southwestern part of the state on the Coteau des Prairies flow southwest into the Missouri drainage.

The environmental diversity of Minnesota is paralleled by its cultural diversity. In the forested southeastern portion of the state, cultural characteristics are associated with the eastern woodland cultures of the lower Midwest. Eastern Archaic, Woodland, and Oneota complexes are found in this area and it appears that the Mississippi River was a major conduit for information and interaction from south to north.

The prairie zone in the western part of the state is on the eastern margin of the Plains culture area and this is reflected in the

archeological complexes found in the region. The Prairie Archaic appears quite early and is characterized by a singular emphasis on bison hunting and procurement. The western flavor of the complexes found in the prairie area continues until the time of European contact, as does the important role of bison procurement in the area.

Cultural complexes in the northern portions of the state appear to be most closely related to other lake-forest cultures in eastern Manitoba, Ontario, and northern Wisconsin and Michigan. The distinctive characteristics of these complexes emerge in the Lake-Forest Archaic and Old Copper cultures and the subsequent ceramic cultures display similar relationships throughout this environmental zone.

The cultural and environmental diversity of Minnesota have several important implications that must be borne in mind.

First, there is no single cultural sequence that works well throughout the state. For example, although sequences in southeastern Minnesota roughly parallel those elsewhere in the Eastern Woodlands, they are markedly different from those found in the prairie area in western Minnesota. Trying to impose a rigid classificatory framework on the entire state based on one of these major cultural sequences leads to confusion and poor communication between scholars.

Second, the major culture areas within the state are at the extreme limits of their range. The prairie complexes are on the eastern edge of the prairie zone; the woodland complexes of the Mississippi valley are on the northern and western edges of their distribution; and the lake-forest complexes are on the western margin of this zone. Thus, trends within the larger culture may be more apparent in these "hinterland" or "frontier" areas than in the "heartland" areas of these broad culture regions. At the same time, the boundaries between these areas appear to be permeable, not rigid. There is evidence that although particular groups lived within one environmental zone, they used other zones as well. Similarly, there is evidence that groups of people of one zone interacted with others across these boundaries.

Finally, the boundaries of major environmental zones and the plants and animals they contained changed significantly over time. Presumably humans responded to these changes, but the character of these responses remains unclear. For example, the prairie-forest margin 5,000 years ago was far to the east of its location in the nineteenth century. Did the Prairie Archaic then move eastward along with the prairie expansion? If so, one would expect to find a complex sequence of sites with early Eastern Archaic sites first, and then Prairie Archaic sites in the same area somewhat later, subsequently followed by other sites with eastern woodland characteristics as the prairie retreated to the west. If such sequences exist, do they reflect actual movements of social groups, or local populations changing their material culture to adapt to shifting environmental conditions? The answers to these questions remain elusive, but the evaluation and interpretation of these complex kinds of interactions both within and across major environmental and cultural boundaries is one of the most distinctive and challenging research problems in the state.

Detailed and carefully controlled environmental data is essential if the types of research problems described above are to be successfully addressed. Fortunately, there have been outstanding programs in glacial geology, pale-ecology, and limnology at the University of Minnesota for thirty years. The literature produced by these programs—most notably by H. E. Wright, Jr. and his students and colleagues—is voluminous and often quite useful to the archeologist.

However, it is important to note that local responses to changing environmental conditions can vary significantly from site to site, even within a distance of a few tens of miles. The reader is encouraged to pursue the paleoenvironmental literature in more depth if they are interested in specific sites or areas within the state.

## Evolution of the Minnesota Landscape

The configuration of the Minnesota landscape, both today and at any given moment in the past, is a function of its geological foundation (bedrock), glacial history, and climate. The processes of erosion and aggradation (sediment deposition) of sediments and landforms by wind and water are driven, in part, by climate and act on the landscape elements created by the interaction between bedrock geology and glacial history.

Because these factors are closely interrelated, it is difficult to discuss one without reference to the other. Therefore, in this section we discuss the bedrock geology, glacial history, landforms, and climate of Minnesota. In the concluding section of this chapter, we present an integrated review of the major environmental events and trends which were in operation during each of the five major cultural "periods" in the state from roughly 11,500 years ago to the present.

## Bedrock Geology

Minnesota is located near the low-relief center of North America, roughly halfway between the continents' two major mountain ranges, the Rockies and the Appalachians. Although significant mountain ranges were present roughly 2,700 million and 1,800 million years ago, the state has been geologically "quiet" since 1,000 million years ago, and there has been no volcanism or mountain building since that time. The primary geological processes at work have included local faulting and modest earthquake activity, gentle warping of the underlying crust, slow advances and retreats of Paleozoic and Cretaceous seas, and the continental glaciation of the last several million years (Ojakangas and Madsch 1982:15-17).

The complex series of glacial advances and retreats during the Pleistocene has covered Minnesota with a mantle of glacial sediment, including glacial till, meltwater deposits, and lake clays. These sediments cover roughly 99% of the rocks in the state to depths ranging from a few tens of meters to 150 meters. In northwestern Minnesota, there are no rock outcrops at all within an area of 45,000 square kilometers.

Despite the predominance of glacial sediment on the Minnesota landscape, some bedrock exposures do occur within the state. Bedrock outcrops and exposures are most common around Lake Superior in the Arrowhead region of northeastern Minnesota. Some additional exposures are found in southwestern Minnesota and there are some along the Mississippi River in southeastern Minnesota as well.

There is considerable variability in the type and character of bedrock which underlies the state. In large measure, this is because Minnesota sits astride two of North America's largest physiographic provinces, the Laurentian Upland and the Interior Lowland.

The Laurentian Upland encompasses more than half of Minnesota and contains ancient Precambrian igneous, metamorphic, and sedimentary rocks. This province is essentially coeval with the Canadian Shield, which contains Precambrian deposits that document North America's geological history from 3,600 million to 600 million



years ago. The largest exposures of Precambrian rocks are in northeastern Minnesota, where the glaciers often were eroding rather than depositing sediment. A second set of key Precambrian exposures is in southwestern Minnesota near Granite Falls, where the Minnesota River has downcut through the glacial sediments to the underlying bedrock. These rocks have been dated at 3,600 million years of age and are among the oldest dated deposits in the world.

The Interior Lowlands encompasses most of southern Minnesota. The rocks within this province are predominantly sedimentary rocks of Paleozoic age and are much younger than those of the Laurentian Uplands.

### Bedrock and Humans

Bedrock is of interest to archeologists for two reasons. First, the bedrock provided rocks and materials that were used by the ancient inhabitants of Minnesota. Second, the type and distribution of bedrock exercised control over the direction and flow of the ice lobes that covered the state.

Bedrock was important to the ancient inhabitants of the state for several reasons. Outcrops of bedrock were used as "canvases" for a variety of rock art forms carved or pecked into the rock. Native copper was present in the northeastern portion of the state and the famous pipestone (catlinite) quarry in southwestern Minnesota provided material for pipes and other sacred and secular objects. Bedrock and rocks derived from bedrock incorporated into the glacial till provided raw material for a variety of chipped stone and ground stone tools.

Rock art is relatively rare in Minnesota, since there are only a limited number of outcrop areas present in the state and there have been few concerted efforts to identify rock art sites. However, there are certain regions where rock art does occur. Perhaps the best known of these is the Jeffers Petroglyph site, an extensive series of petroglyphs carved into a massive Sioux Quartzite outcrop in Cottonwood County, southwestern Minnesota. Consisting of more than 2,000 carvings (Lothson 1976:7-8), the irregularly shaped outcrop on which the Jeffers site occurs measures roughly 600 feet in length and varies between 50 and 100 feet in width. There are a number of other Sioux Quartzite outcrops in the region and other concentrations of rock art have been reported. However, there has not yet been any systematic survey of these outcrops to fully delineate the character and distribution of rock art on these features.

Rock art is also found on the outcrops of sandstone and limestone along the Mississippi River trench in the southeastern portion of the state. These soft materials were particularly easy to carve but also erode easily, and many of the known sites are not well preserved. Rock art also is found in caves and fissures along the river and its tributaries from the Twin Cities southward. T. H. Lewis (see Winchell 1911:560-568; Lewis 1887a; 1889) documented a number of sites in this region during the nineteenth century and others have been discovered more recently (e.g., Dobbs 1990; Steinbring 1990).

Rock art is less well known in the northern and northeastern part of the state, but does occur on outcrops of the Canadian Shield rocks in this region. There is a well known series of petroglyphs at Nett Lake and recent surveys work in the Superior National Forest has also identified other rock art sites.

Native copper is another resource used by ancient people of Minnesota. Beginning at least 5,000 years ago, native copper was used

to manufacture spears, gouges, knives, and a variety of other artifact forms. There is no evidence that any of the copper was ever smelted. Rather, it appears to have been cold-hammered into the final, desired form. Copper use continued episodically until at least the thirteenth century A.D. There was a widespread trade in copper, which was particularly noticeable during the Hopewell Interaction Sphere, and native copper artifacts are found widely from Minnesota to New York and south to the Gulf Coast.

\*Native copper was mined and also obtained by collecting nuggets and cobbles from the glacial till of eastern Minnesota. Copper occurs on two islands in Lake Superior: Isle Royale and Michipoten Island (Ontario). A narrow band of copper almost 20 miles long is also present in the Keweenaw Peninsula on the Wisconsin shore of Lake Superior. There is clear evidence that the deposits on Isle Royale—and probably the others as well—were mined by American Indians for several thousand years (see Bastian 1963; West 1929; Griffin, ed. 1961; Clark 1996).

The copper in these two areas formed in cracks and crevices (vesicles) of lava flows that form bedrock in both of these areas. Native (metallic) copper is also found at many places along the North Shore of Lake Superior, including the French River near Duluth and the Stewart River near Two Harbors. Roughly 20 occurrences have also been documented between Duluth and Two Harbors, and between Tofte and Grand Marais. Masses of native copper up to 6 kg in weight have been found. Native copper has also been found in the glacial till eastern Minnesota. The source of the copper in the till remains unclear, but most probably it was derived from Isle Royale and transported by the Superior Lobe of ice (see Rapp 1990a; 1990b).

Another mineral resource that was particularly important to American Indian people is the pipestone (Catlinite) of southwestern Minnesota. Pipestone is a red mudstone that occurs as a 45 cm thick rock layer within the Sioux Quartzite. Pipestone is clay-rich, colored with disseminated hematite, and easily carved. Artifacts made of pipestone are widely distributed in the area between the Appalachians and the Rocky Mountains, indicating that at least during certain periods of time there was an extensive trade in this raw material. Pipestone materials are known as early as the Middle Woodland and have been found in Hopewell contexts. However, it is after about A.D. 1200 that pipestone use becomes particularly important and pipestone artifacts, most notably pipes become an obvious component on most archeological sites in the Plains and Midwest regions.

There are several sources of pipestone, including one in northern Wisconsin, and the origin of many of the earlier pipestone artifacts remains under study. According to Indian beliefs, pipestone was given to them so that they could live in peace with one another, and consequently is an especially sacred part of many Indian peoples' religion. The largest and best known source of pipestone is the sacred pipestone quarry site within the Pipestone National Monument, a 115 ha area in extreme southwestern Minnesota. A small creek cuts through this area and has exposed pipestone within the quartzite. Because the exposed pipestone is weathered and unsuitable for carving, American Indians excavated pits 3-6 feet deep by hand through the overlying quartzite to mine pipestone for their use. Because of its sacred and important role in American Indian religion, today only American Indian people are allowed to excavate pipestone within the monument area (see Ojakangas and Matsch 1982:229-230; Sigstad 1970; Woolworth 1983).

Bedrock geology of Minnesota also defined, in large measure, the types of raw materials that were available for the manufacture of chipped and groundstone tools. There has been little study of the variety of raw material types used to manufacture groundstone tools. However, a wide range of cryptocrystalline rocks, primarily cherts and quartzites, were used to manufacture chipped stone tools.

Chipped stone assemblages in Minnesota contain a wide variety of raw material types including both local materials and those imported from outside the states boundaries. Local materials are derived from numerous different sources and the composition of raw material debris profiles display tremendous regional variation. The two most common imported materials are Hixton Silicified Sandstone, from Silver Mound in southwestern Wisconsin, and Knife River Flint, from quarries in western North Dakota. Hixton, in particular, has been used for more than 10,000 years and artifacts of this material have been found from Michigan west to the Rocky Mountains and south at least as far as Kentucky. Other nonlocal raw materials include Burlington Chert from Iowa and other southern sources; Tongue River Silicified Sediment; and Swan River Chert, Kakebeka Falls Chert, and other materials from Canada.

Materials for chipped stone tools could have been obtained from deposits of glacial till or outwash, from bedrock outcrops, or by quarrying. Cobbles from till and outwash have been heavily weathered and are therefore not as desirable as materials that have not been weathered, although it is clear that material from the till was sometimes used. In general, the regional configuration of raw material use is tied quite closely to the types of bedrock within the region and the proximity of the region to other non-Minnesota sources.

In southern Minnesota, most raw materials are derived from the sedimentary rocks of the region. Although there can be considerable variation in the specific types of materials used by ancient peoples, there are three major chert types in the region.

The Prairie du Chien Group, including the Shakopee Formation and the Oneota Dolomite, contain oolitic cherts that are commonly found throughout most of the prehistoric period. There is significant variation in the quality of the cherts within these formations, particularly the Shakopee. Along the Mississippi River trench, the quality of the material is relatively poor although it is commonly used. In south-central Minnesota, particularly in the Blue Earth River Valley, the Prairie du Chien cherts are visibly different in color and size of oolites, and the material is noticeably higher in quality.

Galena chert is found in the Galena Formation which extends from southeastern Minnesota into Iowa, Wisconsin, and Illinois. The formation contains three members in Minnesota: the upper Stewartville, middle Prosser, and lower Cummingsville (Gonsior et al. 1994:8). Each member contains varying amounts of chert, with the Prosser member having the highest volumes. Galena chert is fossiliferous and occurs as irregular shaped nodules or cobbles, normally under 15 cm in length. Gonsior et al. (1994) suggest that they have identified a series of Galena chert acquisition sites in Fillmore County, although further investigation is needed to test this hypothesis.

A third chert type, variously known as Grand Meadow chert, Rapid chert, or Cedar Valley chert, is also common during certain periods of southern Minnesota prehistory. Cedar Valley is a smooth, grey, high-quality material of particular toughness that makes it well suited for scrapers and projectile points. It is ubiquitous during from ca. A.D. 1000-1300 in Oneota and Silvernale phase sites in southern Minnesota.

At some of these sites, more than 95% of the endscrapers are made of this material. After ca. A.D. 1300, it appears to decline in popularity. It was also used, albeit less frequently, from the Paleo-Indian period onward. At least one fluted point made of the material has been identified and Cedar Valley has also been identified from Woodland contexts.

Cedar Valley chert occurs in relatively small nodules and in the mid-1970s, the Minnesota Statewide Archaeological Survey discovered an intact quarry site for the material in Mower County (Minnesota Historical Society 1981:52; Trow 1982). Aerial photographs clearly show hundreds of quarry pits scattered across an area of at least 20 acres near a small stream. Recent unpublished research by Orrin Shane (Science Museum of Minnesota) is evaluating the geological position and material properties of Cedar Valley Chert. Recently the Archaeological Conservancy purchased the intact portion of the quarry site, ensuring that it will be permanently preserved.

In northern and northeastern Minnesota, the types of raw materials used are distinctively different than in southern Minnesota and are defined largely by the very different bedrock units within the Canadian Shield. Harrison et. al. (1995:19-22) present a very useful overview of the raw materials used in this region, based both on the Minnesota and Canadian literature. Like southern Minnesota, there are a variety of materials that were used by prehistoric people, including a variety of igneous and metamorphic types. Particularly common materials include Knife Lake Siltstone, Jasper Taconite, Gunflint Silica, and Hudson Bay Lowland Cherts.

Knife Lake Siltstone is medium to dark grey and silicious enough to have good flaking properties. Because of its relatively low quartz content, it does wear rapidly and is easily eroded. This material is derived from the Precambrian Knife Lake sedimentary group and its stratigraphic equivalents and is known primarily from the Knife Lake area in the Boundary Waters area of extreme northern and northeastern Minnesota. A number of sites appear to be associated with quarrying of this material in the Knife Lake area and there is evidence to suggest that there was transport or exchange of this material both to the east toward Thunder Bay and south into north-central and northeastern Minnesota (Harrison et. al. 1995:20).

Jasper Taconite or Taconite is an oolitic chert which occurs embedded in the shale of the Gunflint formation, a group of sedimentary rocks which include shale, tuff, carbonate rocks, cherts, and taconite. This formation extends from the Minnesota-Ontario border east along the north shore of Lake Superior. The color of Jasper Taconite varies from bright red to very dark red or almost black, depending on the amount of iron in the rock and the degree of oxidation of the iron. The oolites tend to be clearly visible and in some cases are white and very densely distributed. Taconite outcrops occur in places where the Gunflint Formation has been cut by streams or by the beaches of glacial Lake Minong, and is also sometimes found as cobbles in glacial drift in central and northeastern Minnesota and northwestern Wisconsin (Harrison et. al. 1995:20).

Gunflint Silica is found in the same formation and locations as jasper taconite and often grades into this material. Gunflint Silica occurs in a variety of colors, tends to be translucent, and may have mottled or oolitic inclusions or thin, straight dark bands running through the material. Gunflint Silica has a tendency to block fracture, which makes it less suitable for large bifacial tools, but the flaking properties of smaller pieces are quite good and scrapers are commonly made of this material (Harrison et. al. 1995:21).

Hudson Bay Lowland cherts are opaque materials that display a wide variety of color and shading. Although they tend to be solid in color, a combination of colors and wavy, complex, sometimes agate-like bands may be present. They contain small inclusions or fossil fragments and often retain portions of a yellowish or white chalky cortex. This cortex is never found on chert-like materials from the Gunflint formation and is a distinctive characteristic of these cherts. As their name suggests, Hudson Bay Lowland cherts originate in Canada and were transported to northeastern Minnesota by glacial action. Nodules are found in fill or gravel deposits throughout northeastern Minnesota and, because their size decreases markedly with distance from the original source, nodules in Minnesota tend to be relatively small (Harrison et. al. 1995:21).

The raw materials of western and northwestern Minnesota are also distinctive from other portions of the state. There are few bedrock outcrops in this region, particularly within the Lake Agassiz basin, and raw materials tend to be taken from the glacial till. Influences and sources from the Plains to the west and Canada to the north are particularly apparent. Bakken (1985) has reviewed raw materials used in this portion of the state and identified argillite, basalt, jasper, quartz and quartzite, Swan River Chert, Red River Chert, and Tongue River Silica at sites within the region. The most important of these materials are Swan River Chert and Red River Chert.

Swan River Chert was the most common material identified by Bakken. There is significant variation in color, and many pieces are multi-colored, with colors including white, grey, pink, orange, red, yellow, brown, and light green. Swan River Chert also has a wide distribution in Canada and occurs in Alberta, Saskatchewan, and the western part of Manitoba.

Red River Chert is defined by Bakken (1985:36) as a material related to the Cat Head Chert and which may be derived from the Cat Head Member of the Red River Formation. This material was the second most common found during Bakken's study and is characterized by light colored, mottled or banded, and highly opaque. The fracture is fully conchoidal although breakage along internal cracks or flaws sometimes occurs. Bakken notes that there is a variety of Red River that is coarser and often fossiliferous, and another which is pure white which is dull, chalky, and slightly porous. Red River Chert is apparently derived principally from glacial till in the region.

In concluding this discussion of raw materials used for chipped-stone tools, some mention must be made of 'the quartz problem' in Minnesota. Quartz is common, although not ubiquitous, in many portions of the state. More than 100 years, a number of quartz 'tools' were discovered near Little Falls in north-central Minnesota and, because of their relatively crude nature, were thought to be of great antiquity (see Lewis 1887b; Winchell 1911). This claim created a great deal of controversy, particularly since naturally fractured quartz is often difficult, if not impossible, to distinguish from quartz which has been used or worked into tools. Although it is now generally agreed that the quartz tools from Little Falls are not of great age, the difficulty with differentiating culturally-modified quartz from naturally weathered quartz remains a difficult problem. There is no doubt that quartz was on occasion used by prehistoric peoples and indisputable quartz tools have been recovered. However, quartz does not appear to have been a material of choice and archeologists working in Minnesota tend to err on the side of caution when dealing with quartz materials.

## Bedrock Control of Glaciation

The course of glaciation in Minnesota (and the Great Lakes region generally) and the delineation of glacial history depend indirectly on the bedrock geology of the region. The erosional resistance of bedrock determined the preglacial lowlands that guided the ice lobes which protruded from the ice sheet. Similarly, the lithology of the bedrock provided raw materials which were picked up and incorporated into the glacier and subsequently redeposited as till, moraines, etc. Analysis of the different types of materials in the till has allowed scientists to determine the source of these materials and the direction from which a particular ice formation moved into the state.

Each of the Great Lakes occupies a preglacial lowland that is clearly defined by the limits of erosionally nonresistant rocks. In Minnesota, the Precambrian bedrock is resistant to erosion but has broad belts of rock that is far more easily eroded. The most obvious area of weak rocks is the Lake Superior basin, where relatively soft, red sandstone and shale is found in the center of the Lake Superior syncline. On the south margin of this are the more resistant copper-bearing rocks of the Keweenaw Peninsula and south of that is a lowland cut into additional sandstones. This lowland constrained the Chippewa Lobe of ice. On the north margin of the Lake Superior syncline are resistant lava flows that form the North Shore Highland. This highland reaches elevations of up to 2,300 feet and is itself bordered by the intrusion of the Duluth Complex which forms a high plateau that was not glaciated during late Wisconsin time, even though the surrounding lowland areas were filled with ice (Wright 1972a:518).

Another lowland is present south of Lake Superior which is localized by the poorly cemented Cambrian sandstones that lap up onto the Canadian Shield. This lowland continues southwest to the Minneapolis area and was followed by the Superior Lobe of glacial ice which expanded out of Lake Superior and across the low divide south of the lake. Later in time, this same lowland was occupied by the Grantsburg Lobe which moved in the opposite direction northeasterly toward Lake Superior.

The central part of the state is underlain by igneous and metamorphic rocks which have no pronounced differences in erosional resistance. There were no prominent lowlands or highlands to channel ice lobes and it has been invaded from both the east and west at different times as ice expanded out of the adjacent basins. In this region the glacial drift is the thickest in the state.

The Red River Valley lowland on the western side of the state was as important in glacial history as was the Lake Superior lowland in the east. The Red River Valley is underlain by soft Cretaceous shales that cover the Paleozoic rocks of the Great Plains and, in Minnesota, assorted Cretaceous sediments lap onto the Precambrian shield as well. Late during the Wisconsin glaciation, the Red River Valley lowland channeled the Des Moines Lobe of ice southeastward down the Minnesota River Valley and then south across a low divide into central Iowa. The Minnesota River Valley is bordered on the southwest by a small ridge of resistant Precambrian rock, the Sioux Quartzite, which may have been high enough to have escaped being covered by the Cretaceous seas. This ridge is called the Couteau des Prairies and was never covered by ice during the Wisconsin, although glacial till laps up against its flanks and there is evidence for some windblown deposits mantling its top.

## Glacial History

Dwindling climatic stability brought on by cyclic variations between warm and cold intervals ushered in the beginning of the Quaternary period some two million years ago. These climatic changes resulted in the growth and decay of the Laurentide Ice Sheet, a large mass of glacial ice with accumulation centers in Quebec and Hudson Bay. Maximum growth of the ice sheet during the Pleistocene Epoch resulted in glaciation of a large portion of the north-central United States.

Four major periods of glaciation are recognized based on till sheets of widely differing age, separated by soils and nonglacial deposits formed during stages of deglaciation. In chronostratigraphic order these are the Nebraskan, Kansan, Illinoian, and the Wisconsin. The several drift sheets of the region are named from states in which they are well displayed or where drift was clearly differentiated at an early date.

Details of glacial activity during the Nebraskan, Kansan, and Illinoian are largely obscured, either by erosion or burial beneath later deposits (Ojakangas and Matsch 1982). However, exposures of Pre-Wisconsin drift occur near the surface in the southeastern and southwestern corners of the state (Leverett 1932). The landscape consists of gently rolling hills comprised of glacial drift and a system of well developed stream networks. Erosion along the valley sides of the stream networks has exposed a considerable amount of bedrock. Blanketing the drift and bedrock is a thin layer of loess, a windblown deposit of silt having uniform size and texture, deposited during the last glaciation. The majority of the landforms and sediments covering the bulk of Minnesota were deposited during the Wisconsin glaciation. Therefore, constraining earlier glacial events is highly speculative.

Due to its excellent exposure of deposits throughout the state the Wisconsin glaciation has been the study of numerous scholars. Wright (1972a), Ojakangas and Matsch (1982), and several others have been trying to piece together the events of the last glaciation. Most work is based on stratigraphic relations, radiocarbon dating of wood incorporated into glacial sediments, and study of modern glaciers as analogs to past events. According to Ojakangas and Matsch (1982:105):

Beginning about 75,000 years ago, after a long warm period following the Illinoian glaciation, the climate again deteriorated. The Laurentide Ice Sheet expanded across Canada. During the ensuing millennia, up to about 12,000 years ago, Minnesota was the stage across which tongues of ice advanced and retreated many times.

Early Wisconsin glaciation events are speculative due to modification of deposits by later glacial events. Wright (1972a) postulates the oldest drift of probable Wisconsin age exposed at the surface in Minnesota is in the Wadena drumlin field in the west-central part of the state, deposited by the Hewitt phase of the Wadena Lobe. Ojakangas and Matsch (1982) indicate that three glacial events may have occurred before the deposition of the Wadena drumlins. Exposures of drift in northwestern and western Minnesota show four tills in superposition. The oldest till deposited contains pebble lithologies indicative of western and northern provenance's (source areas), the eastern Dakotas and the Winnipeg Lowland. Wood obtained from this till is beyond the limits of radiocarbon dating but is presumed to be older than 40,000 years. Directly overlying this deposit is a till containing igneous and metamorphic rock fragments derived from the Canadian Shield. This may represent an early advance

of the Rainy and Superior Lobes of north and northeastern Minnesota. Following the deposition of this till, a drift sheet composed of sandy till containing an abundance of Paleozoic limestone fragments believed to have been derived from the Winnipeg Lowlands was laid down. Whatever glacial landforms that may have been constructed during this time were obliterated by the formation of the Wadena drumlins.

In Wadena, Todd, and Otter Tail counties about 1,200 streamline hills of glacial sediment forming a fan-shaped pattern constitute the Wadena drumlin field. Ranging from a southern to southwestern to western trend, the areal pattern represents radiating flow of the Wadena Lobe in its waning stages (Ojakangas and Matsch, 1982). The eventual stagnation of the Wadena Lobe to the west and southwest of the drumlin field resulted in the collapsed of the sediment laden ice margin forming a broad hummocky deposit named the Alexandria Moraine.

The Alexandria Moraine is an ice marginal accumulation of debris ranging from 20-30 km wide, over 300 km long, with relief ranging from 30-100 m (Mooers, et al. 1996, in press). Both Wright (1972a) and Ojakangas and Matsch (1982) postulate the formation of the Alexandria moraine was contemporaneous with drumlin formation from the Wadena Lobe. However, recent investigations by Mooers, et al. (1996, in press) suggest the Alexandria Moraine was deposited by the Alexandria phase of the Rainy Lobe. Mooers, et al. (1996, in press):

In addition to an abundance of granite, greenstone, and gneiss derived from the Precambrian Shield, the drift contains two distinctive lithologies indicative of the source region of the Rainy Lobe during this phase: an abundance of Paleozoic carbonate, postulated to have been derived from the Hudson Bay, and a distinctive graywacke that appears identical to rocks described from the Omarolluk Formation, which outcrops throughout the eastern part of Hudson Bay. These "dark erratics" or "omars", have been used extensively as indicators of ice flow direction. Omars are common throughout the deposits of the Alexandria phase of the Rainy Lobe, and indicate an ice accumulation center in Labrador/Quebec.

The Alexandria Moraine was later overridden by the Des Moines Lobe during Late Wisconsin time so the surface expression of the deposit has been somewhat obscured. One can imagine the moraine must have been impressive in size before being modified by later glacial events.

Beginning about 30,000 years ago shifting centers of snow accumulation upon the Laurentide Ice Sheet led to the renewed growth of the Rainy and Superior Lobes. Glacial ice entered Minnesota from the northeast and the Lake Superior basin. The lobes coalesced forming a continuous mass of ice forming a thin cover to the west of Lake Superior and a thick sheet of ice occupying the Lake Superior basin. Far to the west the ice field joined with the somewhat less prominent Wadena Lobe.

The maximum stand of this glacial advance is marked by a system of looping moraines in central and north-central Minnesota. The Wadena Lobe constructed the Itasca Moraine in northwestern part of the state while to the southeast the Rainy and Superior Lobes built the St. Croix moraine.

The St. Croix moraine extends from Leech Lake in north-central Minnesota southward to an area southwest of St. Cloud. South of this point the moraine is buried by deposits of the Des Moines Lobe, which originated to the northwest of Minnesota, but it can be traced

to the southeast through its topographic expression and the abundant exposure of the distinct St. Croix drift in excavations (Wright 1972a; Meyer and Hobbs 1989; Meyer et al. 1990; Patterson 1992).

The glacial sediments and landforms associated with the St. Croix moraine in central Minnesota provide a detailed record of the maximum and recessional events of the Superior and Rainy lobes (Mooers 1988). During recession, each major lobe broke up into smaller, multiple sublobes, dynamically independent from one another. The St. Croix moraine varies in morphology from north to south. Behind the outer moraine are drumlins, tunnel valleys, eskers, and glacial-thrust systems that can be correlated with the demise of the Superior Lobe sometime after 20,000 years ago.

As ice from the Superior Lobe retreated northeastward another large mass of ice began its descent into the Red River and Minnesota River Lowlands. This ice sheet reached its maximum extent 17,500 years ago near the city of Des Moines, Iowa, earning the name the Des Moines Lobe. A number of offshoots in the form of sublobes invaded areas recently abandoned by the Superior Lobe (Ojakangas and Matsch 1982). Two of the sublobes were responsible for the formation of glacial lakes in Minnesota and adjacent Wisconsin.

The Grantsburg Sublobe moved northeasterly through the Twin Cities basin overriding the St. Croix moraine blocking drainage of glacial meltwater to the south forming glacial Lake Grantsburg. Beginning around 12,000 years ago, the St. Louis Sublobe flowed east into the Lake Superior basin. As the ice margin began retreating from the area 11,600 years ago, water became ponded at its front margin forming glacial Lakes Aitkin and Upham.

As the Grantsburg Sublobe withdrew from its maximum, Lake Grantsburg drained, and the meltwater formed a series of outwash plains wherever the wasting ice exposed low ground resulting in the formation of the Anoka sandplain (Wright 1972a). At about the same time the Des Moines Lobe reached its maximum extent the Superior Lobe had accumulated enough ice in the Lake Superior basin for several more ice advances. These final advances resulted in the formation of the Mille Lacs and Highland Moraines. A contemporaneous advance by the Rainy Lobe in northeastern Minnesota formed the Vermillion Moraine.

Recession of the Des Moines Lobe from its Lake Wisconsin maximum is marked by a series of moraines in north-central Iowa. Final wastage of the Des Moines Lobe left a distinctive fine textured till composed of mainly Paleozoic limestone and Cretaceous shale. The drift, and the loess derived from it, are the parent materials for much of the soils of the southern and western parts of Minnesota. These fertile soils are responsible for the development of agriculture in these areas of the state.

During glacial retreat, small preglacial lakes formed along the outside edge of the melting ice margin. The most conspicuous of these is glacial Lake Benson near which was dammed by a narrow moraine formed near Granite Falls. From Granite Falls further retreat of the ice to the Big Stone moraine, the divide between the Minnesota and Red River valleys, dammed southward drainage from the ice front forming glacial Lake Agassiz (Wright 1972a). Two additional preglacial lakes preceded Lake Agassiz. One in eastern South Dakota, Lake Minor, drained through a channel at an elevation of 1,100 feet, and the other in western Minnesota drained through the Fish Creek channel at an elevation of 1,070 feet (Matsch and Wright 1967).

The actual sequence of ice retreat was not a straightforward matter. As Teller puts it (1987:53-54):

After retreating several hundred kilometers north of its 14 ka [14,000 years uncalibrated] maximum in Iowa, a series of at least eight rapid readvances (surges) and retreats of the Red River-Des Moines Lobe occurred . . . . During this period, each successive glacial advance fell short of its predecessor, and each intervening glacial retreat appears to have receded slightly farther north. Several times before 12 ka the glacial margin wasted north of the divide between Hudson Bay and Mississippi watersheds at the southern end of the Red River Lowland . . . . At times, lakes developed in the southern (upslope) end of the lowland for a few hundred years before being overridden by a new surge of ice. Finally, about 11.7 ka, ice wasted north across the divide into the Red River Valley for the last time, establishing Lake Agassiz.

At its maximum extent, Lake Agassiz was the largest Pleistocene lake ever in North America, covering more than 350,000 square kilometers in Canada and the United States. The history of glacial Lake Agassiz is extremely complex and the fluctuation in lake levels and drainageways of Lake Agassiz also have significant implications for an understanding of the prehistoric cultures of Minnesota at this time.

Formation of Lake Agassiz and its outlet at Brown's Valley followed as the ice withdrew into northern Minnesota. The Big Stone moraine was dissected by the outlet stream, the incipient glacial River Warren, which cut down through outwash valley trains formed in front of the Big Stone moraine (Wright 1972a). Downcutting of the outlet channel temporarily ceased and stabilization of the lake occurred at elevation of 1,060 feet known as the Herman strand line. A beach strand line formed on the east side of the Red River lowland that can be traced over 150 miles northward to Maple Lake. At this point the lake turns abruptly east into the Red Lakes lowland. On the west side of the lowland the beach is traceable from its southern outlet into Manitoba, a distance of 350 miles.

Continued growth of Lake Agassiz owing to further ice retreat increased the volume of water flowing through its southern outlet resulting in downcutting of the outlet and stabilization of the lake at an elevation of 1,040 feet, the Norcross strand line. Repetition of this process produced the Tintah strand line at 1,020 feet and the Campbell strand line at 980 feet.

The Campbell strand line was abandoned probably by 9,600 years ago (Wright 1972a: 544). Fluctuation of the lake level occurred presumably due to surges in an ice lobe to the northeast near an outlet to Lake Superior. Wright (1972:544) recounts the final withdrawal of Lake Agassiz from Minnesota as follows:

As Lake Agassiz retreated from the Campbell beach for the last time the southern outlet was abandoned for good, and eastern outlets to Lake Superior were utilized as several lower strand lines were formed. Even an outlet northwest to the Mackenzie River occurred at one time (Elson, 1967). Although the northern part of the lake expanded, as the ice withdrew toward Hudson Bay, the southern part became restricted, despite continual southern tilting of the land. By 8,300 years ago the lake was restricted to Manitoba, although still with an outlet eastward to Lake Superior. By 7,300 years ago, sea water worked its way through Hudson Straits and around the west side of Hudson Bay, and Lake Agassiz drained to this point, as do modern remnants Lake Manitoba and Lake Winnibigoshish. Within Minnesota, the only large remnants of Lake Agassiz

are the huge Red Lakes in Beltrami County, and Rainy Lake and Lake of the Woods on the Canadian border.

New drainage relations were established along the what are now the Minnesota and Mississippi River Valleys during the demise of Lake Agassiz. The declining water levels in the lake resulted in the abandonment of glacial River Warren and the formation of the Minnesota river. These have undergone a complex system of developments in late glacial and postglacial times and the reader is referred to Wright (1972a), Teller and Clayton (1983) and Teller (1987) for detailed discussion of this problem.

## Topography and Physiography

Although Minnesota is often characterized as being relatively flat, it contains significant variation in topography and relief. Figure 5 is a shaded relief map of the state which clearly shows Lake Agassiz and the lowlands created by the Des Moines Lobe of ice extended south into Iowa; the older areas not glaciated during recent times in southwestern and southeastern Minnesota; the complex topography of central and north-central Minnesota; the major moraine complexes; and the rugged topography of the Mississippi River trench and the Lake Superior highlands.

The physiography of Minnesota is particularly complex. Wright (1972b:561-78) presents an excellent overview of 27 physiographic provinces of the state and this summary is drawn primarily from that presentation. Wright's map of the physiography of Minnesota is presented as Figure 6 and the following discussion is extracted from his article.

The effects of the Des Moines Lobe of ice on the Minnesota landscape are clear on the landscape. Glacial Lake Agassiz created two distinct physiographic provinces in the northwestern and northern portions of the state. The glacial Lake Agassiz area is flat, almost featureless, and was created primarily by the deep-water sediments of the lake. The Beltrami Arm of Lake Agassiz represents an early stage of the lake when it extended eastward across northern Minnesota almost as far as Ely, Mn. Today, this area is perhaps the largest wetland in the world and contains extensive deposits of peat overlying lake clays. These peats appear to have formed with the onset of moister conditions beginning perhaps 4,000 years ago at the end of the prairie period. The Beltrami Arm was contained on the south by a complex of moraines and outwash plains termed the Bemidji Area. The glacial history of this area is complex but it appears that its' glacial landforms relate both to the movements of the Wadena Lobe of ice and subsequent invasion by the St. Louis Sublobe.

The effect of the Des Moines Lobe to the east and south is most apparent in the Minnesota River Valley, the Blue Earth and Olivia Till Plains, and the Owatonna Moraine Area.

The Minnesota River Valley extends between the till plains in a straight course for 180 miles from its head at Browns Valley to the big bend at Mankato and then northeast for an additional 40 miles to the moraine complex west of Minneapolis. The valley was formed by glacial River Warren, which drained glacial Lake Agassiz, and the river today is grossly underfit. In the upper reaches of the river, two long river lakes are present. These lakes (Lac qui Parle and Big Stone Lake) were created by fans from the Chippewa and Whetstone River's respectively which dammed the Minnesota. Downstream from these lakes, the river has downcut into very ancient Precambrian rock and outcrops of these materials continue to Mankato, where Paleozoic



Figure 5. Relief map of Minnesota.

rocks appear. The change in bedrock at Mankato accounts indirectly for the sharp bend at Mankato.

The Blue Earth Till Plain is generally featureless, although where it abuts against the Couteau des Prairies there is a certain linearity that reflects weak lateral moraines formed during shrinkage of the ice lobe or which were created by channels of old ice-marginal meltwater streams. The courses of the Redwood, Cottonwood, and Watonwan rivers follow these old channels. Numerous prairie lakes are found in this area and the portion of the till plain south of Mankato was covered by glacial Lake Minnesota and is thus particularly flat and rich in clays and silts.

The Olivia Till Plain is similar to the Blue Earth Till Plain, although the linearity of deposits is weaker in most areas. The Olivia Till Plain extends northward and becomes constricted between the Minnesota River Valley and the Alexandria Moraine Complex. In this area, the till plain is crossed obliquely by the Chippewa and Pomme de Terre rivers, both of which built multiple sand-filled channels on the plain before merging with the Minnesota River.

The Owatonna Moraine Area contains a series of moraines that formed along the eastern edge of the Des Moines Lobe. The eastern edge of the moraine area terminates abruptly beside the Rochester Till Plain and provides a striking example of the precise margin of glacial activity. On the western edge, the moraine complex grades into the Blue Earth Till Plain. Relief is rugged in the northern portion of the area but decreases to the south. Ancient vegetation in the north was forest and in the south was primarily prairie. The expansion of the Big Woods some 500 years ago followed the course of the Owatonna Moraine southward into the prairie region.

The Des Moines Lobe deposits in southern Minnesota are bordered on the west by the Couteau des Prairies and on the east by the Rochester Till Plain.



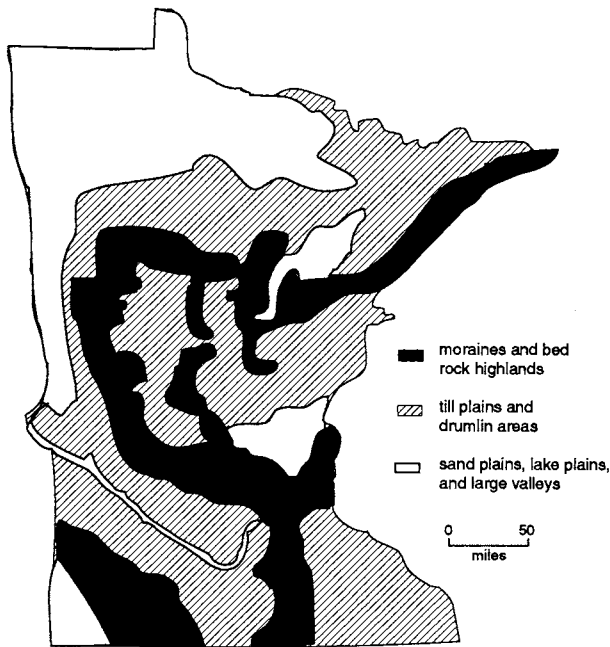


Figure 6. Physiography of Minnesota (after Wright 1972b).

The Coteau des Prairies, Outer Part is a wedge-shaped upland which has a remarkably straight, steep eastern escarpment which trends southeast. The upland and its scarp have the appearance of a structurally controlled plateau. Although no exposures of bedrock have been found in the region, Wright (1972b:573) hypothesizes that there is some kind of bedrock upland that separated the preglacial Minnesota lowland from the neighboring James River lowland in South Dakota.

When the Des Moines Lobe filled the Minnesota River lowland with ice, the lobe rose on its western flank up over the escarpment and onto the crest of the Coteau, creating the Bemis moraine at its highest point and the Altamont and other moraines as it withdrew and retreated down the escarpment.

The Coteau des Prairies, Inner Part is a small triangle of drift largely covered with loess (windblown sediment). The loess buries drift of both Wisconsin and pre-Wisconsin age and thickens toward the southwest. These deposits probably originated as windblown silt from the outwash deposits of the Big Sioux River to the south in Iowa. This area is characterized by a well developed drainage system and the absence of depressions. Numerous outcrops of Sioux Quartzite in this area bear polish and striations created by several ice advances from different directions.

The Rochester Till Plain extends from the Owatonna Moraine eastward to the Mississippi River floodplain and is a nearly featureless pre-Wisconsin till plain with a partial cover of loess that thickens toward the Mississippi. The precise age of the till(s) that underlie the loess remain unclear. The eastern margin of the till plain appears to contain loess resting directly on bedrock and has been referred to as driftless, much like the area in Wisconsin directly across the Mississippi River.

The eastern portion of the till plain is deeply dissected by streams flowing eastward into the Mississippi (the Cannon, Zumbro, Whitewater, and Root). These deeply dissected valleys are generally

flat and abut abruptly against the heavily forested hill slopes. In the downstream reaches of these streams, there is often evidence of backwater lakes that extended upstream from the Mississippi and which were created during periods of glacial outwash in the Mississippi Valley.

The Mississippi River floodplain itself is complex and has been extensively modified by modern dams and navigation channel maintenance. More than 90 feet of sediment have been deposited in the floodplain since the end of glacial Lake Agassiz's discharge down the river some 9,000 years ago. Most of the tributary streams have formed alluvial fans where they join the Mississippi. Lake Pepin, a massive river lake extending from Red Wing to Wabasha, is formed by the alluvial fan of the Chippewa River entering from Wisconsin.

To the north, the physiography of central Minnesota is complex and reflects the action of the various lobes of ice that intruded into this area. Central Minnesota is constrained on the west by the massive Alexandria moraine, on the south by the Owatonna and Eastern St. Croix Moraines, and on the north and northeast by Sugar Hills-Mille Lacs Moraine. Deposits contained inside of these belts of moraines include the Wadena Drumlin Area, the Brainerd Drumlin Area, the Western St. Croix Moraine which separates the two drumlin areas, and the Anoka Sand Plain.

The Alexandria Moraine Area is a complex of lake-dotted moraine deposits ten to twenty miles wide and which is interrupted by extensive areas of outwash. This area contains drift derived from two different ice lobes. The bulk of the moraine appears to have been produced at the terminus of the Wadena Lobe, but was subsequently overridden by the Des Moines Lobe. The Alexandria moraine complex contains the thickest glacial drift in the state and is rugged and heavily wooded. Northward the moraine complex gives way to the Itasca Moraine and moraines in the Bemidji area. On the southeast, it merges with the St. Croix Moraine. However, both moraines were overridden by ice and partially obscured, so boundaries between the two are arbitrary.

The St. Croix Moraine marks the limit of the combined Superior and Rainy lobes of ice. The central section of the moraine was late overridden by ice and partly obscured. The Eastern St. Croix Moraine extends from St. Paul northeastward into Wisconsin and is expressed as a rugged belt of hills and depressions. The moraine is bordered on the south by a broad outwash plain and on the north was subsequently overlapped by ice from the Grantsburg sublobe (Des Moines lobe). The eastern segment of the St. Croix Moraine is composed of stony, reddish-brown glacial drift.

The Western St. Croix Moraine borders the upper Mississippi River on the west for about 100 miles. The moraine is about six miles in breadth and has a particularly sharp face to the west, where it is edged by outwash plains that bury parts of the Wadena Drumlin Field. The moraine is cut west of Brainerd by the Pillager Gap, a broad feature which carried the Crow Wing River and its outwash from the west into the Mississippi River.

The Itasca Moraine is a massive deposit created by the Wadena lobe of ice and west extends east-west. The moraine is characterized by numerous north-south lake-filled trenches created by tunnel valleys. These tunnel valleys end abruptly at the south edge of the moraine, where the streams emerged and disgorged their massive loads of gravel onto the Park Rapids outwash plain.

The Sugar Hills-Mille Lacs Moraine Area includes several different moraines from Mille Lacs Lake north and eastward to Grand Rapids, Mn. Not all of these moraines were created by the same glacial actions.

The most distinctive of the moraines is an arcuate moraine that bounds Mille Lacs Lake on the south and west and which contains sandy till and outwash related to the Superior Lobe. On its inner side, it has a cap of clay till deposited when the St. Louis sublobe spread out of the glacial Lake Aitkin basin. The morainic topography extends northward and northeastward, and much of this area also has a cap of St. Louis sublobe till overlying stony or sandy moraine deposits.

The Wadena Drumlin Area is bounded on the east by the St. Croix Moraine, on the west by the Alexandria Moraine, and on the north by the Itasca Moraine. This area contains more than 1,200 conspicuous drumlins arrayed in a fan-shaped pattern which were formed by the Wadena lobe spreading to the west and south. Portions of the drumlin field are buried or obscured by outwash plains of different ages. On the west, younger till and outwash overlie the area. On the north, outwash emerging from the Wadena lobe as it stood at the Itasca Moraine has obscured the drumlins and on the east outwash from the Rainy Lobe at the St. Croix Moraine has had the same effect. Relief of this area is, as might be expected, quite rolling.

The Brainerd-Automba Drumlin Area is composed of most of the ground moraine of the Rainy and Superior lobes inside the arc of the St. Croix moraine and which has not been buried by younger outwash or drift. There are at least three major drumlin fields within this area and the entire area is interrupted in many places by outwash plains. The largest of these plains is the Mississippi River Valley train which enlarges north of Brainerd into a great complex of pitted plains, mostly leading to moraines in the Sugar Hills-Mille Lacs area. The area south of Mille Lacs lake is also interrupted by sharp erosional valleys containing swamps, lakes, or underfit streams. These are probably tunnel valleys formed by streams flowing under the glacial ice under high hydrostatic pressure.

The glacial Lake Duluth and Barnum Clay-till Areas are on the western margin of the Brainerd-Automba Drumlin area. The glacial Lake Duluth area is a partly dissected clay plain that marks the former bed of glacial Lake Duluth at an elevation of roughly 1,000 feet above sea level or 400 feet above the current level of Lake Superior. The plain is deeply dissected by the St. Louis River and its tributary, the Nemadji. The Barnum Clay-till Area adjoins the Glacial Lake Duluth area and consists of an area of red clay till and associated outwash which was formed during at least two brief advances of the Superior Lobe in which preglacial lake clays were overridden and deposited. The most prominent feature of the area is the Nickerson moraine, which represents the southeast flank of the ice lobe.

The Anoka Sandplain Area lies north of the St. Croix Moraine and between the Mississippi and St. Croix rivers. It is a broad sandplain formed largely by glacial drainage from the north and west. The Sandplain is best described as a complex mosaic of landforms, lakes, and vegetation. Low regions of upland represent areas of till that were not buried by the outwash sand define the high areas within the Sandplain and expanses of sand dunes created both immediately after deglaciation and probably during the mid-continent dry period are also present. Numerous ice-block lakes and marshes are scattered across the area, as are the remnants of tunnel valleys which contain long chains of lakes. Lake levels in the Sandplain fluctuated over time and the history of the region is complex.

The physiography of northeastern Minnesota is defined by the interaction of glacial ice and glacial deposits with the bedrock of the Canadian Shield. Physiographic areas in this portion of the state include the North Shore Highland, the Border Lakes Area, the Toimi

Drumlin Area, the Giants Range, the Aurora-Alborn Clay-till area, Glacial Lakes Upham and Aitkin, and the Chisholm-Embarrass Area.

The North Shore Highland is underlain by basalt and other igneous rocks and overlooks Lake Superior from a height of between 900 to 1,500 feet. It extends all the way from Duluth, at the head of Lake Superior, to the Canadian border. Although its border with the lake is abrupt and dramatic, its interior boundary is less prominent and is based on the drainage divide between the short streams flowing from the interior to the coast of Lake Superior and the linear headwater streams of the St. Louis River system.

At one phase of glaciation, the Superior lobe filled the Superior basin and spread up the steep slope of the North Shore Highland, terminating at the Highland moraine.

The Border Lakes Area is an area of bedrock lakes which occupies a belt roughly 25 miles wide and which extends about 130 miles west along the Canadian border. In this area, glacial activity was primarily confined to differential erosion of bedrock, producing patterns of lakes and ridges that reflect the rock structure. Several distinct patterns can be distinguished and these vary geographically across the area. The area has, in most places, relatively limited soil development, and is heavily wooded.

The Toimi Drumlin Area is northwest of most of the North Shore Highland and is characterized by southwestward trending drumlins and a linear stream pattern. The drumlins are between 1 and 2 miles long, one quarter mile wide, and between 30 and 50 feet in height. The region is drained on the southwest by the Whiteface and Cloquet rivers. The St. Louis River roughly delimits the area on the south, where younger glacial drift obscures the drumlin patterns. On the west, the Toimi drumlins are overlapped by red clayey drift of the St. Louis sublobe. On the north, it is truncated by the Vermilion moraine and on the east by the Highland moraine. A few of the swales between the drumlins are filled with lakes, but most contain bogs. Often these bogs contain lakes in the middle, indicating the progression of infilling of the lake by bog growth after the lake was largely filled with sediment.

The Giants Range is a highland of granite which rises 200 to 400 feet above the plains to its north and south. The Giants Range contains the three-way divide between drainage to Hudson Bay, the Great Lakes, and the Gulf of Mexico. The Giants Range is immediately north of the Mesabi Iron Range, an area that is now pockmarked with massive open pit mines that can be seen for miles.

The Chisholm-Embarrass Area lies between the Giants Range and the eastern arm of Glacial Lake Agassiz. It is a wedge-shaped area of low moraines and outwash plains. It is bounded on the north by the moraines that excluded Lake Agassiz. These moraines trend roughly to the east, were deposited by the Rainy lobe, and are stony and dominated by crystalline rocks. The western area was subsequently overridden by the St. Louis sublobe and surface drift in this area is fine grained and calcareous. Outwash plains are common between the moraines.

Glacial Lakes Upham and Aitkin are large expanses of glacial lake plains. Glacial Lake Upham is south of the Giants range and the lake plain and marginal sand plains consist of a broad expanse of swamp-covered silt and sand. The region is drained southward by the St. Louis river, which turns abruptly southeastward at the south end of the plain to flow past the end of the Toimi Drumlin Field and the North Shore Highland before entering Lake Superior at Duluth. The Glacial Lake Aitkin plain is transected by the meandering Mississippi River and is separated from Glacial Lake Upham to the east by a high



morainic ridge and an alluvial fan deposited on the lake plain by the glacial Mississippi River. During the glacial period, the main lake was confluent eastward with Glacial Lake Upham, which created a substantial outlet gorge down the St. Louis River.

The Aurora-Alborn Clay-till Area lies between the Toimi Drumlin Field on the east and the plains of Glacial Lake Aitkin and Upham to the west. The area consists of red-brown clay till deposited by the St. Louis sublobe during its advance to the northeast and east. The ice picked up clay from the sediments of an earlier Glacial Lake Upham and redeposited it at the ice lobe margin, generally as a veneer less than 25 feet thick. This till partially buries the Toimi Drumlin field to the east and laps up against the Giants Range to the north. Along the southeastern part of the area, the till forms a distinct moraine which crosses the St. Louis River.

## Vegetation

One of the most distinctive characteristics of Minnesota is that three of the major continental ecosystems come together and abut one another within the state. In the 1930s, Francis Marschner prepared a detailed map of the vegetation of Minnesota in the nineteenth century using the General Land Office survey records (Marschner 1974) and Heinselman (1974) has prepared a legend for the map and more detailed description of the vegetation units. More recent research by a variety of scholars is refining these initial formulations, as well as expanding our knowledge of vegetation change through time.

Dense deciduous forest dominated by oak, maple, and other species covered the southeastern portion of Minnesota. This forest was the northernmost extension of the eastern deciduous forest of the lower Midwest and is similar to vegetation found in eastern Iowa, Wisconsin, and Illinois. In general, deciduous forest extends as far north as the Anoka Sandplain and east onto the Owatonna Moraine. Within the deciduous forest, Marshner mapped three basic vegetation units: Big Woods (containing both oaks and more mesic species like elm and maple); river bottom forest; and aspen-birch vegetation with elm, maple and others as associated species.

The north-central and northeastern portions of the state are covered with mixed hardwood and coniferous forest. There is wide variation in the plant communities within this forest, defined in part by local soil and climatic conditions. Stands of white pine used to be quite common, and vast expanses of birch, maple, pine, and other tree's are still present. In far northeastern Minnesota, spruce is present, and the wetlands of the Beltrami Arm of Lake Agassiz are covered with a mixture of wetland species including birch, poplar, tamarack, and coniferous species. Within the boundaries of the mixed hardwood and coniferous forest, Marshner mapped 6 basic vegetation units: mixed hardwood and pine (including white pine, maple, basswood and other species, with balsam fir in the north); pineries (nearly pure stands of white pine or white and norway pine); jack pine barrens and openings (jack pine with oak, aspen, and hazel brush); pine flats (with hemlock, spruce, fir, cedar, and white pine) and aspen-birch (with white and norway pine, balsam, fir, birch, and others as associated species). In addition, he mapped two bog units—conifer bogs and swamps (containing tamarack, spruce, cedar and balsam) and open muskeg or floating bogs (containing mosses, rushes, marsh-grasses, alder brush and scattered small tamaracks).

Perhaps the most striking aspect of Minnesota vegetation is the vast expanse of tall grass prairie that covered the western portion of the state. The prairie extended from the northwestern corner of the state in the Lake Agassiz basin south and then southeast to the Iowa border. The prairie was dominated by numerous tall grasses and forbs, particularly Big and Little Blue Stem. The boundary between forest and prairie was often an oak savannah, characterized by patches of fire-resistant white oaks (e.g., *Quercus macrocarpa*), brush, and prairie grass. Marshner distinguished between areas of tall-grass prairie and what he termed wet prairie, marshes and sloughs (which contained marsh grasses, reeds, rushes, wild rice, with willow and alder-brush in places).

The distribution of vegetation types in Minnesota is controlled by climatic variation across the state, fire, and to a lesser extent, landform.

There are sharp climatic gradients across the state. Temperature tends to decrease from south to north and precipitation tends to increase from west to east. Thus, the southwestern portion of the state (covered by prairie) is generally the warmest, driest portion of Minnesota while the northeastern portion is generally the most cool and wet. These climatic gradients are largely a function of the placement of the three continental airstreams that converge within Minnesota (see below). Borchert (1950) observed that the prairie-forest margin tended to follow the maximum extent of the warm, dry westerly air from the Pacific and this observation appears to explain the expansion of the prairie in the past as well.

Fire played a particularly important role in the ecology of the forests and prairies of Minnesota, rejuvenating the prairie itself and maintaining or expanding the border between the prairie and the forest. Fire was constrained at the prairie-forest margin only by natural fire-breaks (lakes, streams, marshes, and steep slopes) and fire-tolerant species like the bur oak (*Quercus macrocarpa*). Moore (1972) has reviewed the history of fire on the plains and prairie while Grimm (1981) has examined the characteristics of fire as it related to the Big Woods and the prairie-forest border in southern Minnesota.

It is difficult to imagine, today, the extent and intensity of the periodic conflagrations that swept across the prairie landscape. Often fires could be easily avoided or traversed by people with relatively little risk. However, when fuel, wind, and humidity all reached certain critical levels, prairie fires could be wild and unpredictable. In March of 1854, Arba Cleaveland described prairie fires in Carver County, just west of Minneapolis/St. Paul, as follows:

The prairie fires . . . have been raging all the month. Some night, when there is no moon, the whole heavens are illumined and it looks like one mighty conflagration. Other nights, when the fire is near I can see to pick up a pin anywhere, but it does not frighten me at all, for I know it is harming no one, or at least it will not, if they take the precaution they should to burn around everything they have. I have heard of but one being burned out near us, that was a German 3 miles west of us. We burned round our house and barn last fall. I should not dare to sleep one night when it was not burnt. We have winds in the spring, and a fire rushes on faster than a horse can run; there is such an amount of vegetation in the woods that the fire will run there, as well as in the meadow where the grass is 14 feet high. (for there was grass in Mr. Lyman's meadow high as that). You can only faintly imagine how such a fire looks, with the flames rising as high as the tops of trees, roaring, crackling, and sweeping

onward with a velocity nothing can check, but want of fuel. The country is so destitute of mountains or large hills, that we can see the reflection of fires, that are miles and miles distant. [Grimm 1981:82]

The role of fire in prehistoric settlement patterning has not been fully explored, but Arba Clevelands experience suggests that it may have played an important role in where sites were located during certain times of the year. Certainly in southern and southwestern Minnesota, sites tended to be located on the eastern side of lakes, suggesting that prehistoric peoples of the state utilized natural firebreaks to their full advantage.

Patterns of vegetation in Minnesota have not been stable through time, but rather have shifted dramatically in response first to the melting of glacial ice and subsequently to climatic factors. Vegetation change varies throughout the state and can be rather complex. Details of the evolution of vegetation in the state from tundra to its modern configuration are discussed in the following sections.

## Climate

The climate of Minnesota is controlled primarily by the interaction of three continental air masses. These are the dry, warm air of the westerly Pacific air mass; the cold, dry air of the northerly Arctic air mass; and the warm, moist air of the southerly Gulf Tropical air mass. The interaction of these three air masses is complex and climatic conditions within the state can vary dramatically over a few tens of miles. As a general rule, temperatures in the state decrease from the Iowa border north to Canadian boundary. Precipitation increases from the western part of the state to the east. The climate of Duluth and the area near Lake Superior is buffered to some extent by Lake Superior itself.

Because of Minnesota's relatively high latitude and position at the margin of the three air masses, its climate is characterized by extreme yearly and monthly fluctuations in temperature, precipitation, and storm intensity. Winters can be extremely cold, with or without heavy snow cover. Summers can be very hot or relatively cool, and may be quite wet or quite dry. Further, there have been significant climatic changes through time and extrapolating modern climatic conditions back even a few hundred years can be a misleading practice for the archeologist.

An excellent historical climatic record was maintained by the military at Fort Snelling in the Twin Cities of Minneapolis/St. Paul and is used here to describe recent variation in the climate of this portion of Minnesota. Temperature data is available from 1820 to 1987 and precipitation data is available from 1837 to 1990.

Figure 7 shows the average monthly temperature and mean monthly precipitation for the period from 1837 to 1987. Both temperature and precipitation appear to follow relatively straightforward patterns. January is the coldest month of the year, and temperature steadily increases into the summer, with July on average being the warmest month of the year. Precipitation follows a similar pattern, increasing steadily from February until June, which is on average the wettest month of the year, and then decreasing to December. This pattern is deceptive, however, since there is considerable fluctuation from year to year in both temperature and precipitation. Figure 8 plots the standard deviation of average monthly temperature and precipitation and a rather different picture of Minnesota climate emerges. Temperature during the summer months is relatively predictable, but winter temperatures can vary dramatically

from very cold to relatively warm from year to year. Similarly, while winters tend to have extended snow cover, the amount of precipitation during the summer months can fluctuate almost as dramatically as does temperature during the winter.

There are also longer-term fluctuations in temperature and precipitation that have important implications for the student of Minnesota's past. Figures 9 and 10 show mean annual temperature and total annual precipitation at Fort Snelling. Individual data points for each year are given along with a five-year moving average of the data which smooths the data and shows the characteristics of the longer term climatic trends. After a relatively warm period in the 1830s, mean annual temperature steadily declined until 1880, when it began to climb once again, culminating the very hot period of the 1920s and 1930s. Trends in precipitation are equally pronounced but less linear in character. The Civil War years and the Dust Bowl days are clearly apparent, as are episodes of much higher precipitation during the late 1870s and 1880s, the period at the turn of the century, and the period since 1987.

Figure 11 combines the three-year moving averages of total annual precipitation and mean annual temperature to illustrate longer-term trends in Minnesota climate. The period of increasing coolness which began around 1830 is punctuated by periods of both extreme dryness and relatively moist conditions. Immediately after the Civil War, temperatures remained cool but precipitation was high, with a noticeable spike in both just after 1880. Temperature and precipitation both increased from around 1890 until 1910, creating warm, moist conditions that were in marked contrast to the cool-dry conditions that immediately preceded this period and the cool-wet conditions that had dominated the state after the Civil War. Beginning around 1910, climate in the state shifted to an extended period of low to extremely low precipitation and high to very high temperatures that ultimately culminated in the Dust Bowl days from approximately 1925 until 1935. Dry periods also occurred with decadal frequency in the early 1950s, early 1960s, and mid 1970s. Temperature, however, was not as extreme and did not exacerbate the effects of these dry periods as was the case during the Dust Bowl.

The significance of both annual and longer-term variability in temperature and precipitation in Minnesota cannot be overstated. Because of the exceptionally cold winters and sensitive response of vegetation and animal populations to climatic conditions, even seemingly modest changes in climate patterns over a few years could have significant effects on human populations in the state. Although the hubris (and central heating) of the late twentieth century tends to understate the significance of climatic shifts in Minnesota, we suspect that a return to the cold-wet conditions of the nineteenth century or the hot-dry conditions of the Dust Bowl years would have consequences for even our relatively protected culture. The implications for the hunting and gathering societies that inhabited Minnesota for most of the last 11,000 years, or for the horticultural groups of the last 1,000 years, are perhaps larger than traditionally thought.

In addition to annual and decadal changes in climate, there have been significant longer-term climatic shifts in Minnesota beginning with the global warming that culminated in the melting and retreat of the glacial ice that covered the state. Numerous pollen cores and studies around the state have documented the patterns of vegetation—and presumably climatic—change. Until recently, nothing like the precision provided by historic climatic records was available for the

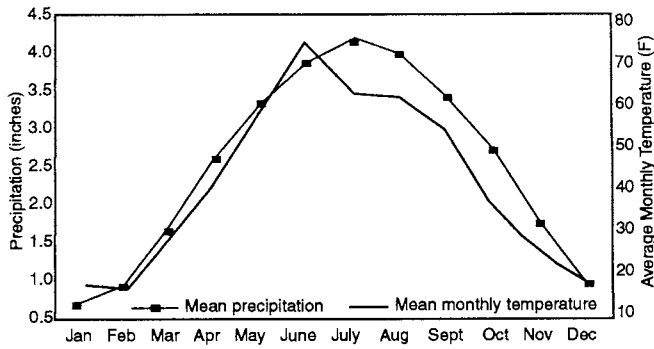


Figure 7. Monthly temperature and precipitation, Minneapolis, 1837-1987.

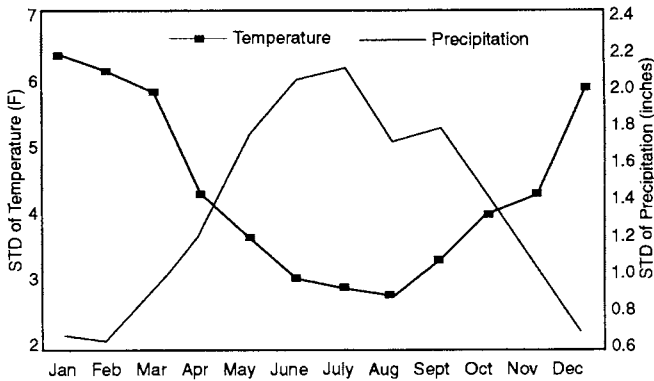


Figure 8. Monthly variability in temperature and precipitation, Minneapolis, 1837-1987.

archeologist. However, during the last decade studies at Elk Lake in northwestern Minnesota have provided a high-resolution picture of climatic and vegetation change in the Minnesota for the last 10,400 years.

Elk Lake is a small glacial ice-block lake situated on the Itasca moraine in northwestern Minnesota. The lake contains almost 20 meters of sediment in its basin, documenting more than 11,000 years of lake history (Bradbury and Dean 1993). The majority of the sediment is varved (10,400 years) and provides a detailed chronicle of limnological and climatic changes at the lake for most of the Holocene. Because the lake lies along the prairie-forest boundary, it provides an excellent record of the changes in the composition and location of these two major environmental zones and the interplay between the air masses that control climate in Minnesota.

A detailed synthesis of the climatic history of the region based on the Elk Lake data has been recently prepared (Bradbury et al., eds. 1993). Although care must be taken in extrapolating climate at Elk Lake to other parts of Minnesota, particularly the southern portions of the state, the Elk Lake data provides a very useful point of beginning for archeologists interested in the complex interplay between human culture and environment in Minnesota.

Three broad phases in the history of Elk Lake have been identified. The first phase is the Postglacial Lake (R. Y. Anderson et al. 1993:3; see also Bradbury et al. 1993:309-328). During this period, the ice block that formed the lake melted slowly and a small, temporary lake formed above the block of melting ice. By the time the glacier was

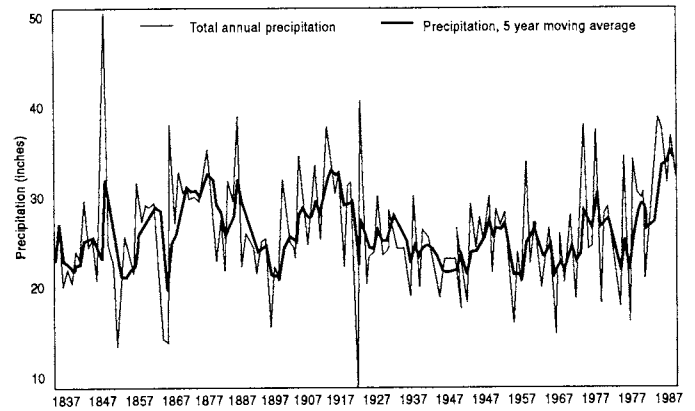


Figure 9. Total annual precipitation, Minneapolis, 1837-1987.

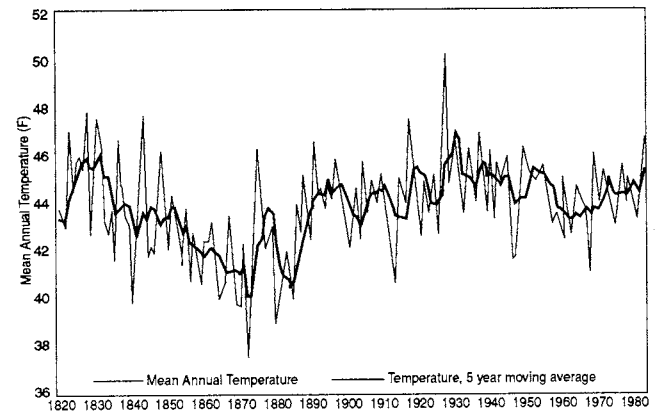


Figure 10. Mean annual temperature, Minneapolis, 1820-1987.

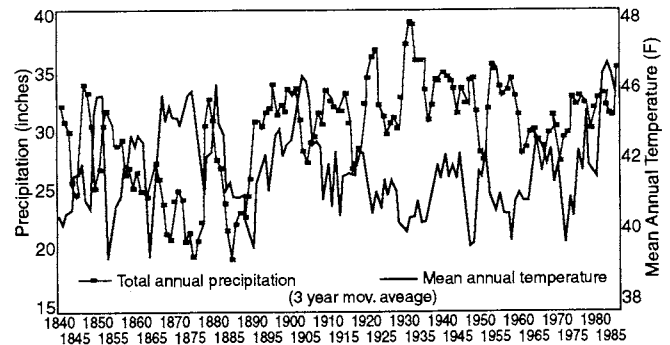


Figure 11. Mean annual temperature and total annual precipitation, Minneapolis.

several hundred kilometers to the northeast, the lake was surrounded by a forest of spruce and birch. This situation persisted from about ten to eight thousand years ago, until oak savanna replaced the coniferous forest under drier mid-Holocene climatic conditions.

The next stage in Elk Lake's history is as a Prairie Lake (R. Y. Anderson et al. 1993:4-5). The mid-Holocene has been widely recognized as a period of time when climate was warmer and drier than at present, and has been variously referred to as the altithermal, hypsithermal, climatic optimum, or prairie period. During this time, Elk Lake records the development and expansion of the prairie.

Between about eight and four thousand years ago, oak savanna and prairie vegetation expanded eastward by as much as 100 kilometers. Climate during this period was marked by shifting dominance and oscillations between the three continental airstreams that converge on Minnesota. Although the prairie period has been described as a warmer period in many parts of the north-central United States, at Elk Lake, it appears that prairie period climate was drier and cooler, not warmer. In part, this may be due to the fact that the glacial ice sheets were no longer blocking surges of dry, cold arctic air into the Minnesota region. While this situation may not have been true throughout Minnesota, it appears that at Elk Lake the climate was similar to conditions found today in the Canadian prairie.

There is evidence for increased sediment deposition at Elk Lake (and elsewhere) during the prairie period. Intense winds and the changed vegetation of the region apparently resulted in much higher levels of wind erosion and the deposition of windblown sediment. Pulses in the influx of sediment into the lake on the order of centuries appear to be associated with solar activity and possibly with changes in the Earth's magnetic field (R. Y. Anderson 1993). Further, the long-term mid Holocene trend toward a drier climate was interrupted by a strong, rapid reversal that lasted about 600 years between 4.6 and 5.2 thousand years ago.

By four thousand years ago, moister conditions associated with the increasing dominance of the tropical airstream had returned to Elk Lake and a mesic forest of pine, birch, and other hardwoods was established around the lake. Sediment influx into the lake decreased and it appears that climatic conditions were more stable than they had been during the previous four thousand years. Even though climatic conditions were relatively more stable and large-scale fluctuations had ceased, variations on the order of decades and centuries were still present. There is also evidence that climatic changes similar to historically documented climatic episodes like the Medieval Warm period and the Little Ice Age occurred in the region, although these changes cannot be clearly correlated with the historical episodes.

## Summary of Major Environmental Events and Trends

The preceding sections have summarized a broad variety of information about the physical environment of Minnesota. Because of the wide range of material covered, it seems appropriate to conclude this discussion of the physical setting by summarizing the major environmental events and trends as they directly relate to the major culture periods discussed in the rest of this document. We would stress again that climatic and vegetational change was often time-transgressive in Minnesota. In other words, the particular expression of certain types of changes may have been expressed somewhat differently in different portions of the state at different times.

### Paleoindian (Fluted Point Pattern)

The first people to enter Minnesota did so during the late glacial period when the landscape, climate, and vegetation were strikingly different than today. Massive ice sheets covered most of the state except the southeastern portion until roughly 14,000 years ago. Although ice was gone from the state by 11,300 years ago, a major readvance of ice across the Lake Superior basin occurred around

10,000 years ago, but by 9,500 years ago, this last vestige of glacial ice had completely vanished from the state.

Lake Agassiz formed about 11,600 years ago as glacial ice retreated over the continental divide into Canada. Initially, it drained east and was contemporary with Glacial Lakes Upham and Aitkin. Subsequently, Lake Upham and Aitkin were drained, and Agassiz itself went through a series of fluctuations in water level, horizontal extent, and outlets. Lake Agassiz was certainly present when the first humans moved into the Minnesota region and expanded to its greatest extent between 11.4 and 10.4 years ago. The lake continued to be a major landscape element until around 9,600 years ago and undoubtedly had a significant effect on regional climate. The full details of the "lake effect" created by Lake Agassiz for northern Minnesota remains somewhat unclear, but it is quite possible that local conditions were wetter and cooler because of the lake. Similarly, the effect that this massive body of water had on settlement, transportation, subsistence, and spiritual practices may have been profound, although the implications of Agassiz for early human activity in Minnesota has yet to be fully explored.

The climate in Minnesota during the initial stages of glacial retreat are still poorly known. However, the periglacial conditions described by Wright (1987) would have probably existed in at least part of the state during this period. Strong winds created shifting dunefields and blankets of windblown soil (loess), while meltwater from the ice sheet carved deep channels in certain parts of the state. Blocks of unmelted ice were buried by debris and may have remained in place for hundreds of years. Tundra was probably present prior to 11,600 years ago, although probably only as a relatively narrow band adjacent to the ice margins.

Despite these seemingly inclement conditions, at least part of Minnesota was available for human colonization even during the maximum expansion of the Des Moines lobe. The driftless areas of southwestern Wisconsin and southeastern Minnesota (Rochester Till Plain) were not covered with ice during this period and a relatively wide corridor remained open almost to the Twin Cities even 14,000 years ago.

By around 11,600 years ago, vegetation across the state appears to have consisted largely of spruce and grassland, possibly a relatively open spruce/forest parkland. Data from Elk Lake (Bartlein and Whitlock 1993:281) suggests that the climate was colder and drier, with January temperatures roughly 5° C lower than today, July temperatures 2.5° C lower, and precipitation lower by around 200 mm.

The period between 11,000 and 10,000 years ago appears to represent a gradual transition from immediate postglacial to early Holocene conditions. At Elk Lake, the transition begins with high percentages of spruce, tamarack, and birch pollen present. This is followed by a period with high percentages of spruce, birch, and various hardwoods including ash, oak, and elm. The period terminates with a dramatic shift from a landscape dominated by spruce to one dominated by pine. Several marked changes in climate are inferred by Bartlein and Whitlock (1993:282) during the course of this transition. They suggest that July temperature initially decreases about 2.5° C, but subsequently rises with the increases percentages of birch and hardwood species, as does annual precipitation. The shift from the spruce to pine forests suggests sharp increases in both January and July temperatures to values only a few degrees colder than present. It appears that spruce disappears rapidly between about 10,200 and

10,000 years ago and is quickly replaced with pine. This event appears to be associated with a relatively rapid increase in temperatures. This event appears to be time transgressive and would have occurred earlier in southern portions of the state.

In summary, climate during this period shows a transition from relatively cold and dry conditions to relatively cool and moist conditions during the early Holocene. The vegetation changed from spruce parkland to spruce forest and finally pine forest with some hardwoods present.

#### Paleoindian (Lanceolate Point Pattern)

The brief and final surge of glacial ice into the Lake Superior basin occurs around 10,000 years ago, but is short-lived and by 9,500 years ago the state is once again ice-free. Lake Agassiz was still present in the state, but about 9600 years ago, the natural features damming Lake Agassiz at its southern outlet failed and a final catastrophic flood or series of floods occurred down the Minnesota River, effectively flushing out the Minnesota and Mississippi River trenches. These final flooding episodes probably destroyed any archeological sites that were in the floodplain of the Minnesota and Mississippi. However, the fluctuation of the Minnesota and Mississippi river levels controlled the base level of streams that flowed into these rivers, and early archeological sites may be buried under a mixture of alluvial and colluvial deposits at or near the mouths of streams which empty into the Minnesota.

The vegetation of Minnesota between 10,500 and 8,000 years ago changed rapidly in response to changing climate and the differing positions of the glacial ice and preglacial lakes. The vegetation units and individual species present in Minnesota were generally unlike any modern vegetation types. According to Webb, Cushing and Wright (1983:154-155):

By 10,000 years B.P., forest covered all of the Midwest except for west-central Minnesota and eastern South Dakota, where woodlands grew. The boreal-forest/deciduous-forest ecotone disappeared and was replaced by two new ecotones as a result of the immigration of *Pinus* [pines]. The first lay across central Minnesota, northern Wisconsin, and upper Michigan; to its north were *Picea* [spruce]-rich forests with *Betula* [birch] (probably *B. papyrifera*) and *Pinus* [pines] . . . The second ecotone was located in extreme northern Iowa, Illinois, Indiana, and Ohio; to its south were deciduous forests composed of *Quercus* [oak], *Acer* [maple], *Ulmus* [elm], *Fraxinus* [ash], and *Ostrya/Carpinus* . . . The second ecotone was sharply defined from southern Michigan into Illinois . . . but it was more diffuse to the west. There appreciable numbers of *Ulmus* and *Fraxinus* trees grew in central Minnesota and Wisconsin and separated the region between *Quercus* forests and conifer forests . . . At 9000 B.P., the *Picea* and *Quercus* forests had both moved farther north, and prairie had begun to develop in the southwest. A boreal forest of *Picea*, *Pinus* (mostly *P. banksiana*), and *Betula* grew in northeastern Minnesota . . . The prairie/forest ecotone had developed but was diffuse in comparison to its later development. In Iowa and central Minnesota, the open woodland included trees of *Acer* and *Ulmus* as well as *Quercus*. (Common names added).

The transition from the use of fluted points to lanceolate points in Minnesota remains poorly documented. However, recent dating

of the Browns Valley skeleton and associated lanceolate projectile points indicate that by 10,000 years ago this transition had already occurred. This transition is seemingly associated with the transition from spruce forest to pine/hardwood forest in many areas of the state. Climatic conditions were warmer than earlier and slightly cooler than present, with precipitation higher than previously and about the same as today. At Elk Lake, there is evidence of a warmer and drier interval between about 9,500 and 9,100 years ago and it is probable that this is expressed elsewhere in the state as well.

As discussed in earlier sections, the climate of Minnesota is controlled by the interaction of three continental airstreams. However, it appears that until around 9,000 years ago, the proximity of the glacial ice sheets prevented outbreaks of extremely cold arctic air from the north into Minnesota. If true, this would explain the presence of plants like elm which are susceptible to harsh winter conditions relatively early at Elk Lake. After 9,000 years ago, the arctic air stream could move south into Minnesota, creating a significant change in the dynamics of climate within the state. The brief period of warmer, drier conditions between 9,500 and 9,100 years ago may reflect shifting storm conditions caused by the Pacific airstream to the west, and be a precursor to the drought conditions which would follow.

In summary, the prairie so characteristic of portions of Minnesota did not develop until after 9,000 years ago and during much of the period under consideration, most of Minnesota, particularly the southern portions, was covered with a forest composed of oak and pine. There is no modern analog for this type of vegetation, and interpreting the interplay between human groups and the environment remains an interesting challenge for archeologists.

#### The Archaic

The transition from the Lanceolate Point Pattern (Plano) to the Archaic remains problematic in Minnesota. Studies of this particular problem are complicated by the fact that at least three distinct Archaic complexes (Eastern Archaic; Prairie Archaic; Shield Archaic) occur in Minnesota. The emergence of each of these complexes quite probably followed a rather different trajectory and will be expressed differently at different times in different parts of the state. Further, significant fluctuations in climate and the configuration of vegetation across the state probably resulted in movement of particular Archaic cultures and/or shifts in adaptive strategies and the toolkits associated with these strategies. Moreover, this rather tripartite division may well oversimplify the rather complex interaction of hunting and gathering people with the dynamic environmental zones of Minnesota itself.

One of the most striking aspects of the Minnesota environment during this period is the rapid expansion of the prairie. The movement of the prairie-forest border has been reconstructed using pollen data from a variety of pollen cores throughout the Midwest. A 20% level of prairie-forb pollen is interpreted as approximating the position of the prairie-forest border. According to Webb, Cushing, and Wright (1983:147):

In broad time intervals, the prairie moved eastward from 9000 to 7000 B.P. and then retreated westward to its position at 500 B.P. Intermediate times show the movement to have been more complex. Before 9000 B.P., no broad area of prairie vegetation existed [in the Midwest]. From 9000 to 9000 B.P., the prairie moved eastward along its entire margin and extended farthest eastward in central Illinois. The eastward movement continued in Minnesota and Wisconsin from

8000 to 7000 B.P. but in Illinois the prairie moved westward. By 7000 B.P., the prairie had reached its most eastward position in north-central Minnesota. From 7000 to 6000 B.P., the prairie border was stable except for a westward retreat in north-central Minnesota. By 3000 B.P., the prairie was far west in northern Minnesota but had again extended eastward in central Illinois. [references to figures in the original deleted]

While the prairie was expanding rapidly, forest cover in southeastern, north-central, and northeastern Minnesota underwent significant changes as well. The character of these changes is complex and is explored in great detail in Webb, Cushing, and Wright (1983). In very simple terms, the broad expanse of pine and pine/oak forest prevailing around 9,000 years ago was relatively quickly replaced by other forest configurations. In southeastern Minnesota, forest dominated by oak and hardwoods moving in from the south developed. The broad distribution of oaks across the state dwindled and in northern Minnesota, white pine expanded into the state and a mixed coniferous/hardwood forest emerged. In northeastern Minnesota, spruce moved farther to the north and forest cover including pine, birch, and other species developed.

The climate during the Archaic was markedly different from both the preceding and subsequent periods. Prevailing winds were much stronger than today and appear to have been often from the northwest. During the initial period of prairie expansion between 9,000 and 7,000 years ago, climate became increasingly drier and windier (contributing to prairie expansion). It also appears that this period was cooler as well, at least in northern Minnesota.

Between 7,000 and 4,000 years ago, dryness continued to increase and temperatures increased as well. At Elk Lake, it appears that the climate during this period was characterized by mild winters, windy springs, and warm, windy summer conditions. July temperatures were roughly 1° C warmer than at present, increasing to 2° C warmer toward the end of the period. Precipitation was roughly 100 mm less than present.

One of the most distinctive aspects of climate during this period is the very strong winds from the northwest and west. These windy conditions exacerbated the dry conditions by increasing evapotranspiration and there is evidence of extensive windblown deposits of sediment throughout the period. There is evidence of extensive dune formation at this time, as well as the formation of blankets of windblown sediment. Lake levels dropped 10 to 30 feet or more to record low levels and many more shallow lakes dried up entirely.

In general, climate was drier, windier, and particularly unstable. There is evidence for several abrupt episodes of warmer, moister conditions. The best documented of these is at Elk Lake where the influx of windblown sediment stops abruptly at 5,400 years ago and then increases again at 4,800 years ago.

The climatic conditions during the Archaic have several implications for archeological investigation. First, simply locating sites of this period may be challenging and this may, in part, be why the Archaic remains problematic in the state. Sites adjacent to wetlands or lakes may now be well below water level or buried beneath more recent colluvial or lacustrine deposits. Streams and rivers were undoubtedly lower during this time, and sites in primary streams may be buried beneath thick deposits of alluvium or colluvium, while earlier sites along tributary streams may have been eroded away as these streams downcut to the lower base level of the primary stream. The

deposits of windblown sediments and dunes in portions of the state may have buried sites. In other situations, they may be completely deflated by wind erosion during this time.

Second, the dynamic character of climate and vegetation during this period may have required new and rather specific adaptations to the Minnesota landscape by hunting and gathering groups. Rapid shifts in the location of plant resources and animal herds may have challenged groups and required more mobility than in other parts of the Midwest. Population densities may have been kept lower than otherwise as well because of the need to remain highly mobile and respond quickly to changing conditions. In sum, traditional models and taxonomy of the Archaic elsewhere in the Midwest may simply be inadequate to explain and interpret human activity along the prairie-forest border during this time.

#### From Woodland to the Present

Four thousand years ago, the strong winds that had dominated Minnesota for almost five millennia abruptly dropped and climate within the state was increasingly buffered by the warm, moist tropical airstream to the south. Between 4,500 and 3,500 years ago, it appears that climate was warmer and moister than today. The Elk Lake data suggest that by 3,500 years ago, July temperatures were 1.5° C warmer and January temperatures were about 2° C warmer than present, with precipitation being roughly 100 mm greater than today. Both temperature and precipitation gradually decrease after 3,500 years ago to reach modern values. The large-amplitude changes which characterized earlier Minnesota climate are no longer apparent, but lower-amplitude changes on the order of decades and centuries are present.

Climate in Minnesota during the last 4,000 years has been controlled principally by the location, strength, and interaction of the Arctic (cold, dry), Pacific (warm, dry), and Tropical (warm, moist) airstreams. Unlike the period from ca. 9,000 to 4,000 years ago, no single air mass appears to dominate Minnesota climate for extended periods. Therefore, even minor shifts in the location and intensity of these air masses in Minnesota can result in significant regional differences in temperature and precipitation across the state. Further, as population increased and food procurement strategies became more focused, particularly after the development of intensive food production based on corn and wild rice, smaller-scale environmental changes could potentially have relatively larger effects on populations in the region.

The debate about the relationship between environmental and cultural change has been ongoing for several decades (cf. Griffin 1961; Baerreis and Bryson 1965; Wendland 1982). While the reality of the relationship between climate and cultural change during the last 4,000 years remains to be fully demonstrated, it is essential that local and regional archeological investigations take into consideration changing environmental conditions.

There have been a variety of studies of major and minor climatic fluctuations in North America during the last two decades (see among others Baerreis and Bryson 1965; Webb and Bryson 1972; Wendland and Bryson 1974; Fritz et al. 1979; Bernabo 1981; Gajewski 1988). Although there is still disagreement over timing and details of these climatic episodes, a relatively detailed outline of climatic fluctuation is emerging. It is worth noting that the Elk Lake data are generally consistent with some of these changes.

As noted above, there appears to a trend of progressive cooling during the last 2000-4000 years, with most of the cooling taking place between 3,500 and 2,000 years ago. The period since 2,000 years ago seems to represent a continuation of this long-term trend with significant fluctuations on the order of centuries being apparent during this time. It appears that there were relatively warm periods between 1,000 and 500 years ago, and relatively cool periods between about 1,600-1,400 and 400-200 years ago. Studies of tree-ring indices suggest rising temperatures from 1,100 to 800 years ago, then decreasing temperatures until 600 years ago and low temperatures between 600 and 300 years ago (Gajewski 1988:259-260). Patterns of precipitation are more difficult to reconstruct and are therefore more controversial.

The period of rising temperatures between 1,100 and 800 years ago is coeval with the emergence of maize horticulture and the increased utilization of wild rice. While one hesitates to make causal links between climate and culture change, the synchronicity of these changes is surely more than coincidental. It is also of interest to note that the decline of the Middle Mississippi-related cultures (Silvernale phase) and the westward expansion of Oneota groups occurs at about the same time that temperatures begin to decrease. Bryson and Baerreis (1968) have suggested that the demise of the Mill Creek cultures of northwestern Iowa at this time was in large measure the result of a drought which they believe occurred during the thirteenth and fourteenth centuries (see also Bryson and Murray 1977).

The onset of low temperatures at the beginning of the Little Ice Age undoubtedly had a significant impact on the prehistoric residents of Minnesota. Bryson and Murray (1977:88) conclude that the Little Ice Age lasted from approximately A.D. 1550 to 1850, and that the so-called normal patterns of precipitation and temperature during the last hundred years are, in fact, anomalous when compared against such patterns during the last 2,000 years. In a more detailed study, Grimm (1981) has demonstrated that the onset of the Little Ice Age begins about A.D. 1550 in southern Minnesota. Fritz et al. (1979) have reconstructed variations in climate in North America since 1602, and conclude that winter temperatures during the period A.D. 1602-1900 were as much as 3.1° C colder than temperatures during the period A.D. 1901-1962, while summer temperatures were as much as .3° warmer (Fritz et al. 1979:40). Patterns of precipitation were also significantly altered.

The effects of the Little Ice Age in Europe are documented in written records and appear to have been profound. Although the relative shift in mean temperatures and precipitation may appear to be relatively minor, it is almost certain that the Little Ice Age had a major impact on the late prehistoric peoples occupying Minnesota and also shaped some of the activities and settlement during the initial Euro-American colonization of the region.

Vegetation patterns and composition also changed during this period. In northern Minnesota, the vast peatlands of the eastern Lake Agassiz basin had begun to form in the eastern portion of the Lake Agassiz basin. The formation of these peatlands is significant, since it is quite possible that numerous early prehistoric sites are buried under these deposits and are not easily discovered today.

The forest also began invading the prairie and the prairie-forest border moved westward. This movement was not a straightforward linear progression. Rather, the woodland invasion was conditioned by a number of factors, including soils, the relief of the landscape, local precipitation, and the frequency and intensity of prairie fires.

By 3,000 years ago, the prairie-forest border in the southern half of Minnesota was at approximately the location at which it was observed by the first European explorers. However, in the northern half of Minnesota, the woodland along the prairie-forest margin (dominated by oak?) had expanded into eastern North Dakota, a position which is substantially west of its position at the time of European contact (see Grimm 1981; Webb, Cushing and Wright 1983). Further, the gradient across the prairie-forest border was well defined and this ecotone extended eastward across Illinois almost into northern Indiana (Webb, Cushing and Wright 1983:156).

By 3,000 years ago, the patterns of vegetation in Minnesota approximated those at the time of European contact (see Figure 20 above). During the late prehistoric period, changes in vegetation involved the increase in the number of spruce trees growing in northern Minnesota, a possible shift in the distribution of hickory in the extreme southeast portion of the state, the development of the Big Woods in southern Minnesota (Grimm 1981) and changes in the nature and location of the prairie forest border (Figure 32.). According to Webb, Cushing and Wright (1983:157), the prairie was less extensive in the southwest and the prairie/forest ecotone was more diffuse than at 3,000 years ago. It also appears that in northwestern Minnesota the prairie-forest border retreated eastward from North Dakota into Minnesota, while expanding slightly westward in west-central Minnesota (Webb, Cushing and Wright 1983:Figure 10.4). Independent support for this movement of the prairie-forest border is found in Michlovic (1987:62):

Geomorphic and pedologic study of soils at the Mooney site [in the Red River Valley] reveal a series of buried A horizons. These soils reflect cycles of deposition and weathering due to changes in the flooding patterns of the Red River. Changes in flood patterns are probably related to short term climatic fluctuations . . . This evidence for climatic change in the late-Holocene should be taken into consideration when interpreting the prehistoric sequence on the Plains.

Archeologist must bear in mind, however, that local expression of changes in climate are a function of a variety of factors that produce markedly different effects in specific locales. Webb et al. (1983:163) make this point abundantly clear:

the detailed study of the Big Woods by Grimm (1981) has elucidated the factors controlling the transition westward from mesic deciduous forest . . . through forest and brushland to prairie. The dominating local controls on the distribution of these vegetational types are soils, topography, and especially fire, which itself is affected by such topographic elements as lakes, streams, areas of high relief, and other features that provide fire breaks . . . the almost annual late-summer fires (many apparently set by Indians) were blown by dry southwesterly winds. Prairie, therefore, commonly terminated against streams and lakes or against rough morainic topography, and the forest border was dominated by *Quercus macrocarpa* [bur oak], which has thick, fire-resistant bark, or by *Populus tremuloides* [aspens], which sprouts readily after fire. The forest fringe provided by these two tree types was commonly burned by ground fires, but the sweep of the wind was greatly reduced within the woodland fringe, and the fires did not carry easily into the mesic forest beyond, which was composed of species not adapted to repeated fires. This situation was especially prevalent where rough topography



reduced the wind fetch and thus the spread of fire. The topography and soils in the glaciated terrain of the Big Woods area were such, however, that broad areas of low relief with sandy soils and prairie openings existed east of forest-covered morainic ridges. After the middle-Holocene prairie expansion in this area, the forest advance in the late Holocene presumably involved the filling in of such prairie openings by *Quercus-Populus* brush prairie or woodland, and the *Quercus* woodland on the morainic ridges to the west became sufficiently dense and extensive to protect the area in its lee from fire and permit the development there of mesic forest. The forest seems to have moved westward in jumps and stages, and the elements of the prairie/forest mosaic formed a continually changing pattern under the influence of broad-scale climatic changes. This detailed study of the prairie/forest ecotone shows that climatic change may be the ultimate cause for regional vegetational change but that topography, fire, and soil are proximal factors controlling the exact timing and local expression of the vegetational change.

The question of human/environmental interaction during the last 3,000 years in Minnesota is a particularly exciting area of investigation with particular relevance to our society today. The increasing availability of high-resolution vegetation and climatic data like that from Elk Lake will enhance our ability to critically examine both human-land interaction and site formation processes. Moreover, advances in automated cartography and the availability of digital data sets allow archeologists to create more sophisticated models and presentations of changes in the cultural and natural landscape of the state.



### 3 History of Research, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

#### Iowa Research

The history of the development of archeology in Iowa is particularly well documented compared to other upper Midwestern states (Green 1992b). D. Anderson (1975c) and McKusick (1975c, 1979) provide excellent summaries, and Kurtz (1979) has prepared a social history of the early years of Iowa archeology. McKusick (1970, 1991) has provided an in-depth analysis of the Davenport frauds, and the national prominence brought to Iowa through these hoaxes. Green (1992b) has described the impact of Charles R. Keyes on Iowa archeology and the development of archeology in the eastern United States.

As might be expected, the history of archeological research in Iowa parallels the development of archeology in the eastern United States in general, with the important exception that Iowa lacked professionally trained archeologists and university programs in anthropological archeology for the first half of the twentieth century. This was a crucial time in the development and professionalization of archeology in the United States, and, as a result, Iowa research contributed little to archeological knowledge or to the development of cultural histories and regional syntheses developed during this time period. The lack of university training in archeology in Iowa resulted in a failure to produce new generations of archeologists with an Iowa orientation, resulting in the loss of vast amounts of information with each passing generation. These two impediments resulted in Iowa being far behind other states in the Midwest in knowledge of its prehistoric inhabitants, a problem from which it is still recovering today.

Willey and Sabloff (1980) begin their history of American archeology with the Speculative period (1492-1840) but note that speculation did not end suddenly in 1840, but continued to be an important part of archeological investigations during the ensuing Classificatory-Descriptive period (1840-1914). Since Iowa was not opened for settlement until the 1830s, and no published excavations took place until much later, I will begin my review with the Classificatory-Descriptive period.

#### The Classificatory-Descriptive Period (1840-1914)

Willey and Sabloff (1980:34) characterize the Classificatory-Descriptive period as follows:

The principal focus of the new period was on the description of archeological materials, especially architecture and monuments, and rudimentary classification of these materials. Throughout the period, archeologists struggled to make archeology into a systematic scientific discipline. They did not succeed, but they laid the foundations for many of the achievements of the twentieth century.

While the numerous mounds and earthworks of eastern Iowa were almost certainly noticed and speculated upon by the earliest Euro-American explorers of the region, the earliest published reference to Native American earthworks apparently occurs in John Newhall's (1841) *Sketches of Iowa, or the Emigrant's Guide* (McKusick 1975c; Green 1993), where he describes Toolesboro Mounds and a nearby enclosure at the McKinney site. Mounds were reported at the Dubuque town site in the 1830s, and the looting of mounds throughout the state proliferated with the flood of white settlers entering the region. McKusick (1975c:19)

quotes an 1859 magazine article as reporting, "The good people of Keokuk are deeply engaged in digging for Indian skeletons. They have already found about forty." However, this early plundering by local residents was almost never reported, and can not be considered a part of the history of archeological research in Iowa.

In the years following the Civil War, a movement developed across the eastern United States for the formation of local Academies of Science. Professional men in the larger communities would gather together at the local academies to discuss local observations and research projects, discuss various theories about the natural history of North America, and present papers, often publishing these discussions and presentations in Academy Proceedings. Archeology, or antiquarianism as it is more aptly termed during this time often played a large part in these organizations, and the digging of mounds was a very common activity. The most active of these academies in Iowa was the Davenport Academy of Natural Sciences, established in 1869, although the Sioux City Academy of Sciences and Letters, the Muscatine Academy, and the Iowa Academy of Sciences were also active (D. Anderson 1975c; McKusick 1975c). Speculation played a large part in the study of human antiquity in the New World. Nothing was known about how long humans had lived here (much as now), and, with the recent discoveries of Neanderthals in Europe, some Native American skulls were incorrectly identified as Neanderthal skulls, and the belief that the people who had built the numerous mounds throughout the eastern United States had occupied the New World during the Pleistocene was very strong. In addition, the current Euro-American view of Native Americans as barbarous and lazy led to the belief that their ancestors could not have built the mounds, especially the monumental earthworks of Ohio and the southeast (Kurtz 1979). Many of the theories involved with the Moundbuilder Myth related them to ancient civilizations of the Old World, including the lost tribes of Israel (see Silverberg 1968, and Mallam 1976b). Much of the mound exploration focused on finding interesting artifacts and on finding support for various Mound Builder theories. As McKusick (1975c; 1991) points out, these theories are not so different from those presented by modern pseudo-archeologists such as Eric Van Danikan and Barry Fell.

McKusick (1975c) places the beginnings of the serious study of Iowa prehistory with the excavations at the Cook Farm Mounds in Davenport by the Reverend Jacob Gass in 1874. D. Anderson (1975c) reports that as early as 1873, J. B. Cutts reported on artifacts found in northwest Iowa in the Annual Report of the Smithsonian Institution for 1872, and that W. J. McGee, of the Smithsonian conducted mound surveys in Dubuque County. Work began in the Ottumwa locality along the Des Moines River (Evans 1880; Dahlberg and Dahlberg 1880). Kurtz (1979:14-15) notes that in the early years of the academy movement:

Iowa archeologists were a decidedly social group. Samuel B. Evans, an Ottumwa newspaper editor, worked with a number of individuals who published on their own (or at least corresponded with the Smithsonian about their work) including the Dahlbergs, D.C. Beaman, and Capt. Kitterman. Seth Dean and S. V. Proudfit worked closely together in digs and mention other coworkers. Indeed it appears that Dean's archeological interest faded when Proudfit left for an appointment to the Interior Department in Washington D.C. . . . J. E. Stevenson of the Muscatine Academy names a dozen or more coworkers.

These tended to be community professional men, evenly split between those under forty and those over forty. This is in marked contrast to the later portion of this period.

Reverend Gass began excavating at the Cook Farm Mounds in 1874 and soon recovered a series of copper axes, some with cloth attached, platform effigy pipes, and other Hopewellian imports. Since Gass was not fluent in English, his results were published by Farquharson (1875, 1876) (McKusick 1975c). Gass was apparently a diligent worker who would spend many days on a mound excavation, and is said to have chided other members for being lazy in their one-day outings. This attitude and the spectacular finds from the Cook Farm Mounds led to resentment among some members of the academy. In 1877, they convinced him to return to Cook Farm Mounds and excavate again. He soon found three inscribed slate tablets, one with animals, one with a zodiac, and a third with Near Eastern signs. These tablets seemed to have tremendous significance for the origin of the Mound Builders, and the tablets were sent to the Smithsonian Institution for examination. A letter from Dr. E. Forman expressed doubts about the authenticity of the tablets, but the letter was not published by the academy (McKusick 1975c; 1970; 1991).

The next year, also at Cook Farm Mounds, Gass encountered a stone altar, two effigy pipes, and a carved limestone tablet. Later he purchased an elephant effigy pipe from a farmer, and found another in a mound in Louisa County. These pipes appeared to be definite proof that the Mound Builders had been in the region during the Pleistocene (McKusick 1975c; 1970; 1991). The publication of these discoveries aroused a great deal of national and international attention. In 1883, Henry Henshaw (1883) of the Smithsonian raised the question of fraud in connection with Gass' discoveries. This aroused the ire of the Davenport Academy, and, indeed, of local academies across the country. Support poured in for the authenticity of the tablets from around the world, even from such an authority as Max Uhle (McKusick 1975c; 1970; 1991). Eventually, it became known that the artifacts had been manufactured in the academy, and had been planted by resentful members, but they had aroused such a controversy that a massive cover-up was launched. As late as 1920, Keyes appeared to accept the finds as genuine (McKusick 1975c). However, the publication of Cyrus Thomas' (1894) report on his mound excavations throughout the eastern United States brought to an end any speculations about lost races of mound builders among serious scholars and firmly established the earthworks to be the products of the ancestors of Native Americans.

Thomas' (1894) report is based on the fieldwork of a number of individuals throughout the eastern United States. In Iowa, this fieldwork was conducted by Colonel P. W. Norris, who largely confined his research to northeast Iowa along the Mississippi. Norris conducted excavations on the Hartley Terrace in Allamakee County. He also excavated at Fish Farm Mounds and mapped mounds and earthworks in Dubuque, Clayton, Wapello, Van Buren, and Lee counties. From his extensive excavations throughout the east, and through careful ethnohistoric research, Thomas was able to firmly link the custom of mound construction to the Native Americans encountered by the first Europeans to visit the New World. Others working during this time period were Charles Aldrich (1884) and William Williams (1880) in Webster County, Proudfit (1881, 1886) and Dean (1883) in the Glenwood locality in Mills County, Banta and Garretson (1881) in Henry County, Clement Webster (1887a, 1887b, 1889a, 1889b, 1891) in Chickasaw, Cerro Gordo, and Floyd counties, Pratt (1876), Harrison and Pratt (1893), and Lynch *et al.* (1893) at Toolesboro, in Louisa County, and many others (D. Anderson 1975c, Kurtz 1979).

McKusick (1975c) terms his next period Scientific Origins: 1882-1897. He begins this period with Norris' excavations at the Hartley Terrace in 1882, "a period expanded by the scientific mapping of Theodore Lewis and culminating in the published bibliography and county survey by Frederick Starr (1897a) (McKusick 1975c:31)." T. H. Lewis, funded by A. T. Hill, was a trained surveyor who was hired to survey mounds, earthworks, and rock art in 18 Midwestern states, as well as in Manitoba. All in all he surveyed 50 enclosures, made 100 rock art rubbings, and surveyed 15,000 mounds (McKusick 1975c). Lewis' accurate maps are often all that remains of many of these structures today. His work in Iowa was concentrated in Allamakee and Lyon counties (D. Anderson 1975c).

Both D. Anderson (1975c) and McKusick (1975c) attach great significance to the work of Frederick Starr in Iowa. D. Anderson (1975c:72) states that "the most important single development before the turn of the century was F. Starr's bibliography and summary of all available archeological data in the state, published in 1897." While McKusick (1975c:31) notes that "his systematic approach marks the scientific origins of archeological study in Iowa, scholarship replacing the antiquarianism characteristic of the mound explorers." Starr was the first professionally trained anthropologist to work in Iowa and was hired as a professor of anthropology by Coe College in Cedar Rapids, where he began teaching an anthropology course in 1886 or 1887 (McKusick 1975c; D. Anderson 1975c). While at Coe, Starr (1887a, 1887b) conducted brief excavations near the Blood Run site in Lyon County and described a shell heap near Cedar Rapids. Although he soon left Coe to start the anthropology department at the University of Chicago and become a founding member of the American Anthropological Association, he maintained an interest in Iowa archeology and published a bibliography of Iowa Antiquities (Starr 1892) and a county-by-county summary of known archeological sites. "Starr (1897a) specifically urged the necessity of topographic maps, excavation plans, excavation photographs, vertical profiles, and artifact descriptions. These were lacking in his own Iowa fieldwork, but others were working to improve techniques" (McKusick 1975c:42).

Starr had begun teaching anthropology classes at Coe in the mid-1880s, and returned at least once from Chicago to lecture in Iowa City (McKusick 1975c). Between 1897 and 1899, W. J. McGee, a native Iowan, and member of the Bureau of American Ethnology held the title of Lecturer on Anthropology at the University (Kurtz 1979). This title was later held by Duren J. H. Ward, a Harvard trained Unitarian minister in Iowa City. Ward was very enthusiastic about the possibilities for anthropological research in Iowa, and soon published a paper entitled *Historico-anthropological Possibilities in Iowa* (Ward 1903a) in which he explained why archeological research should be carried out in the state. A staunch advocate of anthropological instruction, he published another article (Ward 1903b) advocating the teaching of anthropology and, "establishing an 'Anthropological Academy of Iowa' with a branch in every county and important town (D. Anderson 1975c:72)." Of course, this was not economically practical, and nothing came of his suggestions. He did, however, succeed in establishing the Iowa Anthropological Association under the State Historical Society of Iowa (Ward 1904a, 1905). Under the auspices of the Association:

Ward (1904[b]) made a site survey north of Iowa City and suggested the need for such 'modern' techniques as soils analysis, lithic source analysis of artifacts, and the employment of specialists in geology, botany, zoology, and anatomy, in order to obtain the complete and accurate interpretation of

archeological sites and their environmental context. [McKusick 1975c:37]

Later he conducted excavations in a mound at Lake Okoboji, preparing a detailed profile and site plan, as well as including appendices on skull morphology and teeth (Ward 1905). Unfortunately, he never completed a final report on his excavations. He also conducted ethnographic fieldwork among the Mesquakies at Tama, and published two articles (Ward 1906a, 1906b) (McKusick 1975c). Ward left Iowa City in 1907, and his leaving marked the end of the Iowa Anthropological Association. Ward had been the only professionally trained anthropologist in the state, and, unfortunately, aside from briefly invigorating programs at the Davenport Museum (successor to the Academy), and the State Historical Museum in Des Moines, his efforts had little lasting impact on the state. Neither the University nor the Historical Society would fund positions for archeologists for years to come (McKusick 1975c).

The only other professionally trained archeologist in the region at the time was William Nickerson, but his sole research appears to have been to conduct the Davenport Museum's 1908 excavations at Albany Mounds in Illinois (Nickerson 1912). Having lost out on the directorship of the Museum to J. Herman Paarman and having not been retained by the museum following the excavations, he appears to have left the profession (McKusick 1975c). Nickerson's excavations have since been fully reported (Herold 1971). The other major scientific excavation to take place during this time was conducted by the State Historical Museum in Des Moines, spurred, in part by Ward's work at the State Historical Society in Iowa City (McKusick 1975c). Charles Aldrich, the Museum's director, engaged Thompson Van Hyning to conduct excavations at the Boone Mound, in Boone County. For the time, excavation techniques were quite good. The mound was shovel scraped down in sections, revealing a stone slab floor with stone burial chambers. The chambers were carefully surveyed and photographed, one of the first examples of field photographs in the state. Unfortunately, after a quarrel with Edgar Harlan, Aldrich's successor as director, Van Hyning resigned from the Museum and took all the notes and plans and most of the artifacts with him. Although Harlan (1908) published a brief report and Van Hyning (1910a, 1910b) published two brief reports, no detailed final report was ever published (McKusick 1975c). That was the last major excavation conducted by the museum, and, although Harlan (1910, 1914, 1934) continued to express an interest in archeology, no professional archeological program was ever to develop there either (McKusick 1975c).

While these few examples demonstrate that an attempt was being made to improve fieldwork techniques, most other digging in Iowa showed no difference from earlier time periods. Members of the Sioux City Academy trenched the Mill Creek Broken Kettle site with no concern for stratigraphy or context (Stafford 1906; Powers 1910), while Richard Hermann (1906, 1907, 1908) continued to loot mounds in the vicinity of Dubuque (D. Anderson 1975c; McKusick 1975c). However, the publication of Thomas' (1894) report had spelled the end of the Mound Builder myth, and also the end to the glory days of the local academies. Archeology was becoming professionalized. Kurtz (1979) notes that the end of the Mound Builder myth generally accounted for the end of interest in Iowa archeology on a national level, and also the loss of a generation of Iowa researchers. He notes that the number of publications by authors under the age of 40 declines precipitously after 1893, and notes that:

The gaps in McKusick's chronology now stand out as times of little publication, particularly the 1897-1903 interval. If there is progress in technique, it is not a continuous part of the Iowa archaeological scene; it must be reintroduced from other more active areas. . . . Norris and Thomas were the destroyers of an idea, and Starr—the summarizer of an already dead epoch. . . .

Whatever their interest, the digging and the participation in formal and informal organizations in Iowa declined. Iowa archeology after this loss of interest . . . is characterized by a group who still uses the local academy as a formal organizational tool, but it is an older group, unable to attract young workers. The field has become more professionalized not by the addition of a new type of researcher but by the loss of a large amateur contingent. It is a time when summaries, surveys, and organizational plans are more prominent than actual digging. [Kurtz 1979:17]

Ellison Orr's (1913, 1917a, 1917b) name first appears in the archeological literature during this period, promoting the preservation of effigy mounds in Allamakee and Clayton counties (D. Anderson 1975c; Kurtz 1979). In 1920, Charles Keyes (1920) published a paper summarizing the archeology that had been conducted in the state, noted the previous concentration on mounds and pointed out that other types of sites were desperately in need of investigation (D. Anderson 1975c; McKusick 1975c). Although neither of these men were professionally trained archeologists, they would be the dominant forces in Iowa archeology for the next 30 years.

### Classificatory-Historical period: The Concern with Chronology (1914-1940)

Willey and Sabloff (1980:83) describe the first half of the Classificatory-Historical period as follows:

The central theme of the Classificatory-Historical period in American archeology was the concern for chronology. The name of the period, *historical*, carries this implication, at least insofar as history is a time-ordering of events. . . . The search for chronology prevailed in both the earlier and later parts of the period, but it was especially dominant in the earlier part; after 1940, other problems began to compete for attention.

Stratigraphic excavation was the primary method in the drive for chronological control of the data. It was introduced to American archeology in about 1914 and in the next two decades spread to most parts of the New World. The principle of seriation was allied to stratigraphy, and, also serving chronological ends, it developed in conjunction with stratigraphic studies. Typology and classification, which had their systematic beginnings in the previous Classificatory-Descriptive period, now became geared to stratigraphic and seriation procedures—plotting of culture forms in time and space. Besides artifact classifications, American archeologists also began culture classifications. These, too, were strongly influenced by chronological considerations.

A native of Mount Vernon, Charles Keyes was educated at Cornell College, Harvard, Berlin, and Munich and taught at various Iowa public schools and the University of California at Berkeley before being hired as a professor of German Literature by Cornell College in his home town in 1903. Along with being a recognized German scholar, Keyes also published scholarly articles on ornithology, but although never professionally trained, his greatest contributions came in the field of archeology (D. Anderson 1975c; Tandarich and Horton 1976; Green 1992b). As Green (1992b:81) states:

Charles R. Keyes participated in many of the developments that advanced American archaeology to a professional discipline. He conducted an enormous amount of work in the 1920s and 1930s on behalf of the National Research Council's Committee on State Archaeological Surveys, a forerunner of the Society for American Archaeology. . . . In fact, Keyes helped create the methodological framework for statewide archaeological survey programs. His sponsor at the State Historical Society of Iowa, Benjamin F. Shambaugh, undertook publication by the Historical Society of the Committee's Guidelines for State Archaeological Surveys (Wissler 1923).

Keyes was instrumental in establishing the first Plains Conference for Archaeology in 1931. . . . He served on the planning committee for the second Plains Conference, held in 1932 in Lincoln, Nebraska, and, along with Ellison Orr and Paul Rowe, discussed Iowa archaeological discoveries there. . . . Keyes brought the third Plains Conference to Mount Vernon in 1936, where he invited Plains and Midwest (Wisconsin and Illinois) archaeologists to discuss the newly developed Midwest Taxonomic System [sic]. . . .

Other important conferences in the development of American archeology in which Keyes participated include the 1935 archeological conference in Indianapolis, which developed formal classifications for archeological complexes of the eastern United States within the Midwest Taxonomic Method, the Conference on the Woodland Pattern in 1941, which clarified Woodland distributions and material culture in eastern North America, and the 1947 Fifth Plains Conference, in which he reported on western Iowa manifestations with Plains affiliations (Green 1992b).

As a result of Keyes' 1920 paper, originally presented before a meeting of the Iowa Academy of Science, Benjamin Shambaugh, director of the State Historical Society of Iowa, saw an opportunity to reestablish an archeological program in Iowa City, and, in 1921, appointed Keyes as a research associate at the Society and director of the Iowa Archaeological Survey (McKusick 1975c; Green 1992b; Tandarich and Horton 1976; D. Anderson 1975c). As McKusick points out, although the title sounded impressive, it was simply a summer position. After one summer of site survey at the Iowa Lakeside Laboratory and two summers of library research, Keyes spent the next 11 summers traveling around the state examining local collections. In 1925, Keyes (1925) published his first progress report. At this time Keyes had a relatively unsophisticated view of Iowa prehistory, seeing it as a timeless, "archeological present" with different groups occupying different parts of the state (McKusick 1975c). Cultures he recognized at this time were Hopewell or Mound Builder culture of eastern Iowa, Iowa's Cave Men of the river gorges and ravines of northeast Iowa, Earth Lodge Villages of northwest Iowa, and An Old Algonkian Village in east-central Iowa (McKusick 1975c). By 1927, Keyes' (1927a) understanding of Iowa prehistory had increased dramatically, and he published an important article for popularizing Iowa archeology. As D. Anderson (1975c:73) states:

There he tried to dispel the lingering Mound Builder myth, presented ethnographic and linguistic data bearing on Iowa cultures and named and defined the kinds of sites the public should report, adding enclosures, agricultural plots, caches, pits, workshops, and boulder effigies to his previously published list [village sites, caves, shell mounds, burial mounds, cemeteries, trails, spirit places, petroglyphs, stone dams or fish traps, and stone quarries] [Keyes 1925].

In this paper, Keyes expanded his Old Algonkian Village to Algonkian culture, which could be found throughout the state, the Iowa's Cave Man designation was dropped, the Mound Builder designation for Hopewell was dropped, and he recognized Effigy Mound culture. In addition, Keyes for the first time in this paper defined Oneota culture and pointed out differences in Oneota ceramics between Correctionville and eastern Iowa sites (McKusick 1975c). Using historic documents, he suggested a link between the Oneota remains and the Historic Ioway tribe (D. Anderson 1975). Also in this paper, he defined the Mill Creek culture of northwest Iowa, suggesting links to the historic Mandan for this manifestation (McKusick 1975c). In a 1928 publication Keyes coined the term Glenwood for manifestations in Mills County affiliated with the Nebraska phase of the Central Plains tradition (McKusick 1975c).

During this time period, Keyes was becoming acquainted with more and more professional archeologists from other states. "J. B. Griffin, W. C. McKern, L. A. Wilford, W. R. Wedel and W. H. Over made on-site visits and exchanged information. This ultimately led to the founding of the Plains Anthropological Conference in 1931" (D. Anderson 1975c:73). In 1929, funding for Keyes' position was shifted from the State Historical Society to the University of Iowa. The two were closely intertwined at that time (McKusick 1979; Green 1992b). This would have been an advantageous time to establish a department of Anthropology at the University, especially since the Medical College had hired several physical anthropologists. However, according to McKusick (1979), the physical anthropologists were pushing for an intra-university division of anthropology instead of an inexpensive department, and it never came to pass.

By 1934, federal funding for archeological research had become available through the Works Progress Administration (WPA) in order to provide employment for the local unemployed. By this time, Keyes had learned as much as he could about Iowa's prehistoric occupants through studying surface collections. Serious excavation was needed to learn more about the state's prehistory. Keyes applied for and received federal funding. Being in his 60s at this time, he decided that he was too old for fieldwork, and hired Ellison Orr, in his late 70s, to direct the excavations. Orr was a fellow amateur ornithologist and archeologist whom Keyes had known for several years, but this marked the first time that the two had worked together (D. Anderson 1975c; McKusick 1979).

Orr was a native of McGregor, and, at various times in his life, had been a school teacher, farmer, bank cashier, and Clerk of the District Court. From 1904 until his retirement in 1930 he was the manager of the telephone company in Waukon (Tandarich and Horton 1976; McKusick 1979). He was also a well trained surveyor (M. Wedel 1959; Keyes 1934). Throughout his lifetime, Orr maintained a keen interest in natural history, geology, ornithology, and archeology. He spent much of his free time exploring the countryside in Allamakee and surrounding counties recording bird life, geological phenomena, and archeological sites. As M. Wedel (1959:2) states:

Ellison Orr of Waukon, Iowa, had walked or ridden over practically every square mile of Allamakee County in his lifetime and was intimately familiar with the adjoining counties as well. As he went about surveying or on telephone business, he watched cut banks and plowed fields for Indian artifacts. He located dozens of sites in northeast Iowa, particularly in his county, and assembled an extensive personal artifact collection with accompanying descriptive notes. He carefully mapped many sites. When he retired from business in 1930, at the age of 73, he devoted himself chiefly to archeology. Thus he was free to help on the F.E.R.A. project.

During the first year, 1934, Keyes and Orr conducted excavations at Oneota and Woodland sites in Allamakee County (D. Anderson 1975c; M. Wedel 1959). Over the next five years, excavations were carried out in northeast Iowa, north-central Iowa near Webster City, in the Glenwood locality, and on Mill Creek sites in northwest Iowa (McKusick 1979, D. Anderson 1975c), and a large amount of archeological information was recovered. Unfortunately, the federal relief programs only provided funding for excavation, and there was no support for analysis and write-up. Orr spent countless hours of unpaid time during the winter months writing up detailed excavation reports and continued his work even after he was no longer on the Survey's payroll in the 1940s.

Keyes, meanwhile, had neither the inclination or the funding to publish technical reports, much to the dismay of his professional colleagues in other states (McKusick 1979; Green 1992b). Upset over Keyes' failure to publish, Orr willed his collections and manuscripts to Effigy Mounds National Monument rather than to the State Historical Society when he died in 1951 (McKusick 1979). Green (1992b:82) quotes Orr from a letter to Paul Rowe at Glenwood as saying "it is time for Mr. Keyes to be making some complete and comprehensive reports on the large amount of work done, the results, and the material collected. We are far behind Nebraska in this respect." McKusick (1979:6) states that "from correspondence, and more directly from Dr. James B. Griffin, I have learned that Griffin, Carl Guthe, W. C. McKern, and others continually tried to help Dr. Keyes put the discoveries into a more scientific framework."

Keyes continued to defend his inclination to write only summary reports understandable by the general public. Although he wrote lengthy letters to professionals in the surrounding states concerning his excavations and interpretations of Iowa archeology, data from Iowa are conspicuously lacking in the major syntheses of eastern North American prehistory that were prepared during this time period (Green 1992b). Orr's reports were finally semipublished in limited distribution form on microcards (Orr 1963) by McKusick but have been long out of print and little used. Although Logan (1959; 1976) and Mott (1938; Mott Wedel 1959) have published on Keyes' and Orr's northeast Iowa Woodland and Oneota materials respectively, and several other students have done Master's theses on materials from the Keyes Collection (Fugle 1962; Henning 1961; Ives 1962), a great deal of information remains untouched in the Keyes Collection at the State Historical Society in Iowa City (cf. Tiffany [compiler] 1981; Tiffany 1986c; Tiffany et al. 1990) and in the Orr Collections at Effigy Mounds National Monument. Although Keyes did plan on writing a comprehensive report on the survey and a series of detailed reports on various phases and aspects in Iowa, these were not completed before his death in 1951 (Green 1992b).

Neither Keyes nor Orr was trained as an archeologist, and even though they were widely read and continually strove to improve their excavation techniques through consultation with professional archeologists, their methods often fell far below contemporary standards (McKusick 1979). This caused them to miss many features, such as postmolds and house outlines, and diminishes the value their excavations of stratified rock shelters might have attained. A final tragedy of the Keyes and Orr years lies in their failure to train younger people with an interest in Iowa archeology, and much information passed to their graves with them. Although Keyes was a lecturer in anthropology at the University of Iowa following his retirement from Cornell in the 1940s, held field schools in Palisades-Kepler State Park in 1942, 1944, and 1945, and advised a graduate student in writing her Master's thesis (Grissel 1946), Mildred Mott Wedel is the only person able to consider him as a mentor (Green 1992b). Keyes (1941, 1942) produced two summary

papers on Iowa archeology, and a summary on cultures of western Iowa (Keyes 1949) in his later years.

Unfortunately, the University of Iowa was very late in adding anthropology to its curriculum, but as Green (1992b:83) states:

In 1949, the University of Iowa hired cultural anthropologist David Stout and dental pathologist and physical anthropologist Alton Fisher. They had few opportunities to work with Keyes, however. By 1951 archeologists were also on staff at Effigy Mounds National Monument and at the Sanford Museum in Cherokee. All of them wanted to learn from Keyes, and Keyes provided as much assistance as he could, but the hours he was able to devote to archeology were spent writing what turned out to be his last summary publication on Iowa archeology (Keyes 1951)

During the Keyes and Orr years, other amateur archeologists were active in various parts of the state, and often communicated with Keyes and Orr. Paul Rowe and D. D. Davis were very active in the Glenwood area, recording and excavating sites. In northwest Iowa, Nestor Stiles, A. A. Christiansen, and F. L. Van Voorhis were active in recording sites, and Van Voorhis excavated two houses at the Chan-Ya-Ta Mill Creek village site. In northeast Iowa, Dr. Henry P. Field was active in recording and excavating sites. Although Rowe and Davis published some results, the work of most of these people remains unpublished (L. Alex 1980; D. Anderson 1975c). In eastern Iowa, Paul Sagers was also very active during this time period. Keyes and Logan used his collections from the Mouse Hollow and Levsen Rock Shelters in their definitions of ceramic traditions in eastern Iowa (Marcucci et al. 1991).

By the end of this era, two of Keyes' and Orr's dreams had been realized, Effigy Mounds National Monument was established in 1949 (See Orr 1917a, 1917b; Keyes 1933), and the Iowa Archeological Society was formed in 1951 (McKusick 1979; D. Anderson 1975c; L. Alex 1980).

### The Classificatory-Historical Period: The Concern with Context and Function (1940-1960)

During the second half of the Classificatory-Historical period, new experimental trends concerned context and function—and hinted at process. They did not replace the prevailing preoccupation of the Classificatory-Historical period, which remained firmly set in chronological ordering. The dissatisfactions, stirrings, and experiments did not cohere into a revolution—that was to come later—but they were portents of the future. The decades from 1940 to 1960, we think, are appropriately contained within the definitions of the Classificatory-Historical period, but it was also a time of ferment and transition (Willey and Sabloff 1980:130-131).

The new contextual-functional approaches are considered under three headings in our discussions. The first of these headings or categories takes as its theme the proposition that artifacts are to be understood as the material relics of social and cultural behavior. Earlier attempts had been made to ascribe use or function to archeological artifacts, but the difference in 1940-1960 period was in the close attention paid to context in arriving at functional inferences.

A second contextual-functional approach is that of settlement patterns. It was felt that the way man had arranged himself upon the landscape, with relation to its natural features and with relation to other men, held important clues for the archeologist

in his understanding of socioeconomic adaptations and sociopolitical organizations.

The third approach, relating to the other two, is that of the relationships between culture and natural environment. That is, it involved man and his resource base. While sometimes referred to as *cultural ecology* in the 1940-1960 period, it was generally something less than the ecosystem approach of more recent years.

The changes described above were somewhat slower in coming to Iowa archeology due to its somewhat arrested development during the Keyes-Orr years, and Iowa archeology contributed little to these developments (D. Anderson 1975c).

By the time of Keyes' and Orr's deaths, four events had taken place that would set the stage for the next era of Iowa archeology: the formation of the Iowa Archeological Society, the addition of David Stout and Alton Fisher to the faculty at the University of Iowa, the establishment of Effigy Mounds National Monument, and the arrival of W. D. Frankforter at the Sanford Museum and Planetarium in Cherokee (D. Anderson 1975c; McKusick 1979; L. Alex 1980). The Iowa Archeological Society was organized by William Kennedy and Wilfred Logan of Effigy Mounds National Monument, along with Dr. Henry Field and others. The first annual meeting was held in Iowa City in 1951, and was organized by Stout and Fisher. Late in that year, Frankforter, A. C. Thompson, and Clinton Lawver formed the Northwest Chapter of the Society, based at the Sanford Museum, and the group began making site surveys and conducting salvage excavations in the area, as well as providing public lectures, field trips, and museum displays on northwest Iowa archeology. A Northeast Chapter was formed, and with Logan's help excavations were carried out at Spike Hollow Rock Shelter (Logan 1953). Paul Beaubien, of the Omaha office of the National Park Service began mound excavations at Effigy Mounds, and encouraged public participation. A Central Iowa Chapter was also formed in 1953 by R. W. Breckenridge and C. S. Guyne at Iowa State University, and they sponsored work by Rowe and Davis in southwest Iowa (D. Anderson 1975c; L. Alex 1980). Over the years other chapters have been formed, some disbanded and reformed several times, and the Society has continued to publish a *Journal* of ever increasing quality. It has served as a major force in amateur-professional cooperation and communication and has done much to increase awareness of Iowa archeology among the general public. Through time, the *Journal* has tended to become more and more technical, somewhat separating amateurs and professionals, but annual field schools and certification programs in site survey, excavation, and laboratory analysis have allowed for a great deal of amateur participation in Society activities.

Dr. David Stout joined the faculty of the Department of Sociology at the University of Iowa in 1949 to teach social anthropology. In 1952, he convinced the department to hire a second anthropologist. Stout had directed WPA excavations as a graduate student and selected Dr. Reynold Ruppé for the position because of his interest in archeology, somewhat to the consternation of his sociologist colleagues (see Stout 1953). Ruppé assumed editorship of the *Journal of the Iowa Archeological Society* in 1953, and operations were moved to Iowa City as Alton Fisher assumed the presidency. Stout and Ruppé, in cooperation with the Sanford Museum that had been conducting excavations at the Phipps Mill Creek Village site since 1952, organized a summer field school in 1955, and set up an archeological laboratory in the basement of the Old Armory on the University campus (see Ruppé 1954b). Two other field schools in later years focused on the Wittrock Mill Creek Village site and the Smith Woodland site (McKusick 1979; D. Anderson 1975c; L. Alex 1980).

Unfortunately, Dr. Ruppé was severely overworked, being required to teach three to four courses per semester, as well as serving as *Journal* editor. As a result, although materials from some of these excavations formed the basis for several Master's theses under his direction, no comprehensive final reports on these projects were ever produced (McKusick 1979). Ruppé was further hampered in his archeological efforts by lack of financial support from either the state or the university. All of his activities had to be funded through grants from foundations, and much of his time was taken up in preparing grant applications. He was especially frustrated by the lack of action on the part of state government in the protection of archeological sites. This was the height of the postwar building boom, and construction was taking place everywhere. Archeological sites were being destroyed at an alarming rate, and, under state law, there was no authorized person with the authority to monitor this destruction or mitigate impact on important sites, as was required by federal highways legislation.

A proposal to name a State Archeologist was defeated in the Iowa Legislature in 1957, and Ruppé was extremely disappointed (see Ruppé 1957b). Although the act did pass in 1959 and Ruppé was appointed State Archeologist, there was no funding provided for the position, and it provided no relief from his heavy teaching load. Bridled with the responsibility for preserving and recovering information from archeological sites in the state without being provided with the means to do it (Ruppé 1960a), Ruppé grew more discouraged and accepted a position as chairman of the Department of Anthropology at Arizona State University (D. Anderson 1975c; McKusick 1979; L. Alex 1980). However, Ruppé's tenure in Iowa had been productive. He had established an archeological laboratory at the University of Iowa, had succeeded in establishing an official Office of the State Archeologist under state law, and had established the first professionally run training program in Iowa history. He trained a new generation of Iowa archeologists, including Adrian Anderson, George Cowgill, Dale Henning, John Ives, Richard Flanders, and Eugene Fugle, several of whom would remain very active in Iowa archeology for years to come (L. Alex 1980).

Ruppé's replacement, Dr. Marshall McKusick, arrived at the same time as Dr. June Helm joined the faculty, in 1960. From 1960 to 1964, McKusick concentrated on publishing the accumulated Master's theses of Ruppé's students, redrawing the Hill-Lewis survey maps of Iowa mound groups, publishing Orr's manuscripts, and writing a popular account of Iowa's prehistory (McKusick 1964a). The only fieldwork carried out during this time period was the excavation of the rampart at the Hartley Fort in 1964 (McKusick 1964c). A major accomplishment of McKusick's first four years as State Archeologist was securing a small state appropriation for the Office of the State Archeologist. In summarizing this period, McKusick (1979:22-23) states:

The application of radiocarbon chronology made a startling change in viewing archeological sequences. The recognition of Paleo-Indian and Archaic artifacts and sites was a new development, largely due to the work of Frankforter. No systematic view of Woodland sequences existed except in northeastern Iowa where Logan had reinterpreted the Orr excavations and specimens. Most of the discussion centered on the late prehistoric village cultures and on the interpretations of students who had worked under Professor Ruppé. Glenwood culture, an extension of the Central Plains tradition in southeastern [sic] Iowa, was reinterpreted by Adrian Anderson (1961); Mill Creek culture on the northeast periphery of Middle Missouri Tradition was studied in part by Flanders (1960), Ives (1962), and Fugle (1962). Oneota culture, known in



northeastern Iowa from Mildred Wedel (1959), was expanded by Henning's (1961) discussion of western Iowa Oneota pottery. There were a number of other studies, but none of them were concerned with historic period archeology. With exceptions, the research carried out by the Iowa Archeological Survey during the 1930s still seemed to dominate the thinking of the few active archeologists. This thinking was soon to change.

In addition to preserving Effigy Mounds and providing public interpretation, Effigy Mounds National Monument was originally intended to serve as a regional archeological research center (McKusick 1979). In 1951, Logan (1951) published the first popular synthesis of Iowa archeology since that of Keyes (1927a). Beaubien (1952, 1953) excavated Hopewellian and Effigy Mounds and proposed that they had been constructed by two different groups over a long period of time, and that there was a gradual transition between the two groups (D. Anderson 1975c). Logan assisted members of the Northeast Chapter in their excavations at the Spike Hollow Rockshelter. Meanwhile, Logan examined the Keyes-Orr materials recovered from northeast Iowa Woodland sites for his Ph.D. dissertation at the University of Michigan. This study, completed in 1958 (later published in 1976), has become a standard work for those working in northeastern Iowa and southwestern Wisconsin. Unfortunately, since Logan's time at the Monument, the increasing demands for public interpretation and funding limitations have severely curtailed research activities, and it has never fulfilled its potential as a regional research center (McKusick 1979).

At the Sanford Museum in Cherokee, W. D. Frankforter, trained as a paleontologist, headed up a group of enthusiastic amateurs who were interested in geology and archeology, organized as the Northwest Chapter of the Iowa Archeological Society. They began excavating the Phipps Mill Creek Village in 1952. Ruppé and his students joined the excavations in 1955. Although no comprehensive report on these excavations ever appeared, the materials recovered formed the basis of several of Ruppé's students' Master's theses (D. Anderson 1975c). Also in the mid-1950s, members of the Northwest Chapter became involved in salvage operations at three large Oneota sites along the Little Sioux River. Materials from the Dixon site were ultimately included in Henning's (1961) study of Oneota ceramics in Iowa.

Perhaps Frankforter's greatest contribution to Iowa archeology came through his excavations and reporting on Archaic sites. Keyes had not concerned himself with pre-ceramic cultures in Iowa (D. Anderson 1975c). In 1952, Paul Rowe (1952a, 1952b) published Paleoindian and Archaic points found in Mills County, and amateurs around the state soon followed suit. Frankforter investigated the Turin burials, originally believed to be Paleoindian in age in 1955. Although the burials were eventually assigned an Archaic age, they still represent the earliest burials investigated in Iowa (see Fisher *et al.* 1985). Frankforter conducted excavations at the Hill site, an Archaic campsite in Mills County in 1958. Also in 1958 and 1959, Frankforter and Agogino excavated at the Simonson site, an Archaic bison kill site in Cherokee County, firmly establishing an Archaic presence in western Iowa (D. Anderson 1975c; McKusick 1979). Frankforter left the Museum in the early 1960s, and activities lapsed until the arrival of Duane Anderson in the late 1960s.

Another group of investigators active during this time period represented the first shaky beginnings of cultural resource management in the state. During the postwar years, the U.S. Army Corps of Engineers embarked on an ambitious program of flood-control dam construction on major rivers of the United States. In order to salvage information from archeological sites to be destroyed by dam construction and inundated by the resultant flood pools, a cooperative arrangement was

developed between the National Park Service and the Smithsonian Institution, resulting in the formation of the Park Service's Interagency Archeological Services, and the Smithsonian's River Basin Surveys Program. Several projects were planned for Iowa rivers and streams, including Coralville Reservoir on the Iowa River, Rathbun Reservoir on the Chariton River, and Red Rock and Saylorville Reservoirs on the Des Moines River. An Ames Reservoir was also proposed on the Skunk River but never built, and a Canton Reservoir was planned for the Big Sioux River but never built.

In 1948, Richard Wheeler (1949a) of the Smithsonian River Basin Surveys conducted a preliminary survey of the area of the proposed Rathbun Reservoir in Appanoose County, of the Coralville Reservoir (1949b) in Johnson County, and of the Red Rock Reservoir (1949c) in Marion County. As Coralville Reservoir was nearing completion in 1956, Warren Caldwell (1961), also of the River Basin Surveys, conducted further survey activities and excavated Woodpecker Cave, as well as several now-submerged open air sites within the reservoir region. The State University of Iowa also conducted preliminary investigations at Rathbun Reservoir (McKusick and Ries 1962a), at Red Rock Reservoir (McKusick and Ries 1962b), and at Saylorville Reservoir (Ashworth and McKusick 1964) during 1961 and 1962. As was the case with Wheeler's earlier surveys, however, these surveys followed the general pattern of the time, and largely consisted of consulting local landowners and collectors, with little systematic survey coverage.

## The Explanatory Period

Willey and Sabloff's (1980) Explanatory period is based on the emergence of the so-called "New Archeology" of the 1960s. They define the new archeology by three characteristics, cultural evolution, systems theory, and deductive reasoning. The new archeologists urged archeologists to move beyond artifacts and chronology, to examining the processes of social dynamics and change, as expressed by patterning of artifacts and features. To the new archeologists, the goal of archeological research should be to identify "laws" of social behavior and change. Highly positivist in their approach, they strongly supported a deductive approach to archeological research as opposed to the inductive approach characteristic of most prior research. They advocated "problem oriented research," in which hypotheses on prehistoric human behavior were explicitly put forward, and research strategies developed to directly test these hypotheses. While the new archeology had a profound effect on North American archeology in general, much of it good, as D. Anderson (1975c:80) states:

The "new" archeology has been steadily gathering momentum in American archeology and this trend can be seen in Iowa in an increase in studies dealing with ecology, subsistence and settlement patterns, seasonality and technology. All Iowa studies to date fall short of "explanatory research design" . . . The closest thing Iowa has in terms of the explicit approach would seem to be the climatic and environmental research projects conducted by Baerreis, Bryson and their associates. . . . We must recognize that archeology is now swinging toward the positivist end of the spectrum and that the construction of "models" is the current research style, but we must not forget the contribution of the empiricist viewpoint. The fact that all research entails interplay between induction and deduction is of basic importance. . . . In general it is safe to say that Iowa archeologists have been reluctant to jump head first into the new archeology. On the whole they tend to be less radical and less dogmatic than certain archeologists elsewhere.

The years between 1964-1975 saw a great increase in archeological activity in Iowa. During this time, McKusick was able to obtain a modest level of funding for the Office of the State Archeologist, several research assistants, and a reduced teaching load. Eventually, he was able to appoint Adrian Anderson as Assistant State Archeologist, and Lecturer in the Department of Anthropology. During this time period, McKusick and Anderson embarked on many research and training field projects, including excavations at Fort Madison, Fort Atkinson, and Fort Cherokee. The results of some of these projects were published in the new Reports Series, established in 1970, however, many remain unpublished. In terms of public education, a series of archeological films was released, including films on George Catlin's Indian artwork, prehistoric cultures of Iowa, Woodland, Mill Creek, Oneota, and Glenwood cultures, and Fort Madison and Fort Atkinson archeology.

The Highway Archaeology Program at the University of Iowa had its first meager beginnings during this time period, under A. Anderson, James Boylan, and later John Hotopp. The first large excavation project under this program concerned the excavation of a number of Nebraska phase earthlodges in conjunction with the U.S. Highway 34 relocation project near Glenwood (A. Anderson 1969; Hotopp 1978). In the early 1970s Adrian Anderson was appointed State Historic Preservation Officer (SHPO, I will refer to this agency as the SHPO throughout, as it has gone by several different names over the years), and operated out of the Office of the State Archeologist until the SHPO was made a Division of the State Historical Department. Dean Straffin, one of the first to earn a Ph.D. at the University of Iowa, was also appointed as an assistant State Archeologist and developed an active research and training program at Parsons College, in Fairfield, until its bankruptcy in the mid-1970s. John Hotopp, as Highways archeologist, was also given this title.

With the addition of David Gradwohl to the faculty in 1962, Iowa State University also became an active teaching and research center in central Iowa. Beginning in 1964, through a series of contracts between Iowa State University and the National Park Service, the SHPO, and the U.S. Army Corps of Engineers, Gradwohl and his students conducted major survey and excavation projects in the Red Rock, Ames, and Saylorville reservoir areas, resulting in a series of reports and Master's theses, and the definition of Moingona phase Oneota, in the central Des Moines River Valley. These projects were among the first in the state to utilize systematic survey techniques, where every area of the proposed reservoir areas was examined using pedestrian survey techniques. As a result, hundreds of new sites were recorded in a very short time. Noting the importance of recording areas of "apparent negative evidence" as well as areas where sites were located, Gradwohl reported on such areas as Site Survey Areas, within larger Reconnaissance Units. Shovel testing was not in wide use anywhere at that time.

Along with greatly adding to our understanding of central Iowa Oneota, Gradwohl and his students developed a keen interest in the historic archeology of the region, especially in that of local ceramic production and the coal mining industry. Several Master's theses were produced on historic ceramic kilns within the reservoir areas. Unfortunately, lack of proper funding support prevented Gradwohl from completing the in-depth analysis of much of the material recovered as he would have liked. Although several sites were used by students for their Master's thesis research, much of the material recovered in these massive projects remains unanalyzed.

The Smithsonian River Basin Surveys also remained active during this time period. Additional survey work was performed by John Hoffman (1965), and several sites were later tested and reported on by Lionel Brown (1967b). Brown (1966b) also investigated sites in the Saylorville

Reservoir area. Probably the most extensive work conducted by the River Basin Surveys was carried out by Lionel Brown (1967a) in Mills County in conjunction with the Soil Conservation Service's proposed Pony Creek Reservoir. Here, Brown excavated a number of Nebraska phase earth lodges as well as the Archaic Lungren site. His resultant publication is still a standard work for the region. Although not a part of the Smithsonian Surveys, the National Park Service also conducted excavations at the Jesse Hoover Blacksmith Shop near the Herbert Hoover Presidential Library in West Branch during this time period (D. Anderson 1975c).

Another major player in Iowa archeology during this time was the University of Wisconsin-Madison. Since Iowa had long lacked a Ph.D. granting institution in anthropology, several Iowa students, including Dale Henning, chose to attend the University of Wisconsin-Madison to earn their Ph.D.s. Professor David Baerreis had a Plains archeology background and was interested in the role that climatic change might have had upon prehistoric societies. His work with Reid Bryson had led him to believe that such a change had taken place on the Plains around A.D. 1300. Since both Mill Creek and Oneota cultures had occupied western Iowa during this time period, he reasoned that by excavating sites of both cultures both predating and postdating this change, he should be able to determine if substantial subsistence shifts or changes in settlement pattern had occurred as a result of the change.

Beginning in 1963, Baerreis and his students, in cooperation with the Sanford Museum, began excavating Mill Creek (D. Henning, ed., 1968/1969) and Oneota (Harvey 1979) sites in northwestern Iowa. The arrival of Duane Anderson at the Sanford museum in the late 1960s revitalized the Northwest Chapter, and, in 1970, the Sanford Museum and the University of Wisconsin-Madison again cooperated on excavations at the Brewster Mill Creek site. The Brewster site ceramics were later used by Anderson for his Ph.D. dissertation, and it was subsequently published (D. Anderson 1981b). Several years later, Joseph Tiffany excavated several houses at the Chan-Ya-Ta Mill Creek village for his Ph.D. dissertation, also later published (Tiffany 1982d). Also from the University of Wisconsin-Madison, Manfred Jaehnig (1975) and David Benn (1976, 1980) completed dissertations on northeast Iowa rockshelters. Many other prominent Midwestern archeologists received field training on these various projects.

Duane Anderson's arrival at the Sanford Museum revitalized the Northwest Chapter, and soon members were involved in a number of surveys and salvage excavations all over northwest Iowa (see D. Anderson 1975c). By 1973, when the Cherokee Sewer site was discovered, Dr. Richard Shutler had joined the University of Iowa faculty, and, in cooperation with the Sanford Museum, conducted salvage excavations at this important Paleoindian/Archaic site (Anderson and Shutler 1975). By the mid-seventies, R. Clark Mallam and David Benn had joined the faculty at Luther College in Decorah, and it became a major teaching and research center in northeast Iowa.

Duane Anderson replaced Marshall McKusick as State Archeologist in 1975. One of the first challenges faced by Anderson was the problem of Native American burials and their ambiguous status under Iowa law. This problem came to a head when a large Archaic ossuary was discovered during the construction of the new Lewis Central school building just south of Council Bluffs in the Fall of 1975. Working closely with Native American groups and state officials, Anderson was instrumental in having a law drafted and adopted that could be supported by both archeologists and Native American groups (D. Anderson *et al.* 1978).

Under Anderson's leadership, the Office of the State Archeologist quickly expanded. This was a time when cultural resource management



(CRM) was rapidly coming into its own. The Highway Archaeology Program was expanded to include secondary roads as well as primary roads, and reports were more formalized into the Project Completion Report Series. A major survey and excavation project was the U.S. Highway 518 Project, in Washington County (Lensink ed. 1986). At the same time, many more small federal projects were being required to conduct archeological surveys as a result of Executive Order 11593 and the Archeology and Historic Preservation Act of 1974. Many of these surveys were contracted to the Office of the State Archeologist and were reported in the new Contract Completion Report Series. Alton Fisher had retired from the College of Dentistry and was hired part-time to train students in human osteology in the Department of Anthropology and to analyze human remains prior to reburial by the Office of the State Archeologist. These analyses, and the results of research projects conducted by others were reported in the new Research Papers Series.

In 1976, in cooperation with the Department of Anthropology, the Sanford Museum, the Iowa Archeological Society, and the SHPO, as well as several other institutions, Anderson raised funding to return to the Cherokee Sewer to conduct more extensive interdisciplinary investigations (D. Anderson and Semken, eds. 1980). One of these studies, Hoyer's (1980) geomorphic analysis of the alluvial fan containing the Cherokee deposits was to have wide ranging implications for the future of Iowa archeological research. Joseph Tiffany, hired as Assistant State Archeologist, would become involved in a number of research projects and was especially active in coordinating Iowa Archeological Society field schools and developing the Iowa Archeological Society's Certification program for interested amateurs. He was also active in the development of University correspondence courses on Iowa prehistory and archeology. Also in terms of public education, the Office of the State Archeologist, with funding from the National Endowment for the Humanities, developed Iowa's P.A.S.T. (Programming Archeology for School Teachers), a filmstrip and activity series designed for Iowa grade schools and high schools. A companion book, *Exploring Iowa's Past* was also developed through this program (L. Alex 1980). These resources filled a huge void that had existed for many years in public education in Iowa.

The SHPO was also very active during these years. One significant activity was the sponsoring of archeological overviews of the Iowa-Cedar River Basin (Division of Historic Preservation 1975), the Southern Iowa Rivers Basin (Gourley 1983a), the Skunk River Basin (Gourley 1984), and the Western Iowa Rivers Basin (Benn 1986). These overviews summarized the known archeological resources of these regions and set a priority list of survey and excavation needs. A major survey project was carried out in the southeastern portion of the state in the coal region. The Iowa Coal Lands survey (Till 1976) was an attempt to delineate the extent of archeological resources likely to be impacted by increased coal mining activity in the region. The SHPO also funded a Paleoindian survey of the Lake Calvin Basin by the Department of Anthropology at the University of Iowa (Charlton, compiler 1980). Major, multiyear archeological, architectural, and historic s surveys were conducted in two multicounty regions of the state, in cooperation with the Central Iowa Regional Association of Local Governments (CIRALG) (Gourley 1983b) in Des Moines, and the Area XV Regional Planning Commission in Ottumwa (Till and Nansel 1981a, 1981b, 1983, 1984a, 1984b, 1984c). In addition, the SHPO administered federal funding for major excavations at the Arthur, in Dickinson County (Tiffany, ed. 1982), and at the MAD and Rainbow s in Crawford and Plymouth counties, respectively (Benn, ed. 1990). During this time, as a result of SHPO efforts, Iowa became one of the first states in the nation to attempt to implement the Resource

Protection Planning Process, as suggested by the Department of the Interior. The resultant document (E. Henning 1985) is now somewhat out of date, and of marginal utility, but it represented a major first step in trying to organize the state's cultural resources management needs; a step it is hoped the current document will build upon.

This was an era of increasing refinement of archeological survey techniques. Shovel testing was introduced as a practical method for locating archeological s in areas of ground cover, and posthole testing proved an efficient means of locating buried archeological features. As a direct result of Hoyer's (1980) studies at the Corrington alluvial fan, containing the Cherokee Sewer, and of excavations at the Rainbow site, Thompson and Bettis (1980) were able to fit the Corrington Member into the DeForest Formation defined by Daniels and Jordan (1966) and correlate depositional episodes across western Iowa, and, eventually, eastern Iowa as well (Bettis and Littke 1987). As archeologists gained geomorphic sophistication as a result of these studies, survey and excavation techniques were modified to make use of this knowledge. Geomorphic studies became a standard technique in archeological surveys.

Numerous out-of-state institutions conducted surveys and excavation projects in Iowa as a result of CRM projects. In addition, this time period saw the birth of countless private archeological consulting firms, both within Iowa, and in other states as well, all busily conducting archeological research, and preparing limited distribution reports on their findings. This mushrooming of limited distribution reporting, often never followed up on with wider distribution publication, led to the creation of a vast amount of "gray literature," making it very difficult for individual archeologists interested in a regional or area wide synthesis to gain access to much of this information. In an effort to ameliorate this situation, the National Park Service developed the National Archeological Bibliographic Database (NADB), a relational database for recording all CRM-related literature produced in the United States. In Iowa, the SHPO was put in charge of entering all of the Iowa literature. During this period, the U.S. Army Corps of Engineers continued to sponsor archeological research in the Coralville, Saylorville, Red Rock Reservoirs, funding numerous individual projects, archeological overviews, and cultural resources management plans. In addition, surveys and overviews were sponsored in several Mississippi River Navigation Pools, greatly adding to our knowledge of the archeology of these regions, especially Navigation Pools 17 and 18 (Benn, ed. 1988).

In 1988, William Green succeeded Duane Anderson as State Archeologist, and Stephen Lensink succeeded Joseph Tiffany as Assistant State Archeologist. At the same time, Dr. Mary Whelan joined the faculty of the Department of Anthropology. Under their leadership, the office has continued to grow and become increasingly involved in research and public education. The initiation of Iowa Archeology Week, in 1993, marked a major effort in the latter. For a week, professional archeologists conducted lectures, demonstrations, and workshops on Iowa archeology across the state. Along with Mary Whelan of the Department of Anthropology and Art Bettis of the Iowa Geological Survey, Green has participated in ongoing research at the Gast Farm and Gast Spring sites in Louisa County, directed the mapping of the Toolesboro Mound Group, and has continued research on ancient agriculture in the Midwest. A number of students have completed Master's theses on the Gast Farm and Gast Spring materials under Whelan and Green, and their research at the Gast Spring site has revealed what may be the oldest Archaic structure excavated in Iowa. Lensink has also been involved in a great many research projects, some involving Iowa Archeological Society field schools, including excavations at the Double Ditch site, a fortified Mill

Creek Village in O'Brien County. Fred Finney has also conducted recent Iowa Archeological Society field schools at the Hartley Fort, a fortified Late Woodland village in Allamakee County. Cooperation between the Office of the State Archeologist, the SHPO, and the Department of Anthropology is at an all time high, and Iowa is finally beginning to take its rightful place along with the rest of the Midwest as a major contributor to our understanding of eastern North American prehistory.

## Wisconsin Research

Mounds and mound groups were abundant in Wisconsin during Euro-American settlement, and their visibility on the landscape made them the focus of early archeological investigations. Increase A. Lapham is probably the best known early Wisconsin researcher in archeology (as well as in biology, geology, and meteorology). Lapham began his investigations into Wisconsin's mounds in 1836 and published his compendium in 1855 (Lapham 1855). His skills as a surveyor resulted in the careful mapping of mound groups and their settings. He recognized that Wisconsin's effigy mounds were unique and suggested that the paucity of burials and grave accompaniments argued for their great antiquity. He found also that many conical mounds, on the other hand, included burial features. Lapham related the mounds and other earthworks evident in Wisconsin to "mound builders," but he concluded the Mound Builders were likely to have been ancestors of modern Indians (Lapham 1855; Williams 1973).

Lapham also produced a detailed and accurate map of the Aztalan site and related features (1855). Nathaniel Hyer had reported and mapped Aztalan in 1837 (Richards 1992; Gallagher 1992). He named the site Aztalan speculating that it may have represented the homeland of the Aztec. Lapham and later archeologists, however, recognized that the platform mounds and enclosure at Aztalan were related to similar prehistoric sites across the Midwest and Southeast.

Cyrus Thomas and his agents Col. P. W. Norris and James D. Middleton conducted mound research in Wisconsin on behalf of the Smithsonian Institution (Bureau of Ethnology) in the 1880s (Thomas 1894). The focus of Thomas' work was to demonstrate conclusively that the many varieties of mounds across the country were built by the ancestors of American Indians, and not by some lost race or civilization of "Mound Builders." Their research focused primarily on mounds in the southwestern part of the state. Thomas concluded that the earthen effigy mounds were unique to the Wisconsin area, and limited excavations suggested they were not burial mounds. Thomas also reported on the excavation of numerous conical mounds in southwest Wisconsin, some of which today are recognized as Middle Woodland burial mounds (Stoltman 1979). Excavations of several Barron County mounds in northwest Wisconsin also revealed burial programs which subsequently were identified as Middle Woodland (McKern 1931; Kolb 1988). The Reverend Stephen D. Peet also excavated an effigy mound for Cyrus Thomas in southeast Wisconsin (Thomas 1894). Peet was a Wisconsin resident who was founder and editor of the *American Antiquarian*. Peet published widely on his effigy mound explorations and on "mound builders" (Peet 1892; Silverberg 1968).

The Northwestern Archaeological Survey, also known as the Hill-Lewis survey, was undertaken from 1881 to 1895 when the sponsor unexpectedly died. Alfred J. Hill funded the project and Theodore H. Lewis directed the fieldwork. The survey focused on identifying and mapping mounds across the Midwest, Canada, and the Southeast (Keyes 1928, Dobbs 1991). Although the research was never completed or

published, the extensive field records are curated at the Minnesota Historical Society. The survey records served as the basis for Winchell's (1911) compendium on the prehistoric sites of Minnesota. Although the Hill-Lewis Survey included research into many Wisconsin mounds, the archives have not yet been extensively used by Wisconsin archeologists (Dobbs 1985; Stoltman 1992b).

Other early explorers of prehistoric mounds and sites included George H. Squier who focused his research efforts on western Wisconsin and the Mississippi River valley (Squier 1905, 1914). Squier's investigation of sites around Trempealeau suggested the presence of early Mississippian platform mounds and settlements. Recent research has confirmed the presence and significance of Squier's Mississippian sites (Green and Rodell 1994).

By the beginning of the twentieth century, archeologists active in Wisconsin had formed an Archeology Section within the Wisconsin Natural History Society, and within a few years the section reformed as the Wisconsin Archeological Society. In 1901 the group began to publish *The Wisconsin Archeologist* which continues today as the primary journal on Wisconsin archeology. Charles E. Brown was the journal's editor for many decades and was also Director of the State Historical Society Museum. Brown coordinated an enormous effort to locate and record archeological sites throughout Wisconsin. Although mounds and mound groups were of continuing interest, Brown and his colleagues also collected information on villages, campsites, trails, garden beds, and artifact classes. Brown corresponded with professionals, landowners, and collectors across the state and compiled information by county on maps and in archival files. Brown and his associates also published extensively on sites and artifacts in *The Wisconsin Archeologist* through the 1940s (for example, C. E. Brown 1904, 1906, 1909, 1912, 1916, 1919, 1923, 1924, 1930, 1939, 1945). Brown's archives and publications have served as the baseline for the site files still used by professional archeologists across the state (Hurley 1965a).

The Milwaukee Public Museum became active in Wisconsin archeology in the 1910s with Samuel A. Barrett's excavations of mounds in eastern Wisconsin including the Kratz Creek mounds (Barrett and Hawkes 1919), investigation of mounds and habitation sites on the Menomoni reservation (Barrett and Skinner 1932), and finally extensive excavations at Aztalan (Barrett 1933). Barrett's *Ancient Aztalan* (1933), which was published only 13 years after he completed fieldwork, serves as a model of exemplary planning, mapping, excavating, and reporting during the early phases of Wisconsin's professional archeology. Barrett became director of the Milwaukee Public Museum in 1921 and his active archeological fieldwork ceased. Barrett, who was Alfred Kroeber's first Ph.D. student at Berkeley, was a well-rounded anthropologist and also conducted extensive fieldwork among living American Indian groups across North America including Wisconsin. Until his retirement in 1939 Barrett was instrumental in the design and creation of the many full scale and miniature dioramas illustrating life groups of people, plants, and animals in their environmental setting for which Milwaukee Public Museum became famous (Lurie 1983).

The Milwaukee Public Museum continued an important role in Wisconsin archeology through the activities of Will C. McKern who was hired as Curator of Anthropology in 1925 and served as museum director from 1943 to 1958. McKern, who was also a Kroeber student, continued the tradition of museum involvement in both ethnography and archeology. McKern is perhaps best remembered in Midwestern archeology for his systematic approach to archeological research and the development of the Midwestern Taxonomic Method (McKern 1939). The McKern system was a means of classifying archeological sites and

cultures by comparing material traits. Classification levels included component, focus, aspect, phase, pattern, and base. Developed before the advent of radiocarbon dating, the McKern system fell into disuse after the 1950s when chronological relationships could be established through absolute dating and the Griffin (1952, 1967) and Willey and Phillips (1958) classification methods became more popular.

McKern's archeological fieldwork program in Wisconsin was also systematic. Field investigations were planned in an east-west transect cross cutting the major Wisconsin drainages in central Wisconsin. In this way, McKern planned to sample a variety of cultures which may have used different drainages for settlement, trade, and transportation (McKern 1928). Over the years McKern reported on Museum excavations at several mound groups in Sheboygan and Dodge counties (McKern 1930), Green Lake and Marquette counties (McKern 1928), Trempealeau, Vernon, Crawford, and La Crosse counties (McKern 1931) and Burnett County (McKern 1963). He also described and synthesized data from archeological investigations at Hopewell (Middle Woodland) (1931) and Upper Mississippian (Oneota) (1945) habitation and mound sites in eastern and western Wisconsin. McKern produced the only pre-World War II local synthesis of Wisconsin prehistory (McKern 1942).

During McKern's tenure much of the Museum's archeological work was conducted in cooperation with the University of Wisconsin (Madison) using Ralph Linton's students and other professionals. Individuals who participated in the joint archeological research included Leland Cooper (1933), Philleo Nash (1933), Chandler Rowe (1956), George Quimby (1960, 1966), and Albert Spaulding.

Robert E. Ritzenthaler, who began work at the Milwaukee Public Museum in 1938 while he was still a UW student, continued in the Barrett/McKern tradition of ethnographic and archeological research and cooperative ventures with professional and amateur archeologists. Ritzenthaler retired as Curator of Anthropology in 1972 after producing important publications on Wisconsin's early prehistoric cultures (Ritzenthaler 1946, 1967a, 1972; Ritzenthaler et al. 1957; Ritzenthaler and Quimby 1962; Ritzenthaler and Wittry 1952; Wittry and Ritzenthaler 1956).

Relatively little archeological research was conducted during the Depression and World War II in Wisconsin. Federal funding provided through the Works Progress Administration and other agencies was rarely used for archeological fieldwork in the state (Kehoe 1986). Following World War II, however, there were increasing numbers of archeology students and faculty in state educational institutions. New archeologists joined the University of Wisconsin (Madison) (David A. Baerreis), Beloit College (Andrew Whiteford, Moreau Maxwell), and Lawrence College (Chandler Rowe) faculties. Before long, UW students joined the ranks of other state institutions including the State Historical Society of Wisconsin (Warren Wittry, Robert L. Hall) and the Milwaukee Public Museum (Robert Ritzenthaler). Although researchers continued to investigate Wisconsin's mounds (Maxwell 1950; Rowe 1956), cemeteries (Baerreis et al. 1954, Ritzenthaler 1946, Ritzenthaler and Wittry 1952, Ritzenthaler et al. 1957; Wittry and Ritzenthaler 1956) and habitation sites (Baerreis 1953a, 1953b; Keslin 1958) which had rich artifact assemblages received increasing attention. Stratified rock shelters also were examined to investigate chronological problems in conjunction with radiocarbon dating (Wittry 1959a, 1959b).

The Wisconsin Archeological Survey was formed in 1947 as a professional organization which linked archeologists at the various Wisconsin institutions (Baerreis 1948). The Survey sponsored joint fieldwork among its members and targeted sites that were threatened with destruction (Wittry 1959b). Perhaps the Survey's best known

research project was the investigation of the Aztalan site after it was acquired by the state and developed into a park (Baerreis 1958). Funded by the Wisconsin Conservation Commission (now Department of Natural Resources) and several college field schools, the multiyear investigations included limited excavations to guide partial reconstruction of the site area. Results of the work were published in a series of papers (Maher and Baerreis 1958; Baerreis and Freeman 1958; Wittry and Baerreis 1958; Maher 1958; Rowe 1958). After the 1960s, however, the Survey no longer sponsored fieldwork, but continued as an important professional association with semiannual meetings.

The 1960s and early 1970s saw an increase in "salvage" archeology across the state as federal laws and development projects increased. The Museum Division of the State Historical Society of Wisconsin (SHSW) was particularly active in federal highway and reservoir projects. The unfunded office of State Archeologist was created by Wisconsin statute in 1965 and placed in the SHSW Museum Division. Museum division archeologists who were active during this era included Joan Freeman (Curator of Anthropology and State Archeologist), John Halsey, William Hurley, and Barbara Mead. Major projects included the new Interstate Highway system and the LaFarge Dam project along the Kickapoo River in Vernon County.

The number of archeologists at Wisconsin universities also increased during this period as the "baby boomers" reached college age. James B. Stoltman joined David A. Baerreis on the UW (Madison) faculty, and began long term research in southwestern Wisconsin. The University of Wisconsin-Milwaukee (UWM) established a graduate program and employed several Midwest archeologists including Melvin L. Fowler, G. Richard Peske, Guy E. Gibbon, and Robert Alex. Robert J. Salzer joined the Beloit College faculty and undertook research in north-central Wisconsin. Ronald J. Mason began teaching at Lawrence University and, in cooperation with Carol I. Mason, began long term research in northeast Wisconsin. The University of Wisconsin-Oshkosh also hired a series of archeologists including G. Richard Peske, Steven Bedwell, and Alaric Faulkner. At UW-Platteville Harris Palmer, a geologist, conducted archeological research in southwest Wisconsin rockshelters, and also identified a variety of prehistoric and historic sites in northwest Wisconsin (J. Kolb 1988). During this time Leland Cooper of Hamline University (Minnesota) investigated several prehistoric sites in northwest Wisconsin (J. Kolb 1988). Field schools and grant funding from the National Science Foundation and other sources were used by many of these programs to explore local archeology.

After the mid-1970s Wisconsin archeology underwent major changes in response to the increasing importance of cultural resource management and contract archeology. The new developments were inspired by the passage of the Historic Preservation Act of 1966 and the Environmental Policy Act of 1969. Bureaucratic changes in Wisconsin included the formation of the Historic Preservation Division at SHSW where review and compliance of state and federal projects impacting archeology occurred. Federal funds for planning, survey, and site development were distributed through this division to archeologists working in the state. Eventually a regional archeology program was established and supported by both state and federal funds. By the 1990s the SHSW Historic Preservation Division included staff archeologists in a variety of programs including state archeologist, underwater archeology, burial sites, and compliance. The SHSW Museum archeology program also maintained a staff conducting highway archeology. Archeologists at the SHSW during this period included John Penman, Lynn Rusch, and Jennifer Kolb in the Museum division; Richard Dexter, William Green, Robert Birmingham, Jennifer Kolb, and Sherman Banker

in compliance; Rodney Riggs, Diane Holliday, and Leslie Eisenberg in burial sites; David Cooper in underwater; and Robert Birmingham (State Archeologist), Rodney Riggs, Diane Holliday, Paul Kreisa, and John Broihahn in state programs. The Wisconsin Department of Natural Resources, the major state land managing agency, also began to employ temporary staff archeologists including Robert Fay, Victoria Dirst, and Cynthia Stiles.

Some Wisconsin colleges and universities expanded their archeology programs by integrating academic research and instruction with contract archeology. UW-Milwaukee developed contract and regional archeology research as part of its undergraduate and graduate programs under the direction of Elizabeth Benchley and Lynne Goldstein through the Archaeological Research Laboratory. UW-LaCrosse developed a regional research, contract, and an undergraduate instruction program through its Mississippi Valley Archaeology Center under the leadership of James Gallagher with the assistance of James Theler, Katherine Stevenson, Constance Arzigian, Robert Boszhardt, Roland Rodell, Charles Moffat, and many others. Archeologists at other campuses became involved in contract archeology less formally by operating as independent consultants, or by accepting occasional contract jobs through their institutions. In addition, several colleges hired Wisconsin archeologists to enhance their teaching and local research programs including UW-Parkside (Barbara Vander Leest, Robert Sasso), UW-Platteville (Clarence Geier), UW-Eau Claire (Robert Barth), UW-Stevens Point (John Moore) and the UW-Center System (Carol I. Mason, David Overstreet, John Forde, Ronald Lippi, William Gilmore, Linda Foreman, and many others).

The SHSW historic preservation program also established regional archeology centers with archeologists at college campuses across the state. The centers assist with the state's effort to identify and manage archeological sites and to provide public outreach services. Regional archeology centers have included UW-Milwaukee (Goldstein, Benchley), UW-Madison (Stoltman), UW-LaCrosse (Gallagher, Stevenson, Boszhardt), UW-Oshkosh (Dirst, Jeffrey Behm, Carol L. Mason), UW-Stevens Point (Moore), and UW-Eau Claire (Barth). Noncollege-based regional centers included Burnett County Historical Society (Edgar Oerichbauer), Neville Public Museum (Koski, Yingst, Speth), and Nicolet National Forest (Bruhy, Stiles). Many of these regional centers have produced prehistoric archeology summaries and study units which have been used in this overview.

There has been little local museum involvement in Wisconsin archeology since the 1970s. The Milwaukee Public Museum ceased active archeological research in Wisconsin after Ritzenthaler retired. Recently Archaeological Rescue, Inc., which uses Milwaukee Public Museum facilities, has provided opportunities for the public to participate in local archeological research. Rescue has been under the supervision of several archeologists including David Overstreet, John Wackman, and Susan Gibson Mikos. The Neville Public Museum in Green Bay has recently become active in northeast Wisconsin archeology with part-time archeological staff (Yingst, Speth). The Kenosha Public Museum employs professional archeologists (Dan Joyce, Ruth Blazina-Joyce) who conduct research in southeast Wisconsin in cooperation with other professionals and local amateurs.

A few federal agencies with offices in Wisconsin also established archeological programs after the mid-1970s. The U.S. Forest Service, which has its eastern region headquarters in Milwaukee, began a long term archeological program at the Nicolet National Forest in northeast Wisconsin under the direction of Mark Bruhy. The Chequamegon National Forest in northwest Wisconsin, in contrast, hired a series of short term archeologists and consultants to undertake its compliance

work. The Bureau of Land Management also had its eastern region headquarters in Milwaukee, and employed an archeologist (Duane Marti) for a brief period. Little BLM work was undertaken in Wisconsin, however. Recently, the U.S. Army has employed staff archeologists at Fort McCoy (Kate Kachel, Wendell Greek, Karyn Caldwell) as well as contracting with archeological consultants.

Several other federal agencies have sponsored work in Wisconsin without having a state based office or local archeological staff. The National Park Service regional office in Lincoln has employed contract and staff archeologists in Wisconsin along national trails, waterways, and lakeshores, but has not established any long term archeological presence. The U.S. Army Corps of Engineers has contracted for numerous Wisconsin archeological investigations in conjunction with its waterway management responsibilities from its offices in Rock Island, St. Paul, Chicago, and Detroit. The Corps of Engineers has been especially effective in having the results of archeological research published in *The Wisconsin Archeologist*.

A variety of Wisconsin-based private firms have been established to conduct archeological investigations in conjunction with cultural resource management projects. The Great Lakes Archaeological Research Center, owned by David F. Overstreet, has included a number of principal archeologists such as Gordon Peters, John Wackman, Patricia (Bruhy) Richards, and John Richards. Philip Salkin and Carl Hendrickson are the principal archeologists at Archaeological Consulting and Services, another large archeology firm. Some Wisconsin contract archeologists work for engineering firms (Allen Van Dyke, Berg-Zimmer Engineering), and many others have worked as independent consultants.

Today, advances in understanding Wisconsin prehistoric and historic archeology are being made by a variety of researchers involved in academic, contract, and amateur archeology. The primary publishing outlet for archeological research continues to be *The Wisconsin Archeologist*, which is published by the Wisconsin Archeological Society, an organization of amateur and professional archeologists. The volunteer editorship of the journal has passed from its beginning in 1901 through the hands of Charles E. Brown, Robert E. Ritzenthaler, James B. Stoltman, William Green, and David F. Overstreet. A summary of Wisconsin archeology was published by the Society (Green et al. 1986) and has served as the state archeology preservation plan. Recently, the Museum division of the SHSW has begun a formal publication series to distribute some of its highway archeology reports to a wider audience. Most contract archeology reports, however, receive limited distribution to agencies and sponsors. Some limited distribution reports were made available for this overview, but many were inaccessible.

## Minnesota Research

The archeology of Minnesota has been a subject of interest to its residents and scholars since before Minnesota became a state in 1858. Although the earliest records of antiquities are from military expeditions and missionaries, systematic recording of mounds and earthworks began as early as the Civil War years. Because Minnesota was settled rather later than other areas of the Midwest, extensive land clearing and cultivation did not begin until the 1860s. As a result, the archeological sites, mounds, and earthworks of the state were available for study in relatively pristine form for much of the nineteenth century.

Much of our knowledge of the mounds and earthworks of Minnesota is due to the quiet industry and generous nature of Alfred J. Hill. Not only was Hill's archeological labor the earliest in the state, but was of the

longest duration and most scientifically rigorous in its conception and implementation.

Born in London in 1833, Hill was trained as a civil engineer and emigrated to the United States in 1854. Hill lived first in Red Wing, Minnesota, which contained one of the largest concentrations of mounds and earthworks in the Upper Mississippi Valley. Although the details of Hill's brief residence in Red Wing are unclear, it is probable that his time here sparked his interest in the antiquities of the "Great Northwest".

In 1855, he moved to St. Paul where he worked as initially as a draftsman, spending much of his career in the state land office. Hill's skill as a draftsman, his lifelong interest in maps and mapping, and his position in the state land office provided him with a unique opportunity to pursue his interests in archeology. He was in ongoing contact with United States deputy surveyors who were then surveying Minnesota, as well as others working in Minnesota and adjacent states, and very early began to encourage these surveyors to provide him with information on the location, number, and size of any mounds or other archeological materials that they encountered during their work.

During the Civil War, Hill served first in the Sixth Minnesota Infantry during the Dakota Conflict and subsequently was ordered to Washington, DC where he served in the office of topographical engineers. After the war, Hill joined the Minnesota Historical Society and served as a member of the Committee on Archaeology and subsequently as Treasurer.

As a member of the Committee on Archaeology, Hill developed an extensive correspondence and distributed a printed circular calling attention to the mounds and other antiquities throughout the state, and requesting information on them. This circular, in several different versions, was widely distributed over a period of years. The information that he obtained was carefully organized in a series of large notebooks which formed the basis for at least some of his later investigations.

In the 1870s, the Historical Society discontinued the Committee on Archaeology. Hill was not willing that the archeological research in which he had become deeply interested should be stopped and he continued his individual studies, liberally interspersed with geographical and historical information. Despite his deep commitment to archeology, however, Hill never viewed himself as an archeologist. After a visit to a mound group near St. Paul, he commented that:

This was the last attempt I made to survey or personally note any mounds. The job was too large for much impression to be made by getting only a group at long intervals, as the leisure of an employee only could permit. After this, I told my friends that I was only keeping the place warm until a real archeologist should turn up. (Hill, unpublished correspondence, Minnesota Historical Society).

In 1880 Hill met Theodore Hayes Lewis and quickly concluded that the 'real archeologist' that he had been waiting for had finally arrived. Although Lewis was almost twenty years younger than Hill, his passion for archeology was equally intense.

For some years, Hill had been hoping that an extensive survey of the ancient earthworks of Minnesota and adjacent states could be conducted. Funds for such a survey were not available from public sources and obtaining an appropriate person to conduct the survey was even more difficult.

In an unpublished prospectus for the survey (Hill 1881) he observed that:

In carrying the scheme into execution, certain difficulties are presented. A competent surveyor could probably be easily found to work for a moderate compensation and traveling expenses,

and would doubtless do the best he knew how, but his operations would be apt to be merely perfunctory and his collected information defective . . . and he would have no special taste or enthusiasm to keep him to the work whenever a fully compensated place in the regular line of his profession should be offered him. To find by inquiry the right man for the right place in this respect, would be a work of much time and trouble, and this paper would not have been written were it not that such a man is now living and procurable. Theodore Hayes Lewis, a young man yet under 30 years of age, has from his boyhood had a special predilection for the subject of American Antiquities . . . a generation has passed since the time when investigations and surveys of the kind here urged should have properly commenced, but they seem to have had few friends and no patrons. Should this opportunity be taken advantage of and a reasonable arrangement be made with Mr. Lewis, the archives of the Minnesota State Historical Society will in future years have much more valuable information to boast of than mere fragmentary knowledge collected by a dilettante of its former archeological committee—otherwise most probably that will be all.

Funding for the Survey did not materialize, but in 1881 Hill and Lewis entered into an agreement whereby Hill would devote up to 10% of his financial resources toward the Survey and Lewis would conduct the field portion of the project (Lewis 1898). Late in 1881, Hill entered into a formal contract with Lewis to begin the Survey. Shortly thereafter, Lewis made his headquarters at Hill's home at 406 Maria Avenue in St. Paul and for the next fifteen years, the house on Maria Avenue was the center of the most extensive archeological activity ever privately initiated and supported on the American continent.

The plan for the Survey specified that the study area was to include all of the north-central states insofar as they lay north of the Great Mound of Cahokia opposite St. Louis, Missouri (e.g. Minnesota, North Dakota, South Dakota, Wisconsin, Iowa, Illinois, Indiana, Nebraska, Missouri, Kansas, and Michigan; as well as the province of Manitoba). Within this broad area, Lewis used the information gathered by Hill during the previous decades, along with his own inquiries, to delineate the areas he would examine during a specific season. Travel was often difficult and was generally restricted to train or foot transportation. During the fifteen years of the Survey, Lewis traveled more than 54,000 miles, more than 10,000 of which he walked (Lewis 1898).

While Lewis conducted the field portion of the Survey, Hill was the patron of the project and provided funds for Lewis' support, contributing \$16,200 over the 15 year period. Apparently, Hill's enthusiasm for the Survey never diminished and in later years, he may have provided money for Lewis to travel in the southern states as well as within the Survey area proper. In all, the Survey painstakingly documented more than 2,000 mound and village sites containing more than 17,000 individual mounds and earthworks. Although some of the results of the Survey were documented in the more than 35 articles published by Lewis in *Science*, *American Anthropologist*, and other journals (see Winchell 1911:576-577 for bibliography), the plan of both men was to publish the Survey as a comprehensive study on the mounds and antiquities of the Great Northwest.

Hill abruptly died of typhoid pneumonia in June of 1895, bringing an abrupt end to the Northwestern Archaeological Survey. Hill's death was unexpected and no will to govern the disposition of his rather large estate could be found. Although T. H. Lewis protested that Hill had planned to leave funds to complete and publish the Survey, no tangible

evidence of this desire surfaced. After a rather lengthy probate process which included a mysterious fiancé who was to have married the elderly Hill and a law suit, the Ramsey County Probate Court ruled that because Hill had died intestate, all of his estate was to be given to his nearest living relatives, two elderly cousins in Ontario and England.

Another major figure in Minnesota archeology, Jacob Vrandenburg Brower, recorded some of the details of this unfortunate situation in his journals, particularly his own outrage when it was learned that the heirs would not donate the Survey records to the Historical Society but rather required that they be purchased for several thousand dollars. Although Brower attempted to convince the Society to purchase the Survey records, the funds could not be found and the records were in danger of being shipped off to England where they would have been lost forever. Ultimately, it appears that Brower purchased them himself with the intention of incorporating them with his own records into one master work on the archeology of Minnesota.

Theodore Lewis continued to publish articles on archeology between 1895 and 1898 and for several years was a partner in a publishing business in St. Paul. After Brower's death, he left Minnesota and his subsequent whereabouts and ultimate fate remain unknown.

Because the Survey was never published, it has remained largely unknown to scholars outside the Midwest and has been overshadowed by the Smithsonian Institution's landmark publication on the mounds of eastern North America (Thomas 1894). While the tremendous intellectual importance of the Smithsonian's work cannot be understated, the fact remains that while the Smithsonian documented some 5,000 mounds throughout eastern North America, the NWS recorded more than three times as many, often in far greater detail. However, one of the most valuable aspects of the Survey is that it can be used to reconstruct detailed drawings of sites that have since been damaged or completely destroyed. T. H. Lewis was visiting sites at a time when many of them had never been plowed or had only recently been opened for cultivation. Lewis had an opportunity to see and record them at a time when the world and the land were very different than they are today and in a very real sense, the Northwestern Archaeological Survey records a landscape that has since vanished forever.

J. V. Brower became interested in Minnesota archeology in the late 1880s and quickly became an influential figure in the history and archeology of the state. Brower had moved to Minnesota and enlisted in the First Minnesota mounted rangers in 1862. After participating in several battles with Indians during Sibley's campaign in that year, he continued his government service first as a civilian and then as a seaman with the United States fleet on the lower Mississippi River. Returning to Minnesota after the war, Brower married in 1867 and was elected Auditor of Todd County at age 23. For the next twenty years, Brower built a very successful career as an attorney, legislator, and elected official and at various times exercised considerable political power at both the county and state levels.

Brower's interests in both geographic exploration and archeology were initially focused outside of Minnesota. He became well known in Kansas for his research on the route of 1541 Coronado expedition and the location of Quivira, and later was involved in a survey to locate the ultimate source of the Missouri River in Montana. Brower's involvement with the Minnesota Historical Society began in 1889 when he became interested in the rumored claim of Captain Willard Glazier to be the actual discoverer of the source of the Mississippi River. Brower's research and explorations, particularly around Itasca Lake and its basin, effectively discredited this claim and his report was published by the Society as Volume VII of its collections. When the Itasca State Park was established

by the State Legislature in 1891, he was appointed as its first Commissioner and for the next nine years labored under a variety of difficulties to bring what was only a 'park on paper' into reality.

Newton Winchell described Brower as "a man of unique and even picturesque personality, and in his makeup included a vast fund of energetic efficiency" (Winchell 1911:xiii) and both aspects of his character are clearly visible in his archeological investigations. He had been an industrious collector of archeological specimens, maps, and books for many years prior to his active involvement in Minnesota archeology. Between 1889 and 1892 he worked in loose collaboration with A. J. Hill, but after this time increasingly went his own way, expanding and testing theories and ideas about the origins of the Mississippi River and the Indians who had peopled Minnesota.

In December of 1896, a fire in St. Paul destroyed the large collections of archeological specimens, maps and field books, and library that Brower had amassed. Sadly, the records and collections of others who had loaned material to Brower were destroyed in this fire as well. However, with characteristic energy, Brower started a 'New Series' of notebooks and embarked on an ambitious project to publish the results of his years of studies in an eight volume series entitled "*Memoirs of Explorations in the Valley of the Mississippi*" (Brower 1898-1904). The first two volumes of the series dealt with Kansas and were largely geographic and historical in nature. Volumes 3-7, respectively entitled *Mille Lac*, *Kathio*, *Kakibikansing*, and *Minnesota*, presented the results of Brower's investigations in Minnesota. The final volume, entitled *Mandan*, dealt principally with North Dakota and was delivered to the printer shortly after Brower's death in 1905.

Brower was a forceful and dynamic individual. As Winchell (1911:xiii) observed, "His grasp of individual topics was direct and immediate, often bold and commanding, and his publications were striking, readable, and weighty, although somewhat sketchy". In comparison to the meticulous and detailed records maintained by Hill and Lewis, Brower's work falls short of the mark, despite their importance in other respects. However in other respects, Brower was ahead of his time in perceiving the relationship between archeology and other disciplines and applying these interrelationships to specific problems.

Like Hill, Brower was intrigued by the relationships between geography, history, and archeology and attempted to articulate these in his series of publications using what would later emerge in a somewhat different form as the direct historical approach in archeology. More to the point, Brower articulated specific questions and problems that he wished to address and pursued them with vigor. For example, the question of the relationship of the Indian groups to the earthen mounds of North America dominated archeological thought during the last half of the nineteenth century. In Minnesota, Brower translated this broader question into a specific one relating to the mounds and earthworks of the Mille Lacs region of north-central Minnesota. In his volume on Mille Lac (Brower 1900:133-135) he spells out the problem and his conclusions in some detail:

It is now stated as an ascertained fact that the flint implements and pot shards recovered from explored mounds at Mille Lac, resting in contact with bundled skeletons on the original surface under the mounds explored, are identically the same in every essential particular as the flint implements and pot shards recovered from the adjacent village sites. That ascertained fact concludes an identification of the builders of the mounds as the people who occupied the ancient settlements. Now, to perfect an identification of the ancient villagers, there is only one certain, undeviating, narrow and beaten path to follow: Who were first



found there and what were they doing when discovered? What customs and habits and artifacts were observed as characterizing the nations of men who were originally discovered at Mille Lac? History discloses an indisputable answer . . . [Brower here reviews the narratives of Radisson, Duluth, Hennepin, Carver, Catlin, and Franquelin's map in some detail as well as the distribution of sites he has studied and their contents] . . . Surprising as the results are, it is compulsory that we bow to the unalterable supremacy of historic truth, and it is an unexpected privilege to interlock with it an archeologic confirmation of its correctness. The ancient M'de Wakan people bundled the bones of their dead, placed them upon the surface of the ground at Mille Lac, and there constructed the mounds which cover them; imperishable monuments, which are a lasting record of the happening of events in that region distinguishing the lapse of time from a prehistoric era to the historic period, now first elaborated.

Almost a century later, Brower's initial formulation remains largely unchanged and stands as a tribute to his pioneering work in this region.

It is largely because of J. V. Brower that the records of the Northwestern Archaeological Survey are still extant and were, at least in part, published in Newton Winchell's *Aborigines of Minnesota*. Brower's own death in 1905 prevented the completion of his grand plan and ultimately funds were found to purchase the Survey records from Brower's estate and to prepare the comprehensive document he envisioned. This massive task fell into the capable hands of Newton H. Winchell.

Like others of his day, Winchell had a broad-ranging interest in the natural and cultural history of Minnesota. As the first director of the Minnesota Geological Survey (1872-1900), Winchell was directly responsible for many pioneering studies of Minnesota's geology and published 24 annual reports that are notable for their length and thoroughness. While Winchell is primarily known to archeologists as the author of *Aborigines*, his annual reports contain a variety of archeological information on quarries and other matters that is often overlooked.

It remains unclear precisely how Winchell became involved with the preparation and publication of *Aborigines*, but his earlier connections with Warren Upham, an executive officer of the Historical Society, undoubtedly played a key role. In any case, Winchell assumed this task with efficiency and in 1911 produced *Aborigines of Minnesota*, a 761 page volume that remains the most comprehensive published collection of information on the mounds, earthworks, and other early archeological information from Minnesota, as well as the ethnography of the Ojibwe and Dakota.

Winchell was modest about his own role in the publication of this important volume and states in his preface to the volume that

Mr. Hill's archeological labor in Minnesota stands preeminent . . . his contribution to archeological science will stand always as a monument, *aere perennius*, to his name, ranking in value and permanence with the names of many others whose labor was better known by their contemporaries and was emblazoned on many printed pages. Mr. Hill plowed the field where Mr. Lewis sowed the seed, the fruit of which Mr. Brower garnered. It is simply the putting of this fruit into the current markets of archeology which has fallen to the writer. (Winchell 1911:ix).

The publication of *Aborigines* brought to an end an important chapter in the history of Minnesota archeology. The relatively undisturbed archeological landscape that *Aborigines* records was, by

1911, almost gone and the tradition of independent scholarship was giving way to the more formalized tradition of academic archeology based in colleges and universities. For the next six decades, Minnesota archeology would be driven by this academic model of inquiry, guided primarily by A. E. Jenks, Lloyd A. Wilford, and Elden Johnson, all of the Department of Anthropology at the University of Minnesota.

Born in 1869, Albert E. Jenks was trained in economics and had received a B.S. degree in 1896 from Kalamazoo College, a B.A. degree in 1897 from the University of Chicago, and his graduate degree at the University of Wisconsin. While at Wisconsin, he conducted his dissertation research on the American Indian utilization of wild rice in the Great Lakes region and through this research, he became a self-taught ethnographer. Jenks subsequently published a revised version of his dissertation through the Bureau of American Ethnology in Washington (Jenks 1900) and the contacts Jenks made at the Bureau were to stand him in good stead throughout his career.

A. E. Jenks founded the University of Minnesota Department of Anthropology in 1918, when the joint sociology/anthropology department was split into two separate entities (see Johnson 1990, from which much of the following discussion is drawn). The Department was initially named 'Anthropology and Americanization Training Course', reflecting both the nature of American society at the end of the first World War and Jenks own interests (Johnson 1990:16). Many of the first courses were designed to foster the integration of immigrants and Native Americans into mainstream American society and reflected Jenks own belief that anthropology should provide not only scientific data and theory but must use these to take an active role in social change. However, by 1922, the Americanization emphasis had disappeared. In 1923 Wilson D. Wallis joined the faculty, bringing a broader cross-cultural perspective to the University, and he and Jenks constituted a two person department until Jenks retirement in 1938.

For reasons that remain unclear, Jenks' career interests shifted to archeology toward the end of the 1920s. Through his contacts at the Bureau of American Ethnology, he learned of a site in New Mexico that needed excavation and in 1928 took a group of students to the site to begin work. One of these students was Lloyd A. Wilford who served as Jenks' assistant.

Wilford was 35 at the time and had already worked in several different careers, including teaching at rural public schools, service in the Navy during World War I, employment with the Veterans Bureau, and work as an attorney. He had returned to the University of Minnesota for graduate work in political science and, needing a minor field, had chosen anthropology because he had heard that Jenks was a good lecturer (Johnson 1974:1). His work in 1928 as Jenks assistant was the beginning of a career that would transform Minnesota archeology and last until his retirement thirty-one years later.

Since neither Jenks or Wilford had any training in excavation methods, they and their students served a brief apprenticeship under Wesley Bradfield at Cameron Creek, New Mexico, before beginning three years of excavation at the Galaz site on the Mimbres River (Johnson 1974:1). In the spring of 1930, Jenks and Wilford joined a group from Beloit College under Alonzo Pond and excavated a Capsian site, shell midden number 12 at Ain Beida, in Algeria. The group included a number of Wisconsin students who were later to become professional anthropologists and discussions with some of these individuals like Lauriston Sharpe and Sol Tax shaped Wilford's interest in pursuing professional anthropology as a career.

Jenks' work in archeology had been supported by gifts from prominent local businessmen and he had received an annual budget of

\$2,500 per year for his work in New Mexico. However, while in Europe following the Algerian project, Jenks purchased a large paleolithic collection of material, as well as several smaller collections. When his patrons learned that Jenks had used his field research funds to buy artifacts, they were understandably upset and the University Board of Regents promptly prohibited Jenks from soliciting private funds (Johnson 1990:20).

While this unfortunate event put an end to Jenks international endeavors, it resulted in the formation of a local field research program in archeology in 1932, supported by a modest research grant from the Regents of \$600 per year. This research program marks the beginning of serious scientific archeology in Minnesota and the remaining six years of Jenks career were spent conducting excavations in the state, assisted by Wilford (Johnson 1990).

A review of the sites excavated during this six year period (Johnson 1974:6-7, Table 1) reveals that the new field program investigated a wide variety of sites throughout the state, establishing a pattern that would characterize Wilford's approach to archeology for the next two decades. Undoubtedly most of these excavations were conceived by Wilford and were used as material for his doctoral dissertation since Jenks attention seems to have been focused on a series of human skeletons which appeared to him to be of great antiquity.

The first of these skeletons was discovered by highway construction workers near Pelican Rapids in west-central Minnesota (Johnson 1974:2). Jenks was called to the site and learned that the skeleton appeared to have been found in clays associated with a periglacial lake which was of considerable antiquity. Jenks obtained the skeleton and associated artifacts and subsequently published a monograph describing the find entitled "Pleistocene Man in Minnesota" (Jenks 1936). It should be noted that most of the analysis, description, and writing was in reality prepared by Wilford.

A second major discovery of an ancient skeleton was made near Browns Valley in western Minnesota in 1933. Jenks was able to obtain the skeleton and artifacts on loan and his monograph on this find appeared as an American Anthropological Association Memoir in 1937 (Jenks 1937). Again, Wilford was instrumental in preparing the monograph which, because of the associated artifacts now recognized as Late Paleoindian (Plano), was particularly significant.

In 1938, a third brief study which was designed to further Jenks view that very ancient humans had lived in Minnesota, appeared and for the first time Wilford was listed as a coauthor (Jenks and Wilford 1938).

During this period, Wilford decided to pursue a career in anthropology and enrolled in the Ph.D. program at Harvard in 1932. After three semesters of residence, he passed his qualifying examinations and began work on his doctoral dissertation which was completed in 1937.

Although it was never published, Wilford's dissertation (Wilford 1937) marked a significant turning point in the study of Minnesota archeology. Based on materials he had collected during his years as Jenks' assistant, Wilford prepared archeological site summaries for Kathio, Howard Lake, Blackduck Lake, Laurel, Round Mound, and the Tudahl Rock Shelter. The dissertation was also one of the earliest attempts to apply the new Midwestern Taxonomic System.

When Jenks retired in 1938, Wilford continued on the University of Minnesota staff with a Civil Service appointment as an archeologist assigned to the Department of Anthropology. He began teaching classes in the Department during the second World War and was appointed as an associate professor in 1948. Shortly thereafter he was promoted to professor, a rank that he held until his retirement in 1959.

Throughout most of the period from 1938 to 1959, Wilford was the only professional archeologist working in Minnesota and during this time he followed the pattern of research he had developed during his early work with Jenks. Because he did not have any teaching duties during spring quarter, his annual round began at this time when he made a scouting trip though the state, making new contacts with landowners, amateur archeologists, and collectors, checking on the condition of sites (particularly those listed in Winchell), and making arrangements for the excavations he would conduct that summer. After each scouting trip, Wilford had his notes transcribed and these were placed in files organized by county, along with correspondence and other information that he collected over the years.

Each summer, Wilford took a small group of students out to conduct excavations at the sites he had selected during his spring trip. Wilford was particularly conscious of the environmental diversity in Minnesota and attempted to excavate sites in different environmental areas—and of different archeological cultures—each year. Excavation at each site lasted about two weeks and then, after the units were carefully backfilled, Wilford and his students moved on to their next site. The budget for each season was quite small, amounting to \$300 per year in the 1930s and subsequently growing to \$600 per year at the time of his retirement (Johnson 1974:5). Of necessity, Wilford and his students camped throughout the season, enjoying the fine weather and enduring the rains, bugs, and heat which can also characterize Minnesota. Evenings were spent completing and copying field notes and, when the sky was clear, Wilford would sometimes bring out his star charts and provide the students with elementary astronomy lessons.

After the field season was completed, Wilford spent the fall and winter months carefully cataloging and describing the materials he had excavated. A typed report was then prepared on each site. These reports following a standard format that described the site location, excavation procedures, feature description, artifact analysis, and a brief comparative analysis. Although few of these reports have ever been published, they remain available for study at the University of Minnesota, along with Wilford's carefully catalogued artifact collections from each site, county notes, and photographic archives.

Wilford viewed culture content and the spatial/temporal relationships between sites and complexes as fundamental to all archeological research and reporting. His own careful fieldwork reflected this view, as did his detailed descriptions of the materials from each site that he worked at. In 1954, he articulated his own goals and the theoretical framework within which he worked, observing that the inclusion of detailed description and analysis of site data is a necessary prerequisite to the interpretation of archeological information. Presenting inferences and interpretations without the data to support them was simply bad science (Wilford 1954; Johnson 1974).

These views are reflected in the numerous site reports and manuscripts prepared by Wilford and the relatively smaller number of synthetic professional publications based on the data he gathered over almost three decades. Although some archeological complexes have been added and others modified, Wilford's description and analysis of the archeological cultures still forms the classificatory basis for much of the work conducted in the state.

Wilford's first technical paper appeared in *American Antiquity* in 1941. This paper (Wilford 1941a), like his dissertation, applied the Midwestern Taxonomic System to Minnesota. In this publication, he defined a number of archeological complexes within Minnesota including the Oneota, Effigy Mound, Mille Lacs, Headwaters Lakes, Rainy River, Red River, and Southern Minnesota aspects. A number of foci were also



defined and described. These included Orr, Blue Earth and Humphrey for Oneota and Kathio, Howard Lake, Blackduck, Laurel, Arvilla, and Lake Traverse for the Woodland Pattern. A revised classificatory system published toward the end of his career (Wilford 1955a) remained much the same, adding the Malmo Focus and deleting the Lake Traverse aspect.

In the years to come, he published several additional papers in which he refined his initial formulations and added additional archeological units. In 1945, he described three new Mississippian cultural units: Great Oasis, Cambria, and Silvernale (Wilford 1945a), and in several other papers during this period expanded his definitions of the Mille Lacs aspect (Wilford 1944), the Headwaters Lakes aspect (Wilford 1945b), and the McKinstry Mounds of the Rainy River aspect (Wilford 1952). In addition, he published several shorter papers describing specific sites and artifacts from sites around the state (e.g. Wilford 1941b, 1943).

Wilford's original papers remain required reading for any serious student of Minnesota archeology. His formulations are clear and are a seminal application of the Midwestern Taxonomic System. The absence of absolute dating techniques during most of his career are obvious, and a careful reading reveals some of the weaknesses of Midwestern Taxonomic System. Nonetheless, the overall chronology and delineation of cultural units provided an important base for the various problem-oriented types of approaches that are more common today. This fact is particularly obvious when one considers that many of the units described by Wilford—particularly Kathio, Blackduck, Laurel, Arvilla, Howard Lake, Blue Earth, and Orr are still of significance in the larger context of both Minnesota and western Great Lakes archeology.

Wilford retired from the University in 1959 and was succeeded by Elden Johnson. Like Wilford, Johnson came to archeology with a rich and diverse background.

Born in South Dakota, Johnson's mother was from Minnesota and his father worked for the fish and game division of South Dakota and later joined the U.S. Fish and Wildlife Service where he spent the remainder of his career. After graduating from high school in Albuquerque, Johnson entered the premed program at the University of New Mexico. World War II intervened, however, and he joined the U.S. Army Air Corps following the bombing of Pearl Harbor. During the war, he flew numerous missions as a P-38 pilot with the First Flight Group in North Africa and Italy. After being discharged in 1945, he came to Minnesota where his father was now regional director of the Fish and Wildlife Service and enrolled in the University of Minnesota. A chance course on acculturation taught by Richard Beardsley, a temporary instructor from the University of California/Berkeley, stimulated his interest in anthropology and he graduated in 1948 with a double major in anthropology and zoology (Streiff 1990).

As an undergraduate, Johnson had begun working at the St. Paul Science Museum (now the Science Museum of Minnesota) sorting and cataloging a variety of ethnographic specimens. Because of his experience, the Science Museum sent him to Browning, Montana to catalog the Great Northern collection of ethnographic material, reinforcing his interests in cultural anthropology and the Indians of the Great Plains. This experience undoubtedly led to his Masters thesis entitled "Kinship in a contemporary Yanktonai-Dakota Indian Community," completed after four quarters at the University.

In the fall of 1950, Johnson entered Yale for further graduate work. To support himself, he worked first at a local hospital and then for the remainder of his stay at the Human Relations Area Files (HRAF) project under George P. Murdock and Chellan Ford. His initial dissertation topic required fieldwork in Chile, but after financial support fell through at the last minute, Johnson found himself travelling to Thailand and

Cambodia on a Ford Foundation Foreign Area Fellowship, in part a result of his work with the HRAF project. Although his goal was to study the socio-economics of a small market town, illness and the outbreak of the French Indo-China War disrupted his work. After a number of frustrating months in the field, he returned to Minnesota in 1953 where he began to work at the Science Museum and taught a course or two each quarter at the University of Minnesota. In 1955, he was hired as a full-time instructor at the University while remaining a part-time curator at the Science Museum. During the 1958-1959 term, he accepted the position of Director of the Science Museum on a part-time basis but decided that constant fund-raising was not to his liking and he returned to the University as an Associate Professor.

Although Johnson's primary interests had been cultural anthropology, he had taken a few archeology courses at the University, where he had participated in Wilford's 1948 field school, and at Yale with Irving Rouse and Wendell Bennett. During his time in southeast Asia, he spent part of his time, when unable to enter his study area, looking for artifacts along local rivers, laying the groundwork for a lifelong interest in the archeology of Asia. After his return to Minnesota, he became more deeply involved in archeology and as his first major project, directed a two year study beginning in 1954 by the Science Museum of the archeology and ethnography of Spring Lake Park south of St. Paul on the Mississippi River. During this project, he examined the Lee Mill Cave, Sorg, Schilling, Hamm, Renelius, and Bremer sites, a complex which had until that time been poorly known (Johnson 1959). From 1953 until 1959, he also worked on Wilford's projects and excavated with him at sites throughout the state, including Barton, Gillingham, Roseau River, Nett Lake, and the Christenson Mound. During Wilford's last field season, he also excavated at the Franz site and in Roberts County, North Dakota. After Wilford's retirement, Johnson assumed his teaching schedule and curatorial responsibilities for the University archeology laboratory.

During the next decade, Johnson dramatically expanded the archeology program at the University and, as was happening in many parts of the country, shifted its emphasis to a problem-oriented and regional focus. His own training in ethnography was particularly apparent in the emphasis on ethnohistory that he brought to archeology. Further, he recognized the importance of interdisciplinary and environmental studies in archeology and developed strong links with the strong glacial geology and paleoecology programs at the University guided by H. E. Wright, Jr. This interdisciplinary approach is apparent in the work of many of Johnson's graduate students of this period (cf. Shay 1971) and other projects that he developed, particularly several involving the fluctuation and movement of the prairie-forest border in northern Minnesota. The series of papers in the memorial volume for Lloyd Wilford (Johnson, ed. 1974) clearly demonstrate the breadth and depth of interests that Johnson fostered in his students during this period.

One of the first tasks Johnson began was to expand Wilford's strategy of regional spot excavation into statewide regional surveys. His initial surveys in the Red River Valley and northwestern Minnesota were funded by the National Science Foundation and additional regional work, beginning in 1960 were funded by the Minnesota Resources Commission (MRC). Many of the seminal works conducted during the 1960s were funded by MRC and a thoughtful plan for working with the states archeological resources were developed. Unfortunately, because of various political and institutional developments, this funding source was short-lived.

Perhaps the survey that had the most lasting affect on Johnson's career was Leland Coopers test excavations in the Mille Lacs area. Although Wilford and Will McKern had identified the Kathio-Clam River

focus as protohistoric Dakota, Johnson doubted this relationship and sent Cooper (who had worked with him on the Spring Lake Park project) to test the Cooper, Sawmill, and Petaga sites along the Rum River outlet of Mille Lacs Lake. Cooper discovered a wealth and complexity of material that prompted Johnson to initiate a long-term research project in the Mille Lacs area which lasted until 1976. Excavations concentrated on the Cooper, Wilford, and Petaga sites but many other smaller sites in the area were excavated or tested to provide an in-depth investigation of changing lifeways of ancient Indian people in one specific area of the state. Theses, monographs, and papers based on these excavations appeared regularly for two decades (Streiff 1972).

In 1963, Johnson was instrumental in the passage of the Field Archaeology Act, which replaced an earlier statute devoted to prehistoric archeological sites passed 1939. This earlier law was the result of efforts by Lloyd Wilford and the Rev. Henry Retzek, who had discovered the Sauk Valley skeleton. It prohibited excavations without a permit and named the Minnesota Department of Conservation as administrator and required that a professional archeologist employed by the University of Minnesota be given the responsibility of certifying applications for excavation. Although funds were never appropriated and enforcement was spotty at best, the law provided some measure of protection for sites. The new Field Archaeology Act specifically designated a state archeologist in the university and shifted administrative responsibility to the Minnesota Historical Society. Johnson was appointed Minnesota's first State Archeologist and served in that (unpaid) capacity until 1979. Unfortunately, the 1963 act did not appropriate funds for the position either, a fact which has continued to create numerous difficulties.

As State Archeologist, Johnson was instrumental in developing several other critical aspects of archeology in Minnesota. He strongly believed in publication of professional results and in cooperation with the Minnesota Historical Society began the Minnesota Prehistoric Archaeology Series which served as an outlet for a number of key reports and publications, including several based on Wilford's earlier work. He also was firmly committed to public involvement and education and prepared two editions of the popular *Prehistoric Peoples of Minnesota*, as well as developing a series of other public programs both at the University and later at the Institute for Minnesota Archeology. He also felt it was essential to involve the living descendants of those native Americans whose remains archeologists were investigating. He was one of three anthropologists to meet with Native Americans to discuss the management of archeological resources at the important Airlie House seminar in the early 1970s, and remained active with this issue throughout his career. Finally, he believed that professional communication and interaction were essential components of research and founded the Council for Minnesota Archeology to promote and facilitate communication among professionals working in the state.

In 1972, Johnson became Chair of the Anthropology Department and served in this position from 1972-1975 and again from 1977-1984. As Chair, he continued his efforts to strengthen archeology in the Department, with Janet Spector and Guy E. Gibbon joining the Department and providing expertise in ethnohistory/historic archeology and Midwestern prehistoric archeology respectively. Spector focused most of her interest on ethnohistory and the Dakota. Gibbon's wide-ranging interests contributed significantly to the Department, as did his subsequent (and current) leadership of the Interdisciplinary Archaeological Studies program.

During the mid-1970s, Johnson recognized the emerging importance of cultural resource management and began to devote an increasing amount of effort to compliance surveys with his students, most notably

in the Headwaters Lakes area, the Boundary Waters Canoe Area, and on Prairie Island near Red Wing. He also instituted course work in cultural resource management and developed opportunities for many of his students in this field as well as more traditional academic careers. In 1987, Johnson retired from the University but immediately accepted the position of Executive Director of the Institute for Minnesota Archaeology, on whose Board he had served since 1982. He guided the Institute through a critical period of its development, at the same time continuing his own research interests and expanding public education programs. He stepped down from this position in 1991, a year before his untimely death.

While Johnson was developing prehistoric archeology at the University of Minnesota, the Minnesota Historical Society began developing its efforts in historic archeology. Four distinct areas of activity emerged during the 1960s and 1970s: underwater archeology, excavations at Fort Snelling, historic sites archeology, and the Statewide Archaeological Survey. In addition, the Minnesota State Historic Preservation Office was established at the Society and it also developed a large contracting program for the Minnesota Department of Transportation and Department of Natural Resources.

The development of underwater archeology at the Society was largely due to the efforts of Robert Wheeler. Wheeler had been hired at the Society for the 1958 centennial of statehood and, while not an archeologist, was a diver and strong proponent of taking archeology to the public. In due course, Wheeler met Dr. E. W. Davis whose professional work with taconite had taken him throughout northeastern Minnesota. Davis discussed with Wheeler his emerging ideas about the potential for finding fur trade era artifacts at rapids or portages where trade canoes had been upset or lost, and the underwater archeology program at the Society was born. Diving expeditions to several rapids in northeastern Minnesota were undertaken in 1960 and 1961 with spectacular results, including nested trade kettles, trade gun parts, and a plethora of other materials. In 1963, the First International Underwater Archaeological Conference was held in St. Paul, initiating a new field in archeological research in North America. With support from various sources, including the Hill Foundation of St. Paul and the National Geographic Society, Wheeler continued the underwater program, exploring numerous sites and portages in the northeastern part of the state, and jointly with the Royal Ontario Museum along the Canadian border in the Boundary Waters Canoe Area. The program ended in 1976, but its results have been documented in several different volumes including Holmquist and Wheeler (1964); Wheeler, et. al. (1975), and Birk (1975).

A second major project at the Society was the extensive excavations at historic Fort Snelling. Site of the first permanent U.S. military establishment in the Upper Mississippi Valley, the fort had been founded in 1819 on a high bluff overlooking the confluence of the Minnesota and Mississippi rivers. Many of its original structures from the early nineteenth century were still intact within the larger modern military reservation.

Highway and airport expansion as well as construction of new buildings at the modern fort began to threaten the original historic structures early in the 1960s. The Society began a campaign to save and preserve the fort, and to demonstrate that there were significant nineteenth century deposits still present, began modest archeological investigations. These excavations were subsequently expanded and continued until 1980. During this time, a variety of excavation was conducted at the fort, including studies of the sutlers store, barracks, stables, midden deposits outside the fort walls, the Round Tower at the fort, and other areas. The results of these investigations have been used

in the living history programs developed at the Fort and in its reconstruction's, but have not been published in any detail.

The growing national interest in history and historic sites during the 1960s led the State of Minnesota to evaluate and expand the State's role in historic site preservation and interpretation, and the Minnesota Historical Society was charged with this responsibility. A corollary to this effort was increased archeology at different historic sites, and a variety of smaller projects were conducted during the late 1960s and 1970s at a variety of sites, including Fort Renville, Sayers Post (presently called the Northwest Company Post), and others. Ongoing investigations at Grand Portage National Monument, the origins of which dated to 1936, were conducted by Alan Woolworth as time was available from 1961 to 1975.

A final major effort during this period was the Statewide Archeological Survey. Funded by the Minnesota State Legislature in 1977 and again in 1979, the Survey was housed in the State Historic Preservation Office and was designed to meet four specific goals. These were: (a) To formulate models that predict the distribution of archeological sites throughout the state; (b) To locate additional archeological sites; (c) To update as necessary the archeological site files of the State Archeologists (a list of currently known archeological sites); and (d) To design and implement an archeological site data bank that is compatible with, and takes full advantage of, the Minnesota Land Management Information System (MLMIS).

During the four years of its existence, Survey archeologists developed predictive models that described the distribution of archeological sites in Minnesota, based on 11 major surveys they conducted in all or parts of 21 counties. These surveys employed statistical methods to collect accurate, objective, and representative data about the distribution of prehistoric archeological sites. They also located more than 900 previously unreported prehistoric archeological sites, reviewed the State Archeologists site files and field-checked sites for which records were outdated or inadequate; and created an archeological database for MLMIS. Survey archeologists also created a series of important recommendations designed to guide future archeological survey and planning in the state (Minnesota Historical Society 1981).

The Survey provided a significant and important base of data about the distribution of prehistoric sites in the state. Although a very useful summary of the survey results was prepared, the complete survey was never published and many of its excellent recommendations were not implemented. The computerized site database was never fully implemented and fell into disuse.

The Minnesota State Historic Preservation Office (SHPO) was formed not long after the passage of the National Historic Preservation Act of 1966 and housed at the Society. Like most other SHPOs in the country, its beginnings were modest but has since expanded and today administers the joint state-federal preservation program, the National Register of Historic Places, and other activities.

The Minnesota Department of Transportation began its involvement in archeological programs with a simple request to district engineers in 1951 that they report archeological sites encountered during road construction. In 1968, the Department established a program to conduct survey of all proposed state and interstate trunk highway construction. In 1975, a similar program was initiated for federally assisted construction on county and municipal state aid highways. These surveys and other contract services were conducted for the Department by MHS until 1994. MHS continues to provide similar contract services for the Minnesota Department of Natural Resources.

Although the major archeological efforts during the 1960s and 1970s were housed at the University and Historical Society, a number of other programs were initiated during this period.

Archeology faculty and programs developed at Hamline University quite early, and similar programs were initiated at several state universities, including Moorhead State, St. Cloud State, Bemidji State, and Mankato State. The contributions of these various programs are identified throughout the following overview of Minnesota archeology.

Dr. George R. Rapp began the Archaeometry Laboratory at the University of Minnesota/Duluth to investigate and provide a number of quantitative 'hard science' services to archeology, including trace-element analysis, phytolith and macro-botanical studies, and geoarcheology. This program has participated in a number of significant projects overseas and has also been involved in the archeology of northeastern Minnesota, as well as cooperating with the Superior National Forest program. The laboratory is also a key part of the Center for Ancient Studies (now Interdisciplinary Archeological Studies) which was formed at the University of Minnesota to promote and facilitate the training of students in multi-disciplinary archeological efforts.

The Science Museum of Minnesota also expanded its involvement in archeology during this decade, beginning with G. Joseph Hudak in 1972 and his successor Dr. Orrin Shane who became Curator of Archeology for Anthropology in 1978. Both individuals reinvigorated the Science Museums activities in Minnesota archeology, as well as expanding its programming and exhibits in anthropology.

Because of expanding federal requirements to deal with cultural resources, a number of federal agencies hired archeologists and began archeological programs. The St. Paul District Corps of Engineers, U.S. Fish and Wildlife, and several others added archeologists and historians to their staff and began contracting out a number of compliance projects. The Superior and Chippewa National Forests, covering much of northern Minnesota, developed archeological programs in the mid-1970s and have been active in public programming and archeology on forest lands.

At the beginning of the 1980s, there were several significant changes in the archeological landscape. The recession and a major state budget crisis of 1981 caused severe difficulties for many public institutions and required significant program reductions. The Historical Society "effectively eliminated" its archeology program, although continuing the State Historic Preservation Office and contract efforts for MnDOT and MnDNR. Downsizing and budget cuts began at the University which, combined with an increasingly indifferent intellectual climate in the Department toward state archeology, diffused much of the gains of the earlier decades. Other state institutions and universities also felt the effects of decreasing financial resources.

One response to these difficult times was the creation of the nonprofit Institute for Minnesota Archaeology (IMA). Founded in 1982 by Doug Birk, Clark Dobbs, Ted Lofstrom, and Tom Trow, the Institute established an ambitious three-part mission which included long-term research programs, public education, and stewardship of the archeological record. Another important, albeit unstated, goal, was the creation of an organization where archeology would be the principal and only priority. The IMA had several immediate successes, including the purchase and preservation of an undisturbed French wintering post near Little Falls, the initiation of long-term research programs at Little Falls and Red Wing, Minnesota, and the implementation of other thematic research projects including the French presence in Minnesota and the application of geophysical tools to archeological investigation. During

the following 14 years, IMA would become instrumental in the preservation of several other major archeological properties and initiate a number of public education projects under the leadership of Elden Johnson and others.

Another important development was the establishment of the Leech Lake Heritage Sites Program at the Leech Lake Chippewa Reservation in northern Minnesota. This program actively involved tribal members in a variety of archeological activities and pursued research within the reservation, the Chippewa National Forest, and elsewhere in northern Minnesota.

A third development was the increasing dominance of contract archeology or cultural resource management. Although several private firms had been formed during the early and mid-1970s to conduct such work, the majority had been conducted through a few existing institutions with archeology or history programs. This situation began to change during the mid-1980s, as more private firms were founded to conduct this type of consulting work for private and governmental clients. This led to tensions between all of the players in the cultural resources field as traditional roles and assumptions about how archeology was funded and conducted began to be questioned.

At this writing, halfway through the 1990s, the trends discussed above have continued to accelerate. Funding for research archeology has become exceptionally difficult to obtain. Academic programs in the state continue to be under financial constraints, while tuition and costs for students inexorably rise faster than the rate of inflation. These reduced resources stand in stark contrast to the resources available for contract work and companies specializing in contract archeology, whether as independent firms or divisions within larger engineering companies. Such firms have come to increasingly dominate the archeological profession. As with any business, the ultimate concern of such firms is "the bottom line," and archeological investigations are largely site and project specific with little time or leisure available for more thoughtful or expanded treatment of the materials under consideration. Quality control is variable and while individual archeologists may have long-term commitments to specific interests, these cannot be supported in a meaningful way by most firms.

The precarious and potentially ephemeral nature of this situation has been clearly demonstrated in 1995 and 1996, as the network of laws and regulations requiring cultural resource work have episodically come under attack. At least some archeologists (both in the private and public sectors) are beginning to question whether cultural resource management is truly living up to its potential. More ominously, some agency personnel, who have now been exposed to archeological dogma and information for more than 20 years, are beginning to ask the same questions. For better or for worse, one suspects that Minnesota archeology is approaching another watershed in its history, much like those following the publication of *Aborigines of Minnesota* and the retirement of Lloyd Wilford. Only time will tell how the contributions of this generation of archeologists compare to those who have gone before them during the last 140 years.

## 4 The Paleoindian Period, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

The first evidence for American Indians in the Northeast Woodlands region dates to approximately 11,500 B.P. and is marked by the presence of fluted, lanceolate points. Most sites from this initial settlement period are isolated finds distributed across the older landforms since glacial ice still covered much of the region. Settlement and subsistence data are rare, but it appears that early Paleoindian peoples were hunters of large mammals and lived in small bands or family groups which traveled long distances in the search for food and shelter. After the glacial ice retreated, human settlement expanded throughout the northern reaches of the study area. By the close of the Paleoindian period, lanceolate point forms were more diverse, and larger groups appear to have been hunting and gathering across the region. Figure 12 illustrates the location of many Paleoindian sites and areas discussed below.

### Iowa

#### Pre-Clovis (?-11,500 B.P.)

The earliest cultural group in the Western Hemisphere universally accepted by North American archeologists are the makers of Clovis points (Roper 1986). However, there is just enough evidence for some to accept a pre-Clovis occupation of the region. No evidence of such cultural groups has been recovered in Iowa, but if they exist, they would

not be found on the Des Moines Lobe, as this region was covered by glacial ice during much of this time period. Buried horizons in rockshelters and in ancient terraces of streams are more likely settings in which these sites might be found. They may also occur within loess deposits on uplands (Benn 1986, E. Henning 1985; Nolan and Hickson 1993). A challenging problem will be to recognize these sites if they are found, since there are (at least at present) no well defined archeological complexes with diagnostic artifacts against which such ancient sites in the Upper Midwest may be compared (Dobbs n.d.). Benn (1986:24) has suggested that evidence for pre-Clovis occupation of the region might consist of "flake or chopper lithic industries rather than lanceolate points, and bone or wooden tools in association with butchered animals." And E. Henning (1985) has suggested that stone tools may be absent entirely, and that the entire tool assemblage could consist of bone or wooden tools.

#### Paleoindian (11,500-8000 B.P.)

The earliest well accepted inhabitants of the New World are cultural groups that archeologists have termed Paleoindian. Numerous Paleoindian sites, mainly in the Southwest, have securely dated the appearance of this tradition to around 11,500 B.P. (Bonnichsen et al. 1987). In general, the Paleoindian period can be subdivided into two

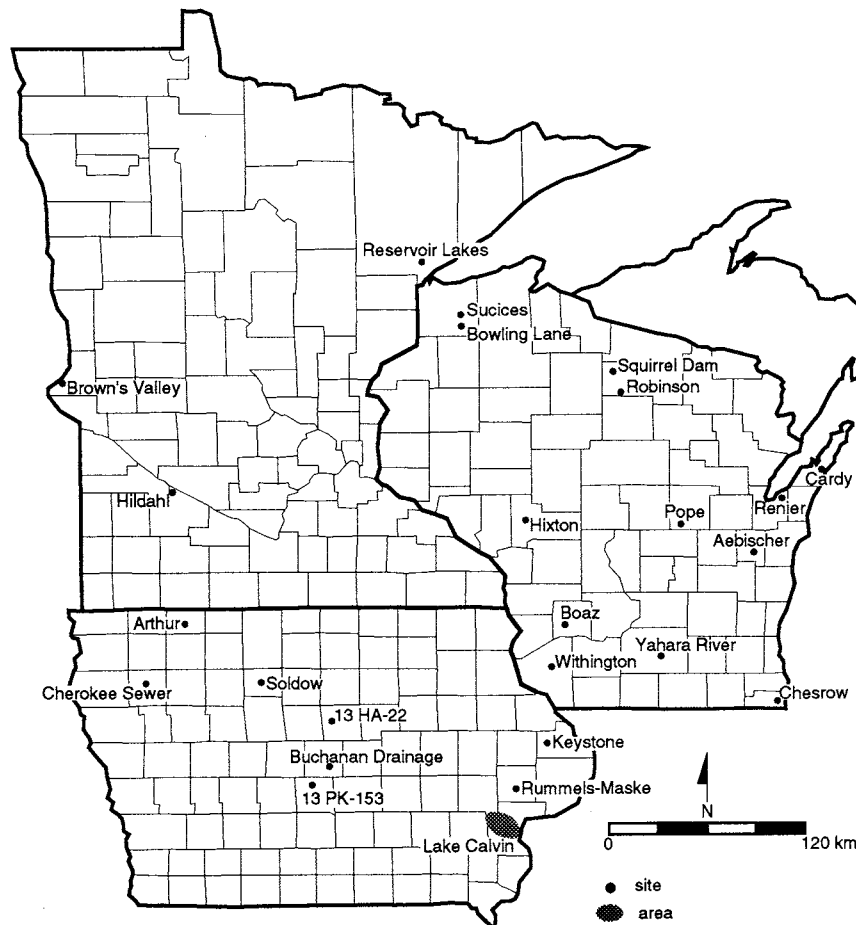


Figure 12. Paleoindian sites and areas.

patterns or traditions. The earlier of these is the fluted point tradition, consisting of Clovis and Folsom (11,500-10,000 B.P.), and the later (10,000-8000 B.P.) characterized by a variety of unfluted lanceolate point types, can be divided into the Plano and Dalton traditions or patterns in Iowa (Benn, ed. 1988). E. Henning (1985:22) defines the Paleoindian Study Unit as follows:

As in other portions of the hemisphere, Paleoindian occupation of the Midwest is best known from kill and processing sites. These occupations are characterized by the presence of a lanceolate projectile point tool tradition in association with large mammal procurement. In the earlier portions of the record, some associations are with now-extinct mammalian fauna. Both isolated kills of a few individuals and kills representing large numbers of animals are likely to be found. Other defining characteristics of the Paleoindian period consist of the presence of patterned bone butchering tools, extensive use of exotic raw materials for the manufacture of stone tools and specialized lithic technologies, such as prismatic blades, fluting and parallel and transverse flaking methods. Specialized bone and antler tools are found along with expedient-type butchering tools.

Paleoindian materials have been recovered from the surface in both upland and valley locations in all sections of Iowa. Excavated sites have produced materials from the latter part of the Paleoindian period; these materials have been found primarily in alluvial fans. Alluvial fans occur along major stream valleys, and their origin (in western Iowa) appears to stem from the onset of a major erosional episode beginning about 6,500 B.C. The relationship between alluvial fan site locations and the total area of site locations used by the people themselves is not yet very clear. It is unknown, for instance, whether this association is due to their selection by Paleoindian people, or whether it is an accident of preservation.

#### Fluted Point Tradition

As recently as the 1920s, many archeologists believed that the human occupation of the New World was a relatively recent phenomenon, dating back only possibly one or two thousand years. This view was shattered in 1924 when, near Folsom, New Mexico, undoubtedly human artifacts were found in unquestionable association with the bones of an extinct form of bison (Fagan 1991). Soon other sites were found near Clovis, New Mexico, yielding similar, but somewhat different, types of points than those from Folsom. These points, sometimes found in association with mammoth remains, were named Clovis points. Excavations at the Lindenmeier site showed that Clovis points predated Folsom points, and the former have since been radiocarbon dated between 11,500 and 11,000 B.P. (Bonnichsen et al. 1987). Both point types are leaf-shaped, and have lateral flakes, or flutes, removed from each side to allow hafting to foreshafts of bone and wood (Lahren and Bonnichsen 1974). These fluted points appear suddenly, and without definite predecessors in North America. This leads many to hold that they represent the first peopling of the continent. Some even claim that this human entry into North America led to the widespread faunal extinctions at the end of the Pleistocene (cf. Martin and Klein 1984).

However, other studies have pointed out that the extinction of the Pleistocene megafauna was only a part of a much wider spread pattern of extinctions, including many species not hunted by Clovis people (Grayson 1977), and the Pleistocene Overkill Hypothesis is no longer widely held. David Anderson (1990) suggests that the early people

emerging from the ice-free corridor followed the Missouri and Platte rivers southeastward, forming concentrations of population, or "Staging Areas," south of the ice sheets in the Mississippi-Missouri, and Ohio river valleys, and, from there, followed the retreating ice sheets northward.

Sites from these time periods are very difficult to locate and would likely present major difficulties in excavation. In floodplains, buried surfaces sometimes lie below the modern river levels and near the permanent groundwater table (Bettis and Hoyer 1986; Benn and Rogers 1985). Sites may also exist in Soetmelk alluvium, possibly in the Gunder Member of the DeForest Formation, and on loess-capped terraces and uplands. The lower layers of rockshelters represent another possibility.

*Clovis.* Clovis appears to represent a lifeway with a strong emphasis on the hunting and use of extinct forms of herd animals. Mammoth and mastodon appear to have been the principal prey, but remains of horse, bison, and camel have also been found in quantity at Clovis kill sites (L. Alex 1980). Finds of fossilized mammoth and mastodon bones are common in the Upper Midwest. D. Anderson and Williams (1974) report the discovery of over 350 proboscidian fossils from 32 counties in western Iowa. So far, no artifacts have been found in association with these remains, and there is no reported evidence of butchering marks being present on any of the bones in Iowa. It appears, at least in the Upper Midwest, that Clovis hunters were well adapted to the open boreal parkland within several hundred kilometers of the glacial ice margin (Storck 1988). Social organization and population size is unknown, but a band level of social organization has been proposed (E. Henning 1985).

Excavations at the Rummels-Maske site, in Cedar County recovered the remains of 11 complete and partial Clovis points within the disturbed context of the plowzone. Since no bones, features, or lithic debitage were found in association with the site, it was interpreted as being a cache site (A. Anderson and Tiffany 1972). Aside from the Rummels-Maske site, numerous Clovis points have been reported as surface finds from across the state (L. Alex 1980; D. Anderson 1975, 1981a; Morrow 1984). In a survey of the Lake Calvin Basin for Paleoindian sites, Stevens (1980) documented 14 Clovis and Clovis-like points in private collections in this small region of the state. Collins (1991) has recently reported the recovery of five Clovis points from the surface of site 13HA22, in Hardin County. Clovis points have also been reported as surface finds in Page, Mills, Winneshiek, Allamakee, Clayton, Cherokee, Louisa, Woodbury, Benton, Johnson, Webster, Monroe, Lyon, Wapello, and Cedar counties (L. Alex 1980). Nearly all that is known about Clovis lifeways must be inferred from excavated sites in other regions of the country.

*Folsom.* Although Folsom is generally later in time, Folsom and Clovis appear to be somewhat contemporaneous (Bonnichsen et al. 1987). The geographic distribution of Folsom is more restricted and is centered on the Rocky Mountains and the Western Plains, although Folsom points have been reported from the Dakotas and Nebraska. In Iowa, Folsom points have been reported as surface finds in Mills, Cherokee, Allamakee, Louisa, and Winneshiek counties (L. Alex 1980). As with Clovis points, all reported Folsom points in Iowa are surface finds. Unfluted points, called Midland are also found on Folsom sites, and Folsom assemblages often include unifacial tools and utilized flakes, knives, scrapers, burins, graters, perforators, abraders, chopper/anvil tools, and fleshers (Bonnichsen et al. 1987). As with Clovis hunters, exotic cherts tend to dominate Folsom assemblages.

Like Clovis, Folsom people seem to have concentrated on large game, with a strong emphasis on bison, although deer, camel, peccary,

mountain sheep and other animals have been recovered from Folsom sites in the West (Bonnichsen et al. 1987). At sites in the West, a variety of bison hunting techniques were employed by Folsom hunters, including cliff drives, arroyo traps, and ambushes around springs and lakes (Bonnichsen et al. 1987).

#### Lanceolate Point Tradition

The Lanceolate point tradition is characterized by the presence of a variety of large, unfluted, lanceolate spearpoints (Benn, ed. 1988). These points exhibit fine workmanship and a typical pattern of finely executed parallel flaking across the body of the point. Primary forms are constricting stemmed (e.g., Agate Basin), shouldered points (Hell Gap, Alberta, and Scottsbluff), and types with concave bases (Plainview, Frederick, and Dalton) (cf. Bonnichsen et al. 1987).

Lanceolate points are widely distributed throughout North America and have been reported from the intermountain region of the West, the Western Plains, the southeastern United States, and as far east as Wisconsin, Ohio, and Michigan (Bonnichsen et al. 1987). One of the characteristics of the Lanceolate point tradition is an increasing regionalization of tool styles and adaptive strategies. In the Rocky Mountains and the Western Plains, there is an emphasis on hunting bison, and the Lanceolate point tradition is perhaps best known from bison kill sites (see Frison 1974; Frison and Stanford 1982). This Western pattern is commonly termed Plano.

The Dalton complex is widespread in the Midwest and Southeastern United States, and Dalton points may represent a logical descendant from a Southeastern fluted point complex (see Wood and McMillan 1976; Funk 1978; Goodyear 1982). Dalton remains somewhat problematical, but it may represent hunting and gathering bands adapting to quickly changing environmental conditions and a transition to a more diffuse subsistence base characteristic of the later Archaic groups (Benn, ed. 1988).

*Plano.* In Cherokee County in northwestern Iowa, excavations at the Cherokee Sewer site (13CK405) have revealed a stratified sequence of cultural deposits that include both Plano and Archaic materials. The occupation of the various horizons at this site all appear to represent specialized late winter bison processing. D. Anderson and his associates (D. Anderson and Semken 1980:257) suggest that

no differences were discernable between the Late Paleoindian and Archaic horizons of a magnitude to suggest different economies or adaptive strategies were employed. The only culturally significant differences seemed to lie in a change in the method of hafting projectile points and the introduction of milling stones during early Archaic times. The former appears to be a stylistic consideration of little relevance in understanding the adaptation of hunting-gathering groups to the prairies and the latter may have made its appearance at a considerably earlier time. These differences are insufficient to support the traditional separation of Paleoindian and Archaic. It would appear that if such a separation is possible, it would have to be made prior to 8500 RCYBP, or upon varying subsistence activity carried out during seasons other than late winter.

It appears possible that the transition to the more broad based subsistence economy characterizing the eastern Archaic may have taken place much later on the Plains, and that the basic Paleoindian concentration on bison remained the dominant subsistence strategy in this region until well into the Archaic period. This may necessitate a rethinking of the current classificatory system in use on the Plains (Benn 1986).

Several lanceolate projectile points were found in Horizon III at the Cherokee Sewer site, including an Agate Basin point. All three cultural horizons at this site were buried paleosols within a Corrington Member alluvial fan. The Cherokee Sewer site fan is the type site for the Corrington Member of the DeForest Formation. Horizon III dates to 8500 RCYBP (D. Anderson and Semken 1980; D. Anderson and Shutler 1974, 1978; Hoyer 1980; Bettis and Thompson 1981). Horizon III also produced stemmed and side-notched points, possibly representing a transition from the earlier lanceolate forms.

The nearby Simonsen site (13CK61), another stratified bison kill site, produced a radiocarbon date of 8430 RCYBP from the lowest cultural horizon (Frankforter and Agogino 1959a, 1960; Agogino and Frankforter 1960). However, points recovered from this horizon more closely resemble those found in Horizon II at the Cherokee Sewer site, and it seems more appropriate to regard the Simonsen site as a very early Archaic manifestation (D. Anderson et al. 1980).

The Soldow site (13HB1), in Humboldt County in north-central Iowa, consists of an unstratified multicompartment campsite (Flanders 1977). A portion of a possible Scottsbluff point was excavated from this site, as well as other lanceolate forms and side-notched points. The Arthur site (13DK27), in Dickinson County on the bank of Lake East Okoboji, yielded one complete, and two fragmentary lanceolate points from mixed contexts (D. Anderson and Spriestersbach 1982). Two lanceolate points were excavated from the Robert Battey Rockshelter (13JK21), but were found within general association with Late Woodland materials (Jaehnig 1975). Osborn and Gradwohl (1981) report finding two complete and two partial lanceolate points from the surface of site 13PK153, in the Saylorville Reservoir, but cultivation, gravel quarrying, and inundation totally destroyed the site before appropriate excavations could be carried out. Collins (1991) reports the recovery of Hell Gap points from the surfaces of sites 13HA22 and 13HA65, in Hardin County.

Finding intact sites of this time period may be extremely difficult, since landforms of the appropriate ages lie buried beneath modern stream levels, and upland surfaces of the appropriate ages have been subjected to a great deal of erosion, especially in cultivated areas (Benn, ed. 1988). In the Buchanan drainage in Story County, central Iowa, Abbott and Bettis (n.d.) report lanceolate points from waterlogged deposits atop a gravelly erosional surface (Benn, ed. 1988). According to Bettis and Benn (1984), the invisibility of Plano sites in river valleys to normal archeological survey methods (Thompson and Bettis 1982) is reflected by Gradwohl and Osborn's (1973, 1974, 1975, 1976; Gradwohl 1974) survey results at Saylorville Reservoir on the Des Moines River in central Iowa. All surface finds of lanceolate points were located on late Wisconsinan outwash terraces. Stevens (1980) reports that in the Lake Calvin Basin, all Paleoindian sites were found in upland contexts.

As has been demonstrated, Paleoindian materials are found preserved in Corrington Member Alluvial Fans (D. Anderson and Semken 1980). Paleoindian sites could also be found in the Soetmelk Member and the Gunder and Watkins Members of the DeForest Formation. They may also be preserved in high terraces in large stream valleys (Bettis and Benn 1984).

*Dalton.* Dalton sites are characterized by the presence of lanceolate projectile points with concave bases, particularly Dalton and Dalton-like points, and other related point types (e.g., Cumberland, Quad). These points are seen as logical descendants of the Fluted point tradition of the Southeast (Bonnichsen et al. 1987). Dalton is known best from the southern Midwest and southeastern United States. In



these areas, it appears to represent hunting and gathering bands adapting to environments rapidly changing from Boreal Forest to oak-hickory hardwood forests. Dalton does not have the emphasis on large game hunting typical of other Paleoindian traditions. In fact, Dalton sites have yielded modern faunal and floral species (Goodyear 1982; Wood and McMillan 1976). This lends support to Goodyear's (1982) argument that Dalton people were the first to move into rockshelters in upland drainages. He contends that this represents an expansion of exploitation ranges and a shift toward a more diffuse-based Archaic-type subsistence economy (Benn, ed. 1988).

Dalton is poorly known in Iowa. Dalton points, and their apparent Plains equivalent, Meserve points occur largely as surface finds. Dalton points have been reported from Mills and Jackson counties, and Meserve points have been reported from Mills, Allamakee, Louisa, Henry, Webster, Wapello, and Polk counties (L. Alex 1980). A Dalton point, and an Iowa variant termed a Fayette point (Morrow 1984) were excavated from the lowest cultural horizon at the Keystone Rockshelter (13JK23) in Jackson County, and a Meserve point of unknown provenience was also produced from the site. This is the first site in Iowa where Dalton and Fayette points were found in excavated contexts. Unfortunately, only preliminary analysis has been completed on this site, and, although the presence of floral and faunal remains suggest the site's potential for contributing to our understanding of Dalton lifeways, the present analysis is insufficient to shed much light on the Dalton people (D. Anderson 1987a). Collins (1991) reports the recovery of a Dalton point from the surface of site 13HA65 in Hardin County. Of course, Dalton sites present the same problems of location and excavation as other sites of the Paleoindian period, and will likely be found in the same landform contexts.

## Wisconsin

### Pre-Clovis (?-11,500 B.P.)

No Pre-Clovis sites have been identified or even suggested in Wisconsin. Of course it would be difficult to recognize a pre-Clovis occupation since there is no agreement on what the lithic or faunal assemblages might be like. There are also extensive parts of the state that would have been covered with Late Woodfordian ice during any pre-Clovis incursions.

### Paleoindian (11,500-8,000 B.P.)

In Wisconsin the Paleoindian time period can be divided into two parts, with the earlier period marked by the use of fluted projectile points such as Clovis and Folsom, and a later period when diagnostic point forms include a variety of lanceolates such as Agate Basin and Scottsbluff. Recently several Paleoindian manifestations have been identified across the state based on surface collections and very limited excavations. The recent work suggests that regional temporal and geographical variants may be present.

### Early Paleoindian (11,500-10,000 B.P.)

The first evidence for human occupation of Wisconsin occurs at the end of the Pleistocene. During initial Early Paleoindian times Greatlakean ice (Two Rivers Advance) covered northern Wisconsin and Green Bay, and the Lake Michigan Lobe extended as far south as Manitowoc County. The Lake Michigan basin rose to the Calumet high, and glacial Lake Oshkosh formed. As the ice receded, lake levels

fell and Glacial Lake Algonquin formed across the Michigan, Superior, and Huron basins. New land areas were exposed by the retreating ice and water and were colonized by plants and animals including humans.

The climate during this time was cool and moist. The ice mass may have deflected extremely cold arctic highs and created a temperature regime without the seasonal extremes that typify the modern climate. Areas south of the ice may have been warmed by southerly winds. Close to the ice the vegetation was probably open tundra with grasses, sedge, and caribou, small mammals and birds. Boreal forest grew in outwash areas away from the ice and, unlike the modern boreal forest, it included patches of dry/warm habitat vegetation such as oak, elm, and pine, as well as spruce. Initially the southern Wisconsin boreal forest was an open park tundra, which gradually filled with a closing spruce forest that included pine and deciduous species. The boreal forest gradually spread north as the glacial ice retreated. Mastodon, mammoth, musk ox, giant beaver, moose, and caribou inhabited the boreal forest, and extinct forms of bison lived along the western margins of the state. In Wisconsin there is solid evidence for the exploitation of mastodon and mammoth by humans.

Early Paleoindian is defined on the basis of the presence of fluted projectile points, usually identified as Clovis or Folsom. Using chronologies detailed on the Plains, Clovis is considered to be earlier than Folsom. Most Early Paleoindian sites in Wisconsin are isolated projectile point finds or from surface collections, and no independent chronologies for the region have been developed. There are very few fluted points from excavated contexts. An overview of the variability of fluted points in Wisconsin was presented by Stoltman and Workman (1969) who identified Folsom, Clovis, Quad, Cumberland, and Enterline-Bull Brook varieties in several curated collections from southeast Wisconsin. Stoltman and Workman compared the distribution of fluted points to the glacial landscape as it was understood at the time and concluded that Early Paleoindian occupation began after the Cary maximum (15,000 B.P.) and extended until after what was then known as the Valders maximum (10,500 B.P.). Geologists have since abandoned the concept of a Valders Advance and divided it into the Port Huron Advance (12,900-12,700 B.P.) and the Two Rivers Advance (11,800-11,200 B.P.) (Evenson et al. 1976). The occurrence of fluted points on these landforms does not contradict age estimates for Paleoindian from dated contexts to the West.

Recently, several regional variants of Early Paleoindian have been defined based on point morphology. Stoltman (1992a) has reassessed his earlier work in light of a new fluted point typology and sequence proposed for lower Michigan and southern Ontario (Deller and Ellis 1988). Stoltman now proposes that, in addition to Clovis and Folsom, Gainey complex materials similar to those in Michigan and Ontario are also present in Wisconsin. Gainey points resemble Clovis but are fluted in a Folsom style with a long flute struck from a central basal platform. The Gainey complex is estimated to date to 11,000-10,700 B.P. and is viewed as being later than Clovis. No radiocarbon evidence has been available to confirm the Gainey-Parkhill-Crowfield sequence, and the dates are estimates. Stoltman sees no evidence of Parkhill or Crowfield sites in Wisconsin. He describes Gainey assemblages from two substantial, but disturbed and multicomponent sites: the Aebischer site (47 Ct-30) in east-central Wisconsin, and the Withington site (47 Gt-158) in southwest Wisconsin. The Paleoindian material from both sites include items made from nonlocal rock sources including Moline chert from Rock Island, Illinois, Hixton Silicified Sandstone from Jackson County, Wisconsin, and Burlington chert from eastern Iowa and western Illinois. The use of nonlocal lithics suggests that Paleoindian peoples



were traveling considerable distances across the Midwest, possibly following migratory animals such as caribou (Meltzer 1988). Recently caribou, arctic fox, and hare remains have been identified at a Gainey complex site in Ontario (Storck and Spiess 1994). Because the Gainey complex has only recently been identified in Wisconsin, previous sites and collections have not been reexamined to establish its full extent. However, Overstreet (1993a) has also identified Gainey points in southeast Wisconsin (Dodge County).

Another recently defined Early Paleoindian manifestation is the Chesrow complex of southeast Wisconsin (Overstreet 1993a, 1993b). Unlike other fluted point assemblages in Wisconsin and elsewhere in the Midwest, the Chesrow complex seems to be a localized variant, with almost all stone tools and debitage produced from locally available, low quality chert. Chesrow points are variable and include fluted and unfluted forms, which Overstreet believes reflect synchronic diversity rather than temporal differences. Overstreet believes the Chesrow complex represents the terminal fluted point manifestation in Wisconsin and dates before 10,000 B.P. (1993a:26). Chesrow materials have been reported from 10 sites in a 35 square mile area in Kenosha County. Sites are found both along glacial Lake Michigan beaches and bordering poorly drained interior wetlands. The interior wetland locales have also produced evidence of butchered mammoths and mastodons from excavated contexts. Although diagnostic tool types have not been found with the animal remains, the spatial associations and probable age of the remains strongly suggest the Chesrow complex peoples were harvesting the proboscideans. Overstreet also suggests the Lake Michigan shoreline settlements may have provided access to migrating caribou (1993b:81), although caribou remains have not been found associated with Paleoindian sites in Wisconsin.

The distributions of fluted points across Wisconsin suggests some patterning in the environment and variations in how humans were utilizing their surroundings during Early Paleoindian times. Two cultural provinces may be present in southeast Wisconsin (Overstreet 1993a:68-70). The westernmost occurs along the Rock River and its headwaters and includes Clovis and Folsom points often made from nonlocal cherts. These materials seem closely related to Early Paleoindian sites in Illinois. The eastern province lies along the moraines associated with the Lake Michigan Lobe and includes Chesrow complex artifacts made from only local cherts. Overstreet suggests that although there may be temporal differences among these groups, the spatial distributions suggest that social boundaries may have been operative.

In east-central Wisconsin fluted points appear to be associated with end moraines and glaciofluvial deposits which were part of the margins of glacial Lake Oshkosh, and other glacial lakes at the time of the first human occupation around 11,500 B.P. (Stoltman and Workman 1969; Dirst 1985; R. P. Mason 1988; Overstreet 1993c). Clovis, Folsom, Gainey, and Chesrow materials are represented, but the number of reported sites is sparse compared to southeast Wisconsin (Overstreet 1993c).

The northeastern-most fluted point occurrence in Wisconsin is at the Cardy site (47 Dr 79) in Door County. This poorly documented site apparently produced numerous fluted points which have not yet been examined by professional archeologists. The location of the site suggests the occupation occurred as the Two Rivers ice was retreating, and the settlement may have been situated along the margin of postglacial Lake Algonquin (Overstreet 1980; R. J. Mason 1986; Overstreet 1993b).

In southwest Wisconsin, Early Paleoindian sites are known exclusively from surface finds (Stoltman 1992b; Boszhardt 1989). Clovis, Gainey, and Folsom points have been reported in the region, and are

particularly abundant in Dane County. A study of the distribution of Paleoindian sites (early and late) in the Yahara River basin of Dane County concluded that they are located on benches of well drained glacial outwash sediments at the inlets and outlets of lakes and marshes which were once part of glacial Lake Yahara (Wendt 1985). Wendt sees this association of Paleoindian sites with confluences along former glacial lakes as consistent with Paleoindian settlement locations in other parts of the Midwest. The majority of fluted points were made from nonlocal lithic raw materials (Burlington, Moline, Hixton), suggesting that Paleoindian peoples traveled substantial distances. Wendt's sites also included lithic debris and nondiagnostic stone tools made from nonlocal materials.

Two Early Paleoindian sites in southwest Wisconsin are well known in the literature, although what is actually known of the archeology is quite limited (Stoltman 1993b). The Kouba site in Dane County was initially reported by an amateur archeologist, who was unwilling to reveal its location, and was described as a significant Paleoindian site in the literature (Ritzenthaler 1966, 1967a, 1967b, 1970a). Recently, however, it has been determined that the site is multicomponent, and some of the items reported appear to be from other locations. Consequently, the Kouba materials as reported have been discredited.

A second site, the Boaz mastodon located in Richland County, is significant because it appears to be the only association of an Early Paleoindian point with mastodon in Wisconsin. The association of the point and proboscidean is tentative, however, since the material was recovered in 1897 by nonprofessionals (Palmer and Stoltman 1976). Originally identified as Clovis, the Boaz point has been reclassified as a Gainey point made from Hixton Silicified Sandstone (Palmer and Stoltman 1976; Stoltman 1992b). While other extinct megafauna sites have been located and described in western Wisconsin, no human artifacts or evidence of butchering have been associated with them (Boszhardt et al. 1993).

A third important southwestern Wisconsin site, known as Silver Mound, is the outcrop and quarry locale for Hixton Silicified Sandstone (Boszhardt 1989, 1993). Early and Late Paleoindian points are abundant in the vicinity of Silver Mound, and Early and Late Paleoindian points made from Hixton are found throughout Wisconsin and other parts of the Midwest (Hill 1994). The Silver Mound quarry was used by a series of prehistoric groups from Paleoindian through Middle and Upper Mississippian. UW-La Crosse has recently conducted intensive survey of the outcrop area, and earlier surveys and excavations were conducted, but never published, by UW-Oshkosh and UW-Waukesha (Boszhardt 1993). Apparently no Early Paleoindian points have been found in excavated context at the site.

Very few Early Paleoindian points have been reported in northwestern Wisconsin, and no sites have been professionally excavated. These early sites have limited remains and are found along river terraces and strand lines or beaches of extinct glacial lakes (Dudzick 1993). No Early Paleoindian sites have been reported in northeast Wisconsin.

In summary, a variety of fluted point forms have been reported across southern Wisconsin representing nonlocal and local variants of Clovis and Folsom. Most sites are isolated finds of fluted points, but a few sites also have associated knapping and apparent habitation debris. Usually habitation sites are multicomponent, however, and it is impossible to specify the nature of the Early Paleoindian occupation. Sites tend to be located on high uplands, glacial lake beaches, and high terraces. Some sites are located proximal to modern wetlands which suggests they may be game overlooks. The patchy distribution of sites

may reflect a patchy distribution of targeted resources (Brown and Cleland 1968) in a more equable periglacial environment (Graham and Mead 1987). Only one site in Wisconsin has a fluted point possibly associated with faunal remains (mastodon), but recently several sites with butchered mammoth and mastodon remains have been identified in the southeastern part of the state. No other subsistence information is available from Wisconsin sites. The general impression for Early Paleoindian is that small bands of foragers moved seasonally in and out of the state, targeting lithic source areas and game including proboscideans and possibly caribou. In some areas bands focused on local resources and may have established localized, permanent territories.

### Late Paleoindian (10,000 B.P.-8000 B.P.)

The final Marquette Advance of glacial ice occurred during this period in extreme northern Wisconsin and the Upper Peninsula of Michigan. Associated with the advance were the final Post-Duluth lakes and Lake Minong in the Superior Basin. At the same time, the deglaciation of the North Bay outlet for the Lake Michigan basin created the beginning of the Chippewa Low which lasted for several thousand years. By the end of the period, the glacial ice had retreated, Glacial Lake Agassiz had drained, and Lake Minong had expanded.

The climate was warming but was still cool and moist compared to today. The boreal forest moved steadily northward eventually moving entirely north of Lake Superior. Pine mixed with deciduous elements dominated the north while elm, oak and other deciduous trees dominated the south. Grassland openings appeared in southwestern Wisconsin. The large Pleistocene fauna disappeared by this period probably due to a combination of factors including climatic shifts and hunting pressure from humans. Deer and small mammals appear to be the important protein sources for human subsistence.

Late Paleoindian sites are identified in Wisconsin based on the presence of lanceolate projectile point styles such as Agate Basin, Plainview, Eden, and Scottsbluff (R. J. Mason 1963, 1986). The chronologies and cultural associations of these point styles have been examined in detail on the Plains. In Wisconsin most evidence for this period comes from surface finds and only a few sites have been excavated. Several investigators have proposed two Late Paleoindian phases (R. J. Mason 1963; Salzer 1974; Behm 1986; Overstreet 1993a), the earlier characterized by Plainview and Agate Basin points, and the later characterized by Scottsbluff and Eden points, Cody knives, and rhyolite trihedral adzes. Late Paleoindian projectile points and knives are commonly made from Hixton Silicified Sandstone. Lithic debris also includes Hixton and, at later sites, rhyolite. Late Paleoindian sites are more abundant and widespread throughout Wisconsin than Early Paleoindian sites, and several different types of sites have been investigated.

In southeast and east-central Wisconsin, Overstreet (1993a, 1993c) has identified an early Plano complex and a later Cody complex. Artifacts from both groupings are noted in the state archeological site files as surface finds. In the southeast sites are uncommon and are found primarily on end moraines of the Lake Michigan and Green Bay Lobes.

Late Paleoindian sites are more common in east-central Wisconsin, particularly in Winnebago and Calumet counties where two intensive surveys (Clark 1988; 1993; Dirst 1985) have revealed a substantial number of sites which appear to be associated with glaciolacustrine soils along rivers and extensive wetlands (Dirst 1985; Overstreet 1993c). Several of these sites include diverse tool kits and debris concentrations including knives, scrapers, graters, cores, and adzes. The multiplicity

of activities indicated at the sites suggest they were occupied or reoccupied for longer time periods or by larger groups than in earlier Paleoindian times. One stratified Late Paleoindian site has been test excavated (Metzig Garden site, 47 Wn-283), but has not yet been fully reported (Behm 1986). The excavations indicate a clear stratigraphic separation between the earlier Plano (Plainview) materials and the later Cody complex occupation.

One Late Paleoindian mortuary site has been reported in east-central Wisconsin. The Renier site in Brown County included the cremation of an adolescent who was accompanied by Hixton Scottsbluff and Eden points (Mason and Irwin 1960) that had been burned in the crematory fire. An Early Archaic side-notched point also accompanied the burial, suggesting temporal overlap between the two traditions. Several other possible Late Paleoindian cremations have been identified in the region based on the presence of burned Scottsbluff/Eden point clusters, although human bone has not been found. These include the Pope site in Waupaca County (Ritzenthaler 1972), and the Gorto site in Marquette County in Michigan's Upper Peninsula (Buckmaster and Paquette 1988). The Gorto site points were made almost entirely from Hixton (81 out of 85 points and point fragments). One Early Archaic side-notched chert point was also found in the burned feature.

Late Paleoindian sites are more abundant than earlier sites in southwest Wisconsin as well (Boszhardt 1989, 1993; Stoltman 1992b). While there are numerous isolated surface finds, there are also several sites in the region where numerous Late Paleoindian points and a diverse tool kit have been found. In the unglaciated area Late Paleoindian sites are found along river terraces near wetlands or river-stream confluences. Only two Late Paleoindian points have been reported, for example, in the sandy, unglaciated headwaters environment of Fort McCoy in Monroe County (Salkin 1994). In glaciated areas sites are found at lake outlets (Mead and Berwick 1977). One Late Paleoindian habitation site with in situ material has been excavated and reported (Halsey 1974a), and two rockshelters have been tested, but not reported (Boszhardt 1993; Stoltman 1992b). Late Paleoindian site types include intensively occupied camps (Wendt 1985), rockshelters (Boszhardt 1993; Stoltman 1992b), short term open-air camps (Halsey 1974a), and a Hixton quarry at Silver Mound (Boszhardt 1993). No mortuary sites have been identified in this part of Wisconsin. Recent investigations at the Hixton quarry (Boszhardt 1993) have found exotic lithic raw materials which appear to have been carried in by Late Paleoindian groups (and possibly by later groups) from northern Minnesota/western Ontario (Gunflint Silica, Knife Lake Siltstone, Jasper Taconite), northern or eastern Wisconsin (rhyolite), eastern Wisconsin (Door County Silurian chert), northwest Illinois (Moline chert), and eastern Iowa/western Illinois (Burlington chert).

In northern Wisconsin Late Paleoindian sites are the earliest to appear on the landscape in most areas (Salzer 1974; Behm 1984; Barth 1985; Dudzik 1993). While the majority of sites are known from the discovery of isolated surface finds, some sites have also been carefully excavated. Salzer has identified two Late Paleoindian phases through the analysis of surface sites and excavated stratified sites in Vilas and Oneida counties (Salzer 1974). The presumably earlier Flambeau phase includes sites such as Squirrel Dam (47 On-21) with Agate Basin points and lithic tool kits which include scrapers, flake knives, bipolar cores, and graters. Raw materials include Hixton and locally available basalt, jasper, and quartz. Flambeau phase sites are quite small and are found along lake shores and along stream banks at lake outlets. The somewhat later Minocqua phase includes sites with Scottsbluff points. The lithic tool kit includes end and side scrapers, large and small bifaces, knives,

bipolar cores, and utilized flakes. Raw materials include Hixton and locally available rhyolite, basalt, jasper, and quartz. The one excavated component at the Robinson site (47 On-27) included a small camp and an isolated activity area, possibly a lithic workshop. Minocqua phase sites are found along lake shores and streams at lake outlets. Although Salzer's two Late Paleoindian phases are derived from excavations with good stratigraphic control, the two manifestations were not found at the same site. As a result, we do not know the stratigraphic or temporal relationships between the two phases. No dateable carbon has been recovered from Late Paleoindian sites in Wisconsin, and date estimates continue to be based on evidence from the Plains.

In northwest Wisconsin, Late Paleoindian sites are located primarily along river terraces and appear to be camp sites (Dudzick 1993). Nonlocal lithic sources include south-central Wisconsin (Hixton) and northern Minnesota/western Ontario (Knife River Silica, Jasper Taconite, Knife Lake Siltstone). Recent excavations at three Late Paleoindian sites in Douglas and Price counties suggest that material remains, subsistence, and settlement information may be preserved in some locales. The Bowling Lane site (47 Dg-94) produced an Agate Basin point made of Hixton, while the associated chipping debris was jasper taconite (Haywood 1991). The Sucices site (47 Dg-11) included a chert Plainview point, a Hixton Scottsbluff preform, and a trihedral adze of Knife Lake siltstone, suggesting affiliation with the Minocqua phase or Cody complex. Excavated faunal remains from the site included deer, beaver, and turtle (Rusch and Penman 1984). The Deadman's Slough site (47 Pr-46) (Meinholz and Kuehn 1996) produced Late Paleoindian lanceolate points, Early Archaic notched bifaces, scrapers, and trihedral and bifacial chipped and ground adzes. A cluster of heat fractured Hixton bifaces suggest the presence of a cremation feature. Faunal remains from Deadman's Slough included deer, porcupine and other medium sized mammals, turtle, birds, fish and shellfish. A possible association of Late Paleoindian artifacts with extinct bison has also been reported from the region (Palmer 1954). The variety of faunal remains from the region suggests that Late Paleoindian peoples were generalized foragers rather than big game hunters.

It is interesting to note that, at least in some parts of Wisconsin, excavated Late Paleoindian components are stratigraphically below later occupations at nonriverine open air sites. In some instances, such as at the Robinson and Squirrel Dam sites in northern Wisconsin, the earlier occupations appear to have been buried by natural deposition of loess and windblown sands or other deposits. Archeologists are beginning to recognize the presence of buried early components in similar contexts at sites across the state (P. Richards, J. Richards, M. Kolb, personal communication 1993) and in Illinois (Nolan and Hickson 1993). The burial of Late Paleoindian sites may be attributable to deflation and redeposition processes associated with the mid-Holocene warming period. In some cases, windblown sands were even burying occupation surfaces during the Late Paleoindian period (Behm 1986). In eastern Wisconsin, Late Paleoindian sites may have been located along the postglacial Lake Chippewa shoreline, and these sites presently would be inundated by Lake Michigan. The fact that many early sites appear to be buried or inundated emphasizes the difficulty in discovering and explaining site distribution patterns associated with the earliest human occupants of Wisconsin's landscape.

## Minnesota

### Paleoindian (ca. 11,500-8,500 B.P.)

The timing and origin of the first people in the America's has been and remains one of the most intriguing and controversial topics in archeological research. Until the early twentieth century, it was assumed that people had arrived in the America's after the glacial period and certainly not earlier than five or six thousand years ago. Although some scholars argued that early American Indian people were present during the glacial period, others heatedly rejected this point of view.

The discovery of extinct forms of bison in direct association with chipped stone tools near Folsom, New Mexico in 1924 and subsequent work at Blackwater Draw near Clovis, New Mexico definitively established the contemporaneity of humans and extinct species of Pleistocene mammals in the New World. Each of these sites contained distinctive 'fluted' spear points and subsequently the Clovis and Folsom complexes were defined. During the last 70 years, our knowledge of these ancient complexes has expanded dramatically and fluted points have been discovered throughout the Americas. In recent years, a series of Pre-Clovis sites have been discovered and the case for human occupation in the New World prior to Clovis (i.e., prior to ca. 11,500 years ago) is becoming well established.

Portions of Minnesota were ice-free and open for settlement throughout the late glacial period. Even during the maximum extent of the Des Moines ice lobe, a very wide corridor along the Mississippi River in southeastern Minnesota extending almost to the Twin Cities remained ice-free and portions of central Minnesota were ice-free by 13,500 years ago (Mulholland et al. 1997). Ice had retreated north of the Canadian border by ca. 11,500 years ago and open spruce parkland rapidly moved northward following the ice sheet. However, substantive information on Paleoindian in Minnesota remains quite scanty. The reason for this dearth of information is unclear, but contributing factors probably include relatively lower population densities during this period, burial or erosion of sites during the late-glacial and midcontinental dry period; and modern surface conditions in many parts of the state that are not conducive to easy discovery of sites of this age.

At present, it is possible to delineate two broad patterns of Paleoindian material in Minnesota: the Fluted point pattern and the Lanceolate point pattern. The pattern concept is drawn from the recent discussion of Paleoindian materials throughout North America by Bonnicksen et al. (1987:404) who argue that:

The organizing unit most commonly employed to construct syntheses of early American prehistory is the concept of tradition. Archeological components or specimens grouped within the same tradition are assumed to be historically related. Indeed this concept has heuristic value within a specific region with a variety of complex artifacts. But quite another problem arises with material remains dating 13 to 12 ka. Unrelated peoples may share fabrication techniques for simple stone and bone tools. For this reason, preference is given to the term pattern; it connotes redundancy of common features across regions and/or through time, avoiding unnecessary cultural-historical implications. At this juncture, archeologists lack strong conceptual tools for distinguishing among several competing interpretive hypotheses to explaining patterning, for example, migration, diffusion, and development in situ. For the present purpose, pattern is used as a convenient descriptive

conceptual tool for organizing artifacts with shared shape and technology characteristics”.

The Fluted point pattern includes materials closely related or identical to Clovis and Folsom fluted points and tools. The estimated age for these materials is 11,500-10,000 B.P., inferred from radiocarbon dates for other eastern Clovis sites as presented in Bonnichsen et al. (1987:411-412).

Clovis points are lanceolate in shape and are fluted. The flute typically is removed on both sides of the point and extends halfway to three-quarters of the way up the length of the point. The base and lower portions of the sides of the point are ground. There is a fair range of variation in the Clovis points, and it appears that there were several different types of fluting technology that were employed. Other tools typical of Clovis assemblages have been identified elsewhere in the eastern United States, particularly end and side scrapers, backed bifaces, and perforators (Ellis and Deller 1988), this has not been accomplished in Minnesota.

Clovis was a hunting and gathering culture, with a specific emphasis on the hunting of large herd animals, all of which are now extinct (e.g., mammoth, bison). It appears, at least in the Upper Midwest, that Clovis hunters were well adapted to the open boreal parkland within several hundred kilometers of the glacial ice margin (see Storck 1988).

Folsom points, like Clovis, are fluted and lanceolate in form. They are typically smaller in size than Clovis materials and the flute normally extends almost the entire length of the point. Basal and side grinding is present. Like Clovis, there is a suite of other tools associated with this complex, including knives, end and side scrapers, burins, graters, perforators, large choppers, and bone tools. Folsom appears oriented primarily toward the procurement of extinct forms of bison (see Bonnichsen et al. 1987:413).

The distribution of fluted point materials in Minnesota is scanty although additional materials are being reported with increasing frequency. Very preliminary observations suggest that fluted point sites are often found adjacent to marshy areas and ice-block lakes.

An ongoing project to identify and document fluted point materials in the state has identified Clovis-like points in Waseca, Jackson, Faribault, and Blue Earth counties (Shane 1978, 1989) and the most current iteration of this project has identified more than 50 fluted points in private collections and surface contexts (Higginbottom and Shane 1996).

Romano and Johnson (1990) have described a Clovis point found on Island Lake in northeastern Minnesota. This point is made of a local material, Gunflint Silica, and is described as follows:

The artifact is a basally ground, lanceolate projectile point with two well defined flutes. The distal end has been fractured off. If large thinning flakes were employed in the manufacture of the artifact, there is no evidence remaining on the faces. Both the obverse and reverse faces are covered entirely by the flutes and regular, parallel percussion flaking reaching from the edges to the flutes. The concave base bears small pressure flakes superimposed on the two flute scars. This flaking is related to bevel preparation before and basal thinning after fluting. Projection of the curvature of the edges of the point suggests that the point was only 5.75 cm long and that one third of the tip end has been lost.” (Romano and Johnson 1990:205-206).

Peters (1990) has recovered a basally thinned point from the Bearskin Point site on East Bearskin Lake in northeastern Minnesota. The point is made of siltstone and most closely resembles Holcombe points from Michigan. A polyhedral scraping tool made of Hudsons Bay Lowland chert was also recovered.

Mulholland et. al. (in press) has summarized the available information on the environment, possible timing, and current state of knowledge about Paleoindian materials in northeastern Minnesota and adjacent Ontario. This work provides a useful and detailed review of early vegetation and environment in this portion of the state, as well as a discussion of several of the challenges in identifying and studying Paleoindian materials in this region.

Recently, a large assemblage of Clovis material has been reported to the Institute for Minnesota Archaeology. The material was discovered and collected by private collectors on the Wisconsin side of the Mississippi River near Red Wing. The assemblage is remarkably large and contains both Clovis-like fluted points and bases, scrapers, and more than 1,000 pieces of chipping debris. With but a few exceptions, the tools and chipping debris are made of Hixton silicified sandstone. Although the precise site location has not yet been disclosed, the collection indicates that substantial Clovis sites do exist along the Mississippi River trench.

Information on Folsom in Minnesota is also scanty. A handful of Folsom points have been reported from Minnesota in Nobles, Brown, Cottonwood, Wright, and Sherburne counties. The site forms for the Linden site (21BW8) and the Gilman Lake site (21BW21) indicate that Folsom materials were found at these sites. Three Folsom points in private collections have been documented in Sherburne and Wright counties in central Minnesota (BRW 1994:3-23).

The Lanceolate point pattern (Plano) includes a variety of unfluted lanceolate points that postdate fluted points. During the time Plano existed, glacial ice completely retreated from Minnesota, Glacial Lake Agassiz drained, and vegetation across the state changed dramatically. Although many Lanceolate points have been found across the state, only two sites have been excavated using modern techniques.

The unifying traits of these points are their lanceolate form, fine workmanship, and typical pattern of finely executed parallel flaking across the body of the point. There are a number of named ‘types’ of lanceolate points. The principal differences between these types involve differences in base and stem morphology. Primary types include constricting stemmed forms (e.g., Agate Basin, ‘Agate Basin-like’, and intermountain lanceolate), shoulder points (Hell Gap, Alberta, and Cody), and types with concave bases (Plainview, Frederick, and Dalton, etc.) (cf. Bonnichsen et al. 1987:413).

The Lanceolate point pattern represents a continuation and elaboration of the technological tradition of the Fluted point pattern. Although this pattern may be in part contemporary with the Fluted point pattern, it is generally later.

Lanceolate points are widely distributed throughout North America and have been reported from the intermountain region of the West, the Western Plains, the southeastern United States, and as far east as Wisconsin, Ohio, and Michigan. One of the characteristics of the Lanceolate point pattern is an increasing regionalization of tool styles and adaptive strategies. In the Rocky Mountains and Western Plains, there is an emphasis on hunting bison and the Lanceolate point pattern is perhaps best known from bison kill sites (see Frison 1974; 1978; Frison and Stanford 1982). This Western pattern is commonly termed Plano.

The Dalton complex is widespread in the Midwest and southeastern United States, and Dalton points may represent a logical descendant from a southeastern fluted point complex (see Wood and McMillan 1976; Funk 1978; Goodyear 1982). Dalton remains somewhat problematical, but may represent hunting and gathering bands adapting to quickly changing environmental conditions and may be weakly

correlated with the disappearance of boreal species and the establishment of deciduous forest.

In general, information on the Lanceolate point pattern in Minnesota is restricted to surface finds and collections, but recent studies are beginning to provide a solid base for future investigations.

Florin (1996) has recently completed a comprehensive review of all known Lanceolate points within the state and provided drawings and documentation for each point. The following table (Florin 1996:97-98, Table 1) summarizes his results.

Table 2. Points recovered in Minnesota.

Plains point Types	Number	Percent
Agate Basin-like	115	36
Cody-like	47	14
Plainview-like	31	9
Hell Gap-like	20	6
Alberta/Cody-like	14	4
Angostura-like	9	3
Browns Valley-like	8	3
Alberta-like	9	3
Frederick-like	6	2
Midland-like	5	2
Southern Woodland Point Types		
Dalton-like	35	11
Quad-like	6	2
Northern Woodland Point Types		
Holcombe-like	13	4
Hi-Lo-like	4	1
TOTALS	322	100

Florin observes that a number of sites contain more than one type of projectile point. Given the relatively small number of Late Paleoindian sites, he indicates that it is peculiar that so many sites contain different types of points. Two possible explanations are that the sites are multicomponent or that the Late Paleoindian complexes consist of more than one point type. Florin notes that a similar situation occurs at Lakehead complex sites in Ontario (Ross 1994:6), but that most of the Late Paleoindian components from sites on the Plains generally contain a single point type (Florin 1996:98-99).

The points studied by Florin were made of a wide variety of raw materials, but five raw materials dominate the assemblage. A large number of the specimens (38%) were not available for direct inspection and the raw material type could not be determined. Twenty percent of the points were made of siltstone and this material is especially common in the northeastern portion of the state. Hixton Silicified Sandstone (Hixton Quartzite) from southwestern Wisconsin is represented by 16% of the points and 15% of the points are made of local Prairie du Chien cherts. Fifteen percent of the points were made of materials that could not be identified and 9% were made of Knife River Flint from western North Dakota. Florin draws three conclusions from the raw material studies: (1) that nonlocal materials were used for between one-third and one-half of Late Paleoindian points, (2) local materials comprise between one-half and two-thirds of Late Paleoindian points, and (3) that there are localized areas (e.g., northeastern Minnesota) where natural outcrops of materials occur and that in these areas these materials are selected for use to the near exclusion of other raw materials (Florin 1996:109).

Using materials collected by Elaine Redepenning at Boulder, Island, and Fish lakes near Duluth, Steinbring (1974:67) has provisionally defined the Reservoir Lakes phase in northeastern Minnesota which is described as follows:

This provisional phase is characterized by a recurring combination of Plano types, including clear, intermediate, and variant forms of Scottsbluff, Agate Basin, Eden, Hell Gap, and Plainview points, many of which are made from jaspilite. With them is associated a lithic industry which largely lacks polished and ground stone tools and employs a hard gray "shale" as the principal source material. The artifacts are normally massive and include choppers, crudely made bifaces, crescentic blades, adzes, long heavy picks, and a wide assortment of bold retouched flakes mostly in the form of scrapers. Many of the scrapers are prepared on long prismatic flakes, often along parallel edges and also at the end." (References to figures in the text deleted).

Recently, Harrison et. al. (1995) completed a detailed analysis of the Redepenning Collection and describe it as follows:

The collection consists of 801 tools, 218 utilized flakes, 265 cores/flakes, 13,948 flakes, and 13 pieces of copper. This lithic collection is mostly flaked tools such as bifaces, scrapers, flake knives, choppers, and drills. A variety of activities could be suggested for these tool types, particularly cutting and scraping activities; a few specific types can be recognized. Wood-working tools such as adzes and gouges indicate some concern with major wood projects, perhaps dugout canoe production. Polished tools (abraders, mortar/pestle) are also present . . . Artifacts that generally have been taken to suggest time-relations include both Late Paleoindian and Archaic affiliations. Some of the refined bifaces are Late Paleoindian projectile points (Scottsbluff, Eden, Agate Basin, Alberta). The tri/polyhedral tools (adzes, gouges) have been associated with Archaic cultures as has copper. Traditionally the two cultures are considered to be separate, with Archaic following Paleoindian in time. Sites on the Superior National Forest suggest that the two artifact classes are associated in a Late Paleoindian/Archaic transition period (Gordon Peters and Steve Mulholland, personal communication) (Harrison et. al. 1995:135).

Because all of the Reservoir Lakes sites are within an active reservoir, any stratigraphic context has been destroyed by fluctuating water levels and the heavy erosion this process creates. However, an analysis of site types and locations provides some insights into settlement activities in the area. Harrison et. al. (1995:136-138) divide the sites into five categories based principally on number of artifacts from each site. It is suggested that most of the larger sites are associated with the original waterways of the region, either rivers, lakes, or tributary streams. Sites with smaller numbers of artifacts tend to be farther from original waterways.

Because of the absence of intact deposits, no firm chronology or radiocarbon dates are presented for the Reservoir Lakes complex. Similarly, no suggested revisions to the original formulation of the Reservoir Lakes phase are proposed, although a comprehensive review of the several Late Paleoindian complexes around the Lake Superior basin is presented (Harrison et. al. 1995:6-16).

A similar situation has been identified in southeastern Minnesota, albeit with considerably fewer artifacts and data. Gonsior et al. (1994) studied a series of lithic scatters in Fillmore County which they interpret as procurement sites for Galena chert, which occurs in lag deposits exposed in eroding ravines or other exposures (e.g., tree falls, etc.) and which they suggest was acquired opportunistically (Gonsior et al. 1994:238). The sites were situated in fields that have been cultivated for more than 125 years and apparently no intact deposits of cultural

material survive. However, artifacts span the period from Late Paleoindian to Middle Woodland.

Evidence for Paleoindian use of the sites includes "a possible channel flake diagnostic of the Early Paleoindian fluted point tradition" (Gonsior et al. 1994:237) from the Tieskotter/Stevens site and several Late Paleoindian projectile points. Dalton points were recovered from the Tieskotter/Stevens and Simonson sites and an Agate Basin point was recovered from Tieskotter/Stevens. A Hi-Lo projectile point was recovered from the Kindem site and fragments of lanceolate projectile points that could not be assigned to a known type were recovered from the Tessum/Lunde and Hahn sites.

The absence of excavated information from good stratigraphic contexts is unfortunately characteristic of Lanceolate point pattern studies in Minnesota generally. However, there are three sites which have provided some contextual information for this period: the East Terrace site (21BN6), Bradbury Brook (21ML42), and the Browns Valley site (21TR5).

#### East Terrace Site (21BN6)

During 1993, the Minnesota Department of Transportation sponsored data recovery at two sites that appeared to contain components associated with the Lanceolate point pattern along the Mississippi River in central Minnesota (BRW 1994). Investigations at the Gardner site (21SN14) revealed that it had been heavily disturbed by landscaping activities and no further work was conducted. Work at the East Terrace site (21BN6) indicated that it also had been disturbed to some extent, but that there were intact deposits of cultural material at the site. A total of 102 square m was excavated, and seven features were discovered and investigated. The investigators concluded that the site is a multicomponent habitation site which was discontinuously occupied over a period of as much as 9,000 years. Occupations occurred during three specific time periods: Late Paleoindian (8000-6500/5000 B.C.), Late Archaic-Initial Woodland (1500 B.C.-A.D. 300/400), and Early-Middle Terminal Woodland (A.D. 300/400-1000/1200). They indicate that the Late Paleoindian period can be further subdivided into Hell Gap and Alberta/Scottsbluff complexes (BRW 1994:1.6).

Analysis of the horizontal and vertical distribution of artifacts at the East Terrace site suggests that it retained some of its integrity, despite mixing of cultural materials from the various components. There are several short-term flintknapping activity areas present at the site and seven features within the area that was impacted by construction. Six features were identified at the site during various stages of excavation. Three of these features were rock concentrations and three were interpreted as fire hearths. A corner-notched projectile point thought to be associated with Feature 3 was found 20 cm from the east edge of the feature. The available evidence indicates that the site was occupied sporadically and for very short periods of time.

The investigators interpret the major activities at the site as the reduction of local (and occasional nonlocal) lithic materials into bifaces and small flake tools. They suggest that other activities included limited direct subsistence pursuits like the processing of animal and vegetable resources. The limited number and the range of stone tools also suggest that the occupation at the site was transient in nature and may represent small groups of Native Americans moving through the area on their way to more resource-rich areas at surrounding wetlands (BRW 1994:1.6-1.7).

Three radiocarbon dates were obtained from the site (BRW 1994:4.112). Beta-63623 was from organic-stained soil recovered from

Feature 7 and the uncalibrated date is  $1970 \pm 70$  radiocarbon years. Beta-65347 was from wood charcoal obtained from Feature 4 and yielded an uncalibrated date of  $2810 \pm 60$  radiocarbon years. Beta-64567 is from wood charcoal obtained from Feature 3 and yielded an uncalibrated date of  $4560 \pm 60$  radiocarbon years.

The association of East Terrace with the Lanceolate point pattern is based principally on the discovery of several lanceolate points and point fragments at the site. An Alberta and Scottsbluff point were found, as were two fragments of Hell Gap points (BRW 1994:4.78-4.79).

#### Bradbury Brook (21ML42)

The Bradbury Brook site was discovered in October 1989 by archeologists conducting survey for the Minnesota Department of Transportation. Situated near the confluence of Bradbury Brook and the Rum River in east-central Minnesota, initial investigations yielded hundreds of pieces of chipping debris composed principally of siltstone, a locally available material (Malik and Bakken 1991). Surface collection at the site indicated that there were several distinct concentrations of material within the site. The largest of these, located nearest to Bradbury Brook, measured approximately 15 by 20 m. Preliminary analysis of the surface data suggested that 21ML42 was a quarry site and the heavy weathering of the chipping debris hinted that it might be of great antiquity.

Because of its probable significance, MnDOT sponsored a data recovery project between May and September, 1990. Deposits were water-screened to ensure that the full range of chipping debris was recovered and 125 square m of the site were excavated. A total of 125,679 artifacts was recovered, including 113 flaked stone tools, 727 cores and core fragments, 115 hammerstones, 17 anvilstones, 52 anvilstone fragments, 19 scrapers (two of which were an unusual turtleback form), 53 preforms, a trihedral adze chipped from siltstone, an assortment of other bifaces, utilized and retouched flakes, and chipping debris (Malik and Bakken 1991:5; 1993:ix). A single diagnostic artifact, the basal portion of a stemmed projectile point which Malik and Bakken (1991:5) interpret as an Alberta point, a Late Paleoindian form. More than 99% of the artifacts were made of siltstone which apparently was being dug from the glacial till at the site or gathered from the nearby stream (Malik and Bakken 1993:xi).

Although most of the site was contained within the plowzone, excavation identified an area roughly 6 m on a side that contained intact deposits below the plowzone. This extended to a depth of 60 cm below the base of the plowzone. The upper levels of this deposit contained a dense concentration of anvilstones, hammerstones, partly finished tools, and chipping debris. At a depth of roughly 25 cm below the plowzone, the size of this feature had decreased to about 1.5 m and artifact density dramatically increased. One single 5 cm level at this depth contained more than 3,300 artifacts and in places the flaking debris was packed so densely that some levels contained almost no soil. At the base of this feature, a few small fragments of charcoal were recovered (see Malik and Bakken 1991:5; 1993:75-78).

Three samples of charcoal that could be used for radiocarbon dating were recovered and two were submitted to Beta Analytic. Sample MHS-90-1 consisted of several small pieces of charcoal recovered by hand from a depth of 40-50 cm within the pit feature. This zone was essentially sealed beneath a solid cap of siltstone chipping debris. Total weight of MHS-90-1 was slightly over 1 g (Malik and Bakken 1993:23-24). MHS-90-2 was recovered by flotation of soil matrix from a balk left within the pit feature and came from the top half of Profile Stratum 5. This sample



was not submitted for dating and is curated at the Minnesota Historical Society.

MHS-90-3 was recovered by a combination of flotation and hand sorting of the soil matrix from the balk left in the feature and came from a slightly lower level of the feature at 50-60 cm below the plowzone. This sample consisted of a large number of very small, dark specks and initially appeared to weight almost 4 grams. Subsequent examination of this sample by Beta revealed that only a small portion of the sample was, in reality, charcoal.

Malik and Bakken (1993) do not present the original reports from Beta and the details of the dates are somewhat unclear. They comment that:

Samples MHS-90-1 and MHS-90-3 were submitted to Beta Analytic, Inc. for radiocarbon dating. Because the samples were small, the accelerator mass spectrometry (AMS) technique was used. The samples were pretreated by Beta, using their standard methods for removing contaminants. The carbon was reacted to produce graphite, which was applied to copper targets. AMS measurements were made on these samples, in triplicate, at the Eidgenossische Technische Hochschule (ETH) University In Zurich, Switzerland. The dates were adjusted by  $^{13}\text{C}$  for total isotope effect generated in both nature and during the physical and chemical laboratory procedures. The  $^{13}\text{C}$  contents were measured concurrently with those of  $^{14}\text{C}$  and  $^{12}\text{C}$  in the accelerator beams, allowing precise corrections (Murray Tamers, personal communication 1991).

The date for MHS-90-1, the hand picked sample, was  $9,220 \pm 75$  B.P. (Beta-44685; ETH-7944). The date for MHS-90-3, recovered by hand sorting and flotation of feature soil matrix, was  $2445 \pm 55$  B.P. (Beta-44685, ETH-7945)." (Malik and Bakken 1993:24).

Based on this description, we assume that the dates reported above have not been corrected to calendar age but have been normalized using the  $^{13}\text{C}$  ratio.

The discrepancy between these two dates from the same pit feature is disturbing. However, Malik and Bakken (1993:76 footnote) comment that

The provenience is not nearly so well controlled for the charcoal obtained by flotation of soil matrix from the balk left in the feature. Approximately 40 l of soil were processed to obtain a very small sample consisting [sic] of minuscule [sic] charcoal flecks. The fact that the date of  $2445 \pm 55$  obtained on this sample is not in agreement with the former date is not surprising, and their [sic] is no doubt that the previous date should be preferred.

Because the date from MHS-90-1 was collected by hand from beneath a well-defined and 'sealed' stratum, this explanation seems reasonable. The date of  $9220 \pm 75$  is consistent with the Alberta point recovered from elsewhere in the site. Therefore, an uncalibrated age range of 9070 to 9370 (two standard deviations) seems reasonable for the feature and, by extension, the site as a whole.

One of the more interesting aspects of the analysis of Bradbury Brook was refitting of broken anvilstones. By rejoining pieces of anvilstones, Malik and Bakken (1991:5, 1993) were able to evaluate the stratigraphy of the site. They suggest that refitting established connections between all levels of the excavation from the bottom of the plowzone to the bottom of the pit feature and between parts of the workshop as far as 4 m apart. They suggest that the same anvilstones were reused and moved around during the entire time the site was in use. They conclude that the total duration of the site occupation was

probably no more than several trips to the workshops during the life span of a generation or two of the people inhabiting the region.

They further suggest that the site contains two and possibly three focal areas of activity within the intact deposit at the site. Each of these focal areas seemed to occupy a shallow basin, as if trampling and pounding had worn a bare spot into the ground. In their view (Malik and Bakken 1991:5), each basin contains more than one work station, each with its own anvilstone, hammerstones, and chipping debris. Further, while the largest concentration was a stone workshop, the smaller southern concentration at the site (where the Alberta point was found) may have served as a base or temporary camp where the group carried out other daily activities not directly associated with procurement and processing of siltstone.

### Browns Valley (21TR5)

As discussed earlier, several presumably ancient skeletons were discovered in Minnesota during the 1930s and reported by A. E. Jenks (1937). One of these finds consisted both of skeletal materials and Plano tools found during gravel mining near Browns Valley in western Minnesota in 1933. The spear points associated with this find were subsequently termed 'Browns Valley' points and are still used as a Plano point type.

Jenks returned the skeletal material and artifacts to the individual who had discovered them sometime during the late 1930s and for many years it was assumed that they had been lost or destroyed. However, during the late 1980s, Orrin C. Shane III of The Science Museum of Minnesota (SMM) discovered that the materials were still extant and was able to obtain them for additional study using modern methods. One specific goal of the study was to date the bones themselves using modern isotopic methods.

Radiocarbon dating of the skeletal materials was conducted in 1990 and 1991 (Shane 1991) and results of the bioanthropological analysis are now being completed.

Two AMS dates were run on amino acids derived from the Browns Valley skeletal material. The first of these dates was obtained from XAD resin-purified hydrolyzate amino acids extracted from a fragment of cortical bone removed from the right femur of the Browns Valley skeleton. The age determination for this sample was  $8790 \pm 110$  years radiocarbon years (NZA-1102). However, because this date was on grouped amino acids rather than a single purified acid, it was interpreted as probably being younger than the actual age by ca. 200-300 years. Therefore, a second sample of a single amino acid (purified aspartic acid) was submitted for dating. This sample yielded an age of  $9049 \pm 82$  radiocarbon years (NZA-1808). Since both dates overlap within two standard deviations, Shane felt that for all practical purposes, the age of the skeleton could be placed at 9,000 radiocarbon years ago (uncalibrated). These radiocarbon dates established the antiquity of the Browns Valley skeleton beyond any reasonable doubt, making it the most complete and best preserved Paleoindian individual discovered in the Americas at that time (Shane 1991:i-1).

Because the AMS dating process directly counts the atoms of the carbon isotopes in a sample, the delta  $^{13}\text{C}$  values for the two samples were also obtained. These values were -21.8 for NAZ-1102 and -25.0 for NZA-1808 (Shane 1991:3).

Most plants use one of two photosynthetic pathways to incorporate carbon from  $\text{CO}_2$  in the atmosphere. Plants with  $\text{C}_3$  photosynthesis use the Calvin-Benson pathway to fix carbon into a 3-carbon molecule, whereas plants with  $\text{C}_4$  photosynthesis use the Hatch-Slack pathway to



fix carbon into a 4-carbon molecule.  $C_3$  photosynthesis characterizes most woody plants and some grasses; most grasses have  $C_4$  metabolism (Shane 1991:3).

The  $^{13}C$  values for Browns Valley Man indicate that he lived in and consumed food from an essentially pure  $C_3$  environment. At first, this seemed inconsistent with vegetation reconstructions which indicated that extensive grassland was present in the region 9,000 years ago, since it was assumed that this prairie was composed of  $C_4$  grasses and other  $C_4$  plants. However, research has recently shown that the species composition of grasslands in Texas has changed from  $C_3$  to  $C_4$  species during the past 12,000 years (Kelly et al. 1991), probably in response to global warming. It appears that the  $C_3$  pathway is an adaptation to cooler, more moist climatic conditions whereas the  $C_4$  pathway is more suitable to hotter, drier conditions. It would appear that the vegetation of the northern Plains 9,000 years ago was constituted primarily of  $C_3$  plant species and that Browns Valley Man lived in an environment dominated by  $C_3$  grasses, herbs, forbs, and shrubs and by bison and other animals consuming  $C_3$  plants. This interpretation is consistent not only with current vegetation reconstructions, but also with more recent high-resolution paleoclimatic reconstructions of the region as well (e.g., Bradbury and Dean, eds. 1993).

## Conclusions

The Lanceolate Point pattern (Plano) appears to represent a continuation of the technological tradition of the earlier fluted point pattern. Plano seems to be a hunting and gathering complex with a heavy emphasis on the hunting of large game, principally bison. In general, Plano appears to originate in the Rocky Mountains and Western Plains, and spread eastward. Although it is tempting to suggest that Plano is principally an adaptation to a grassland/steppe environment rich in large game, the wide distribution of Plano throughout the Midwest makes this a very tentative hypothesis. The relationship of Plano to the mixed pine forest in Minnesota remains a tantalizing conundrum.

In northwestern Iowa, excavations at the Cherokee Sewer site have revealed a stratified sequence of cultural deposits that include both Plano and Archaic materials. The occupation of the various horizons at this site all appear to represent specialized late-winter bison processing. Anderson and his associates (D. Anderson and Semken 1980:257) suggest that there were too few discernible differences between the Late Paleoindian and Archaic horizons to indicate different economies. It is probable that a similar situation occurred in Minnesota as well. Plano was present during a period of rapid and dynamic environmental change that was expressed somewhat differently in different parts of the state. Therefore, far more information is required from carefully excavated sites before any detailed discussion of the character of culture change and cultural dynamics of the Lanceolate Point Pattern can be attempted.

## 5 The Archaic Period, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

The Archaic generally marks a shift from the specialized hunting of large game to a more broad-based exploitation of a wide range of plants and animals. In some areas the period also witnesses the development of defined social territories and residential bases and the beginning of plant domestication. The nature of Archaic settlement and subsistence across the Northeast Woodlands, however, is quite variable, and many of the hallmarks of Archaic to the east and south never appear in the region. The major climate changes of the Early and Middle Holocene extend the prairie across Iowa and into central Minnesota and southwestern Wisconsin, and the northern forest zone becomes distinctly different from the deciduous forest areas to the south. Archaic lifeways adapted to local conditions in each of these areas. Figure 13 illustrates the location of many Archaic sites and areas discussed below.

### Iowa

Iowa's location near the prairie/forest ecotone places it in an interesting position for contributing to our understanding of the differing development of Archaic lifeways during this period of rapid environmental change. During the Mid-Holocene Warm period (Altitheirnal, Hypsithermal), short grass prairie moved eastward into

western Iowa, while tall grass prairie covered the rest of the state. The rapidly changing climate and these vegetational changes may have had a dramatic effect on the prehistoric inhabitants of the region who generally developed different cultures related to both the Plains in the west and the Woodlands in the east.

Originally defined in the Eastern Woodlands by Ritchie in the 1930s (Griffin 1967), the Archaic has long been recognized as representing a shift from specialized nomadic hunting of large game, such as Pleistocene megafauna, with expedient use of plant foods to broad based use of a wide variety of small game and plant food sources, including some domesticates (Ford 1985; Smith 1987, 1992). Eventually this resulted in central based collecting, with a seasonal round of exploitation, that Caldwell (1958) has termed Primary Forest Efficiency. However, the presence of large herds of bison on the Plains seems to have allowed the occupants of this region to maintain a more specialized, nomadic lifeway, in some cases, nearly up until Historic times (Fagan 1991). Although there is evidence of a broadening of resource base in the Western Plains, the Central and Southern Plains are not well known during this time period (W. Wedel 1978).

Major distinguishing characteristics of the Archaic are the appearance of a wide variety of side-notched and stemmed points, knives, and scrapers, with much greater regional variation than in

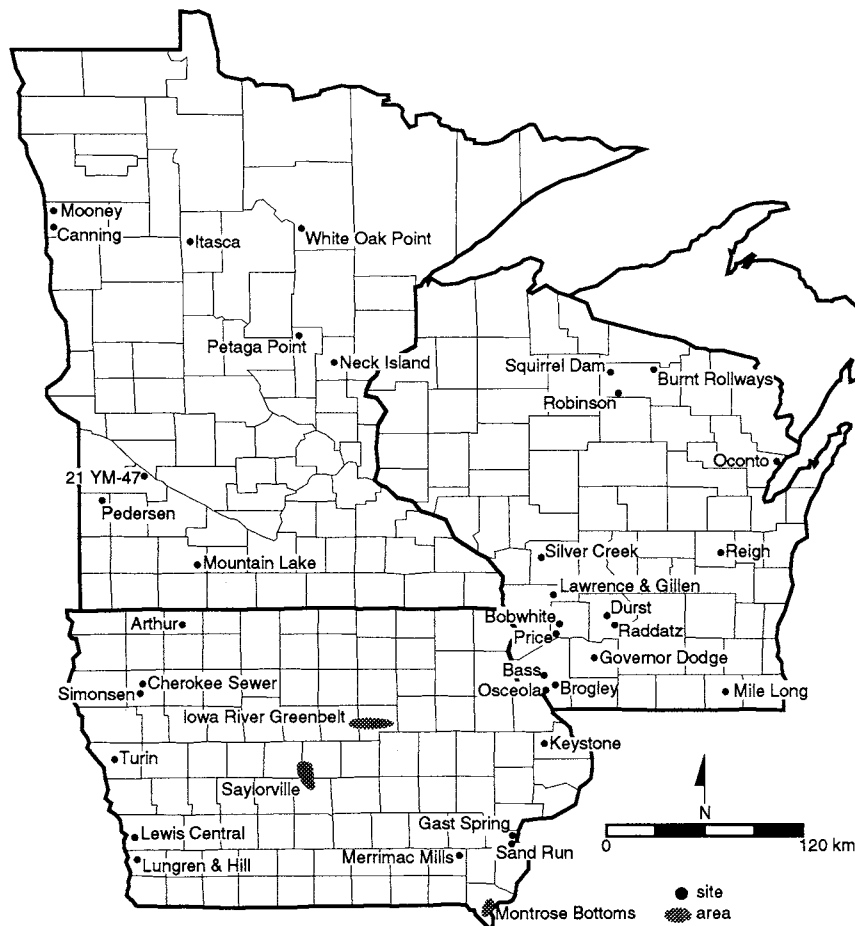


Figure 13. Archaic sites and areas.

earlier time periods. Stones for grinding seeds appear for the first time during this period, and other ground stone tools, many for woodworking, first appear in the East. The atlatl, or spear-thrower, is another important invention of this time period (L. Alex 1980).

Most of what we know about the Archaic of Iowa comes from isolated bison kill and burial sites in the western part of the state. These are too few, and they provide too little variation to say much about Archaic settlement and subsistence (Benn 1986). There are even fewer data on the Archaic of eastern Iowa, and we are largely forced to rely on comparisons with sites from surrounding states for an interpretation of the Archaic in this part of the state.

### Early Archaic (9500 to 8000 B.P.)

In the Eastern Woodlands, with the vanishing of the Pleistocene megafauna there appears to have been a shift to a much broader utilization of a wide variety of small game and plant foods, eventually resulting in population concentrations in areas of the greatest diversity of resources, and the development of a seasonal round of exploitation, involving larger, semipermanent base camps, and smaller, seasonal resource procurement campsites (Fagan 1991; Stoltman 1986a; Benn ed., 1988; Phillips and Brown ed. 1983).

Early Archaic points are fairly common as surface finds in eastern Iowa. Benn (ed., 1988:139) reports the presence of Thebes/Grundy and Hardin points, and the likely presence of St. Charles and Kirk Cluster types in the Mississippi River Valley in southeast Iowa. He notes, however, the absence of bifurcate base points like LeCroy and St. Albans, and the absence of Graham Cave points. He also notes that, based on the low yield of points from surface-collected sites, that no large base camps were located in his Pool 17 and 18 survey, although they may be buried. All sites producing Early Archaic point types were located on high sandy terrace remnants protruding through more recent alluvium deposited during aggradation of the Mississippi River Valley which continued into the Mid-Holocene Warm period (Benn, ed. 1988).

Two Thebes points and a Little Sioux point are reported from unknown proveniences at the Keystone Rockshelter (13JK23) (D. Anderson 1987a). Large numbers of Thebes points are reported from upland and Wisconsinan terrace sites in the middle Turkey River Basin in northeast Iowa (Collins and Green 1988). Collins (1991) recorded four Early Archaic base camps, one seasonal camp, two limited activity sites, and one specialized activity site in Hardin County on the Des Moines Lobe during the Iowa River Greenbelt survey. The base camps were all in upland or terrace/alluvial fan locations. The limited activity sites occupy Wisconsinan benches, and the specialized activity site is located away from the Iowa River on the Des Moines Lobe. Artz (1991) located three sites yielding Early Archaic point types during a highway corridor survey along the Mississippi River in Lee County. All three sites occupied Late Wisconsinan terraces.

These site locations fit well with predictions based on models of the Holocene alluvial stratigraphy of eastern Iowa developed by Bettis (Bettis and Littke 1987; Bettis and Hoyer 1986; Bettis 1988). Uplands and Wisconsinan terraces are the only land surfaces dating to this time period that have not likely been buried or eroded away by more recent alluvial episodes. Buried soils in the Gunder Member of the DeForest Formation, the Corrington Member alluvial fans (see Hoyer 1980; Wiant et al. 1983), and the High Terrace of the Des Moines and

other river valleys in the state dating to this time period are likely to contain buried Early Archaic deposits.

The Early Archaic is slightly better known in western Iowa. Collins (1991) has noted that the Archaic in the Midwest seems to be time-transgressive, beginning earlier in the east, and later in the west. Indeed, at the Cherokee Sewer site (13CK405), the Early Archaic is dated from 8500 to 6500 B.P. (D. Anderson, Shutler, and Wendland 1980). In Horizon II at this site, dated at between 7370 and 7480 B.P., the remains of 15 bison were recovered, along with stone and bone-butchered and hide-working tools, and a grinding stone. Twenty-two projectile points were recovered. Ten of the points were notched, and nine were unnotched. Fifteen of the points were made from Tongue River Silica from South Dakota (D. Anderson 1980). Deciduous human teeth were also recovered, indicating occupation by family groups rather than male hunting parties. From tooth eruption data and the presence of fetal bison bone, the site was interpreted as representing a late winter kill/butchering site. The age and sex distributions of the remains are consistent with winter nursery herds (Pyle 1980).

Comparisons between the assemblages from the Late Paleoindian Horizon III and the Early Archaic Horizon II showed no statistically significant differences in activities performed during these two intervals of occupation. The authors interpreted this evidence as indicating that Late Paleoindian and Early Archaic inhabitants of the eastern Plains margin pursued much the same lifestyle, causing a need for rethinking our traditional separation of Paleoindian and Archaic stages on the eastern Plains (D. Anderson et al. 1980; see also Benn 1986). Anfinson (1987) has proposed the existence of three Archaic phases in southwestern Minnesota (and presumably northwestern Iowa): the Cherokee phase, from 8900 to 7500 B.P., the Itasca phase, from 7500 to 5000 B.P., and the Mountain Lakes phase, from 5000 to 2200 B.P. The Cherokee phase would represent the Early Archaic in this region.

The nearby Simonson or Quimby site (13CK61), with a radiocarbon date of  $8430 \pm 520$  B.P., produced projectile points more closely resembling those of Horizon II at Cherokee Sewer site than those from Horizon III (Frankforter and Agogino 1959a, 1960; Agogino and Frankforter 1960; D. Anderson, Shutler, and Wendland 1980). The bison remains at Simonson have been identified as *Bison bison occidentalis*. However, Pyle (1980) notes a major confusion in bison taxonomy and the existence of many intermediate forms and hybrids, and hence he refers to the Cherokee bison as *Bison bison*, subspecies indeterminate. A ground stone axe was also recovered from this level (Beals 1965), strengthening the case for placing this site in the Early Archaic rather than Late Paleoindian category. The large confidence interval on the radiocarbon date also would seem to indicate that it likely fits into Anfinson's Cherokee phase. McKusick (1964a) includes the Simonsen site and the Hill site in the Logan Creek complex defined by Kivett for Early Archaic sites in eastern Nebraska and western Iowa, and Anderson et al. (1980:263) note that the Cherokee materials compare well with the Logan Creek assemblage. Some of the material at the Soldow site (13HB1) may represent Early Archaic utilization of the site (Flanders 1977).

The Hill site (13ML62) in Mills County, southwest Iowa, has yielded a radiocarbon date of  $7250 \pm 400$  B.P. from a cultural horizon buried 17 feet below the top of a terrace of Pony Creek (D. Anderson et al. 1980; Frankforter and Agogino 1959a). Vertebrate remains recovered from the Hill site included bison, deer, mole, bird, and turtle. Two

burned areas and a fire pit were also encountered. Artifacts included five side-notched and one unnotched point, along with knives, scrapers, and modified flakes, as well as a possible mano fragment. Because the faunal remains could not be articulated, it appeared to Frankforter and Agogino (1959a) that animals had been brought to the site from other kill localities. They also noted that only selected portions of animals were represented. They interpreted the Hill site as a long term occupation, and it may represent a residential camp of the type envisaged for the eastern Archaic. The variety of bones encountered also seems to represent a broadening of the resource base characteristic of the east. W. Wedel noted in 1961 that the Logan Creek complex seemed to have cultural affinities with the Eastern Woodlands. Perhaps by focusing on kill sites such as Cherokee, we are getting a skewed view of life on the Eastern Plains periphery during the Early Archaic.

### Middle Archaic (8000 to 4500 B.P.)

During the Middle Archaic, the trends that began in the Early Archaic continued, and there is much evidence for increasing permanence of settlements and specialized exploitation of the local resource base.

In a survey of Navigation Pools 17 and 18, along the Mississippi River, Benn, ed. (1988) discovered a Middle Archaic site distribution much like that described by J. Brown and Vierra (1983) for the Illinois River Valley. He noted that this portion of the Mississippi River Valley appeared to be more heavily occupied during Middle Archaic times than the Salt River Valley in Missouri or the Central Des Moines River Valley in Iowa. From this observation, he concluded that there was a, "time-line of cultural intensification . . . moving from the large midwestern river valleys west across the Prairie Peninsula (Benn, ed. 1988:143; see also Benn and Rogers 1985)." Sites were located along lakes and backwater sloughs, on well drained sand ridges, a settlement pattern that began during late Paleoindian times and continued into the succeeding Woodland and Late Prehistoric time periods. Benn also surmised that the number of sites increased through time during this time period. Osceola points, a type transitional to the Late Archaic, were abundant in private collections, and five of the 11 Middle Archaic sites in Pools 17 and 18 have Osceola components. Interestingly, Benn, ed. (1988) also reports sites on bluffs and upland ridges producing mass quantities of ground stone axes, bannerstones, plummets, and side-notched projectile points. He believed that some of these sites probably represented base camps, but that some may have been burial sites like the Bullseye site in Illinois (see Hassen and Farnsworth 1987). Finn (1982) interpreted the Merrimac Mills site (13JF92) as a continuously reoccupied small upland residential base, utilized on a seasonal basis.

Sites of this time period are the earliest to appear in buried contexts above the water table. Benn, ed. (1988) recognized two types of buried Middle Archaic sites in this portion of the Mississippi River Valley. One type consists of light scatters of fire-cracked rocks and flakes, often lacking diagnostic artifacts. The other type of site consists of dark middens, such as Sand Run West (13LA38) (Benn, ed. 1987; U.S. Army Corps of Engineers 1985), containing "pit roasting features, trash-filled pits, masses of chipped and ground stone tools, fire-cracked rocks and organic remains of fish, mammals, nuts and seeds (including wild rice) and presumably mussel shells, which have not been preserved in the acid soil" (Benn, ed. 1988:142). Site 13LA38 is the

stratified site where the Odessa Sequence was defined. The area appears to have been periodically occupied from late Middle Archaic times through Oneota (Benn, ed. 1987). Bettis and Benn (1987) were able to recognize seven Archaic cultural depositional components at the site. The lowest of these appears to overlap with the Helton phase and compares well with the Hemphill phase defined by Conrad (1981) for west-central Illinois (Benn, ed. 1988). These sites seem to conform to the Koster model of J. Brown and Vierra (1983) and occur in the lowest paleosol of the Odessa Sequence. Such sites could also be present in the Gunder Member of the DeForest Formation in eastern Iowa (Bettis and Littke 1987) and are known to be present in Corrinton Member Alluvial Fans (D. Anderson and Semken 1980; Baker and Whelan 1992; Wiant et al. 1983).

At the Gast Spring site (13LA152), a backhoe trench excavated to a depth of 5 m in an alluvial fan encountered a basin-shaped cultural feature, perhaps a house. The feature was encountered in a paleosol previously radiocarbon dated to  $6215 \pm 70$  B.P. Cultural remains included fish, turtle, bird, mammal bone, seeds, gastropods, charcoal, fire-cracked rock, flake tools, a biface, and a microblade core. A radiocarbon date of  $5730 \pm 90$  B.P. was obtained on charcoal recovered from the pit feature (Baker and Whelan 1992). Excavations by the University of Iowa continue to expose a larger area of this paleosol. In western Iowa, this is the time period of the DeForest Gap (Benn 1986), and it is expected that Middle Archaic sites would not be preserved in small valleys but may be preserved in high terraces in large stream valleys (Bettis and Benn 1984).

During the earliest part of the Middle Archaic, the Koster site produced broad, corner notched Helton and Rice points; in western Iowa, small side-notched points like Tama and Little Sioux points were being made at this time. For the rest of the Middle Archaic of Iowa, side-notched points like Matanzas, Godar, Raddatz, and Osceola dominate (Benn, ed. 1988). Interestingly, the Tama and Little Sioux point complex appears to extend west, but not east of the Mississippi River Valley (Benn, ed. 1988).

Elsewhere in eastern Iowa, a single Little Sioux point was recovered from an unknown provenience at the Keystone Rock Shelter (13JK23). Collins (1991) located one possible Middle Archaic site in an upland location during the Iowa River Greenbelt survey, and two possible Middle Archaic base camps in buried contexts at the interface of Corrinton Member alluvial fans and Gunder Member terraces. He noted that Middle Archaic components appeared to be underrepresented in the project area. This seems to agree with the observations of Benn and Rogers (1985) in the Des Moines River Valley. Collins (1991) interpreted this underrepresentation as a reflection of the shift to stream valley occupations during the Mid-Holocene Warm period and subsequent site burial or destruction by alluvial activity.

In western Iowa, as in the east, the Middle Archaic occupies the height of the Mid-Holocene Warm period. Benn (1986) points out that some have reasoned that the warming and drying of this period would have led to an eastern style concentration of populations in the river valleys and a broadening of the resource base. Benn (1986) counters this argument with the proposition that the mesic prairies of Iowa could have attracted large numbers of bison from the drier Western Plains, leading to an incentive to continue the specialized bison hunting tradition of earlier times.

Several sites dating to Middle Archaic times have been excavated in western Iowa. Horizon I at the Cherokee Sewer site has been radiocarbon dated to between 5950 and 6300 B.P. (D. Anderson et al.

1980). The remains of a minimum of 10 bison were recovered from this horizon, as well as chipped stone tools, small side-notched projectile points, domesticated dog remains, and a bird bone flute. The latter two discoveries represent the earliest examples discovered on the Eastern Plains (D. Anderson and Semken 1980). As with Horizons II and III, Horizon I appears to represent a late winter processing site, showing little difference from the late Paleoindian and Early Archaic horizons. We must remember, however, that at Cherokee we are looking at a specialized site type concerned with the procurement and processing of a particular resource at a particular time of year, and that we may be getting a biased view of life during Middle Archaic times.

The Lungren site (13ML224) in Mills County has been dated at  $6280 \pm 120$  B.P. (D. Anderson, Shutler, and Wendland 1980). At this site, exposed by gully erosion of a tributary of Pony Creek, L. Brown (1967a) encountered a large midden feature, a firepit, and a scatter of bones, bison teeth, ground and chipped stone tools, including a single side-notched point, and mussel shell. It was Brown's belief that most of the site had already been eroded away. Brown interpreted the site as a short term camp utilized by nomadic big game hunters.

On the basis of two surface-collected sites in Mills County reported by Rowe (1952b), McKusick (1964a) defined the Keg Creek complex. On typological grounds, he placed the Keg Creek complex later in time than the Logan Creek complex, and equivalent to what Flanders termed the Humboldt complex, based on the Soldow site (13HB1) in Humboldt County. It appears that, as defined, these complexes would cover the time periods we would now call Middle and Late Archaic. However, since the Keg Creek complex is based on unexcavated sites and the Soldow site is multicomponent, these complexes would appear to have little utility. They may, however, be encountered in the literature.

The Turin site (13MN2) in Monona County attracted a great deal of attention when it was discovered in 1955 and has appeared widely in print (Ives, ed. 1955; *Life* 1955; Ruppé 1956; Krieger 1956; Wormington 1957; A. Anderson 1957; Frankforter and Agogino 1959a, 1959b; W. Wedel 1961; McKusick 1964a; L. Brown 1967a; Newman 1967; D. Anderson et al. 1978; D. Anderson et al. 1980; Fisher et al. 1985). During quarrying operations, the skeleton of an adult male was encountered (Fisher et al. 1985). Several days later, a juvenile skeleton was discovered in a slump block of loess in the sand and gravel pit. Eventually, two more skeletons were located in situ and excavated by Ruppé and Frankforter (Fisher et al. 1985).

Since the bones appeared to be buried beneath 20 feet of Wisconsinian loess overlying pre-Illinoian till, the burials were assumed to be Pleistocene in age and caused quite a stir (*Life* 1955). Skeleton 3 was found flexed in a shallow burial pit. The body had been sprinkled with red ocher, two *Anculosa* shell beads were found near the neck during excavation, and an additional 16 beads were found during laboratory analysis. A side-notched point made from Knife River Flint was found between its feet in the pelvic region (A. Anderson 1957; Fisher et al. 1985). The notion of a Pleistocene age for the burials was dispelled when bone from skeleton 3 yielded a radiocarbon date of  $4720 \pm 250$  B.P., and bison bone 2.7 m (8 ft.) below the burials yielded a date of  $6080 \pm 300$  B.P. (Crane and Griffin 1960).

A revisit to the site area by D. Anderson, Tiffany, Bettis, and Thompson support the contention that the burials were found in redeposited loess alluvial fill of the Hatcher Member of the DeForest Formation (Fisher et al. 1985). Fisher et al. (1985) interpreted the

Turin burials as individual burial episodes and an indication that the dead were disposed of in prescribed areas during Middle Archaic times. They also state that the site represents the earliest and most westerly occurrence of burial traits associated with Eastern Woodlands Middle Archaic sites. Unlike the Late Archaic Lewis Central School sites (13PW5) (D. Anderson et al. 1978), there is no evidence of interaction between individual social groups represented in the Turin burials. This suggests to Fisher et al. (1985:215), that, "integrative cultural mechanisms such as the periodically constructed ossuaries of the Late Archaic period (Lewis Central School) and conical burial mounds of the Woodland period were not developed as yet among the band level societies of the Middle Archaic period on the eastern border of the Great Plains."

### Late Archaic (4500 to 2500 B.P.)

E. Henning (1985) has divided the Late Archaic in Iowa into four regional variants: the Prairie/Plains Late Archaic in the western third of the state, the Prairie Lakes Late Archaic on the Des Moines Lobe, Old Copper culture in northeast Iowa, and Eastern Archaic over the rest of the state. Due to the extremely small amount of excavated site data, these divisions are to a certain extent hypothetical and will undoubtedly be subject to revision as more data come to light.

### Eastern Archaic and Old Copper

As with earlier time periods, we know much more about the Late Archaic from sites in Illinois than from eastern Iowa. In the American Bottom, near East St. Louis, McElrath et al. (1984) were able to define four successive Late Archaic phases: the Falling Springs phase (5000-4300 B.P.), the Titterington phase (4300-3900 B.P.), the Labras Lake phase (3900-3000 B.P.), and the Prairie Lake phase (3000-2600 B.P.).

Based on his excavations at Sand Run Slough (13LA38) and widespread examinations of surface collections, Benn (ed., 1987, 1988) has identified three Late Archaic point complexes in eastern Iowa. This lowest complex is similar to the Hemphill phase and is transitional with the Middle Archaic. It is characterized by side-notched Matanzas and Godar points, with more Osceola points, winged T-drills, and grooved axes. The complex has been dated at Sand Run to between 4140 and 4270 B.P. (Benn ed. 1988).

Benn's (ed., 1988:145) second Late Archaic point complex recognized in eastern Iowa seems to compare well with Titterington phase assemblages. It consists of "Wadlow, Karnak, Sedalia, Etle/Atalissa and Nebo Hill [point] types, with gouges, drills, heavy scrapers, axes and grinding equipment rounding out the inventory." The Titterington phase shares many traits with the Sedalia phase of eastern Missouri (Chapman 1975), and the two may, in fact, be synonymous. As McElrath et al. (1984:46) point out, "Clearly, the Sedalia and Titterington phases are related, if not equivalent, and cannot be completely separated. For historical reasons, both designations probably will be used until a definitive interareal comparative analysis is undertaken." They also point out that Titterington burial sites suggest that several ceremonial systems were operating in different regions during Titterington times. The Titterington/Sedalia phase also shares traits with the contemporary Nebo Hills phase of western Missouri (Reid 1983).

Collins (1991) has proposed a Titterington/Sedalia occupation of the Iowa River Greenbelt area on the Des Moines Lobe in Hardin County, north-central Iowa. This area falls into E. Henning's (1985)

Prairie Lakes Archaic region. E. Henning predicted that the Late Archaic in this region should have affinities with the Late Archaic of southern Minnesota. Collins' data do not support this hypothesis, demonstrating that the region, at least as far north as Iowa Falls, appears more closely related to the Eastern Archaic than to cultures to the north. This agrees with the findings of Benn and Rogers (1985), who found that Late Archaic artifacts in the Saylorville Lake region north of Des Moines also fit within the Titterington/Sedalia tradition.

Roper (1986) reports that the only diagnostic Late Archaic point found in Red Rock Reservoir during her 1984 and 1985 surveys, a Table Rock Stemmed point, does not fall within the Titterington/Sedalia tradition. In fact, she notes that, compared to data from Saylorville Lake (Benn and Rogers 1985) just upstream from Red Rock, Late Archaic sites in Lake Red Rock are surprisingly sparse. This may be a result of abundant wetland and gallery forest resources on the Des Moines Lobe, where Saylorville Lake is located. She postulates, based on pollen data (Kim 1986; Van Zant 1979), that the Hypsithermal may have continued until 3200 B.P. in Iowa and that, because of low environmental diversity in Central Iowa, high residential mobility may have persisted into the Late Archaic time period. She also postulates that "manifestations of major Late Archaic complexes were not present in central Iowa." Stanley et al. (1988) suggest that the paucity of Late Archaic sites in Red Rock may be due to biased survey coverage. Overstreet (1986, 1987) found a similar paucity of Late Archaic components in Coralville Lake in the lower Iowa River Valley. Only two Late Archaic components could be positively identified. Boszhardt and Overstreet (1983) located no Archaic sites in Navigation Pool 12, and Overstreet (1984, 1985) determined that any Archaic sites in Navigation Pools 10 and 11 would be deeply buried, below the current water table. Neither did Barnhardt et al. (1983) locate any Archaic sites on the Iowa side of the Mississippi River in Navigation Pool 16.

Recent investigations by Overstreet (1988) suggest that the so-called "Old Copper Complex" may have originated during this time period, or may have begun during Hemphill times. His investigations at the Osceola site, the "Old Copper" type site demonstrated that the site did not represent an "Old Copper" burial site at all, but that

inhabitants from nearby floodplain residential localities used the prominent knoll for disposal of human remains. . . Fully articulated burials, partial and perhaps more complete cremations, bundle reburials, and the variety of artifacts ranging from Archaic to Woodland times may simply reflect mortuary programs across an extensive temporal span. [Overstreet 1988:54-55]

Overstreet hypothesized that people in the Osceola site region were involved in trade through the Mississippi River with peoples to the north and to the south, involving copper, galena, and chert from Late Archaic through Middle Woodland times. Furthermore, Salzer (1986a) points out that investigations of North Bay and Nokomis phase Middle Woodland sites indicate that many of the copper artifacts previously connected with "Old Copper" actually date to Middle Woodland times.

The Osceola site lies just across the Mississippi River from Dubuque County, and occasional surface finds of copper artifacts in northeast Iowa caused E. Henning (1985) to define an "Old Copper" presence in northeastern Iowa. The Olin site (Ruppé 1954a) would seem to support this. In 1954, a copper pin, two Osceola type points, some logs, and bison, beaver, and caribou remains were dredged from

a sand quarry some 35 feet below the land surface near the Maquoketa River. However, the context of these materials appears suspect, and it seems unlikely that all these materials date to the same time periods. Caribou were not likely to have been in Iowa at the end of the Mid-Holocene Warm period (McKusick 1964a). It seems likely that copper artifacts were being traded into eastern Iowa during this and succeeding time periods.

Benn's (ed. 1988) third projectile point complex found in eastern Iowa conforms to neither the Labras Lake assemblage, which seems rather problematic, nor the Prairie Lake phase assemblage of the American Bottom (McElrath et al. 1984). It contains points present in each of these assemblages (e.g., Merom, Springley), but lacks other point types diagnostic of these two phases. Benn's (ed. 1988) complex consists of stemmed points like Table Rock, Durst, Springly, Robbins, Tipton, and Merom, and side-notched points like Fort Dodge and Conrad points. As this appears to be a time of increasing regionalization of point styles, it seems likely that Late Archaic complexes in eastern Iowa are more closely related to the Durst phase of Wisconsin, the tentative Logan phase of Illinois characterized by Springley Cluster points (Conrad 1986), and other complexes to the south and west. Stoltman (1986a) dates the Durst phase from 3200 to 2600 B.P., roughly contemporary with the Prairie Lake phase of the American Bottom, and sees a general shift in the manufacture of point types from side-notched forms to stemmed forms around 3200 B.P. Perhaps when stratified Archaic sites have been excavated in eastern Iowa, a similar trend will be observed there as well.

Toward the end of this phase, and continuing on into the Early Woodland period, a distinctive mortuary complex called Red Ocher developed in Wisconsin and spread over into northeastern Iowa (Stoltman 1986a). Although red ocher had been found associated with burials dating to earlier time periods, the Red Ocher complex represents a distinctive artifact assemblage, consisting of exotic Wyandotte Chert (formerly Indiana Hornstone), ovate cache blades, copper beads, awls, celts, knives, and points, birdstones, gorgets, bannerstones, grooved axes, and marine shell necklaces, as well as Turkey Tail projectile points. The complex appears to date to between 3000 and 2000 B.P. (Stoltman 1986a).

Burial complexes such as "Old Copper" and Red Ocher represent the first evidence for status differences between individuals and the growing development of social complexity. It is likely that such status differences were achieved, and not ascribed. Such complexes were likely widespread ceremonial complexes shared by many distinct social groups, and portend later Woodland period developments culminating in the Middle Woodland Hopewell Interaction Sphere (Struever 1964a). By the end of this period, the construction of mounds over mortuary areas had begun, long considered to be one of the defining characteristics of the succeeding Woodland period. Several Red Ocher burials have been excavated in northeastern Iowa (Beaubien 1953; Logan 1976; McKusick 1964b; Green and Schermer 1988), but all appear to date to the later part of this complex and are Early Woodland in cultural affiliation.

#### Prairie/Plains and Prairie Lakes Late Archaic

As stated earlier, lifeways on the Plains seem to have changed little throughout the Archaic (W. Wedel 1961; Fagan 1991). In fact, Anfinson (1987) points out that using the term Archaic on the Plains is misleading because of its implications about increasing sedentism

and complexity in the East. In the Prairie Lakes region of Minnesota, South Dakota, and Iowa, he refers to the Late Archaic time period as the Late Middle Prehistoric. On the Plains, as in earlier time periods, subsistence appears to remain centered on bison hunting. Social groupings appear to have remained scattered bands of semi-nomadic bison hunters, supplementing their diet with smaller game and gathered wild plant foods (Fagan 1991). Johnson and Wood (1980), however, point out that Eastern Plains Archaic sites in river valleys demonstrate a more Eastern Archaic adaptation, with deer hunting, fishing, and nut and seed collecting. It is likely that such a pattern existed in western Iowa river valleys during the Late Archaic, but the only excavated Late Archaic site in western Iowa is a mortuary site and is not informative about subsistence or settlement strategies. However, the fact that deer bone is present may be significant (D. Anderson et al. 1978).

The Lewis Central School site (13PW5), dated at 2815±80 B.P., is the only major excavated Prairie Plains Late Archaic site in Iowa (D. Anderson et al. 1978), and it was instrumental in the development of Iowa's current burial law. In this Archaic ossuary just south of Council Bluffs in Pottawattamie County, the remains of a minimum of 25 individuals were recovered from redeposited loess approximately 3 m below the current surface of an alluvial terrace of the Missouri River. Additional bones had been removed by heavy equipment at the time of the site's discovery. Most of the artifacts recovered were associated with a single individual: burial 2. This 45-55 year old male was found partially flexed, and incomplete. Associated artifacts included a side-notched point, an ovoid knife, an endscraper, a broken biface, 3 unworked flakes, an antler beam with the brow tine removed, a bone awl, and a shaped mussel shell (D. Anderson et al. 1978). Other artifacts recovered included two large side-notched points, an antler tine, several unworked flakes, three awl fragments, a small side-notched point, a drill, and a quartz scraper. Ten unworked mussel shells were also recovered, as was a small clinker.

Burials consisted of both articulated remains and bundle burials. Of the 11 identified individual burials, only two were female. There was no evidence that any of the burials were intrusive, and the authors interpreted the burials as representing a single burial event. The authors hypothesized that the site represented evidence of a cyclical burial event where scattered bands of hunter-gatherers gathered together to construct an ossuary, thereby reinforcing group solidarity and identity, similar to Red Ocher ossuaries and Woodland mounds to the east. They suggest that such an event could be connected with a time of plentiful food resources, such as a communal bison hunt, or the harvest time of a particular plant food (D. Anderson et al. 1978).

Reid (1983) extends the Nebo Hill phase of northwestern Missouri into extreme southwestern Iowa, based on the location of site 13PA8 in Page County. This site, located on a ridgetop overlooking the Nodaway River, consisted of a cache of 30 Eteley Stemmed and Sedalia Lanceolate points made of Burlington Chert. The Nebo Hill phase appears to date between 4300 and 2600 B.P., making it contemporary with the Titterington/Sedalia phase, and later phases. It is characterized by Nebo Hill points, bifacial hoes, bifacial gouges, rectangular and ovate manos, rectangular celts, three-quarter grooved axes, and fiber-tempered pottery, long one of the defining characteristics of the ensuing Woodland period. This is the earliest pottery yet found in the Midwest. None has yet been found in Iowa, and, while it is likely that other Late Archaic groups in the Midwest were manufacturing and using fiber tempered pottery, it has not survived or yet been

discovered. Fibers identified as temper include big bluestem (*Andropogon gerardi*), switchgrass (*Panicum virgatum*) and probably bulrush (*Scirpus* sp.) (Reid 1983).

Faunal remains recovered from Nebo Hill sites include deer, fish, turtle, duck, and squirrel. Floral remains, so far, are limited to black walnut (*Juglans nigra*), and Chenopodium seeds. So far, no evidence has been recovered of the use of cultigens by Nebo Hill people. The settlement pattern appears to include small low density sites on alluvial terraces, large high density sites on interfluvial summits, and, possibly, narrow earthen mounds with extended burials and exotic bifaces. Reid (1983) notes that Osceola, Sedalia, and Eteley, are commonly found as caches and at mortuary sites, but they are rare in campsites. He postulates that these points are prestige items, possibly indicating participation in an eastern Late Archaic interaction sphere.

In the Prairie Lakes region of Minnesota, South Dakota, and Iowa, Anfinson (1987) defines the Mountain Lake phase during the Late Archaic time period. According to the Anfinson (1987), settlement during this time period consisted of major habitation sites on peninsulas and islands in prairie lakes. He suggests that this lacustrine orientation allowed increased sedentism. Subsistence appears still dominated by bison, although remains of fish, small mammals, turtle, and waterfowl are represented. There is no evidence for an increasing reliance on plant foods, no intensive nut collecting, and no evidence of the use of cultigens. Nor is there any indication of major base camps located in river valleys. No copper has been reported from Mountain Lake phase sites. The lithic assemblage consists of small lanceolate and stemmed points and medium side-notched points similar to those found to the east on the Prairie Peninsula, endscrapers and sidescrapers, and retouched and utilized flakes, as well as some ground stone. There is little evidence as to burial patterns, but Anfinson (1987) believes that they are probably single interments similar to the Turin burials (Fisher et al. 1985). It is Anfinson's belief that this adaptational pattern remains largely unchanged in the region throughout Woodland times until the introduction of maize horticulture around A.D. 900.

Anfinson (1987) includes the Arthur site (13DK27) within the Mountain Lake phase although the Late Archaic/Early Woodland occupation of the site is very sparse (Tiffany, ed. 1982). Although probably associated with the Late Woodland occupation of the site, the faunal assemblage fits in well with Anfinson's Mountain Lake pattern. Mammalian remains included bison, wapiti, deer, possibly antelope, dog, mink, otter, raccoon, rabbit, muskrat, and beaver (Semken 1982). Fish were represented by gar, pike, pickerel, muskellunge, bullheads, catfish, bass, sunfish, bluegills, pumpkinseed, crappies, perch, walleye, bowfin, drum, minnows, and suckers (Vondracek and Gobalet 1982). Plant remains were sparse but included several species possibly utilized by the site's inhabitants. These included vervain (*Verbena stricta*), wartweed (*Euphorbia maculata*), grape (*Vitis riparia*), lambsquarter (*Chenopodium* sp.), thistle (*Cirsium* sp.), knotweed (*Polygonum* cf. *aviculare*), and milk-vetch (cf. *Astragalus*) (Sullivan et al. 1982). Nearly all the species present could be easily located within a short distance of the site's location on the shore of lake East Okoboji, and conform well with Anfinson's (1987) Mountain Lake lacustrine orientation.

Tiffany (1982a) interprets the site as representing a seasonal camp for foraging, fishing, and hunting. He suggests that it was probably utilized in the spring and early summer, with the occupants seeking shelter in river valleys during the winter. Perhaps future investigations of buried site contexts in Corrington Member alluvial fans, and Gunder



and Roberts Creek Member terraces will reveal the remains of such winter settlements. As noted earlier, Collins (1991) reported a Titterington/Sedalia presence in the Iowa River Valley on the eastern edge of the Des Moines Lobe. He also reports an increase in the number of upland sites, interpreted as limited activity sites for exploiting localized upland resources. It may be that groups inhabiting the eastern and southern portions of the Prairie Lakes region were more influenced by groups to the south and east than by their neighbors to the north.

Benn and Rogers (1985) also describe Titterington/Sedalia materials from the Saylorville Reservoir in the Des Moines River Valley, near the southern edge of the Des Moines Lobe. Excavations at site 13PK149 (Darr-es-Shalom) and 13BN103 revealed buried Late Archaic horizons (Osborn and Gradwohl 1981;1982). The lowest cultural level at 13BN103, dated at 3610 B.P., produced medium sized, parallel stemmed projectile points and pit features. Level 8 at 13PK149, dated between 3145 and 3095 B.P., contained pit features with clam shells, bone fragments, charcoal flecks, and unworked stone. No diagnostic points were recovered from this horizon, however. Level six, dated to 2670 B.P., produced more features and a possible shelter. This level produced large to medium sized stemmed or shallowly notched points similar to those found with the Lewis Central School burials (D. Anderson et al. 1978). Osborn and Gradwohl (1982:279) conclude that:

From the evidence at hand, the people of the Archaic tradition in the central Des Moines River Valley subsisted primarily by hunting large mammals such as deer, elk, and possibly bison, in addition to gathering nuts and seeds and collecting freshwater mussels, turtles, and other riverine resources. Some degree of seasonal sedentism appears to be reflected in the hearths and trash-filled pits discovered in the lowest cultural zones at 13PK149 and 13BN103.

This description would seem to match more closely Late Archaic cultural patterns to the east and south, or perhaps the Kansas sites discussed by Johnson and Wood (1980), than the Mountain Lake pattern described by Anfinson (1987). It seems likely that, at least along the major river valleys, eastern Archaic patterns of subsistence and settlement prevailed. With further research, E. Henning's (1985) Prairie Lakes Late Archaic area may need to be revised.

## Wisconsin

The paucity of dated stratified sites in Wisconsin has made it difficult to establish any tight regional chronological controls for the Archaic, as well as for other time periods. Furthermore, the few stratified sites which have been described were formed or excavated in such a way that stratigraphic and intrasite relationships are not always clear. The temporal and cultural subdivisions for the Archaic in Wisconsin derive in large part from sequences that have been worked out in neighboring states.

The Archaic is recognized as a long time period during which human groups exploited diverse resources across a variable landscape. Hunting activities focused on deer and a variety of small mammals and collecting included fish, shellfish, nuts, and seeds. Evidence for domestication of some native plants is known from other parts of the Midwest and can be expected to exist in Wisconsin Archaic as well. Settlement-subsistence patterns changed from an apparent focus on wide range foraging and targeting of large game, to more localized collecting territories which included a variety of plant and animal

resources. Evidence for the use of communal burial areas or cemeteries is abundant during the Wisconsin Archaic.

In Wisconsin, Archaic sites are identified through the presence of various side-notched and stemmed projectile points, ground stone tools such as three-fourths- and full-grooved axes, and a variety of copper tools. Some authors also define the Archaic based on the absence of other attributes such as pottery and burial mounds (Stoltman 1986a).

The chronologies proposed for the Archaic in Wisconsin have been based on stylistic changes in projectile point forms, a few stratigraphic excavations, and data from unstratified, multicomponent sites. The standard Midwestern tripartite division of the Archaic into Early, Middle, and Late is often applied to Wisconsin materials, but there is little consistency found in the dates and material culture applied to each unit. One widely disseminated Wisconsin Archaic chronology (Stoltman 1986a) bears little resemblance to other Midwestern chronologies. A subsequent revision by the same author (Stoltman 1992b) is also at variance with chronologies for neighboring states (Table 3). While it might be expected that the Wisconsin chronology would vary from those to the south and west due to climatic differences and/or time transgressive cultural processes, the radiocarbon record for Wisconsin Archaic is limited. It seems more judicious at this point to accept dates from carefully excavated and well stratified sites in neighboring states to provide a general time framework for the Wisconsin materials (Brown and Vierra 1983; Ahler 1993; Lovis and Robertson 1989). For the present purposes, we suggest the Archaic period can be divided into Early Archaic (9500 - 8000 B.P.), Middle Archaic (8000 - 4500 B.P.), and Late Archaic (4500 - 2500 B.P.).

### Early Archaic (9500 - 8000 B.P.)

The Early Archaic appears to be contemporary with Late Paleoindian. Wisconsin archeologists distinguish the two cultural traditions by the form of the spear or projectile points, with Late Paleoindian points characterized as lanceolate or stemmed and Early Archaic points characterized as side notched or corner notched. It is not clear what the temporal and spatial relationships are between Late Paleoindian and Early Archaic materials. The points are often found together in mixed contexts (Wendt 1985). At sites where stratigraphic relationships are evident, Early Archaic materials are never earlier than Late Paleoindian (Mason 1981). A few Wisconsin area sites have produced Late Paleoindian and Early Archaic points in contemporary burial contexts (Mason and Irwin 1960; Buckmaster and Paquette 1988; Meinholz and Kuehn 1996). Some Early Archaic point types such as Hardin Barbed may be variants of Late Paleoindian forms such as Scottsbluff (Behm 1981; Luchterhand 1970). Wisconsin Early Archaic point types include bifurcate base varieties, Thebes, Hardin Barbed, Dovetail, and others. Early Archaic point forms often have beveled blades which may reflect a tool resharpening technique.

Early Archaic hunter/gatherers have been characterized as deriving from the woodland environments of the Southeast, in contrast with the more Plains-oriented, big game hunting tradition of Late Paleoindian (Mason 1981). Spatial analyses of Late Paleoindian and Early Archaic projectile point distributions in Illinois suggest that both groups may have focused on hunting deer in the uplands during the winter season (Luchterhand 1970). Early Archaic sites have not been reported in alluvial valleys or rockshelters in Wisconsin, but this may be only because such early Holocene land surfaces have not been

identified and excavated (Stoltman 1992b). Cultural materials from the lower levels of the Raddatz Rockshelter may be Early Archaic in age, but neither temporally diagnostic tools nor radiocarbon samples were recovered (Wittry 1959a).

Early Archaic sites are known primarily from surface finds of diagnostic projectile points across the state (Flick and Goldstein 1993; Stoltman 1992b; Boszhardt 1990; Barth 1985; Harrison 1991). Diagnostic points are often found in well drained, upland settings, and are rare to absent in rockshelters and alluvial valleys (Stoltman 1992b). In southeast Wisconsin Early (and Middle) Archaic sites tend to be located near small, secondary streams on higher elevations than later sites (Goldstein and Flick 1993:189).

Early Archaic materials have been found in excavations, but seldom in a context which allows for the clear definition of an Early Archaic zone or component. In Southeast Wisconsin, Early Archaic points have been recovered from the Mile Long site (Overstreet and Bruhy 1979), 47 Kn-36/134 (Overstreet 1987) and 47 Je-463 (Goldstein 1979). The Bass site (47 Gt-25), located in the uplands of southwestern Wisconsin, is an extensive, single component Early Archaic site which has been test excavated (Stoltman et al. 1984). Extensive surface collections from the Bass site revealed numerous Hardin points, and test excavations revealed quarry and workshop debris. In northwest Wisconsin the Deadman's Slough site (47 Pr-46) produced Early Archaic bifaces in association with a late Paleoindian occupation (Meinholz and Kuehn 1996).

### Middle Archaic (8000 - 4500 B.P.)

By Middle Archaic times, the Mid-Holocene warming trends were transforming the landscape across the Midwest. In Wisconsin variations in regional rainfall and localized climatic fluctuations affected both postglacial lake levels and vegetation. At the beginning of the period, the Chippewa and Houghton low lake levels were manifest in the Lake Michigan and Lake Superior basins. Around 5500 B.P. isostatic rebound raised the North Bay outlet and the basins began to fill with water. Postglacial lake Nipissing drained through the Chicago and Port Huron outlets and reached a maximum altitude around 4500 B.P. The Nipissing transgression extended across the Huron, Michigan, and Superior basins. Lake level fluctuations during this time were affected

not only by exposure and incision of outlets, but also by climatic fluctuations which produced variations in rainfall across the basin drainages.

Vegetation changes across Wisconsin during the Middle Archaic suggest the area was moister than other parts of the Midwest during much of the Mid-Holocene warming episode. The mesic deciduous forest of southern Wisconsin included both oak and elm until around 5500 B.P. This was also a period of stable floodplains in western Wisconsin. Drier conditions from 5500 to 3400 B.P. produced a decline of elm and the dominance of oak and xeric stands of oak with prairie openings in the south. In northern Wisconsin, the pine forest exhibited fluctuating composition and boundaries during this period. After spreading across most of Wisconsin from the east by 8000 B.P., the southern margin of pine retreated to the northeast until 6000 B.P. and then shifted to the west into southern Minnesota. By 6000 B.P. the pine was associated with a mixed deciduous forest including maple and birch.

As previously discussed, defining Middle Archaic cultural materials in Wisconsin is problematic due to a paucity of stratified sites and classification disagreements among archeologists. Based on controlled excavations at stratified sites in Illinois and elsewhere, Middle Archaic sites can be expected to produce a variety of large side-notched, corner-notched, and stemmed projectile points. Within this Archaic series Table Rock Stemmed, Godar, and Matanzas points have been identified from Wisconsin surface collections (Stoltman 1992b; Barth 1985).

A more commonly identified cluster of Archaic projectile points in Wisconsin, however, is the side-notched series of Raddatz, Osceola, and Madison. These point types have been identified by various authors as Middle Archaic, Late Archaic, and Woodland. The point types have been found on unstratified, multicomponent sites in all parts of the state. Raddatz points were initially identified in stratified rockshelter deposits in south-central Wisconsin (Wittry 1959a, 1959b). According to Wittry's formulations, Raddatz points are quite variable in size, shape, and workmanship, but generally are large, have straight bases, U-shaped notches, lanceolate blades, and basal grinding. Osceola points were found by Ritzenthaler in what he identified as a burial pit at the Osceola site in southwestern Wisconsin (Ritzenthaler 1946). The points are larger and more finely made than Raddatz and

Table 3. Selected Archaic chronologies for Wisconsin, Illinois, and Michigan.

Date BP	WI (Stoltman 1992b)	WI (Stoltman 1986a)	IL (Brown and Vierra 1983)	IL (Ahler 1993)	MI (Lovis and Robertson 1989)
11,000	Early Paleo 9500-8200 B.C.				
10,000	----- Late Paleo and Early Archaic				
9,000	8000-6000 B.C.	-----	----- Early Archaic	----- Early Archaic	
8,000	-----		-- 7000-6500 B.C.	-- 6500-6000 B.C.	
7,000	Middle Archaic 6000-	Early Archaic 6500-3000 B.C.	Middle Archaic 6300-3000 B.C.	Middle Archaic 6000-3000 B.C.	-----
6,000	1500/1200 B.C.				Middle Archaic 5000-2500 B.C.
5,000		-----	-----	-----	
4,000		Middle Archaic 3000-1200 B.C.	-----	Late Archaic 3000-1500 B.C.	----- Late Archaic
3,000	----- Late Archaic	----- Late Archaic	----- Late Archaic	----- later Late Archaic	-- 2500-1500 B.C. Terminal Archaic
2,000	1500/1200- --- 300 B.C.	1200-800/0 B.C.	-- 2000-1000 B.C.	--- 1500-600 B.C.	--- 1500-500 B.C.

may represent better made or less utilitarian grave-goods. The context of the Osceola burials and points is questionable, however, and the site appears to be multicomponent and disturbed (Overstreet 1988). Madison side-notched forms have broader blades and smaller notches set closer to the base than Raddatz points (Baerreis 1953a). Madison side-notched points have been reported from unstratified, multicomponent sites throughout Wisconsin and are usually classified as Late Archaic (or sometimes Woodland) in age. Forms resembling Madison side-notched have also been found in Late Archaic burial contexts in eastern Wisconsin at the Oconto site (Ritzenthaler and Wittry 1952) and the Reigh site where they were classified as knives and projectile points (Baerreis et al. 1954). Stoltman has recently suggested that all three point types can be considered variants of Raddatz (Stoltman 1992b).

There is considerable disagreement over the age of the Raddatz point cluster. Wittry used a single radiocarbon date of  $5200 \pm 400$  B.P. (3250 B.C.) (M-813) from a pit feature containing only corner notched points to date the beginning of the Raddatz point series at Raddatz Rockshelter (47 Sk-5) (Wittry 1959a; Boszhardt 1977). The large (2 x 3 m), shallow (0.5 m) pit feature originated in an excavation level which also contained a few Raddatz and straight stemmed points. The vast majority of the Raddatz points, however, were found in excavation levels above the pit feature origins. There is no description of in situ burning associated with the large pit feature, and it is unclear what the dated charcoal sample represents.

A second radiocarbon date at Raddatz Rockshelter from wood charcoal in an ash lens dates to  $1380 \pm 200$  B.P. (A.D. 570) (M-784) (Wittry 1959a; Boszhardt 1977). Two Raddatz points were associated with the ash lens and 16 Raddatz points in total were recovered from this excavation level. Wittry believes the date is much too recent for the Archaic materials associated with the Raddatz horizons.

Wittry concluded that the Raddatz occupation is Middle Archaic because it is stratigraphically earlier than the smaller, Durst stemmed points which he considered to be Late Archaic in age. He also accepted the 5200 B.P. radiocarbon date as representing the age of Raddatz points. Although Wittry found a similar stratigraphic sequence in several other Wisconsin rockshelters with Raddatz predating Durst, no other radiocarbon dates were obtained (Wittry 1959b). Durst stemmed points are generally agreed to be terminal Late Archaic in age, but they have also been found in Middle Woodland contexts in Wisconsin (Freeman 1969).

More recent excavations have been conducted at three southwest Wisconsin rockshelters (B. Lawrence I [47 Ve-154], Governor Dodge [47 Ia-1], and Brogley [47 Gt-156]) The excavations at Lawrence and Governor Dodge have produced a series of radiocarbon dates on wood charcoal apparently associated with Raddatz materials (Halsey 1976; Stoltman 1986a; Boszhardt 1977, 1982). The dates range from  $3820 \pm 65$  to  $3090 \pm 260$  B.P. (see Boszhardt 1977, 1982), which places them firmly within a Late Archaic time range. One slightly earlier date (Wis 368,  $4170 \pm 65$ ) was from a mixed sample of bone and charcoal (Bender, Bryson and Baerreis 1970:336). Stoltman and some others consider these dates to be Middle Archaic in age (Stoltman 1986a, 1992b; Finney et al. 1992). Excavation of the Archaic horizons at Brogley Rockshelter produced a slightly earlier suite of dates ( $4785 \pm 65$  -  $4145 \pm 65$ ), but the cultural assemblage has not been described (Boszhardt 1977; Tiffany 1974; Emerson 1979). Unfortunately, descriptions of the archeological context of these three rockshelters have not been published.

Raddatz points have also been found at excavated, unstratified, habitation sites in southern Wisconsin, but the sites are multicomponent and it has been impossible to achieve tight chronological controls or define cultural associations in these contexts. Excavated multicomponent habitation sites with in situ Raddatz material include Gillen 9 (47 Ve-177) (Halsey 1974b) Price I and Price II (Halsey 1974b; Freeman 1966), Markee (47 Ve-195) (Halsey 1974a), and Bobwhite (47 Ri-185) (Finney et al. 1992). At some of these sites, the Raddatz materials appear to be associated with Woodland materials (Freeman 1966; Halsey 1974b).

Two radiocarbon dates from the Bobwhite site illustrate the frustrations of trying to assign clear temporal parameters to Archaic sites in Wisconsin. The site consisted of a cluster of basin shaped pits and a few fire-cracked rock features. Culturally diagnostic artifacts included Raddatz points and Late Woodland pottery. Feature I, a small basin shaped pit feature produced a radiocarbon date of  $2970 \pm 60$  B.P. (1020 B.C.) (Late Archaic), but contained no culturally diagnostic artifacts. Feature 24 was a large, complex pit feature which included two Raddatz points, a copper bracelet, a bannerstone, and fragmentary remains of a human tooth. Wood charcoal from the pit dated to  $1020 \pm 55$  B.P. (A.D. 930) (Late Woodland). The excavator concluded that the wood charcoal was intrusive from the Late Woodland occupation of the site, but that the human remains and artifacts were associated with the Archaic component (Finney et al. 1992).

Several burial sites have also been classified by some archeologists as being Middle Archaic in age (Stoltman 1986a). In particular Stoltman describes the "Old Copper" cemeteries at Osceola and Oconto, along with the multitude of unproven copper tools from eastern Wisconsin as being Middle Archaic. Many other Wisconsin archeologists consider these materials, along with the Raddatz point cluster, to be Late Archaic in age (Mason 1981; Flick and Goldstein 1993; Overstreet 1992; Mason and Mason 1961). Archaic burial sites and Old Copper will be discussed under Late Archaic in this paper.

Based on information from other parts of the Midwest, there are certain trends and associations we might expect to find with Wisconsin Middle Archaic. The tool assemblage will include grinding stones, ground stone axes, pestles, drills, scrapers and bone tools. Subsistence will focus increasingly on nuts and seeds, and gourds may be used as containers. While deer are likely to provide the major portion of animal resources, small mammals, migratory waterfowl, and fish may increase in importance. Human burials can be expected with habitation sites and also possibly on high positions of the landscape.

In other parts of Midwest during Middle Archaic, we begin to see the establishment of collecting territories, the first base camps, and trends toward sedentism. While these trends are seen by some as response to the drier climate of the Hypsithermal and the restriction of diverse resource zones to major river valleys, others view the changes as a complex response to increased packing of human groups in linear resource zones (Brown and Vierra 1983; Styles et al. 1983; Brown 1986). In Wisconsin, however, the landscape, climate, and water resources are substantially different from the riverine-prairie sections of the Midwest, and these trends are not evident in the archeological record. Some authors suggest that a historic aboriginal pattern of warm season use of large floodplains and winter occupation of interior hunting camps can be projected backward into the Woodland period and even to Middle Archaic times in Wisconsin (Theler 1987; Finney et al. 1992). In this model interior rockshelters are interpreted as winter camps, open floodplain sites and sites with burials are warm season

occupations, and rockshelters close to large rivers may have been used in all seasons (Emerson 1979; Finney et al. 1992).

Whatever Middle Archaic is in Wisconsin, it has not been well defined in excavated rockshelters, cemeteries, or open habitation sites. It may be possible to locate well preserved Middle Archaic sites in alluvial or colluvial contexts in the riverine and unglaciated sections of western Wisconsin. Middle Archaic sites associated with post glacial lake shores may also be found in presently inundated contexts in Lakes Michigan and Superior. Late Middle Archaic sites may also be preserved along the margins of wetlands throughout the state.

### Late Archaic (4500 -2500 B.P.)

During the Late Archaic in Wisconsin the climate shifts from a warming and drying phase to a cool, moist phase. The Mid-Holocene warming and drying in Wisconsin begins at 5500 B.P., substantially later than elsewhere in the Midwest, and lasts until about 3500 B.P. (Winkler et al. 1986; Baker et al. 1992). During this time a xeric oak forest, possibly with prairie openings, is present in the southern part of state. Subsequently, cooler and moister conditions produced a closed oak forest in the south and a southward expansion of elements of the northern conifer-hardwood forest (Baker et al. 1992).

Lake level fluctuations in Lake Superior and Lake Michigan during the Late Archaic have recently been tied to climatic variations which produce variable rainfall in their drainage basins, as well as to variations of lake outlet elevations due to isostatic rebound (Larsen 1985a, 1985b; Hansel et al. 1985). High lake levels associated with postglacial Lake Nipissing occurred at 4500 and 4000 B.P., and Lake Algoma reached a maximum approximately 3200 B.P. The elevations of the relict shorelines associated with these high lake levels varies across the lake basins due to differential uplift of the land surface following deglaciation.

In northern Wisconsin and the Upper Peninsula of Michigan aceramic sites associated with relict Lake Michigan and Lake Superior shorelines suggest that Late Archaic peoples were exploiting a variety of coastal and wetland resources. Limited activity sites reflecting the production of flakes and fire are located to maximally exploit spawning fish and other resources (Anderton 1993; Benchley et al. 1988).

The Late Archaic period in Wisconsin is renowned for its Old Copper culture or complex. First proposed as a separate complex or industry by McKern (1942), Old Copper is noted for its utilitarian copper tools including spear points, knives, ulus, axes, celts, chisels, wedges, awls, and fishhooks, as well as ornaments such as beads, bracelets, rings, and crescents. Aboriginal copper mines and associated mining implements have been identified in northern Wisconsin and Upper Michigan. Unfortunately, most Old Copper implements have been found by amateurs, and their archeological context is unknown. Consequently, the age, associations, function, and meaning of the artifacts are also unclear. The age of Old Copper is usually considered to be Late Archaic (Mason 1981), although some archeologists prefer to call it Middle Archaic (Stoltman 1986a). The presence of copper workshops and tools on Middle Woodland sites in northern Wisconsin, however, suggests the Old Copper tools may not be associated with a single time period or cultural tradition (Salzer 1969, 1974, personal communication).

Even though the majority of known copper tools have been found by amateurs as surface finds or in uncontrolled excavations, the materials have been used by professionals in a number of

distributional, stylistic, and use wear studies (Wittry 1951; Penman 1977). Old Copper tools have been reported primarily in eastern Wisconsin (Wittry 1951). Recent compilations, however, suggest that copper tools may also be abundant in northern Wisconsin, but the wooded conditions of the region may make the artifacts more difficult to locate (Harrison 1991). The presence of copper tools along the Lake Michigan shoreline has suggested to some investigators that the materials postdate Nipissing Lake levels and should therefore be considered Late Archaic in age (Mason and Mason 1961). Unfortunately, the absence of copper and Old Copper diagnostic tools in stratified rockshelters in Wisconsin makes it particularly difficult to tie Old Copper into a regional chronological sequence.

Old Copper tools and ornaments have been found in a few Archaic cemeteries. The three best known "Old Copper" cemeteries are the Osceola, Oconto, and Reigh sites. Even in these contexts, however, the age and associations of old copper artifacts are not entirely clear.

The Osceola site (47 Gt-24) is located in western Wisconsin along the Mississippi River in Grant County. It is well outside the concentration of Old Copper sites in eastern Wisconsin. The site was first excavated by Ritzenthaler in 1945 (Ritzenthaler 1946), and the remains of the site area were recently investigated by Overstreet (Overstreet 1988). Ritzenthaler excavated what he believed to be a 20 x 70 foot burial pit which was eroding out of the bank of a sandy terrace. The site was being actively collected by local amateurs at the time of Ritzenthaler's visit, and it is not clear from his report what material came from his controlled excavations and what was from local collections. He reported finding a variety of copper and stone tools as well as pottery throughout the dark pit fill and especially concentrated in the burial layer at the bottom of the pit. In a later evaluation, Ritzenthaler concluded that the Woodland era pottery was probably out of context, since it should not have been found with Archaic burials (Wittry and Ritzenthaler 1956).

The burials at Osceola were secondary, bundle burials and cremations in a layer at the bottom of the large pit. Ritzenthaler did not identify any individual graves or smaller pit features, although he did note that three burials were capped with rocks. No artifacts were associated directly with any burial. A  $^{14}\text{C}$  date on human bone (M643) produced a date of  $3450 \pm 250$  B.P. (1500 B.C.) (Ritzenthaler 1958). A single flexed burial was found in an area of "intrusive" Woodland artifacts near the margin of the pit. The copper material Ritzenthaler reported from his excavations (and possibly from local collections) includes 21 awls, six socketed spuds, two socketed points, one tanged knife, conical points (one illustrated), beads (one illustrated), one bracelet, one hook, and one ring. Stone tools included finely made side-notched "Osceola" points (seven illustrated), side-notched drills (two illustrated), and scrapers (one illustrated). Pottery fragments were grit tempered and cordmarked. Ritzenthaler did not record the number of burials excavated, but he estimated that 500 may have been interred originally. He mentioned only four skulls from his excavations.

Overstreet's reexamination of the Osceola site and the Potosi terrace region demonstrated that the archeology is far more complex than Ritzenthaler documented. There were multiple occupations of the terrace in Archaic and Woodland times, and natural as well as cultural processes have disturbed and mixed the deposits in many areas. By examining archival data for the area, Overstreet found that Ritzenthaler's excavations had been on a knoll along the terrace edge. The topography of the knoll suggested to Overstreet that it included

two Woodland mounds (Overstreet 1988:54) and had probably been a mortuary area throughout the Archaic and Woodland occupation of the terrace. The "pit" described by Wittry may have been mound fill. In examining Ritzenthaler's materials, Overstreet's team found the remains of a minimum of 16 individuals from the burials (Pfeiffer 1988), far short of the 500 estimated by Ritzenthaler. Overstreet obtained a  $^{14}\text{C}$  date on charred human bone from Ritzenthaler's collection of  $4080 \pm 70$  B.P. (2130 B.C.), which is consistent with a Late Archaic affiliation and with Ritzenthaler's date for the cemetery.

The Oconto site (47 Oc-45) is located in eastern Wisconsin on a sand and gravel terrace along the Oconto River west of Green Bay in Oconto County. The cemetery, which was being impacted by a gravel quarry, was excavated by Wittry and Ritzenthaler in 1952 (Ritzenthaler and Wittry 1952). Numerous post molds were found in the cemetery, but no structure patterns could be discerned. The remains of 45 individuals were recovered from 17 graves and seven cremation pits. Body positions included extended, flexed, and bundle reburials. Only two graves showed evidence of superpositioning. Eight graves and two cremations had associated artifacts. The only copper directly associated with graves was one fishhook, and three flat pieces identified as crescents or spatulas. Other grave associations included a chert side-notched point, one chert scraper, two antler tips, one bone awl, an incised swan bone whistle, and turtle and duck bones. Additional artifacts not associated with graves and from amateur excavations at the site included chert side notched points, perforated pond snail beads, *Unio* and whelk shell fragments, and numerous copper items including awls, socketed point, fishtail point, crescent knife, crescent ornament, bracelet, spiral tube, and three clasps. The side-notched points from Oconto were generally triangular in shape, with shallow notches set close to the base. They do not resemble the finely made lanceolate side-notched *Osceola* points from the west side of the state.

The radiocarbon record from Oconto is controversial due to the generally early dates. Two samples from the original excavation were from wood charcoal. One sample (C836) was from a cremation pit which included two copper spatulas (Wittry and Ritzenthaler 1956) and dated to  $5600 \pm 600$  B.P. (3650 B.C.) (Boszhardt 1977). A second date was run on combined samples from a cremation pit containing no artifacts (C837) and a nonburial feature containing charcoal and an antler tip (C839) (Wittry and Ritzenthaler 1956). The combined sample dated to  $7510 \pm 600$  (5560 B.C.) (Boszhardt 1977). A third bone sample from a burial feature was submitted subsequently and dated to  $4540 \pm 400$  (2590 B.C.) (Ritzenthaler 1970b; Boszhardt 1977, 1982). The bone date seems to be more in line with other Old Copper dates than the two original dates for Oconto. In addition, the altitude of the site places it lower than the Lake Nipissing high water, and since there is no indication of inundation of the burials, the site probably dates later than the Nipissing high water, or after 4000 B.P. (Mason and Mason 1961).

The Reigh site (47 Wn-1) was excavated by Baerreis and others in 1953 (Baerreis et al. 1954) and was subsequently investigated by several avocational archeologists in the 1950s (Ritzenthaler et al. 1957). It is located in eastern Wisconsin on a gravel ridge overlooking Lake Butte des Morts in Winnebago County. The site was being impacted by a sand and gravel quarry. Reigh is a multicomponent site consisting of an Archaic cemetery and a subsequent Woodland occupation. In the Baerreis excavation, a complex array of burial types was found with frequent superpositioning of graves. Baerreis recovered 43 individuals

from approximately 17 graves and two cremations. Primary burials were in extended and flexed positions, and secondary burials were often complex bone masses. The only copper items associated with the Baerreis burials consisted of conical points, beads, and a delicate copper headdress. None of these artifact types are solely diagnostic of the Old Copper complex. Chert side notched points and knives similar to those from the Oconto site were also associated with burials. Other associated items included antler conical points, crane bills, incised swan humerus tubes, owl leg bones, elk antler axe handles (without the copper or stone bits), a conch shell sandal sole gorget, shell disc beads, and hematite with grinding facets. One burial apparently contained red ocher in the grave fill.

The graves excavated by amateurs at Reigh are less completely documented (Ritzenthaler et al. 1957), but included copper material more characteristic of the Old Copper complex. Copper items from Reigh included crescent and socketed knives, chisel, celts, awls, crescent ornaments, elaborate beaded necklaces, a clasp for a shell bracelet, and stemmed points. Also found were antler points, *anculosa* and marine shell beads, an elk antler axe handle, antler points, chert side-notched points, hammerstones, and several graves with heavy red ocher staining.

There is some disagreement over the age and cultural affiliation of the Reigh site in the literature. The presence of a sandal sole gorget led some investigators to classify the site as Glacial Kame, a Late Archaic/Early Woodland manifestation more common to the east of Wisconsin (Baerreis et al. 1954; Ritzenthaler 1958). Others (Crane and Griffin 1959) believed it represented a mixture of Old Copper and Glacial Kame. The radiocarbon record for Reigh consists of one date on bone (M644) of  $3669 \pm 250$  B.P. (1710 B.C.) (Ritzenthaler 1958). This fits well within the Late Archaic age range and seems appropriate for an Old Copper cemetery.

Another Late Archaic cemetery has been described in western Wisconsin. The Price III site (47 Ri-4) is located on a terrace of the Wisconsin River in Richland County (Freeman 1966). Although the excavations revealed an Archaic cemetery, flakes and pottery on surface suggest that a later Woodland occupation of the area was also present. Early and Middle Woodland habitation sites (Price I and II) were nearby. The cemetery included 21 round or oval basin shaped pits containing burials, and a total of 130 individuals were recovered. One large pit contained 88 individuals in 37 burials in 6 levels. Many burials were covered with sandstone or limestone slabs. Red ocher was associated with other graves. Burials included flexed, primary burials, secondary burials, and cremations. Artifacts associated with the graves included two side-notched points with shallow notches which resemble the Raddatz-*Osceola* series, and two stemmed points, one of which resembles Middle Woodland points from the region (Freeman 1966). The only copper associated with the cemetery was a fishhook. Also found were two antler conical points, a perforated black bear canine, and two worked human femurs. The six radiocarbon dates from the Archaic occupation range from  $4180 \pm 150$  B.P. (2230 B.C.) to  $2920 \pm 130$  B.P. (970 B.C.).

The archeological record reveals considerable variability in Late Archaic burials and cemeteries. Burials have been recognized in habitation sites (Bobwhite) and in what appear to be more formal cemeteries. Some cemeteries appear to have been formed as short term, possibly single events (Oconto), and others may include graves emplaced over a long period of time (*Osceola*, Reigh, Price III). There is also considerable variation in cemetery organization, postmortem

treatment of the body, grave type and grave associations. The variability of the burial record suggests a concomitant variability in social organization and social traditions for dealing with the dead.

The radiocarbon record for most rockshelters with Raddatz points and for most Archaic burial sites which include side notched points and copper, forms a continuum dating from 4170 B.P. (2220 B.C.) to 2970 B.P. (1020 B.C.) (Governor Dodge, Osceola, Reigh, B. Lawrence I, Bobwhite). The Price III cemetery also fits comfortably within this continuum. A slightly earlier cluster of dates (4785 - 4145 B.P.) was reported for the Brogley Rockshelter, but the cultural associations and stratigraphic context for the materials have not been described. The Raddatz Rockshelter date on corner notched points and the two early Oconto dates (7510±600 - 5200±400 B.P.) fall outside the continuum and do not appear to reliably date Late Archaic manifestations. Thus it appears that while copper may not be found in stratified rockshelters with Late Archaic occupations, it is found in cemeteries during the same time period.

A terminal Late Archaic manifestation is recognized at least in southern Wisconsin by the presence of Durst expanding stemmed points. Durst points were first defined at the Durst Rockshelter (47 SK-2) where they appeared to be later than Raddatz points, and earlier than small triangular points (Wittry 1959b). All levels of the Durst Rockshelter produced Woodland ceramics, however, and the Durst points appear to be associated with Middle Woodland pottery. Wittry, however, proposed that the Durst points were Late Archaic. At the B. Lawrence I rockshelter in the Kickapoo River valley two aceramic Durst components were stratigraphically separated from the earlier Raddatz occupation and later Woodland component (Halsey 1976). Radiocarbon dates from the Durst component ranged from 3040±250 B.P. (1090 B.C.) (P-2465) to 1840±50 B.P. (A.D. 110) (P-2464) (Halsey 1976, Mead 1979, Boszhardt 1982). The Durst component at the Preston Rockshelter dated to 2710±65 B.P. (760 B.C.) (Wis 946) (Stoltman 1992b; Boszhardt 1982). Unfortunately, the cultural associations and stratigraphic contexts of these two rockshelters have not been published.

Late Archaic diagnostics are commonly found at unstratified habitation sites across Wisconsin. Durst stemmed points, like the Late Archaic side-notched series of Raddatz-Madison (discussed in this chapter under Middle Archaic), are found on numerous unstratified habitation sites throughout Wisconsin. Many of these sites have Woodland components as well. Little remains of the archeological context of the Archaic materials, unfortunately. For example, in southeast Wisconsin 304 Late Archaic sites have been reported. Only 15 of these sites have been test excavated, and none of them have produced intact late Archaic occupations (Flick 1994). At Fort McCoy in southwest Wisconsin, Late Archaic components have been identified in three of Hurley's Silver Creek Woodland sites, but no Archaic features or activity areas were identified (Hurley 1974).

The location of Late Archaic materials on the landscape may provide clues to understanding settlement patterning during the period. For example, along the Crawfish River in southeast Wisconsin, Late Archaic artifacts are often found associated with sites with subsequent Woodland occupations (Goldstein 1987). This is in contrast to earlier Archaic and Paleoindian site distributions which tend to be found widely dispersed in upland locations. In the Late Archaic, sites locations shift to lower terraces. The new pattern may reflect the stabilization of the vegetative landscape following the Hypsithermal and a fall-winter exploitation of wetlands by small,

dispersed groups. Possible spring/summer aggregation camps may be located outside the wetland portions of the southeast Wisconsin region (Goldstein 1987). In other portions of southeast Wisconsin, Late Archaic encampments are reported associated with upland wetlands (Kolb et al. 1989).

Closer to Lake Michigan, small Late Archaic sites are commonly found in the uplands near small wetlands. This pattern has been interpreted as representing short term, extractive use of wetland resources such as plants, waterfowl, and deer (James and Benchley 1980). Some investigators have interpreted the pattern as representing summer hunting camps (Overstreet 1992). The absence of faunal remains associated with Late Archaic occupations in southeast Wisconsin makes it difficult to document the seasonality of subsistence and settlement.

In southwest Wisconsin, habitation sites with Archaic components are rarely reported (Stoltman 1992b; Boszhardt 1990). Only six sites with Late Archaic components have been reported along Silver and Squaw Creeks at Fort McCoy (Hurley 1974; Salkin 1994). One of the Silver Creek sites produced a copper point (Hurley 1974).

Faunal and floral remains have been reported for Late Archaic occupations in stratified rockshelters in southwest Wisconsin. At Raddatz, B. Lawrence I, and Preston white tailed deer dominates the assemblages, and in most cases provides over 90% of the kilocalories from meat sources (Theler 1987). Elk, bison, and bear are also present, but are usually represented by only one or two individuals. The deer remains indicate the rockshelters were used for hunting and processing stations in the winter months (Theler 1987; Parmalee 1959a). Archaic floral remains from Brogley rockshelter included *Polygonum*, *Chenopodium album*, *Iva*, hickory, walnut, and hazel (Tiffany 1974). No evidence for domesticated plants has been reported for the Late Archaic in Wisconsin.

In north-central Wisconsin two Archaic phases have been identified through excavations and surface collections (Salzer 1969, 1974). The Squirrel River phase has not been dated radiometrically, but its small corner notched and side notched points suggest a Late Archaic affiliation. Associated spurred end scrapers and graters, however, suggest the occupation may date considerably earlier in time. A variety of other scraper forms, knives, and large bifaces indicate a variety of maintenance activities took place at the type site. Copper tools include conical points, awls, and fishhooks. The one identified Squirrel River component (Squirrel Dam site 74 On-21) is situated at a lake outlet. Mason (1981) has suggested the Squirrel River phase may be related to the Shield Archaic, which is better known from regions to the north and east of Lake Superior.

A second northern Wisconsin Late Archaic phase is named Burnt Rollways phase after its excavated type site (47 On-41) (Salzer 1969, 1974). Sites of this Late Archaic phase have small corner-notched points, as well as small expanding stem and side-notched varieties. Other stone tools include drills, wedges, various scraper forms, and bifaces. Copper tools include awls, fishhooks, and small ornaments. Recently copper tools and workshop debris have been reported at several stratified Burnt Rollways phase sites (Moffat et al. 1991). Lithic debris is primarily quartz, but formal tools are sometimes made from exotic cherts including Knife River chalcedony. Recent test excavations have also produced organic remains including blueberry, blackberry, beaver, and turtle (Arzigian 1991; Theler 1991). The phase had not been dated radiometrically. Burnt Rollways phase sites tend to be found on high banks along streams and rivers (Salzer 1974; Moffat et



al. 1991, 1992, 1993), at lake outlets (Moffat et al. 1991), and along lake shores (Bruhy and Wackman 1980, Kolb 1988). Late Archaic components have also been reported in northwest Wisconsin based on projectile point styles (Barth 1985; Behm 1984) and copper tools (Harrison 1991), but few Late Archaic sites have been excavated.

## Minnesota

The Archaic stage (ca. 8,000 B.P. - ca. 3,000 B.P.) represents a period of time during which the prehistoric occupants of Minnesota underwent a major readaptation to the postglacial environment of the region. The large mammals of the Pleistocene (e.g., mammoth, horse, camel, etc.) were by now extinct and the rapidly changing environmental conditions of the early Holocene had, in large measure, stabilized. Although there would be continued fluctuation of climate and vegetation, particularly the location of vegetation units, the floral and faunal composition of the environment approximated that of today.

The term stage is used for the Archaic in contrast to the term pattern, which was employed for earlier materials. We have more information available on the lifeways, technology, and settlement/subsistence patterns of Archaic cultures and believe that the concept of an extended stage is most useful. In general, the Archaic stage is characterized by the development of efficient hunting and gathering cultures and the greater exploitation of local environments for different raw materials for food and tools. There is an increasing regionalization that occurs throughout the Archaic and this appears to be linked, in part, to major biomes (e.g., prairie, deciduous forest, lake-forest).

There is a significant change in the technology used for hafting projectile points, and one of the distinguishing features of the Archaic is the appearance of a plethora of notched and stemmed spearpoints, atlatl darts, and knives. Another major innovation that seems to appear in the early Archaic is the utilization of groundstone tools that are manufactured by pecking, polishing, and grinding pieces of granite, basalt, gabbro, and other igneous and metamorphic rocks. The elaboration of groundstone technology is one of the distinctive characteristics of the Eastern and Laurentian Archaic regional traditions.

A distinctive technological complex known as Old Copper appeared about 7,000 years ago and persisted until about 3,500 years ago. At one time, Old Copper was interpreted as a distinct archeological culture. Today, however, it is recognized as a technological complex that is widespread and crosscuts a number of Archaic cultures (Johnson 1964:20-21; Griffin 1961:262). Old Copper is found throughout the western Great Lakes region and is characterized by the utilization of native copper. The principal source for copper appears to have been large nodules found in the glacial drift of the region. Native copper was also quarried, and prehistoric copper mines are present on Isle Royale in Lake Superior.

The Archaic stage is very poorly known in Minnesota. Most information comes from surface finds and private collections. There have been only a few excavations at Archaic sites and these have predominantly been in the northern portion of the state (Shay 1971; Michlovic 1982, 1983, 1985, 1986, 1987a; Caine, conference presentation May 13, 1988). Projectile points are the principal artifact on which chronological models are built. There have been no statewide comparative studies of these artifacts, although Steinbring

(1974) has evaluated an extensive collection of projectile points from the Reservoir Lakes region near Duluth. Therefore, the most basic elements of a framework for the Archaic in Minnesota are not available. This is in marked contrast to other areas in the Midwest where detailed projectile points sequences, along with associated radiocarbon dates, have been defined (e.g., Broyles 1971).

The limited data available for the Archaic makes the study and interpretation of this stage difficult, compounded by the fact that three continental drainage systems (Missouri, Mississippi, Hudson's Bay) and three major biomes (prairie, deciduous forest, lake-forest) converge in Minnesota.

The presence of the various drainage systems means that communication and interaction with other human groups in the Midwest and Canada will be different in separate parts of the state. The presence of the three major biomes implies that there will be substantive differences in the character of Archaic cultures in the various biomes. Study of the Archaic is further complicated by the fact that the position of these biomes shifted substantially through time. These numerous cultural and environmental variables make study and interpretation of the Archaic difficult, but at the same time represent one of the unique strengths of the archeological record in Minnesota. The opportunity to study changing human adaptation to shifting environmental conditions in several different biomes is richer in Minnesota than in almost any other region of North America.

Four historic contexts have been defined for the Archaic stage. Because of the limited information available for the Archaic in Minnesota, we have used the four regional Archaic traditions that appear to be present in the state. Undoubtedly these historic contexts will be expanded, refined, and subdivided as more information becomes available.

## Major Environmental Events and Trends

By 8,000 years ago, the major environmental perturbations that had typified the previous 6,000 years had ended. The glacial ice front was far to the north of the Minnesota border and Glacial Lake Agassiz had vanished from Minnesota. The configuration of the landscape and the composition of the vegetational units were similar, at a gross level, to more recent times. There were, however, significant environmental changes during the Archaic stage. These affected the people living in Minnesota during this time. Moreover, the changes have a significant effect on the ability of modern archeologists to locate and interpret sites from the Archaic stage.

There are four principal aspects of the environment that are especially relevant to archeological investigations of the Archaic stage. These include changing composition of vegetational units; changing locations of vegetational units; shifts in the level of lakes, streams, springs, and groundwater; and geomorphological changes that resulted in shifts in the position of streams and the burial of sites under alluvial and/or colluvial sediments. All of these changes are correlated with changing climate, although the various fluctuations in climate, vegetation, and river responses do not all occur at precisely the same time.

Major changes in the solar radiation cycle created a global warming trend that began about 15,000 years ago and initiated the retreat of the continental ice sheets. This warming trend culminated between 9,000 and 6,000 years ago and resulted in the Mid Holocene Warm period (Altithermal) during which the climate was (considerably?)



warmer and drier than it is at present. This was due in part to the global warming trend and in part due to the shifting location of continental air masses in the midportion of the United States (Wendland 1982; Kutzbach 1987).

Changes in the composition of the forest vegetation in Minnesota occurred during this period as well. They are complex and are summarized by Webb et al. (1983). More pertinent to this discussion is the changing position of the various major vegetation zones and the position of the prairie-forest border in Minnesota during the Archaic stage. The movement of the prairie-forest border has been reconstructed using pollen data from a variety of pollen cores throughout the Midwest. A 20% level of prairie-forb pollen is interpreted as approximating the position of the prairie-forest border. According to Webb et al. (1983:147):

In broad time intervals, the prairie moved eastward from 9000 to 7000 B.P. and then retreated westward to its position at 500 B.P. Intermediate times show the movement to have been more complex. Before 9000 B.P., no broad area of prairie vegetation existed [in the Midwest]. From 9000 to 9000 B.P., the prairie moved eastward along its entire margin and extended farthest eastward in central Illinois. The eastward movement continued in Minnesota and Wisconsin from 8000 to 7000 B.P. but in Illinois the prairie moved westward. By 7000 B.P., the prairie had reached its most eastward position in north-central Minnesota. From 7000 to 6000 B.P., the prairie border was stable except for a westward retreat in north-central Minnesota. By 3000 B.P., the prairie was far west in northern Minnesota but had again extended eastward in central Illinois. [references to figures in the original deleted]

The changing patterns of temperature, precipitation, and vegetation cover across Minnesota during the Archaic stage resulted in substantial changes in the position of streams and rivers. Recent research in the Mississippi Headwaters area (Caine 1988) has demonstrated that Archaic sites perhaps 4,000 years old may be found on abandoned stream courses of the Mississippi River and around old lake beaches far from the current position of the lakes themselves. Michlovic's work in the Red River Valley (Michlovic 1982, 1985, 1986) has shown that Archaic sites may be buried under several feet of alluvial sediment, as has research along the Mississippi River and elsewhere in the Midwest (e.g., Broyles 1971). Lake levels undoubtedly fluctuated during the Archaic stage and investigations that focus on the modern shorelines of lakes may fail to locate Archaic sites because the margins of the lakes were in different locations in the past.

One reason that the Archaic is poorly known is that many of these sites are either buried and therefore will not be found using simple surface reconnaissance, or because they are situated in areas that might appear to be unlikely based on modern topography. Incorporating a clear knowledge of geomorphology and paleoecology into any studies of the Archaic is essential if our knowledge of this long and complex period is to advance.

### Shield Archaic

The Shield Archaic is a hunting and gathering complex that takes its name from the Canadian Shield geological formation (Wright 1972). The closed coniferous forests that covered most of the Canadian Shield were relatively poor in game and other food resources, and this is

reflected in the lack of complexity in Shield Archaic assemblages and the seemingly low population density of Shield Archaic groups.

Characteristic artifacts of Shield Archaic sites include notched points and scrapers. Bone tools are generally not found, but this is probably the result of the very acid soils in the coniferous forests. The rich groundstone tool assemblages of other Archaic traditions are virtually absent in Shield Archaic sites and native copper artifacts are rare.

The Shield Archaic was initially defined by Wright (1972) in his discussion of Ontario prehistory, and Mason (1981:133-137) has an extensive discussion of this complex. The Shield Archaic is very poorly known in Minnesota at this time, although work by the National Park Service and the Superior National Forest in northeastern Minnesota will hopefully result in an expanded knowledge of this complex. No radiocarbon dates are presently available for Shield Archaic sites and the regional chronology of this culture is poorly known. Mason (1981:133) suggests that the Shield Archaic evolved directly from a Late Paleoindian base and represents a cultural tradition that exhibits in-place continuity over thousands of years. In some areas, it appears that Shield Archaic complexes persist until the arrival of Europeans in the region north of the Great Lakes. The geographic distribution of this tradition in Minnesota is very poorly known. Presumably, sites will be found principally on the Canadian Shield in northeastern Minnesota. However, there may well be closely related sites immediately south and west of the Canadian Shield itself.

It is not possible to delineate site types at this time. It is reasonable to hypothesize that small seasonal habitation sites and hunting/processing stations would be found. A variety of Archaic sites have been reported in northeastern Minnesota and the Rainy Lake region of northern Minnesota. It is unclear at the present time which of these should be assigned to the Shield Archaic.

### Lake-forest Archaic

The Lake-forest Archaic is a distinctive archeological complex that is distributed across the mixed deciduous-coniferous forests of central and northern Minnesota. Available evidence suggests that this complex represents a hunting and gathering adaptation to mixed forests and lakes of the region. The lake-forest biome extends from the prairie-forest border eastward into New York state, and the Archaic cultures of this region share many affinities (e.g., Tuck 1978; Mason 1981). There is evidence that the historic waterways along the Great Lakes were used in ancient times and may have formed a corridor for communication and movement of people along an east-west gradient for many thousands of years (Steinbring 1974:67). Archaic sites in northern Minnesota appear to have far more in common with sites farther to the east than they do with those a few hundred kilometers to the south.

The Lake-forest Archaic, with a few exceptions, is very poorly known in Minnesota. Although Archaic sites are known from surface finds or reconnaissance surveys, there have been very few excavations or synthetic studies of this complex. Bleed's (1966, 1969) work at Petaga Point at Mille Lacs provides data on a relatively late Archaic site in the southern portion of the Lake-forest region. More extensive work has been conducted along the Canadian border in and around Rainy Lake and Voyageurs National Park (see Steinbring 1974; Lynott et al. 1986). Current work in the Chippewa National Forest (C. Caine,

conference presentation, May 13, 1988) also promises to shed light on the later portions of the Lake-forest Archaic.

Artifacts associated with Lake-forest Archaic include a variety of notched and stemmed projectile points and other chipped-stone tools, numerous groundstone tools (often made of polished and unpolished "slate"), and an extensive series of implements made of native copper. Copper implements include large beveled adzes, socketed and tanged spear points, conicals, wedges, harpoons, and other forms (Steinbring 1974:68). The typology and chronology of the projectile points associated with this complex is sketchy at present, although the copper complex is better known (e.g., Popham and Emerson 1954; Ritzenthaler 1957; Ritzenthaler et. al. 1957; Ritzenthaler and Wittry 1957; Wittry 1957; Wittry and Ritzenthaler 1957; Griffin 1961; Quimby 1963; Fogel 1963; Steinbring 1970, 1971, 1974).

Knowledge about settlement and subsistence patterns is sketchy, although it is reasonable to argue that fishing, hunting large mammals (particularly deer, elk, and moose), and utilization of a broad spectrum of wild plants were important elements of Archaic subsistence practices.

It has been suggested that the Lake-forest Archaic develops from the earlier Plano and/or Late Paleoindian cultures, but the change and development of the Lake-forest Archaic through time is still largely a matter of conjecture as are the number of discrete complexes that could be defined. The change in Lake-forest Archaic through time will probably be complex. Study of this problem is complicated by the fact that the expansion of the prairie eastward between 5,000 and 8,000 years ago may have resulted in significant changes in the Archaic complexes of central and northern Minnesota. In fact, there may be a hiatus between early and late Lake-forest Archaic cultures in many areas of Minnesota.

Lake levels have fluctuated widely in Minnesota throughout the past. The position of streams and rivers, where they were not deeply entrenched relatively early, have also changed significantly. These geomorphological factors may be one reason that Lake-forest Archaic sites are seemingly so rare. Sites located along the margins of lakes during periods of low water have been either inundated or destroyed by rising water levels. Sites along lakes during periods of higher water than today will be discovered only by identifying ancient beach ridges and examining these areas for Archaic sites (Steinbring 1974; Lynott et. al. 1986; Caine 1988).

Chronology of the Lake-forest Archaic is a difficult problem since so few sites in Minnesota have been excavated. Some radiocarbon dates are available for the Rainy Lake region. In general, the Lake-forest Archaic should span the period from around 8,000 years ago to around 3,000 years ago. This interpretation, however, must be regarded as tentative. We tentatively suggest that the distribution of this complex should be coeval with the distribution of the lake-forest biome. Because of our limited knowledge, it is very difficult to delineate site types at this time. Lynott et. al. (1986:274) suggests that three site types that may exist include small base settlements, seasonal base camps, and small, short-term foraging stations.

#### Prairie Archaic

The Prairie Archaic is a hunting and gathering complex found in the tall-grass prairies of northern North America and Canada. It is undoubtedly closely related to the Plains Archaic which is distributed widely across the high plains west to the Rocky Mountains. The

preeminent characteristic of the Prairie Archaic is intense reliance on bison hunting. Although some scholars have argued that eastern Plains Archaic groups were directing their subsistence efforts toward the hunting of deer, fishing, and the collection of nuts and seeds, evidence from the northeastern area of the Plains suggests otherwise (Michlovic 1987a:59).

The artifact assemblages of the Prairie Archaic remain relatively poorly known. Although there are numerous surface finds of artifacts and some excavated sites, there has not yet been a systematic typological study of projectile points to establish diagnostic types and correlate these with a chronological sequence (although see Anfinson 1987:). In addition to projectile points and hafted knives, other artifacts include end and sidescrapers, choppers, and utilized flakes. Grinding stones and other forms of groundstone tools are sometimes found, but are not as common or ubiquitous in the Prairie Archaic as they are in Eastern Archaic complexes.

The Prairie Archaic spans a period from perhaps 8,500 years ago to around 2,000 years ago. There were surely changes in the Prairie Archaic during this time, but these are unknown at present. The origins of the Prairie Archaic are equally obscure. Excavations at the stratified Cherokee Sewer site in northwestern Iowa produced a sequence of late Paleoindian (Plano) materials underlying early Prairie Archaic materials. Anderson (Anderson et al. 1980:257) has suggested that the only observable differences between the late Paleoindian and Archaic horizons at the site are in methods of hafting tools. It is entirely possible, therefore, that the settlement and subsistence practices of Prairie Archaic groups represent a direct evolution from the big-game hunting practices of late Pleistocene and early Holocene hunters in the prairie area.

An equally puzzling problem is the nature of the Prairie Archaic during the Mid-Holocene Dry period (ca. 5,000 - 7,000 B.P.) during which the climate in Minnesota was significantly warmer and drier than at present, and the prairie expanded far to the east. How these climatic changes affected the Prairie Archaic groups remains unknown. Moreover, if the Prairie Archaic represents a specific adaptation to the tall-grass prairie environment, then it seems reasonable to assume that there should be Prairie Archaic sites extending to the eastern boundaries of Minnesota.

Based on the limited evidence available, Anfinson (1987:89-106) has suggested that there are three Archaic phases in southwestern Minnesota. These are the Cherokee phase (8,900 B.P. - 7,500 B.P.), the Itasca phase (7,500 - 5,000 B.P.) and the Mountain Lake phase (5,000 - 2,200 B.P.).

Although more work has been conducted on the Prairie Archaic than on the earlier periods, our database for this complex remains pitifully small. Michlovic's (1983, 1985, 1986, 1987a, 1987b) work in the Red River Valley has provided invaluable information on the Archaic in that region, and Anfinson's (1982, 1987) recent reevaluation of southwestern Minnesota is also helpful. The most detailed information on the Prairie Archaic comes from the Cherokee Sewer site which is south of the Minnesota border in northwestern Iowa (Anderson and Senken 1980). The recent discovery of a deeply buried bison processing site near Granite Falls, MN (21YM47) may also provide additional information on this lengthy and fascinating period of time.

Radiocarbon age determinations from the Cherokee Sewer site indicate the late Paleoindian and Prairie Archaic occupations span the period from 8,400 years ago to 4,600 years ago (Hoyer 1980).

Radiocarbon dates from the Itasca Bison Kill site indicate an Archaic occupation spanning the period from 7,000 to 8,000 (Shay 1971). Radiocarbon dates from the Canning and Mooney sites in the Red River Valley suggest they were inhabited between 3,000 to 4,000 years ago (cf. Michlovic 1985). A single radiocarbon date of 6390 years ago has been obtained for 21YM47 near Granite Falls and a single date of 3495 B.P. is available from the Pedersen site in Lincoln County.

The range of variation in Prairie Archaic site types is unknown. At present, we may safely suggest that seasonal bison processing stations, particularly winter stations, will be found (e.g., Cherokee Sewer, Canning). Bison kill sites should also be found. Other site types undoubtedly exist and locating and defining these types is of the utmost importance.

### Eastern Archaic

The Eastern Archaic is a rich archeological tradition that represents the distinctive adaptation of humans to the verdant deciduous forests of the midwestern United States. The Eastern Archaic has traditionally been arbitrarily divided into Early, Middle, and Late periods (Fowler 1959). These periods are not, at this time, suggested for Minnesota since it is unclear whether they are appropriate for this state.

The Eastern Archaic is relatively well defined in the lower Midwest, particularly in Illinois, Indiana, and Kentucky. However, it is very poorly known in Minnesota. In general, this tradition is characterized by a wide variety of projectile points that may be notched, stemmed, or have bifurcated bases. There is a well defined sequence of projectile point types, at least in the Ohio Valley (e.g., Broyles 1971) and there is an extensive groundstone industry that includes fully and three-quarters grooved axes, mauls, nutting stones, adzes, gouges, and other implements. Copper artifacts are sometimes found, and there appears to be a relatively well developed shell and bone tool industry as well, at least during the later periods (see Griffin 1950, 1967 and Dragoo 1976 among others for discussions of Eastern Archaic material culture).

Like other archeological traditions during the postglacial period, the Eastern Archaic is typified by the development of increasingly distinctive regional complexes and identities. In some regions, the details of Eastern Archaic settlement and subsistence patterns are becoming relatively well known. This is not the case in Minnesota. However, it does appear that the pattern of extensive use of riverine resources (e.g., fish, freshwater clams), nuts (acorn, walnut, and hickory) and deer is a characteristic of Eastern Archaic groups in the state (see Wilford 1954).

The Eastern Archaic has been interpreted as an extended period during which human groups steadily increased their efficiency in utilizing the resources of the deciduous forest (e.g., Caldwell 1958; Funk 1978; Tuck 1978; Mason 1981). This implies that the Eastern Archaic will be present in Minnesota only during those periods when the deciduous forest was present in the state as well. This suggestion remains a working hypothesis. However, if it is true, then we anticipate that there may be archeological complexes that are similar to Early Eastern Archaic in southern and southeastern Minnesota prior to perhaps 7,500 years ago, but that the Eastern Archaic will disappear and not be found again until the re-expansion of the deciduous forest into the state after perhaps 4,000 years ago. Delineating the nature of the Eastern Archaic and its relationship to other Archaic traditions in the state is one of the more difficult challenges in the study of Minnesota prehistory.

In the lower Midwest, the Eastern Archaic is relatively well dated and spans the period from about 10,000 years ago to about 3,000 years ago. Given the absence of data and radiocarbon dates from Minnesota, it is impossible to discuss the timing of the Eastern Archaic in this state. It is not unreasonable to suggest that, depending on the presence/absence of these cultures in Minnesota, that Eastern Archaic spans the period from about 8,000 years ago to about 2,000 years ago.

Site types for the Eastern Archaic are very poorly known at present. It is reasonable to suggest that two types that will be found are rockshelters and seasonal (warm weather?) fishing stations. It is probable that seasonal campsites and hunting stations will also be identified.

## 6 The Woodland Period, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

The Woodland period generally marks an increasing emphasis on the use of both wild and cultivated plants across the northeast Plains. In some areas, a shift to more sedentary lifeways is indicated by the presence of middens, houses, and village sites. In other areas, however, Woodland peoples continued to subsist by moving seasonally. The extensive use of fragile pottery vessels for cooking and storage provides archeologists with a more variable and time sensitive cultural marker than stone tools, and numerous cultural groups are identifiable in the archeological record. Mounds commonly mark the location of burial areas, and individual differences in wealth and socioeconomic stature are suggested by funerary treatments in some areas. Marked regional differences in cultural adaptations are evident across the essentially modern environmental zones of the study area.

The following discussions address both temporal and spatial variation in Woodland cultures by state. We have followed a standard chronological ordering of Early, Middle, and Late Woodland as much as possible, but in some areas, particularly northern Wisconsin and Minnesota, this tripartite division does not fit the archeology very well. Sites and phases (and ceramic wares, when regional phases have not been defined) mentioned in the text are illustrated.

### Iowa

Because of the larger number of excavated sites, we know more about the Woodland time period than the earlier Paleoindian and Archaic cultures. Traditionally, the Woodland stage has been defined by the first appearance of pottery, the first construction of burial mounds, and the beginnings of agriculture (Griffin 1967; McKusick 1964a; D. Anderson 1981a; L. Alex 1980; Stoltman 1986a). It now seems likely that all three of these innovations had their beginnings in the Late Archaic. The cultivation of squash, gourds, and native cultigens was certainly taking place during the Archaic (Ford 1985; Smith 1987; 1992). Fiber-tempered pottery was being manufactured in the southeast (Jenkins et al. 1986) and by Nebo Hill phase people in Missouri (Reid 1983). Mound construction is also possibly associated with Nebo Hill and with transitional Late Archaic/Early Woodland Red Ocher burials, although these mounds may be later Red Ocher manifestations, assignable to the Early Woodland period (Stoltman 1986a; Green and Schermer 1988). Nevertheless, these Late Archaic occurrences of ceramics and mounds tend to be rare and localized manifestations, and ceramics and burial mound construction only became widespread and commonplace in the upper Midwest at the beginning of the Early Woodland period, around 3000 B.P.

In general terms, Woodland people continued trends begun in the Archaic. Throughout the Woodland time period, people became increasingly reliant upon cultivated plant foods, sedentism continued to increase, status differentiation became more pronounced, and long distance trade and interaction increased, culminating in the Middle Woodland Hopewell Interaction Sphere (Struever 1964a). Many see the Woodland period as characterized by the "coevolution" of sedentism, native cultigens, and ceramic technology (Braun 1986, 1987, 1988, 1991; O'Brien 1987; Smith 1992). The Woodland time period is generally divided into three subdivisions: Early Woodland (3000 B.P.-2200 B.P.), Middle Woodland (2200-1600 B.P.), and Late Woodland (1600-900 B.P.).

E. Henning (1985) has divided Iowa Woodland cultures into four regional variants: Mississippi Basin Woodland along Mississippi River tributaries of eastern Iowa, and extending into the central Des Moines River Valley; Southern Iowa Woodland along the upper Platte, Grand, and Chariton River Basins with overlap into the Des Moines River Basin; North Central Woodland on the Des Moines Lobe and the western portions of the Iowan Erosion Surface; and Plains Woodland in Missouri River tributary basins with extensions into the upper Des Moines River Basin.

### Early Woodland

#### Mississippi Basin Woodland

Woodland groups in this part of the state seem to have developed similarly to groups throughout the Eastern Woodlands. As with many transitions in prehistory, the Late Archaic/Early Woodland transition is a fuzzy one. The Red Ocher mortuary complex straddles the boundary. Originally defined as a preceramic, premodern Late Archaic manifestation (Ritzenthaler and Quimby 1962), Esarey (1986) has argued convincingly for an association of Red Ocher burials and Marion Thick pottery in Illinois burial mounds. The effect the introduction of ceramics had on Early Woodland lifeways remains a point of contention (cf. Stoltman 1978; Tiffany 1986a; Ozker 1982; Seeman 1986). It appears that Early Woodland groups essentially maintained a Late Archaic lifestyle, with the introduction of ceramics.

Further complicating our understanding of the Late Archaic/Early Woodland transition are problems with radiocarbon dating and site visibility due to geomorphic processes taking place during this time period. Goldman-Finn et al. (1991) point out that between 2400 and 2750 B.P. fluctuations in atmospheric carbon 14 production would cause materials to date within a narrow time period of about 2450 to 2550 B.P., resulting in what Blakeslee (1983) termed "apparent synchronicity" of material remains that may be separated by as much as 350 years. On the other hand, accelerated radiocarbon production between 2300 and 2450, and between 2800 and 2900 B.P., tend to spread out dates on organisms that lived during those times. A review of Midwestern radiocarbon dates, largely from Farnsworth and Emerson (1986), revealed that dates did indeed cluster at 2500-2600 B.P. and were scarce in the preceding and following centuries (Goldman-Finn et al. 1991). Adding to the confusion is the likelihood that the Late Archaic/Early Woodland transition is time-transgressive, with the use of ceramics developing earlier in some regions while people living in other regions maintained a nonceramic way of life.

Goldman-Finn et al. further point out that sites from this time period tend to be in buried contexts in the upper units of alluvial fans, and along the Mississippi River Early and Middle Woodland sites are found on islands and floodplains in the second buried soil horizon of the Odessa Sequence (Benn ed. 1987, 1988). This causes them to be largely invisible to conventional surface, and even shallow subsurface archeological survey methods, resulting in their underrepresentation in the archeological record and in faulty interpretations regarding population levels.

At any rate, around 2700 B.P. ceramics appear for the first time in the archeological record of the upper Midwest. These thick wares are known by a variety of names: Fayette Thick in Ohio, Schultz Thick in Michigan,

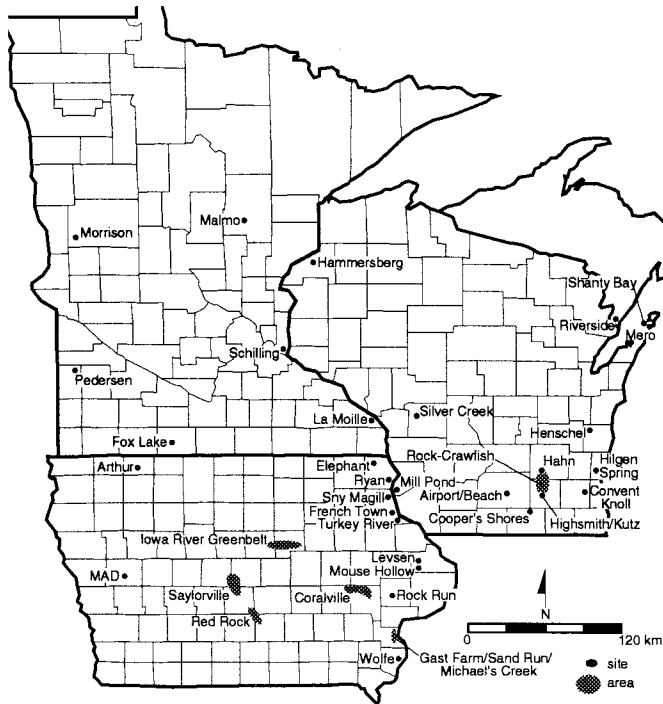


Figure 14. Early Woodland sites.

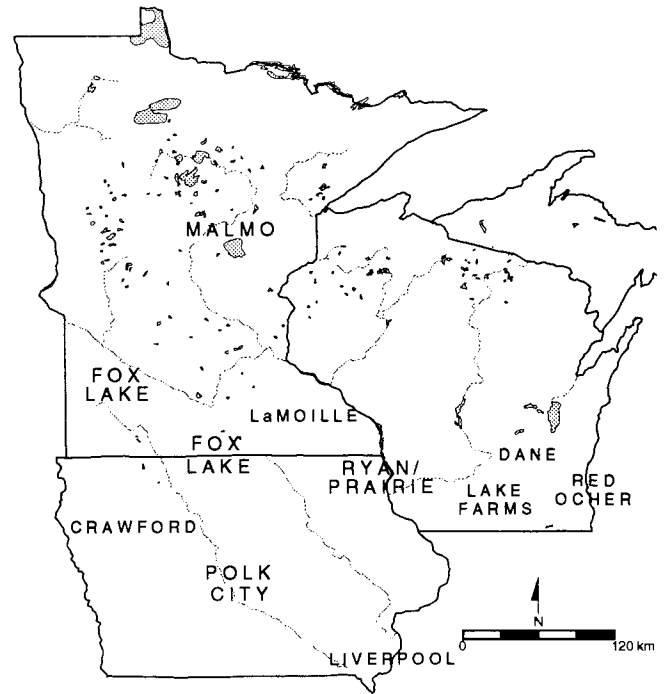


Figure 15. Early Woodland phases.

LaMoille Thick in Minnesota, and Marion Thick in most of the rest of the region (Emerson 1986; Anfinson 1979). Emerson (1986) has suggested that these thick wares might ultimately be derived from the early Vinette I ceramics of New York State. From there they spread to Ohio where they were associated with the Early Woodland Adena culture. Moving westward, they are associated with the Schultz phase in Michigan and eventually reached northeast Iowa and the Illinois and Mississippi River valleys (Emerson 1986). In Illinois, the Marion phase has been minimally defined as the association of straight-stemmed Kramer projectile points and Marion Thick ceramics (Munson 1966, 1982). In the Illinois River Valley, these ceramics date between 2700 and 2400 B.P. (Farnsworth and Asch 1986). A number of contracting-stemmed points are also associated with this phase, preceding phases, and following phases (Munson 1982).

The Ryan focus (Logan 1959, 1976; Benn 1978; Tiffany 1986a), complex (Benn 1979), or phase (Stoltman 1986b; Green and Schermer 1988; Collins and Green 1988) of northeastern Iowa is the only named manifestation of Marion culture in Iowa, although Marion Thick ceramics have been reported from numerous sites in eastern Iowa. Also, Kramer and contracting-stemmed points are common in private collections in the region. Logan (1959; 1976) defined the Ryan focus based on materials excavated by Orr in the 1930s from mound 10 of the French Town Mound Group (13CT166), mound 2 of the Ryan Mound Group (13AM117), and the Houlihan Mound (13AM117), and on Beaubien's (1953) excavations at mound 43 of the Sny-Magill Mound Group (13CT18). Benn (1979) has reported on the problems associated with interpreting these mounds and hesitated to redefine the Ryan focus as a phase, referring instead to the Ryan complex in which he included sites producing Spring Hollow Incised ceramics. As Tiffany (1986a) and Stoltman (1990) point out, this inclusion of Spring Hollow Incised (now Prairie Incised) in the Ryan phase is no longer acceptable. Also, the two Ryan Mounds and mound 43 at Sny-Magill produced Lane Farm Cord Impressed pottery and have

been interpreted as "double-component" mounds, with a later Lane Farm construction phase overlying an earlier Marion Red Ocher substructure (Benn 1979). Benn (1979) also points out that at mound 43 at Sny-Magill, several layers of red ocher were found within the Lane Farm construction phase.

According to Benn (1979), the least problematic example of a possible Marion Red Ocher burial mound is mound 38 of the Turkey River Mound Group (13CT10). Tiffany (1986a) also includes this mound in the Ryan focus. Here, McKusick (1964b) uncovered the remains of 11 individuals. Two burials (1 and 2) were found in the upper levels of the mound, while the remaining nine individuals were found near the base of the mound, at a depth of 62-70 inches (158-178 cm.) below the mound summit (Green and Schermer 1988). These burials were separated from the overlying interments by a layer of limestone slabs.

Burials 3 and 4 were considered to represent a single interment feature and consisted of cranial and postcranial elements of a juvenile, and a nearly complete adolescent skeleton, both displaying red ocher staining. The adolescent burial had marine shell beads in its mouth, and was associated with a polished bone tube (Green and Schermer 1988). Burial 5 was near the center of the mound, directly beneath an alignment of limestone slabs, and consisted of a headless male individual with a mussel shell between his knees.

Burials 6-11 were found in a mass grave. Four of the six individuals were headless, and all but one, Burial 11, were extended burials. Burial 11 was flexed, with the skull present, and was possibly a female. Burial 6 is another possible female, and was headless, with a limestone slab over the pelvic region. Burial 7 was the only extended burial with the skull present, and was also probably that of a female. Burial 8 was probably that of a male, and was also headless. A Kramer-like point, possibly made of Hixton Silicified Sandstone was found within its ribcage. A polished bone awl was found between Burials 8 and 9. Burial 9 was a

headless possible female. A large copper awl or "dagger" was found in the upper chest of this individual. A polished slate bar amulet was found near the left arm, and an Adena point made of Wyandotte or Cobden chert was found in association with this burial, as was a red ocher coated bone awl. The presence of the Adena point could lend support to Emerson's (1986) eastern origin hypothesis for Marion culture. Burial 10 was a headless, extended, possible male, with a Turkey Tail point made of Knife River Flint located between its clavicles in place of the cranium, and an unnotched Turkey Tail point made of Wyandotte Chert was found in the area of Burials 9 and 10 (Green and Schermer 1988).

Tiffany (1986a) expanded the Ryan focus to include the Elephant site (13AM59), a multicomponent habitation site that has produced Marion Thick ceramics and straight and contracting-stemmed points (Logan 1959, 1976). The Smith site (13LA2) in Louisa County in southeast Iowa has also produced Marion Thick ceramics (A. Anderson 1971a), but Tiffany (1986a) considers it too far distant from northeast Iowa to include it in the Ryan focus. However, he does consider it to be a temporal equivalent to the focus. More recently, Collins and Green (1988) have reported recovering the base of a Marion Thick Jar and a nearly complete Kramer point from a tree fall at site 13CT254 in Clayton County, and assigned it to the Ryan phase.

Based on his surveys and excavations in the Prairie du Chien locality across the Mississippi River from McGregor, Stoltman (1990) reports the presence of Marion Thick ceramics, whose makers may have been related to the Ryan focus people of northeast Iowa. However, due to the lack of Red Ocher burials in the Prairie du Chien locality, he is hesitant to extend the Ryan phase into southwestern Wisconsin. Nevertheless, he also notes the presence of similar ceramics, distinguished from Marion Thick by the lack of internal cordmarking, which he has named Indian Isle Punched. While he suspects that further research may reveal a chronological relationship between Marion Thick and Indian Isle Punched, with the Marion ceramics relating to an earlier Ryan phase and the Indian Isle ceramics related to a later Indian Isle phase, for the present he is lumping the two together within the Indian Isle phase, dating between 2250 B.P. and 2050 B.P. No Indian Isle ceramics have been recognized in northeast Iowa at this time.

Elsewhere in Iowa, several sites have produced Marion Thick ceramics. The Gast Farm site (13LA12) has also produced a few sherds (Green and Wallace 1991), and two sherds have recently been reported from the Wolfe site (13DM1) in Des Moines County (Straffin 1971a; Titus et al. 1991). At the Gast Spring site (13LA152), a sherd was discovered in a feature in the uppermost paleosol of this Corrington Member alluvial fan. This paleosol has been dated to 2550±80 B.P. and Marion Thick sherds were also found in the overlying deposits (Goldman-Finn et al. 1991; Baker and Whelan 1992). The Cochran site (13WS7) has produced Marion Thick ceramics (Tiffany 1986a). Overstreet (1984) discovered three cultural horizons underlying the Havana component at the FTD site (13AM210), but no diagnostic artifacts were encountered. In the Pools 17 and 18 survey, Benn (ed. 1988) noted three sites that produced Marion Thick ceramics: 13LA27, 13LA30, and 13LA38, and the aforementioned Smith site is located on a bluff top overlooking these pools. Excavations at 13LA38 revealed that Early Woodland materials were thoroughly mixed with Middle Woodland materials in the second paleosol of the Odessa Sequence (Benn ed., 1987) (I am calling the original land surface beneath the Camp Creek Member the first paleosol). Unfortunately, this seems to be the case with nearly all the Early Woodland sites in the area as people of these two time periods appear to have favored the same site locations (Benn, ed. 1988). A possible exception is site 13LA27, which has the potential for a stratigraphic

separation between the Early/Middle Woodland component and the Late Woodland component (Benn ed. 1988).

Benn (ed. 1987, 1988) has questioned the integrity of the Early Woodland assemblages at Sand Run West (13LA38) because of the lack of straight and contracting-stemmed points found with the Early Woodland ceramics. He noted that not many such points were found with Early Woodland ceramics during testing at nearby Michaels Creek (Fokken and Finn 1984), although they are common in private collections in the region. Benn (ed. 1987, 1988) notes that Griffin (1986) suggested that it appears that Kramer-type points spread independently of Marion Thick ceramics, making it necessary to reconsider whether Marion culture represents a cohesive material cultural unit. In fact, Benn (1987) points out that Kramer points were found associated with Middle Woodland ceramics at Sid's site (13KK16) on the North Skunk River in Keokuk County, that were thermoluminescence-dated to A.D. 70±230 (Benn 1984a). All in all, it appears as though Marion Thick ceramics in Iowa are largely restricted to the Mississippi River Valley and its immediate tributaries, while Kramer points are represented over a wide area of eastern Iowa.

Meanwhile, by around 2500 B.P. different ceramics were being manufactured in the Illinois River Valley (Farnsworth 1986; Farnsworth and Asch 1986). These sandy paste wares tended to be thinner than Marion ceramics and featured incised lines over cordmarking and often exterior nodes or bosses (Griffin 1952). Over the years, a number of very similar wares have been given different names in different regions of the upper Midwest: Spring Hollow Incised in Iowa (Logan 1959, 1976), Fox Lake Trilled in Minnesota (Anfinson 1979), Crawford Trilled in western Iowa (Benn 1983), Glenwood Trilled in southwest Iowa (Tiffany 1978a, 1986a), McBride Trilled in central Iowa (Benn and Rogers 1985), Prairie Incised in southwestern Wisconsin and northeastern Iowa (incorporating Spring Hollow Incised) (Stoltman 1986b), and Dane Incised in southeastern Wisconsin (Baerreis 1953; Keslin 1958). These can be lumped into "Black Sand culture," or perhaps, a Black Sand horizon (See Farnsworth 1986). Whether or not the makers of these similar ceramics have any cultural or temporal relationship remains a matter of contention. However, they do seem to appear earliest in the Illinois River Valley, and later to the north and west where they also represent the earliest ceramics in those regions. Farnsworth (1986) suggests a possible southern origin for Black Sand ceramics.

In southeastern Iowa, Benn (ed. 1987) has noted the problems of mixing of Early and Middle Woodland Components at Sand Run West (13LA38). A similar situation may exist at the Gast Farm site (13LA12) (Green and Wallace 1991), the Wolfe site (13DM1) (Straffin 1971a; Titus et al. 1991), and at other sites in the region. Benn (ed. 1987) notes, however, that the Black Sand component at Sand Run West was likely contemporary with some of the earlier Havana components and that no such overlap is evident in the Quad-State region to the north, but that it may be in the central Des Moines River Valley. In the Michael's Creek locality, Fokken and Finn (1984) report Black Sand components from two bottomland sites (13LA55 and 13LA56), and two upland sites (13LA60 and 13LA140). Three of the sites are classified as residential base camps, while site 13LA140 is interpreted as a limited activity resource extraction camp (Fokken and Finn 1984). These southeastern Iowa sites can safely be attributed to the Liverpool phase of the Black Sand tradition (Munson 1986; Benn ed. 1987). Other sites producing Black Sand ceramics in eastern Iowa include: Levsen (13JK4), Mouse Hollow (13JK59), Crabtown (13JK62) (Logan 1959, 1976; Benn and Marcucci 1981), and Rock Run (13CD10) (R. Alex 1968), rockshelters (Tiffany 1986a), the Rogers site (Logan 1959, 1976), 13MC162 (Forman 1992), and sites 13JH28, 13JH43,

13JH44, 13JH48, and 13JH202 in the Coralville Reservoir area (A. Anderson 1971a; Tiffany 1986a).

In northeastern Iowa, Logan (1959, 1976) defined the type Spring Hollow Incised. While noting its affinities with Black Sand Incised and Dane Incised ceramics, he also noted affinities with Morton Incised and Sister Creeks Punctated, as well as such Linn ware types as Spring Hollow Cordmarked, Spring Hollow Plain, Levsen Stamped, and Levsen Punctated, and placed it in the Late Middle Woodland Linn ware category of the Allamakee phase. A. Anderson (1971a:3), however, noted that:

Black Sand Incised ceramics appear in a variety of decorative forms, and the possibility of some regional variability apparently led Logan . . . to designate the Black Sand Incised of eastern Iowa as Spring Hollow Incised. The variations in decoration and forms may actually result from an extended temporal range.

Anderson was also equivocal about whether these ceramics were Early or Middle Woodland.

Later, Benn (1978), suspecting an earlier age for Spring Hollow Incised, separated it from Linn ware, and (1979) placed it in the Early Woodland Ryan complex along with Marion Thick ceramics and Red Ocher burials. Stoltman (1986b, 1990), convinced that these ceramics postdated the Ryan complex which he designated as a phase associated with Marion Thick ceramics, removed Spring Hollow Incised from this phase. Further, in order to more clearly separate Spring Hollow Incised from the Middle Woodland Linn ware Spring Hollow Series, he renamed it Prairie Incised and defined an Early Woodland Prairie phase in the Quad-State region of southwestern Wisconsin, southeast Minnesota, northeast Iowa, and northwest Illinois, dating from 100 B.C. to A.D. 100.

Interestingly, Stoltman (1986b, 1990) obtained radiocarbon dates from Prairie phase components in southwest Wisconsin of A.D. 70 and A.D. 80. These dates fall well within the Middle Woodland time period of the Illinois River Valley and would seem to support Farnsworth's (1986) model of the Black Sand tradition moving northward and westward out of the Illinois River Valley. By 200 B.C. Black Sand people had disappeared from the Illinois River Valley, having either been displaced or assimilated by the developing Havana tradition (Farnsworth and Asch 1986). As Stoltman (1986b) notes, this points out the problem of using terms like Early and Middle Woodland as both cultural and temporal categories (Stoltman 1978). In the instance of the Black Sand tradition, it would appear that in the Quad-State region at least, an essentially Early Woodland cultural tradition survived well into Middle Woodland times. Indeed, R. Alex (1976), following A. Anderson (1971a), suggested that Spring Hollow Incised (Prairie Incised) might represent a sort of "chronospecies" of Black Sand Incised. Noting that Havana tradition sites are largely restricted to the major river valleys of eastern and central Iowa, he proposed that in regions of the state lacking Havana tradition sites, Spring Hollow Incised was the best candidate for Middle Woodland ceramics.

Prairie phase subsistence appears to have been heavily riverine oriented (Stoltman 1986b; Theler 1986, 1987; Van Dyke et al. 1980). This, however, may be a reflection of the small number of excavated sites attributable to this phase. As Benn (1987, 1988) has noted, many sites of this time period have been buried in floodplain contexts, and are not apparent through common surface survey techniques. Sites that have produced Prairie Incised ceramics in Iowa include: the Elephant site (13AM59), Mound 1 of the Harvey's Island Mound Group (13CT45), Levsen Rockshelter (13JK4), Crabtown Rockshelter (13JK62), Mouse Hollow Rockshelter (13JK59), Spring Hollow Rockshelter No. 1, and the Rogers site (13CD20), and it has been reported from Washington, Pottawattamie, Jasper, Floyd, and Mitchell counties (Logan 1976).

Green and Schermer (1988) attributed mound 37 of the Turkey River Mound Group (13CT1) to the Prairie phase on the basis of two sherdllets of Prairie Incised-like pottery. Excavated by McKusick (1964b), the mound contained the remains of five individuals, one an infant (Green and Schermer 1988). One burial was extended, one was a bundle, and one was cremated. A single skull represented one individual. Red ocher staining was apparent on some of the bones, and a bipointed knife made of Wyandotte chert was also recovered. Apparently, the mound fill came from a nearby habitation site, as it contained Agate Basin and Madison side-notched points (Green and Schermer 1988). Shell beads were found in association with the single extended burial.

Collins (1991) reported one definite and two possible components attributable to the Prairie phase along the Iowa River Greenbelt in Hardin County. Site 13HA22 yielded ceramics comparable to Prairie phase ceramics, and two projectile points made from Hixton Silicified Sandstone from southwest Wisconsin. This further strengthens its Prairie phase affiliation (Collins 1991). Collins (1991) interpreted this site as a base camp in a seasonal procurement round. E. Henning (1985) proposed that this region of the state should be characterized by a North Central Woodland pattern, more closely paralleling developments in southern Minnesota than the Mississippi River Valley. Collins' (1991) research would indicate that this may need to be revised, at least along the major river valleys.

In the Saylorville Reservoir, Benn and Rogers (1985) defined the Polk City phase, characterized by McBride ware, the local equivalent of Liverpool, Fox Lake, Crawford, and Prairie phase wares. They also note that no Marion ceramics have been recovered in the Saylorville area. This may add support to Munson's (1982, 1986), and Farnsworth and Emerson's (1986) ideas concerning the relationships between the Marion and Black Sand traditions. This phase, however, has been dated to 196 B.C. (2146±330) at site 13PK315 (P. Emerson and H. Finney 1984), slightly earlier than Farnsworth (1986) postulated that the Black Sand tradition reached central Iowa. However, the wide confidence interval on this date makes it difficult to draw conclusions from it.

The Polk City phase presents an interesting settlement pattern. Nineteen of the 33 Early Woodland sites known in the Saylorville project area are located within a 5 mile reach of the Des Moines River valley, near the mouth of Big Creek in Polk County (Benn and Rogers 1985). Nearly all of these apparent base camp sites were located on alluvial fans, benches, or uplands, a pattern that differs sharply from Black Sand tradition settlement patterns reported from other areas. In nearly all other regions, Black Sand tradition sites consist of small, seasonal base camps on low sandy terraces. In contrast, at Saylorville, no Early Woodland sites have been located on the T1 terrace of the Des Moines River (Benn and Rogers 1985). Collins (1991) reported that site 13HA22, was also located on a late Wisconsinian bench at the Iowa River bluff base, and a similar pattern is reported by Warren and O'Brien (1982) in the Cannon Reservoir region of Missouri. Unfortunately, no subsistence data are currently available for this phase (Benn and Rogers 1985). However, it is expected that subsistence was similar to that of Early Woodland groups elsewhere, based on intensive processing of vegetable foods, and hunting a wide variety of small mammals, birds, and aquatic resources.

Benn and Rogers (1985) are emphatic about placing the Polk City phase firmly within E. Henning's (1985) Mississippi Basin Woodland Study Unit. E. Henning (1985) has the Mississippi Basin Woodland and the North Central Woodland Study Units overlapping in this part of the state. Collins' (1991) findings in the Iowa River Valley would also tend to support the idea that, at least in the major river valleys, Mississippi



Basin Woodland extends farther north and west than its current boundaries indicate. Mississippi Basin Woodland also overlaps with E. Henning's (1985) Southern Iowa Woodland and Plains Woodland Study Units, but relationships between these units remain unclear.

In the Red Rock Reservoir in the central Des Moines River Valley, Roper (1986) notes that an Early Woodland presence in the area is barely visible. Sherds similar to the McBride ware of Saylorville Reservoir have been found at three sites in Lake Red Rock (Roper 1986; Stanley, J. Anderson, and Rogers 1988; Moffat et al. 1990). Stanley, J. Anderson, and Rogers (1988) propose that Early Woodland sites are located on the Low Terrace at Lake Red Rock, and are possibly buried by Camp Creek Member alluvium.

#### North-central Woodland

Much less is known about Early Woodland people and, indeed, those of nearly all time periods in this part of the state. E. Henning (1985) has suggested that this region was sporadically exploited by groups who did not remain in the region for extended periods of time, and that they were likely more closely related to groups to the north than to groups to the south and east. This may be true in the uplands and tributary drainages of the region, but as recent investigations by Benn and Rogers (1985) and Collins (1991) have shown, eastern influences in the major river valleys prevail farther to the north and west into this region than its current boundaries suggest.

In the Prairie Lakes region of southern Minnesota and northern Iowa, Anfinson (1987) has defined the Fox Lake phase, characterized by the introduction of Fox Lake ceramics. These ceramics appear to be the earliest pottery in this region, and appeared around 200 B.C. The Fox Lake phase is also characterized by the change in projectile point styles from lanceolate and stemmed types to side-notched, corner-notched, and triangular points (Anfinson 1987). These material cultural changes seem to have had little effect on subsistence and settlement or belief systems of people in this region, who appear to have maintained essentially the same lifestyle as the preceding Archaic Mountain Lake phase. As Benn (1983) has pointed out, this early diffusion of material goods is essentially passive. It is not until intracultural processes have resulted in a way for introduced goods to be incorporated into new productive systems that they will play a significant role in cultural evolution. Benn (1983) sees the time-transgressive spread of Eastern Woodland traits into the Prairie Peninsula not as a result of a time-lag in ideas reaching these areas, but of numerous cultural groups across the Midwest on independent, parallel evolutionary trajectories. As he points out, new technologies and beliefs will not be accepted unless they are seen to reinforce or enhance existing cultural values and productive methods.

During the Fox Lake phase, subsistence appears to have remained dependent upon bison, with fish and muskrat also being important. Deer, elk, waterfowl, mussels, and vegetable food remains are rare on Fox Lake phase sites (Anfinson 1987). As in the preceding Mountain Lake phase, settlements tend to be located on islands and peninsulas in lakes. There is no evidence for the construction of burial mounds, and little evidence for widespread interregional trade, although this phase persisted throughout the Middle Woodland time period (Anfinson 1987). A number of Fox Lake ceramics were recovered from the Arthur site (13DK27) (Benn 1982a), indicating an occupation during this time period. Faunal remains included muskrat, bison, deer, elk, and domesticated dog (Tiffany, ed. 1982). Some floral remains were present, but their association with the cultural deposits is questionable. Tiffany

(ed. 1982) interpreted the site as a seasonal camp for exploiting the resources associated with East Lake Okoboji.

#### Prairie/Plains Woodland

The Early Woodland in western Iowa is marked by the appearance of sandy paste, dense, embossed ceramics with trailing over cord roughening known as Crawford ware. It is very similar to Fox Lake Trilled, Black Sand, and Prairie Incised ceramics (Benn 1983, ed. 1990). These ceramics are the earliest manifestation of the Mid-America Woodland tradition (Benn 1986, ed. 1990) in the Prairie/Plains subarea of western Iowa and eastern Nebraska. In defining the Mid-America Woodland tradition, Benn (ed. 1990) follows the Middle Missouri and Central Plains subarea modification of the Willey and Phillips (1958) system, where the taxonomic level of "variant" is added between the level of phase and tradition. While phases relate to cultural developments within a locality, variants relate to regions, and traditions relate to areas (Benn ed. 1990). Crawford ware characterizes the Crawford phase (Benn 1986) of the Valley (Johnson in press) or Orleans I (Haas 1983) variant of the Mid-America Woodland tradition (Benn ed. 1990). At the MAD sites (13CF101-102), this phase has been dated from between around 2400 to 2050 B.P. (Benn 1983).

Evidence from the MAD sites (13CF101-102) indicates that the introduction of ceramics had little effect on the lifeways of the people of this region. The composition of the Crawford component differs little from that of the underlying aceramic components (Benn 1983, ed. 1990). He interprets the Crawford phase occupations as representing seasonal extractive camps utilized by family-sized bands practicing a diffuse collecting pattern with some utilization of native and introduced cultigens. No evidence for storage facilities is present, ceramics are few, and there is no evidence for the construction of burial mounds during this phase. Subsistence remains from the MAD sites consisted of deer, bison, and medium size mammal remains, and grasses, walnuts, acorns, cucurbits, sunflowers, and Chenopod seeds (Benn 1983). Both the aceramic and Crawford phase components produced fine-grained cherts (including Knife River Flint), side-notched projectile points, and large amounts of fire-cracked rock.

Benn (ed. 1983, 1990) argues that perceived population levels on the Prairie/Plains were lower than those in the Midwest during this time period. As a result, although ceramics may have been introduced from the east, they were not widely used, and Benn (ed. 1983, 1990) considers this a mere historical event and not part of cultural evolutionary development. The main impact of ceramic use, Benn argues, is in their advantage over other types of containers such as skin and baskets in withstanding long-term boiling required in the processing of hard starchy seeds (see Braun 1987, 1988, 1991). Benn (ed. 1983, 1990) proposes that Mid-America Woodland tradition people during the Crawford phase did not experience the territorial packing being experienced by Late Archaic and Early Woodland populations in the Midwest and therefore were able to maintain a less sedentary, diffuse pattern of hunting and collecting than was possible in the Midwest. As a result, they did not feel the need for intensive cultivation of hard, starchy seeds, and the sedentary lifestyle this productive change necessitates. Internal cultural processes had not yet reached a point where the introduction of ceramics could be incorporated into a significant change in the Crawford phase mode of production. Ceramics were simply added to the existing container types, with no significant change on the basic Archaic lifeway of the region.

Benn (1983, ed. 1990) applies the same argument to the lack of mound construction and mortuary ceremonialism by Crawford phase

people. The lack of territorial packing, and resultant lack of reliance upon intensive cultivation of vegetable foods and sedentism failed to provide the conditions necessary for the development of social complexity and status differentiation being felt by societies in the Midwest during this time period.

In southwestern Iowa, the Glenwood Trilled varieties of Pony Creek Punctate and Keg Creek Twisted Cord may represent localized equivalents of Crawford ware (Tiffany 1978a). However, nothing is known of settlement and subsistence in this region of the state. Early Woodland components in western Iowa should be found in the Hatcher Member of the DeForest Formation in small valleys and in Late Holocene Terrace deposits in large valleys (Benn 1986).

### Southern Iowa Woodland

E. Henning (1985:35) proposes a Southern Iowa Woodland Study Unit that occupies the "Upper Platte, Grand and Chariton River Basins with overlap into the Des Moines River Drainage." Although little is known archeologically for this portion of the state, she postulates that, while paralleling developments on the Prairie/Plains, this region likely has strong ties to developments in northern Missouri. Unfortunately, very little is known about Early Woodland manifestations there either. Chapman (1980) reports Black Sand Incised ceramics from the upper Chariton River drainage, and in the Lower Missouri River drainage. L. Brown (1967b) reported no Early Woodland materials from Rathbun Reservoir. However, his investigations were strongly oriented toward mound excavations and at the time nearly all mounds were considered to be Middle Woodland, so it is difficult to determine their cultural affiliations. Despite numerous archeological studies in the reservoir region (Wheeler 1949a; McKusick and Ries 1962a; Hoffman 1965; Brown 1967b; Weichman 1976a; 1976b; Benn and Hovde 1981; Grantham n.d.; Bradley 1988; Luckenbach et al. 1988), extremely little is known of its culture history (cf. Cook 1975a; Gourley 1983a). Similarly, as noted earlier, Roper (1986) commented on the paucity of Early Woodland remains in the Red Rock Reservoir on the northern boundary of this region. At this point, it appears as though Early Woodland occupation of this area was sparse. However, this may in part be a reflection of the fact that in many cases Early Woodland sites in this region may be buried in Roberts Creek Member alluvium, and be buried by the Camp Creek Member of the DeForest Formation (Bettis and Littke 1987) (see also Stanley et al. 1988).

### Middle Woodland

#### Mississippi Basin Woodland

The major feature distinguishing the Middle Woodland time period in the Eastern Woodlands is the development of the Hopewell Interaction Sphere, a widespread exchange network and mortuary complex covering nearly the entire eastern United States. In the Illinois and Mississippi Valleys, the regional Hopewellian manifestation is known as the Havana tradition, and I will begin the Middle Woodland with the inception of the Havana tradition, following Munson (1986).

People have defined Hopewell in a number of ways. One is through enumeration of cultural traits, including distinctive ceramic treatments, large burial mounds with elaborate grave goods and earthworks, and exotic items obtained through long distance trade, such as mica, sea shells, obsidian, copper, galena, and grizzly bear teeth (Griffin 1978). Originally, Hopewellian societies were viewed as being rather uniform, however, it has become apparent that significant regional variation exists between Hopewellian groups, and it appears apparent that Hopewell

consists of a series of shared traits and activities among local groups of various lifeways (Jennings 1974: 232). As Caldwell (1964:136) points out, Hopewell "has been called a civilization, a culture, a complex, a phase, a regional expression of a phase, a period, a style, a cultural climax, migrations of a ruling class, a technological revolution, a social revolution, and an in-place development out of previous antecedents." He, along with Struever (1964a), proposed viewing Hopewell as an "Interaction Sphere" between numerous different social groups. An interaction sphere would include local groups participating in long distance trade in exotic items and sharing certain ideological beliefs and practices overlain on local or regional traditions. By this time, reliance on the intensive cultivation of native and introduced plants had increased to such an extent that Smith (1992) makes a strong case for considering Hopewellian people as farmers.

Traditionally, two core areas of Hopewellian development have been recognized: Hopewell in Ohio where the complex was first recognized and Havana in Illinois (Jennings 1974:232, Figure 2). The Illinois River Valley has traditionally been considered the core area of Havana development, and the Havana tradition was assumed to have spread from this core to more distant peripheral areas. However, it appears possible that this view of the Illinois River Valley as the core area may be an artifact of the amount of work that has been done on Havana sites in this area as opposed to the Mississippi River Valley. Further research in the Mississippi River Valley may reveal that it was as much of a core area for the development of Havana society as was the Illinois River Valley.

Early theories on the spread of the Havana tradition from its presumed Illinois River Valley core area emphasized the physical migration of people. Griffin (1979) subscribes to this view for Central Missouri and Kansas City Hopewellian manifestations, and Stoltman (1979) appeared to favor it for southwestern Wisconsin as well, noting the lack of an Early Woodland population there. Gradwohl (1974) sees the Van Hyning phase occupants of the central Des Moines River Valley as recent immigrants, or local folk capable of producing "passable provincial plagiarisms of the real wares from the main 'interactions sphere.'" (Gradwohl 1974:94)

By 1986, however, following his definition of an Early Woodland Prairie phase in southwestern Wisconsin, Stoltman speaks of a "Havanization" process operating on an indigenous Prairie phase population. In noting the contemporaneity of the Prairie phase and the Havana tradition, Stoltman (1986b) points out the problems of using terms like Early Woodland as both temporal and cultural designations. Benn (ed. 1987:243) poses similar questions regarding the Liverpool, Prairie, and Polk City phases in interior Iowa. He questions whether they represent, "a chronological stage of development (and therefore a period) or merely transitional phases of either Archaic or Woodland periods."

Struever (1965) recognized four microstylistic zones within the area occupied by the Havana tradition: Snyders, Steuben, Yellow Bluffs, and Carlyle. Loy (1968), was able to demonstrate a statistically significant difference in percentages and presence and absence of decorative attributes between ceramic assemblages from a site in the Steuben zone and a site in the Snyders zone. Using the same series of attributes, Bailey (1977) found that the ceramic assemblage from the Bennett-Roth site in the Three Rivers region varied significantly from those described for any of Struever's microstyle zones, and proposed the possibility of a fifth microstyle zone in the upper Mississippi River Valley which he called the Bennett Roth zone. Once again, using Loy's (1968) attributes, Benn (1978) examined ceramics from the FTD site (13AM210) located in Struever's (1964a) Tri-state Locality and Benn's (1979) Quad-State region

in northeast Iowa, northwest Illinois, southwest Wisconsin, and southeast Minnesota. He found that ceramics from FTD also displayed significant differences in attribute characteristics from the sites examined by Loy. Using the same attributes, Markman (1988) found that ceramics from Putney Landing in the Three Rivers Area (Benn ed. 1987) of southeast Iowa and northwest Illinois showed greater affinity with the FTD assemblage than with either of the sites in Loy's study. This may tend to support Bailey's (1977) Bennett-Roth Zone for the upper Mississippi River Valley.

Benn (ed. 1987, 1988) assigned Middle Woodland remains in the Three Rivers region to the Havana tradition, noting the presence of artifacts diagnostic of all of Munson's (1986) named phases for the central Illinois River Valley. Munson's earliest fully Havana phase is the Late Marion/Early Morton phase, dating between 2400 and 2250 B.P. This phase is characterized by Marion Thick and "Marion Thin" ceramics in its early portion, and Sister Creeks Punctate and Morton Incised ceramics in its later portion. Point types of this phase include Kramer stemmed and Liverpool stemmed, contracting stemmed Dickson Broad Bladed knives, and later Snyders-like corner-notched varieties. Lamellar blades, a common characteristic of the Havana tradition also make their appearance during this phase (Munson 1986).

Munson (1986) postulates that burial programs differed little from preceding Red Ocher burial practices, with low mound construction, red ocher, and occasional grave goods. Settlement patterns are likely to be much the same as preceding and succeeding cultural groups. Unfortunately, this makes it difficult to discern individual occupations on these sites. At Sand Run West (13LA38), Benn (ed. 1987) notes that there does not appear to be a well developed Marion sequence present, but that Sister Creeks and Morton types were present. He also notes that the ceramics at Sand Run lack pre-Havana characteristics and likely date to the Late Marion/Early Morton phase.

Additionally, Benn (ed. 1987) states that Morton ware is not prominent in interior Iowa or the Quad-State region and that in those areas Sister Creeks Punctate has a Black Sand-like paste. He concludes that in those areas Sister Creeks ceramics likely belong to the Black Sand tradition and not the Havana tradition. The Gast Farm site (13LA12), while yielding three Marion Thick sherds and one Morton sherd, failed to yield Sister Creeks Punctate during a recent controlled surface collection (Green and Wallace 1991), nor did it yield Fettie Incised or Neteler Stamped, characteristic of the succeeding Caldwell phase. There is, however, a significant Black Sand presence at the site, and it may be that it was occupied by Black Sand people during this time period as Benn (ed. 1987) has suggested.

Munson's (1986) next phase is termed the Late Morton/Caldwell phase dating from ca. 2250-2150 B.P. This phase sees the disappearance of Marion ceramics while Morton and Sister Creeks types continue. Ceramic types added during this phase include Fettie Incised, Neteler Stamped, and Havana Zoned (Munson 1986). The complete Havana lithic assemblage, consisting of Snyder's points, Dickson Broad Bladed Knives, lamellar bladelets, and Havana scrapers, is present. Also, exotic trade goods (copper, marine shells, galena, Wyandotte/Dongola chert) are common. Settlement patterns are those of the later Havana phases; large bluff-base camps, with small seasonal resource extraction camps in other floodplain and bluff-top locations. Mortuary patterns seem similar to those of earlier phases. Benn (ed. 1987) notes that this phase is not obviously apparent at Sand Run West. While the diagnostic ceramic types do occur, Fettie Incised and Neteler Stamped are not abundant. He also notes that rectilinear trailed designs over smoothed surfaces are not common, and there are few vessels that lack embossing

but with bevelled lips. This is also the case in interior Iowa and in the Quad-State region. Benn (ed. 1987) points out that Black Sand rims in interior Iowa often exhibit trailing in complex nested chevrons and herringbone designs. This suggests to Benn that the Black Sand tradition persisted later than 2150 B.P. in these regions, and assimilated many Morton/Fettie attributes. He also suggests that something similar to the Early Morton phase may have persisted in the Mississippi River trench.

During the Fulton phase (150 B.C.-A.D. 1), Munson (1986) states that Morton Incised and Sister Creeks Punctate decrease markedly. Fettie Incised and Neteler Stamped continue, and Havana Zoned increases, and Naples Stamped (dentate, ovoid, Hummel) appears. Simple platform pipes appear during this phase, and exotic trade materials are at least as common as in the Late Morton/Caldwell phase. Nearly all the major sites are located on high terraces or talus slopes, and more intensive utilization of cultivated plants first becomes apparent. Mortuary structures are of the typical Hopewell type, with central log subfloor tombs in the immediate vicinity of associated villages.

The succeeding Ogden phase is the classic Havana-Hopewell phase. It is characterized by the appearance of Hopewell ware, and the disappearance of Morton Incised, Fettie Incised, and Neteler Stamped. Naples Stamped and Havana Zoned are the most common ceramic types, and plain ceramics are more common than in preceding phases. Villages are still located on middle and high terraces and talus slopes, and each has an associated mound group. There appears to be an increase in village numbers during this phase, and major villages appear to have been spaced between 8 and 17 km apart. This pattern seems to have persisted throughout the Havana tradition occupation of the region (Munson 1986; cf. Struever 1968; Struever and Houart 1972). Gregg (1974) and Benn (ed. 1988) have recognized a similar settlement pattern in the upper Mississippi River Valley in northwest Illinois and southeast Iowa. Exotic goods increase in both quality and in quantity during this phase, although other characteristics of the mortuary program appear to have been little changed from the preceding Fulton phase. Neither does subsistence appear to have differed markedly from that of the Fulton phase (Munson 1986).

At Sand Run, Benn (ed. 1987) was unable to separate these two phases due to the mixed nature of the deposit. However, he believes that they are likely present at Sand Run and at other major Havana sites in the region such as Wolfe (Straffin 1971a; Titus et al. 1991), Gast Farm (Green and Wallace 1991), Putney Landing (Markman 1988), and Albany (Benchley and Gregg 1975; Benchley et al. 1977). It also seems likely that Hopewell mounds near Davenport (Shaw 1877; Starr 1897b) and Toolesboro Mounds (13LA29) (Harrison and Pratt 1893; Keyes 1932, 1951; Lynch et al. 1893; Orr 1935; Green 1993; Alex and Green 1995) were constructed during these phases. He bases his belief on the fact that large numbers of Havana types occur on these sites, as does classic Hopewell ware (Benn ed. 1987). Benn notes, however, that Naples Stamped ceramics have cord-roughened surfaces and less diversity of stamping and zoned motifs at Sand Run than at the nearby Putney Landing site. These factors led him to tentatively assign the main occupation there to the earlier Fulton phase.

Benn (ed. 1987:72) further maintains that "there is no question that some manifestation of the Fulton/or Ogden phases happened along the major rivers of interior eastern Iowa and along the Mississippi River in the Quad-State region." He points out that "actual types and local varieties of Neteler, Hummel and Naples Stamped and Havana Zoned occur in rock shelter sites (Logan 1976) and in open villages (cf. Weichman and Tandarich 1974)." He states that the occupants of inland

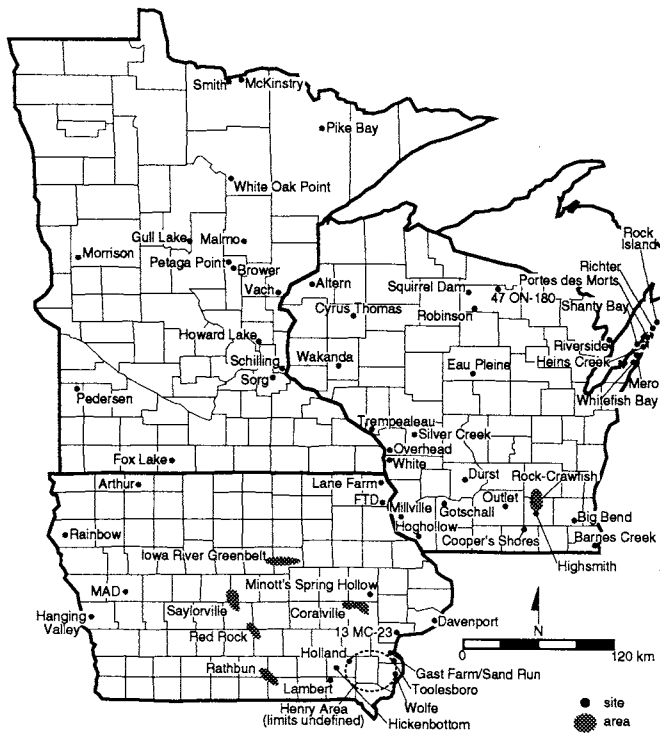


Figure 16. Middle Woodland sites.

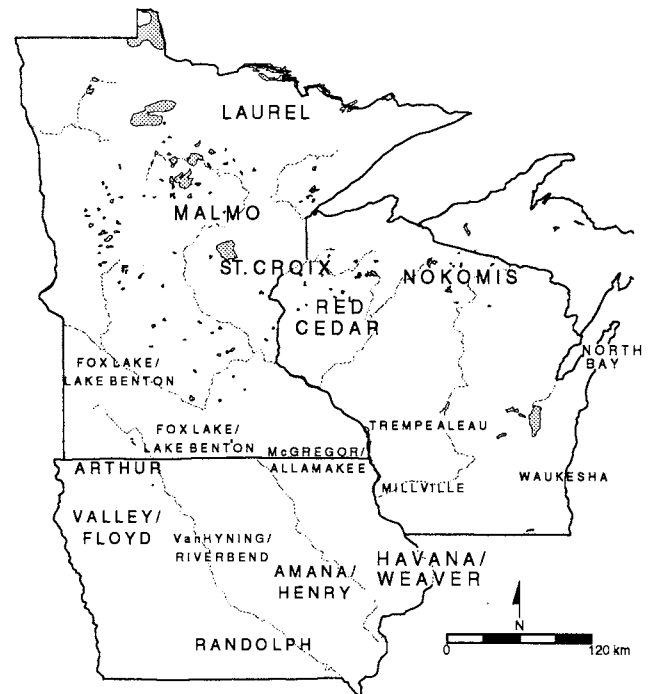


Figure 17. Middle Woodland phases.

areas of Iowa rapidly adopted Havana styles during the Fulton and Ogden phases.

Munson's next phase is termed the Frazier phase, dating between A.D. 200-400. Griffin (1970) named this phase the Steuben phase. During this phase, "Havana Zoned and Naples Ovoid drop out . . . Naples Dentate and Hopewell ware continue, and the Baehr series and significant quantities of Weaver ware (as well as Havana-Weaver "intermediary types") appear." (Munson 1986:294). The majority of vessels have smoothed surfaces, and rounded lips appear in numbers for the first time. Vessel walls also tend to be slightly thinner (see Braun 1985a). Snyder points, Dickson Knives, Havana Scrapers, and lamellar bladelets continue, but Steuben Expanding Stemmed points increase in popularity. The Hopewellian trading network may have become more extensive, and it appears that it was during this phase that most or all of the obsidian and Knife River Flint entered the Midwest. The settlement pattern appears to have changed little from preceding phases, although site density appears to have increased in the Spoon River Valley of Illinois. Subsistence and mortuary patterns, similarly, appear little changed (Munson 1986).

At Sand Run (13LA38), Benn (ed. 1987) reports a substantial component of this phase. He notes the presence of Baehr, Weaver, and Naples ceramics all being present. He also notes the presence of Levsen Stamped ceramics, a late Middle Woodland Linn ware type in the Quad-State region of northeast Iowa (Logan 1976). Benn (ed. 1987) also notes that the Baehr, Weaver, and Naples ceramics do not appear to extend into eastern Iowa, and that they are not apparent in the Quad-State region either. He points out that ceramics from the Young site on the Cedar River (Benn and Thompson 1977) (note also his recantation of Cedar ware (Benn ed. 1987:73)) and in the Quad-State region (Benn 1978; Stoltman 1979) consist primarily of dentate stamped and punctated Linn ware types. While Baehr ceramics are also present at the nearby Putney

Landing (11 He-3) (Markman 1988) and Sloan (11Mc-86) (Benchley, Hassen, and Billeck 1979) sites, based on the controlled surface collection (Green and Wallace 1991) they appear to be absent from the Gast Farm (13LA12) assemblage. In addition, while Weaver ceramics are abundant on the site, sharing the same landform, they are spatially segregated from the earlier Havana components. It may be that the Gast Farm site was not occupied during the Frazier phase. Neither have Baehr ceramics been reported from the Wolfe site (13DM1) (Straffin 1971a; Titus et al. 1991).

Following the Frazier phase is the Weaver phase, dating from ca. A.D. 400-700 (Munson 1986). This phase is considered by many to be early Late Woodland and is clearly transitional between the Havana tradition and succeeding Late Woodland phases. Hopewell and Havana wares are absent from this phase, as are Snyder points, lamellar bladelets, exotic raw materials, and elaborate mortuary practices indicating status differentiation. However, Benn (ed. 1988) has pointed out that exotic trade goods do appear in Weaver contexts in the Three Rivers region. The ceramic assemblage consists nearly entirely of Weaver ware. Vessel lips tend to be rounded and flattened, and vessels generally lack nodding. Decorations are extremely plain, consisting primarily of cordwrapped stick impressions on vessel lips and upper rims. However, Weitzel (1992) has pointed out that outside the Illinois River Valley single tool notches are more numerous than cordwrapped stick impressions on Weaver ceramics. Wall thicknesses are in the 7-8 mm range. Nearly all projectile points are of the Steuben Expanding Stemmed type, and lithics tend to be made from local materials. The settlement pattern appears little changed, but there appears to have been an increase in the number of sites in some areas. Benn (ed. 1988) also notes that Weaver sites are scattered across the middle of the Mississippi River bottom in a non-Havana manner in the Three Rivers region. Sites are also found in creek

valleys away from the major rivers during this phase. Mounds are located on bluffs above major villages during this phase (Munson 1986).

As mentioned earlier, at the Gast Farm site (13LA12) the Weaver component is spatially separated from the earlier Havana components, and constitutes a "ring midden" (Green and Wallace 1991; Green 1992a). Weitzel (1992) was able to demonstrate that tool notching is a more common decoration than cordwrapped stick impressions in Weaver sites outside the Central Illinois River Valley. He tentatively grouped sites in the Three Rivers region, including Sand Run, Michael's Creek, Wolfe, and 13MC23 (and presumably Illinois sites as well) into the local Gast phase within what he refers to as Weaver culture (although he appears to have backed away from naming a Gast phase in Weitzel and Green (1994)). Perhaps the Illinois Valley phases should be considered as the type phases for horizons within the Havana tradition, and phase status reserved for local manifestations of these Horizons.

Test excavations in the Weaver component at Gast Farm during 1991 revealed numerous deep storage pits, one containing 196 grams of charred acorns (Hodgson 1992). In other features, hickory nuts (*Carya ovata*) were the most common nut remains, along with some black walnut (*Juglans nigra*) and hazelnut (*Corylus americana*). Other seeds recovered included little barley (*Hordeum pusillum*), Chenopodium, knotweed (*Polygonum*), sunflower (*Helianthus*), Amaranthus, maygrass (*Phalaris caroliniana*), *Iva annua*, one cucurbit seed, and various grasses. Chenopodium, little barley, maygrass, and knotweed represent the starchy seed complex of indigenous Midwestern cultigens (Asch et al. 1979). Sunflowers, *Iva*, and the cucurbit represent the oily cultivated seed complex. Grape, sumac, and nightshade seeds were also found (Hodgson 1992). Faunal remains recovered from controlled surface collections in 1990 and 1991 revealed that deer remains were the most frequent, with muskrat, wapiti, pocket gopher, raccoon and beaver also represented (Whelan, Neverett, and Sobolik 1992). From excavated pit features, fish remains made up 69% of the fauna. Species recovered include *Ictaluridae*, suckers, bowfin, gar, and drum. Turtle remains were also abundant. Mammalian remains included white-tailed deer, muskrat, raccoon, wapiti, beaver, dog, fox, woodchuck, mink, bobcat, squirrels, pocket gopher, rabbit, skunk, and various mice, voles, lemmings, and a rice rat. Bird remains were surprisingly sparse (Whelan, Neverett, and Sobolik 1992). A canid coprolite was also recovered from the site, yielding the remains of at least 15 fish.

To the west of the Three Rivers region in the lower Skunk and Des Moines River Valleys, Perry (1987) has recently defined Henry ware, a local Weaver equivalent. Examples of Henry ware have been reported from the Williams site (13HN10) (Tiffany 1981a), the Hickenbottom site (13JF52) (Thompson and Fisher 1977), 13HN48 (Perry 1984b), 13DM40 (Perry 1981), 13HN40 (Perry 1984c), and 13LE188 (Perry 1985). The Lambert site (13VB82) (Fulmer et al. 1977) has yielded ceramics very similar to Henry ware, as have sites 13VB258 (Merry 1987), 13VB104 (Artz 1993), and 13LE183 (Billeck 1985b).

In the Quad-State region of northeast Iowa, southeast Minnesota, southwest Wisconsin, and northwest Illinois, Benn (1978, 1979, 1980) has refined Logan's (1959; 1976) designation of a McGregor phase for the earlier part of the Havana sequence, where Havana wares dominate, and a succeeding Allamakee phase, equivalent to Weaver, where Linn ware types are predominant. Stoltman (1979, 1990) noted a similar trend in southwestern Wisconsin, with Havana wares dominating in the earlier Trempealeau phase (McKern 1931), and with Linn ware types predominating in the later Millville phase (Freeman 1969). The Wisconsin Trempealeau phase is closely related to the Iowa McGregor phase, while the Wisconsin Millville phase is likely nearly identical to the Iowa

Allamakee phase (Stoltman 1990). By carrying out a detailed attribute analysis on ceramics from the FTD site (13AM210), utilizing methods and categories developed by Loy (1968), and by comparing attributes to sites in the Illinois River Valley, Benn (1978) was able to demonstrate that the Havana ceramic assemblage at FTD fit comfortably within the Havana tradition, but that important stylistic differences existed between this site and the Illinois Valley sites. As stated earlier, Struever (1965) recognized four microstyle zones within the Havana tradition in Illinois, and Bailey (1977) had proposed a Bennett-Roth Zone for the upper Mississippi River Valley. While Wisconsin authors appear to favor the view that the Trempealeau phase was not part of the Havana tradition (cf. Salzer 1986; Stoltman 1979), no detailed attribute analyses have been carried out on Wisconsin material. Logan (1959, 1976) dated the McGregor phase as being concurrent with the latter half of the Ogden phase, and with the Frazier phase (Munson 1986) of the Illinois River Valley, or from ca. 0 A.D./B.C. to A.D. 300.

Following Hall's (1973, 1980) idea of the intensification of Havana ceremonial activities in the Illinois River Valley as resulting from the circumscribed nature of areas suitable for mud-flat horticulture along major river valleys of the prairie peninsula, Benn (1979) noted an early abandonment of the classic Hopewell burial ceremonialism in the Quad-State region and saw this as a reflection of the frontierlike nature of the region.

If the Illinois and Mississippi River Valleys were circumscribed environments for the subsistence of the Havana tradition, the upper Mississippi River Valley was not. This portion of the river passes through a patchwork of micro-environments. The entire Quad-State region offered a plethora of alternatives for the hunting and collecting Havana peoples. In the face of abundance and a sparsely populated frontier, McGregor phase peoples neither established a copy of the Havana tradition nor perpetuated their style of Havana culture for more than about two centuries. (Benn 1979:59)

Benn (1979) suggests that later burial treatments in the McGregor phase place great emphasis on concern for the safe passage of the dead to the afterlife. Treatments tend to be much less elaborate, and show much less concern for the status of the individual than in the Illinois River Valley, and tend to be egalitarian in nature. This is much the type of treatment to be expected in a plentiful, frontier situation.

The McGregor phase ceramic assemblage contains most of the Illinois Havana ware types (Griffin 1952; Fowler 1955), but curved dentate stamped types are not plentiful, Naples Dentate Stamped is the most common type in the region, and Hopewell ware is rare (Benn 1979). Projectile points are similar to Illinois types, and large habitation areas are also found in the Quad-State region. Nothing is known concerning subsistence practices during this phase.

The transition to the Allamakee phase, around A. D. 300, continues the pattern of regionalization of ceramic styles begun in the earlier Havana tradition phases. In the Quad-State region, Linn ware rapidly replaces Havana ware, beginning, perhaps, as early as A.D. 250 (Benn 1979). While clearly evolving out of Havana types, Linn ware possesses many distinctive features. As Benn (1979:60) states:

In brief, the earliest Linn ware types, Levsen Dentate Stamped and Cord-Wrapped-Stick Stamped, contain strong emphasis on hard, thin vessel walls with smooth, uniform surfaces, round or squared lips lacking any bevel, the use of punctates but the absence of nodes (bosses), and decorative stamps occurring in multiple horizontal belts of diagonal and vertical elements or geometric designs. . . Linn ware also incorporates undecorated

plain and cord roughened types, Spring Hollow Plain and Cordmarked, which are analogous to the post-Havana Weaver types (Griffin 1952). Probably the most interesting Linn ware type is Lane Farm Cord Impressed (Logan 1953, 1959:171), a type which seems to have appeared after the Allamakee phase was underway. Of central importance is the Lane Farm rim decoration consisting of single cord or fabric impressions, which apparently is the harbinger [sic] of fabric decorated pottery of the Late Woodland period in the upper Midwest (cf. Benn 1978) [see below, however, for Stoltman's (1990) ideas on Lane Farm ceramics].

This trend toward strong, thin walled vessels likely has to do with an increasing reliance on hard, starchy seeded native cultigens, that require long periods of boiling to make them palatable (cf. Braun 1985a, 1987, 1988, 1991).

Theler (1987) states that subsistence activities during the Allamakee phase revolved around upland fall-winter site locations, and floodplain terrace summer occupations. Large mammals, mostly white-tailed deer, provided most of the winter subsistence while summer subsistence centered around riverine resources such as fish and mussels. Little is known about plant utilization in this region during this time period, but carbon isotope analysis has demonstrated that maize was not an important part of the diet (Bender et. al 1981). It is likely, however, that native cultigens played a major part in the Allamakee phase people's diet. Benn (1979) notes that Allamakee phase ceramics are much more common in interior northeast Iowa than Havana types, and interprets this as evidence that Allamakee phase people were dispersing into small groups during the winter and moving to inland locations. This fits well with Theler's (1987) interpretations. Benn (1979) attributes this shift in settlement pattern to the open frontier environment of the Quad-State region, population increase, the advent of the bow and arrow, the development of stronger, lighter ceramics, and an increasing reliance on cultivated plant foods.

Mound building also continued into the Allamakee phase, and it is during this phase that Benn (1979; see also Benn, Mallam, and Bettis 1978; Benn, Bettis, and Mallam 1993) sees the beginnings of a ceremonial ritual cycle that continues into the succeeding Effigy Mound Keyes phase in northeast Iowa. In this model, burial mound construction is seen as not building monuments to the status of the individual dead but instead to link the dead, the living, and nature and to reestablish people's relationship to the spiritual world. As Benn (1979:62-63) states:

Mound building was a symbolic activity substantiating the relationships between man, his environment, his ideology, and his means of production. The actions related to mound building also reinforced the preconceived order of reality for all members of society. A mound need not have been raised annually or even at any regular interval of time. Fortuitous events—e.g., the death of an important person, a large initiation of adolescents, environmental stress, foreign pressure, etc.—may have been factors instigating a mound building cycle. At the very least it is likely that a major mound ceremony was conducted during the lifetime of the average-aged person.

In the Prairie du Chien locality of southwestern Wisconsin, from his excavations of stratified sites, Stoltman (1990) noted that Lane Farm Cord Impressed ceramics and Lane Farm Stamped ceramics were never part of the same archeological assemblage, and that the Lane Farm Cord Impressed strata always postdated the strata containing Lane Farm Stamped and other Linn ware types characteristic of the Allamakee/Millville phase. He proposes that the Lane Farm Cord Impressed ceramics

were made by "Lane Farm culture" people, who occupied the region at a later time than that of the Allamakee/Millville phase. He further suggested that Lane Farm Stamped be removed from the Lane Farm Series, and renamed Levsen Stamped, variety rocker stamped, and presumably Lane Farm Cord Impressed be removed from Linn ware and be elevated to a separate ware category. To Stoltman (1990) Lane Farm culture is represented in Wisconsin by the Mill phase, dating between A.D. 500-A.D. 750, and by an unnamed phase in northeast Iowa. The Mill phase has also been tentatively accepted for eastern Iowa as well.

The Middle Woodland occupation of interior eastern Iowa is less well known. Perry (1991) has recently summarized much of what is known about Middle Woodland in this area. He describes the interior Iowa Havana manifestations as consisting of the "Amana Havana" of the Iowa River Valley (A. Anderson 1971a; Weichman and Hedin 1974; Weichman and Tandarich 1974), several rockshelters along the Maquoketa River in Jackson and Jones counties (Logan 1976), and sites in the Rathbun Reservoir region of the Chariton River (L. Brown 1967b). Till and Nansel (1981b) describe the "Holland Hopewell" site (13JF303) along the Skunk River in Jefferson County, near the source area for Warsaw Tabular Chert, a local Mississippian chert that outcrops only in this area (Morrow 1984) but is commonly found on Middle Woodland sites in interior Iowa, and the Mississippi River Valley (Benn ed. 1988).

The "Amana Havana complex" is based on several undescribed Neteler Stamped sherds with no provenience, supposedly from the Amana area (Weichman and Tandarich 1974). A. Anderson (1971b) notes that W. Caldwell (1961) recovered Havana and Weaver or Linn ware from Woodpecker Cave near the Iowa River in Johnson County. Linn ware is also present at the Walters site (13JH42). In addition, Perry (1991) describes recent testing and excavations on Havana "field camps" in the Cedar River Valley in Linn County. Interestingly, the type sites for Linn ware, the three Spring Hollow Rockshelters and Minott's Rockshelter (13LN210), are located along the Cedar River in Linn County (Logan 1976; A. Anderson 1971b).

Perry (1991) noted the presence of a cross-hatched incised rimsherd at site 13LN243. Similar types were recovered by Keyes from the above mentioned rockshelters, from the Young site (13LN133) (Benn and Thompson 1977), Sandy Beach (13JH43) (A. Anderson 1971a), the Walters site (13JH42) (A. Anderson 1971b), Horsethief Cave (13JN8) (Keyes n.d.), and at 13JH500 (Overstreet 1987). Noting that Logan (1959) had left this type unnamed, Perry (1991) applied the name Spring Hollow Crosshatched to it, and noted its similarities with Baehr ceramics of the Frazier phase of the Illinois River Valley. Currently, its known distribution is limited to the Iowa, Cedar, and Wapsipinicon River Valleys in Johnson, Linn, and Jones counties, and it is considered to date to ca. A.D. 200-300.

Perry's (1991) recent investigations at Pleasant Creek/Lewis Bottoms and at Ivanhoe Bottoms resulted in the delineation of a Havana settlement pattern quite different from that of the Illinois River Valley. At Pleasant Creek/Lewis Bottoms, Perry (1991) found that field camps were located on high terraces adjacent to a small stream, while residential base camps were found on the uplands, overlooking the major river valley. Although many investigations have been carried out in the Coralville Reservoir area (Wheeler 1949b; W. Caldwell 1961; Weichman and Tandarich 1974; Weichman 1975; Zalesky 1977; Lewis 1979; Roetzel and Strachan 1980; Ziegrowsky and Zalesky 1981; Schermer 1983h; P. Emerson et al. 1984; Overstreet and Stark 1985a; 1985b; Overstreet, Stark, and J. Anderson 1985; Overstreet 1986; 1987; Overstreet et al. 1986; J. Anderson and Overstreet 1986; Richardson, J. Anderson, and M.



Anderson 1989), nearly all have treated Woodland as a general category, and little can specifically be said about the Middle Woodland occupation there. Future survey and excavation programs will help clarify our understanding of the elusive Amana Havana.

In the Saylorville Reservoir of the central Des Moines River Valley, Benn and Rogers (1985) have recently defined the Van Hyning phase, characterized by High Bridge ware, as the local Havana equivalent, and the Riverbend phase, characterized by Madrid ware, as the local Weaver equivalent. The Van Hyning phase is dated from 100 B.C. to A.D. 400, and appears to be spatially restricted to an area within five miles upstream and seven miles downstream of the Boone Bottoms in Boone County. Base camp settlements in this region are located on TH Terraces, fans, and high TI Terraces of the Des Moines River, produce large amounts of pottery, and contain pits and roasting features (Benn and Rogers 1985; Osborn and Gradwohl 1982). Faunal remains include deer, other mammals, and birds, turtles, and mussels. Iowa State University excavations at Van Hyning phase sites also produced 3 points made of Knife River Flint, and flakes of obsidian were found at sites 13BN30 and 13BN123 (Osborn and Gradwohl 1982). These were important Hopewell Interaction Sphere trade items. Altogether, these sites produced nearly 30% cherts imported from the south and east of the region (Benn and Rogers 1985). Also, a Hopewell Zoned Rim from site 13BN262 was likely imported from the east, and a Valley ware rim from western Iowa was found at site 13BN182. Smaller sites are also known, often producing only a few sherds of High Bridge ware, and often from deflated contexts. Benn and Rogers (1985:44) postulate that these may represent seasonal resource extraction sites utilized by small groups from either of two populations, "small bands on seasonal forays from large, upriver villages; or a more dispersed, loosely organizing [sic] population on the periphery of influence from the Van Hyning phase population."

As noted earlier, the Black Sand equivalent Polk City phase is concentrated in Polk County, while the Van Hyning phase is concentrated in Boone County. These two phases may be, at least partially, contemporaneous, and may represent separate populations (Benn and Rogers 1985; cf. Munson 1982; 1986). Most High Bridge ware types have synonyms with Illinois Havana types, but lack beveled lips, ovoid stamping, and large amounts of zoned stamping and trailing (Benn and Rogers 1985). Gradwohl (1974:94) viewed the Van Hyning phase occupants of the area either as, "fairly fresh Hopewellian migrants from the east, or else their potters produced passable provincial plagiarisms of the real wares from the main 'interaction sphere'." However, Benn and Rogers warn against equating diffusion of artifact styles with acculturation into socioeconomic and ritual systems by "peripheral" groups (cf. Benn 1983). Benn (ed. 1987) concluded, based on ceramic attribute analysis, that the Van Hyning phase was an indigenous central Iowa development influenced by, but not part of, the Havana tradition. Although the Van Hyning phase, as defined by Benn and Rogers (1985) is restricted to a small area in Boone County, Roper (1986) includes Middle Woodland material from Lake Red Rock just downstream in the Van Hyning phase.

Based on excavations by Iowa State University (Gradwohl 1973, 1974) and her own testing, she feels that the typical Middle Woodland settlement pattern of large base camps and small seasonal resource extraction camps is present in the Lake Red Rock area as well. Roper (1986:364) postulates that the Des Moines River may be the most westerly stream in Iowa, "which presents the peculiar combination of forest-prairie mosaic and resources within which Havana tradition populations found their niche."

More recently, Moffat, Koldhoff, and McCorvie (1988:94; Moffat et al. 1990) have noted that Munson (1986) indicated that, "the popularity of interior-beveled lips declines during the Frazier phase in favor of flattened or rounded lips and that Naples Ovoid is no longer made during the Frazier phase." Based on their excavations at the Cormorant sites (13MA387), Roper's (1986) testing, and testing by Rogers and Koldehoff (1987), Moffat et al. conclude that Middle Woodland components in the Lake Red Rock area are more closely affiliated with the Havana tradition than with the Van Hyning phase of the Saylorville Lake area. Apparently many of the Middle Woodland components in Lake Red Rock are contemporaneous with the Frazier phase of the Illinois River Valley (Moffat, Koldhoff, and McCorvie 1988). The Milo's Silo site (13MA41) also yielded dates of this time period (A.D. 300 and A.D. 570) (Gradwohl 1974). This makes a certain amount of sense considering that Saylorville is located on the Des Moines Lobe, a quite different environment from the Illinois and Mississippi River Valleys, while Lake Red Rock is on the Southern Iowa Drift Plain, a much more similar landform region.

While small mound groups are found throughout the Van Hyning phase distribution area, the focal point of the Van Hyning phase is the Boone Mound (13BN29) located on a TH Terrace in the midst of the Gracie Paulson site (13BN30) (Harlan 1908; Van Hyning 1910a; Ashworth and McKusick 1964; Gradwohl 1974; Benn and Rogers 1985). This huge (by central Iowa standards) mound is unique to the region and measured between 130 to 160 ft. (40-50 m) in diameter, and reached a height of 15 ft. 6 in. (4.7 m) (Benn and Rogers 1985). The nearest mounds of comparable size would be the Toolesboro Mounds along the Mississippi River in southeast Iowa (Green 1993; Alex and Green 1995). While Van Hyning's excavation methods were crude by today's standards, Benn and Rogers (1985) were able to develop a pretty good understanding of the mound's stratigraphy. It was constructed of stratified fill from the surrounding village but containing more mussel shells than the midden and they appeared in sheets and piles as if ritually placed there. Raised 18 in. (46cm) above the terrace surface within the mound was a 26 x 18 ft. (8 x 5.5 m) stone slab pavement with irregular edges. Upon this floor was a 20 to 24 in. (50-61cm) high log enclosure measuring 10 x 16 ft. (3 x 5 m) with limestone slabs against the outside. At the corners of the large enclosure were four body-size stone enclosures. The top of the enclosure was covered with wooden poles and glacial boulders. Heaps of ashes (perhaps cremated human remains) and scattered fragments of human bone, representing as many as 25 individuals were found scattered over the stone pavement. However, no unusual artifacts were recovered.

Benn and Rogers (1985) note the similarities of this log enclosure to what J. Brown (1979) calls crypts in Hopewell mounds, although it does not appear to have contained whole skeletons. They interpret the limestone pavement as possibly representing part of a charnal house structure, although Van Hyning, unfortunately did not look for such things as postmolds, to determine if such a structure might have been associated with the pavement. Whatever the purpose of this mound, it must have served as a focal point of the population of the region for a limited period of time. Its unique status in the region indicates that, for whatever reason, the local population apparently never again felt the need for such a ritual episode of mound construction (Benn and Rogers 1985).

The subsequent Riverbend phase (Benn and Rogers 1985), dating from A.D. 400 to A.D. 700, is characterized by the appearance of Madrid ware. This phase should really be considered as an early Late Woodland phase, but I have included it here since I discussed its Illinois Valley equivalent. Although Madrid ware is the local temporal equivalent c



Weaver ware, its closest affinities appear to be with Linn ware of northeast Iowa, although it also shows similarities to Held Creek ware of western Iowa and to Lake Benton Cord Wrapped Stick Impressed ceramics of the Prairie Lakes region (Benn and Rogers 1985). Like other wares of this time period, Madrid ware is characterized by much thinner vessel walls than the preceding High Bridge ware types. Riverbend phase settlements in the Saylorville area appear clustered near older site clusters in the Boone Bottoms around Big Creek in Polk County and in Scandia Bottoms in Dallas County. Blufftop mounds are clustered downstream from the Boone Bottoms (Benn and Rogers 1985). While studies in other regions have concluded that early Late Woodland populations occupied a wider variety of ecozones than Middle Woodland populations, the data from the Saylorville region are too scanty to evaluate this hypothesis (Benn and Rogers 1985). Benn and Rogers (1985) suggest that the dispersed pattern of blufftop mounds may be indicative of a change in social patterns during this time period.

In Lake Red Rock, Moffat, Koldhoff, and McCorvie (1988; Rogers and Koldehoff 1987; Moffat et al. 1990) report on the recovery of several sherds resembling Madrid Plain, and Madrid Cord-Roughened from the Cormorant site (13MA387). They note, however, that these sherds also resemble Linn ware types. The early Late Woodland time period in the Lake Red Rock area remains poorly understood (cf. Roper 1986; Moffat et al. 1990). Much larger assemblages are needed before we can make any definitive statement about the occupation of this region.

In the Iowa River Greenbelt area, Collins (1991) identified five Middle Woodland base camps. All were located in the valley or on adjacent blufftops. Although no diagnostic ceramic rims were recovered, based on the recovery of blade cores, lamellar blades, Snyders points, Knife River Flint, and obsidian, Collins (1991) considers it likely that the Middle Woodland population in this region was more closely affiliated with the McGregor phase people of northeast Iowa than with the Van Hyning phase people of the Saylorville area, although there was undoubtedly contact between the regions.

#### North Central Woodland

In the Prairie Lakes region of north-central Iowa and southwestern Minnesota, Anfinson's (1987) Fox Lake phase continues throughout what is called the Middle Woodland time period in the Mississippi River Valley. Benn (1982a; 1982b) notes chronological changes in Fox Lake ceramics, dividing them into early, middle, and late Fox Lake. Middle Fox Lake ceramics make up the bulk of the types. Anfinson (1987) sees very little change in subsistence or settlement throughout this phase, with bison remaining of great importance, along with other food sources, such as muskrat, wapiti, deer, waterfowl, mussels, and vegetable foods playing minor roles. Sites continue to be located on islands and peninsulas in lakes. There is no evidence of burial mound construction, and mortuary ritual seems to have been minimal, as does interregional trade. Benn (1983) notes that the Hopewell Interaction Sphere was not evident on the eastern plains north of the Kansas City area.

At about the time of the Weaver phase of the Illinois River Valley, and overlapping Anfinson's (1987) late Fox Lake phase and Lake Benton phase, a new type of ceramics began to be manufactured in the region. First defined at the Arthur site (13DK27), this type is known as Arthur Cord-Roughened (Benn 1982a). According to Benn (1982b:172):

Arthur vessels are subconoidal in form with constricted necks and insloping or vertical rims. Lips are slightly flattened and usually cord roughened. The exterior surface is nearly always roughened by horizontally oriented cordmarks. . . . Decoration is virtually non-existent: however, a Fox Lake Horizontal

Cordmarked vessel illustrated by Anfinson (1979:85) appears to be an Arthur Cord Roughened vessel with a row of punctates. Arthur Cord Roughened vessels are as large . . . as Fox Lake vessels, but Arthur Cord Roughened walls are thinner.

Whether this thinning of vessel wall is a result of increasing reliance on cultivated seeds or wild rice has yet to be determined. There is currently no evidence for either during either the Fox Lake phase, or the succeeding Lake Benton phase (Anfinson 1987). Sometime around A.D. 500, Lake Benton ceramics appear in this region, marking the beginning of the Lake Benton phase (Anfinson 1987). While Arthur Cord Roughened ceramics continue to be made in the early part of this phase, other changes make it clear that this phase is Late Woodland, and it will be discussed in the Late Woodland section.

#### Prairie/Plains Woodland

In western Iowa, the Middle Woodland manifestation of the Mid-America Woodland tradition is an unnamed phase of the Valley/Orleans I variant (Benn 1983, 1986; Benn ed. 1990). In western Iowa, this unnamed phase begins with the appearance of Valley ware (Kivett 1949) and its "cousins," Rowe ware (Tiffany 1978a) and southwest Iowa (Benn 1983). These wares, along with others:

are characterized by conoidal, almost neckless vessels with vertical or oblique ("oriented") cord roughening and decorations which combine embossing or punctating, stamping, and occasional broad trailing. The decorative elements of embossing, punctating, stamping and trailing are ubiquitous in Middle Woodland ceramics of the Prairie Peninsula; their obvious source is the Havana tradition in Illinois. However, oriented cord roughening is a decorative treatment indigenous to the western prairie and plains. Oriented cord roughening appears in Early Woodland Crawford and Fox Lake ceramics and continues to be a dominant feature of Middle and early Late Woodland ceramic complexes, particularly in the prairie lakes region of western Minnesota [Benn 1983:79].

During this time period, mound burials also become common for the first time on the plains. Although many features of this phase undoubtedly diffused from Havana tradition populations to the east, Benn (ed. 1983, 1990) warns against interpreting the diffusion of traits with the diffusion of a "Hopewellian" belief system. "Borrowed traits simply blended into and reinforced the ideological and material complex of local derivation, e.g. beads, amulets, atlatl weights, bone pins, oriented cord roughening on pottery—some of which can be traced back to Late Archaic cultures (Benn 1983:80)."

Benn (ed. 1983, 1990) feels that as the processes creating the Hopewell Interaction Sphere were culminating in the east (e.g. territorial packing in forest environments bounded by prairies (cf. Hall 1980), more reliance on native cultigens, elaboration of the trade and information exchange system that regulated resource utilization and sharing), it was just beginning on the western Prairie Peninsula. While territorial packing probably existed by this time, and population had likely increased, Benn (1983, ed. 1990) feels that subsistence changed very little from that of Late Archaic times. At the MAD (13CF101 & 102) and Rainbow sites (13PM91), the Valley components produced a small number of Chenopod seeds, and small amounts of black walnuts, acorns and sunflowers. The Rainbow site also yielded some squash, and a single maize seed was found in the Late Middle Woodland levels (Benn ed. 1990). Faunal remains of the Valley component at the Rainbow site were very sparse, one or two large, medium, and small mammals, and a

few birds, mussels and aquatic resources. Benn (1983, ed. 1990) believes that, while a basically Archaic subsistence strategy was being pursued:

Interregional exchange of resources, ideology and spouses probably increased to establish new territories and generate social prestige and leadership within bands. Economic disputes would have been settled by interaction rather than warfare, for which there is no evidence during this time period. It is possible that an inter-band trading system developed at this time, later to become the progenitor of Plains Village trade systems (Blakeslee 1975; 1978) [Benn ed. 1990:224-225].

While family bands, or lineage bands controlled individual territories, Benn (ed. 1990:218) recognizes a larger social grouping, the aggregate band, as representing, "the smallest culturally reproductive unit of the social formation." According to Benn (ed. 1981, 1990:217):

The purpose of the aggregate-band structure was to maintain relations among regionally interacting family bands, but its hidden function was to establish, justify, and reinforce the social and economic distance between autonomous family bands. This is a dialectical relationship concretized in the concept of territoriality. . . .The conflicting relations in territoriality are twofold. The environment acted as a constraint on the permanent aggregation of hunters and gatherers because of the seasonality of resources and the specter of recurrent environmental stress (drought), and humans adapted by seasonally scheduling their economic activities. The environment of Woodland peoples was crowded enough to place seminomadic bands in competition for the same "first-line" resources. Since everyone had access to the same weapons and was powerless to defend against an isolated ambush. . . , the only means of reducing the potential for conflict was mutual identification of territories. . . .Territories were controlled by kin groups, which functioned as the relations of production, and were passed across generations by the authority of descent ideologies. Woodland kin groups, i.e., family bands, must have met regularly, perhaps annually, to exchange information about territories. The aggregation probably participated in other activities that fostered cohesion, such as a bison hunt, mortuary ceremonies, marriage exchanges, and gossiping.

Tiffany et al. (1988), based on excavations at the Hanging Valley site (13HR28), question Benn's (ed. 1981, ed. 1990) aggregate band model, at least for the Loess Hills region of western Iowa. At this mortuary site, buried in Hatcher Member alluvium, the remains of seven individuals were recovered. Signs of severe nutritional stress were present on all remains, and one individual appears to have been scalped. Only a couple of flakes, some modified shell and bone, and potsherds representing a minimum of seven vessels were recovered from the site. There was no sign of mound construction. Tiffany et al. (1988) interpret the site as representing a continuation of the Archaic burial pattern evidenced at the Lewis Central School site (13PW5). They note that while Middle Woodland mounds have been reported to the east and to the west of this region none have been reported in the Loess Hills region itself. They also argue that faunal and floral remains from this site, and the lack of hunting or animal processing tools at the MAD and Rainbow sites point to basically foraging populations in the region, with little emphasis on hunting. They interpret the signs of severe nutritional stress as indicating that if an aggregate band did exist it did little to alleviate environmental stress, and the scalped individual would seem to indicate that it did little to alleviate conflict over resources either. Tiffany et al. (1988) visualize the family band as representing the largest unit of social

organization during this time period. Clearly, much more research is necessary in this region to determine which model is nearer the truth.

At the MAD sites (13CF101-102), Benn (ed. 1990) encountered circular concentrations of materials around hearths in both the Crawford and Valley components, which were interpreted as structures. From areas of artifact scatter here, and at the Rainbow site (13PM91), Benn (ed. 1990) was able to develop a MAD-Rainbow settlement model featuring seasonal occupation of sites by small family bands.

The succeeding phase, the temporal equivalent of the Weaver phase of the Illinois River Valley, is known as the Floyd phase of the Boyer variant of the Mid-America Woodland tradition. Like the Weaver phase, the Floyd phase is really an early Late Woodland phase, and is characterized by the appearance of Held Creek ware. At the Rainbow site, the Boyer variant was temporally coeval with the Weaver phase, but at the MAD sites, Held Creek ware was dominant by A.D. 250, and was made until ca. A.D. 750 (Benn ed. 1990). Held Creek ware is similar to the contemporary Scalp ware (Hurt 1952) of the Dakotas. Held Creek wares share Weaver ware's characteristics of thinner walls, more constricted rims, and much less decoration than earlier wares. Vessel shapes are subconoidal (Benn ed. 1981, 1990). Benn (ed. 1981, 1983, ed. 1990), however, warns against viewing this shift as diffusion from the east. He notes that Held Creek ceramics develop indigenously from Valley ceramics, and that the pottery makers in both regions were responding to the same technological and social forces leading to thinner walled vessels lacking decoration.

At the Rainbow site (13PM91), two structures were delineated in the Boyer component. Structure 1 was a cigar-shaped house, with postmolds around its perimeter at 1m intervals, and a few large posts along its longitudinal axis. Benn (ed. 1990) interprets this as a dwelling with a center ridge pole and weight bearing walls, around 3.7m wide and 15m long. No daub was recovered, so it was probably covered with mats, skins, or bark. The structure was divided in half by a line of posts and trash pits. The living floor was covered with basket loads of hearth debris as well as bone, shell, pottery, and fire-cracked rocks. Structure 2 appears to have been a circular structure with a central hearth. Interestingly, structure 2 contained hardly any pottery, and Benn (ed. 1990) interprets it as representing a special use structure such as a menstrual lodge or a men's house.

An interesting aspect of the Boyer variant ceramic assemblage is the inclusion of anthropomorphic and zoomorphic figurines, ritually broken, or "killed." Because this was a time of productive reorganization, Benn (ed. 1990:220) interprets these figurines as, "symbols of human dominance within the ecosystem at a time when people were intensifying their efforts to extract more production from natural resources." Please be aware that I am here presenting a much simplified version of Benn's (ed. 1990) model. Since the anthropomorphic figurines look personalized, Benn (ed. 1990:220-221) proposes that, "they were employed as mediators between an individual hunter-collector and his or her environment."

Grave goods associated with burial mounds on the plains tend to be personal adornments in contrast to exotic status items associated with Havana-Hopewell mounds to the east. Benn (ed. 1990:220) suggests that these objects, "represented an individual's subordinate status in nature as he or she perceived it through his or her cultural ideology." According to Benn (ed. 1990), these objects, along with the figurines, are manifestations of an ideological system that allowed people to resolve the paradox:

(1) that an insignificant human, in comparison to the magnanimous creatures and forces in nature, could deal a death-

blow to the largest of animals, the bison, with efficiency and ease; (2) that dexterous and proud human hunters and gatherers, despite their repertoire of myth and magic, could not always cope with nature and extract sufficient nourishment, especially during droughts or otherwise on a day to day basis. .

. For Woodland hunters whose productive base was founded within the small family band often supported by one or a few hunters, the resolution of this paradox must have fallen largely on the individual. The centerpiece of religious thought and ritual, and of ideology in general, must have been the periodic reconciliation between the individual and the forces of nature. [Benn ed. 1990:219-220]

Earlier, this time period was referred to as one of productive reorganization. While a seasonal round of hunting and collecting continued as the main subsistence strategy, more permanent base camps, with evidence for storage facilities, become more common during this time period. Populations were also increasing leading to greater territorial packing. New technologies included the bow and arrow, more efficient thinner walled Held Creek vessels, and storage pits. There also appears to have been a broadening of the resource base during this time period, and there is evidence for the eastern horticultural complex being utilized to a much greater extent. Tobacco first appears on the plains during this time. The intensification of production entailed by increasing reliance on cultivated plants involved a reorganization of the relations of production "into what eventually became a corporate kinship group within a political tribal organization (Benn ed. 1990:227)."

#### Southern Iowa Woodland

As with nearly all time periods, the Middle Woodland occupation of southern Iowa is difficult to assess. Despite a great deal of research (Wheeler 1949a; McKusick and Ries 1962a; Hoffman 1965; L. Brown 1967b; Weichman 1976a; 1976b; Benn and Hovde 1981; Grantham n.d.; Bradley 1988; Luckenbach et al. 1988), very little is known about the archeology of the area (Cook 1975a; Gourley 1983a). As noted earlier, Roper (1986) included all Middle Woodland materials in the Red Rock Reservoir in the Van Hyning phase of the central Des Moines River Valley, but, because of the regionalization that took place during the Middle/Late Woodland transition, she is reluctant to adopt the Riverbend phase name for late Middle Woodland manifestations and is reluctant to name a phase in this region because of the paucity of data. Several mound and village sites excavated by L. Brown (1967b) clearly have Havana affinities, but it is difficult to assess their relationship to the Havana world. Otherwise, Woodland sites in the region have been treated as a general category (cf. Bradley 1988), and little interpretation of specific Woodland time periods is possible.

E. Henning (1985) has proposed that Woodland habitations in this region should have close ties with groups in northeast Missouri. In the Big Bend region, where the Chariton and Grand rivers enter the Missouri, Chapman (1980; see also Kay 1979; Kay and Johnson 1977) divides the Havana occupation of the region into three phases following a Pioneer subperiod Black Sand complex. Chapman (1980) sees the Hopewellian occupation of the Big Bend region as part of the Havana tradition. The earlier Lamine phase corresponds to the Fulton phase of the Illinois River Valley (Munson 1986). According to Chapman (1980) ceramics of this phase are Havana ware types. Chapman's (1980) succeeding phase is called the Classic subperiod, Wakenda phase. This would appear to correlate with the Ogden and Frazier phases of the Illinois River Valley (Munson 1986). This phase shows more affinities with Illinois Havana sites than do Hopewellian manifestations in the Kansas City vicinity. The

settlement pattern also seems to conform to the Illinois pattern of a regional Transaction Center, and satellite hamlets (Kay 1979). Chapman's (1980) final phase in the Big Bend region was the Terminal subperiod, Mellor phase. This phase apparently correlates with the Weaver phase of the central Illinois River Valley. Farther upstream on the middle fork of the Chariton River, Chapman (1980) defines the Randolph phase characterized by Chariton Plain ceramics, burial mounds with stone chambers, and Steuben Expanding Stemmed projectile points.

Roper (1992) notes that ceramics from site 13LC17 on White Breast Creek (a Des Moines River tributary) in Lucas County compare well to Chariton Plain, and on that basis and the presence of expanding stemmed points and mound burials at the Rathbun Lake sites and 13LC17 places the site in the Randolph phase. However, Benn (1993:96) notes that, "although this seems to be a reasonable and illuminating attribution, Roper's case could have been bolstered by comparing the 13LC17 ceramics to contemporary Henry ware from southeastern Iowa." She has addressed this criticism in her latest publication (Roper 1994). The pottery at 13LC17 differs from Madrid ware, and material from the Lambert site (13VB82) in the presence of bossing instead of punctation, as opposed to a preference for plain rims, smooth rather than cord-marked rims, and the near absence of decoration. Roper (1992) notes that the ceramics from 13LC17 compare favorably with ceramics in the Rathbun Lake area, especially with those from the Gideon site (13AN6) (L. Brown 1967b), 13AN45 (Bradley 1988) and Rosencrants Mound 16 (13AN1) (L. Brown 1967b), and she would presumably include them in the Randolph phase as well.

#### Late Woodland

##### Mississippi Basin Woodland

Early archeological research in the Eastern Woodlands mainly concerned itself with the massive earthworks of Mississippian cultures, and the elaborate burials of Hopewellian groups. This "two-climax" approach has dominated thought on the prehistory of the Eastern Woodlands and prairies. Cultures existing in the time period between the decline of the Hopewell Interaction Sphere (Caldwell 1964; Struever 1964a) by A.D. 400 and the emergence of Mississippian groups ca. A.D. 800-1000 were largely ignored. Indeed, Deuel (1958:34) refers to the Late Woodland time period as a "dark age" in prehistory. Braun (1988) has pointed out that treating the cultural groups who produced remains that we find unremarkable as unremarkable themselves is debasing to those people and to their descendents. He points out that these people (1988:18) "led lives as complicated and as meaningful to them as anyone's can be."

More recently, these Late Woodland people have become the center of a great deal more study (Benn 1980; Braun 1983; 1985b; 1987; 1988; 1991; Droessler 1981; Green 1987; Hall 1980; O'Brien 1987; Riggle 1981; Tainter 1983). As Green (1987) states, the time span occupied by these people is nearly as long as that of Hopewell and Mississippian combined. Although not characterized by the elaborate burials and extensive trade networks of the Hopewellian people, nor the massive architecture, maize horticulture, and social stratification that characterize Mississippian society, Late Woodland people developed a highly efficient lifestyle and subsistence strategy and enduring social systems which eventually led them to exploit new environments and maintain their chosen lifestyles. It is also out of this Late Woodland base that Mississippian groups developed, and exploitation of new environmental zones may well have played a role in the earlier Hopewellian decline. Green (1987:20) lists

the following as characteristics of Late Woodland people in western Illinois:

Expansion into upland areas as well as intensified native plant cultivation, population growth, and increased "localization" of resource exploitation zones are also widely understood to be Late Woodland characteristics. . . . The role of maize in the subsistence economy still is poorly understood, and arguments also remain on general questions of Late Woodland social organization and interaction patterns.

It is also widely believed that the bow and arrow came into use during the Late Woodland period (Hall 1980). All of these innovations led to a very different exploitative pattern from that of the preceding Hopewellian peoples, quite possibly with resultant changes in interregional social relations and local social integration.

There are currently two contrasting viewpoints on Hopewellian social organization and decline in the Eastern Woodlands. Proponents of the more traditional viewpoint interpret Hopewell society as, "a complex, hierarchically organized society" (Tainter 1983:142), characterized by ascribed status and widespread regional integration and trade. Tainter and others see the transition to Late Woodland cultures as a collapse of the widespread Hopewell Interaction Sphere and its splintering into less complex societies with much more local autonomy and little regional interaction or integration. Much of the support for this viewpoint comes from studies of mortuary practices and osteological remains. The alternative viewpoint describes Hopewell society as consisting of, "simpler, more egalitarian systems characterized by achieved status differences" (Tainter 1983:142). Buikstra (1977a) views the Late Woodland period as a time of stable levels of social complexity, while Braun (1985b, 1986, 1987, 1988, 1991) sees Late Woodland as a period of increasing social complexity and regional integration. Braun draws much of the support for his viewpoint from changes in ceramic decorative diversity in Late Woodland times. Using Wobst's (1977; see also Hegmon 1992) model of style as information exchange, Braun interprets decreasing diversity in decorative elements among regional and local ceramics as indicating less need for symbolically reinforcing regional and local differences, hence reflecting less social distance between potters, and indicating more widespread cultural contact, interaction, and integration. Regional subsistence shifts tend to support this view as well. As population increased and people became more reliant on cultivated plant foods, individual groups had available to them smaller collecting territories, and since resources are never distributed evenly, smaller territories increased subsistence risk for each group. According to Braun (1985b) this increased level of subsistence risk led to changes in social organization:

Cultural responses to subsistence risk are never limited to the mechanics of subsistence alone, however. Overlapping networks of reciprocity and reciprocal roles among individuals, households, and local aggregates in primitive societies distribute the risks and benefits of production across populations and delegate important decision-making responsibilities. These networks can vary from short-lived negotiated alliances between individuals and groups, to long-lived, ritually and symbolically reinforced structures based on residence and genealogy. A hierarchy of embedded social networks thus can be identified. . . .

Applied to the Midwestern Woodland circumstances, this view of primitive social processes leads to the expectation that, as local production uncertainty increased, the importance of cooperative links between localities should also have increased.

We should expect, therefore, that the social distances among neighboring localities would have decreased, not increased. [Braun 1985b:131-132]

Braun's approach has been strongly criticized (Tainter 1983) and Green has indicated (personal communication) that although the idea of network development to reduce subsistence risk sounds good, there are simply no data to support the idea of the development of such networks. It is Green's opinion that networks arose because of the need for information exchange between Late Woodland groups. As Green (1987:382-383) puts it:

This local level of control does not mean there was no sense of group identity and solidarity. On the contrary, a dispersed "homestead" settlement pattern can strengthen ethnic cohesiveness and unity because of the increased tendency of such societies to maintain opportunities for contact and communication in situations of decreased face to face contact. . . . Pottery style patterns, chert usage, and epigenetic distance measurements show that Bauer Branch and other Late Woodland groups maintained clear societal boundaries and expressed them symbolically. The various groups apparently met at places where the boundaries met, probably in order to share information, initiate exogamous relationships, and maintain alliances to minimize hostilities over territorial competition.

One of the major innovations of Late Woodland times was the settlement and exploitation of previously minimally utilized environmental zones. Nearly all Middle Woodland residential settlements predating A.D. 300 are located in the major river valleys, but throughout the Late Woodland period settlements came to be much more frequently located in tributary stream valleys and in upland locations. Green (1987) portrays the Late Woodland Bauer Branch people of west-central Illinois as a basically egalitarian society living in dispersed communities in upland locales. Their subsistence was derived from hunting and collecting upland resources, supplemented by an increasing reliance on the cultivation of native plants producing hard, starchy seeds. Household units appear to have been autonomous decision makers in terms of settlement and economic matters, but Green postulates in line with Braun (1985b) the existence of an extensive network of communication and alliance between regional groups like Bauer Branch throughout the Prairie Peninsula, "a widespread network of dispersed, but interacting communities" (Green 1987:382). Working in northeastern Iowa, Benn (1980:208-210) describes such a network as the "Late Woodland Interaction Sphere." He goes on to summarize the characteristics of this "Interaction Sphere:"

One such characteristic is the widespread inauguration of the bow and arrow as a major hunting weapon, as evidenced in the appearance of small side-notched and triangular projectile points. Another is the generalized use of cordage as the primary applique in the zoned rim designs of Late Woodland period vessels. A third is the persistent use of burial mounds—effigy, linear, or conical—as a major mode of interment. The fourth characteristic is typified by the Woodland peoples' coexistence with the relatively sweeping social and institutional changes manifest in the general developments associated with Mississippian culture. Apparently the integrative mechanisms, which acted as the cohesive agents binding together the independent social-subsistence units of the Woodland lifestyle, mitigated against the encroachments of the more sedentary Mississippian way of life. A fifth and final characteristic, probably the functional heart of an interaction sphere, is the hypothetical existence of family-band territories among Woodland people. [Benn 1980:209]

As intimated earlier, many of these characteristics had their beginnings coincident with the appearance of Weaver and equivalent wares throughout the Eastern Woodlands and prairies, and most would now consider such wares as Late Woodland. In the Three Rivers region of southeast Iowa and northwest Illinois, Benn (ed. 1987, 1988) notes that, although post-Weaver Late Woodland sites are the most common sites in the region, the ceramics produced during this time period remain unnamed. Two types of ceramics appear to have been manufactured during this time period, an undecorated cordmarked type, and a decorated cord impressed type. These types also exhibit squared and castellated orifices (Riggle 1981; Morgan 1985; Benn ed. 1987; 1988). The cord impressions consist of geometric patterns created by single cord impressions on the vessel rims. The vessels have walls that are thicker than the Madison ware found in the Quad-State region, and more rims lack decoration. Decorated patterns on these unnamed wares are also simpler than those found on Madison ware. Contemporary ceramics include Madison ware in the Quad-State region and beyond (Benn 1980), Loseke ware to the west (Benn and Rogers 1985), Sepo ware in west-central Illinois (Ham 1975) and Mississippi River Valleys (White 1985) to the south, and Bauer Branch (Green 1987) in west-central Illinois (Benn ed. 1987, 1988). There does appear to be some overlap in the distribution of these types, however. Markman (1988) reports both Madison ware and Sepo ware at Putney Landing, Artz (1991) has recently described a sherd indistinguishable from Bauer Branch Shoulder Punctated from site 13LE14 in the Montrose Bottom in extreme southeast Iowa, and Hudson (1991) has recently illustrated a partial Late Woodland vessel from the Coppers Creek site (13VB460) in Van Buren County along the Des Moines River that exhibits tool impressions on its shoulder and lip reminiscent of Bauer Branch ceramics from northeastern Missouri (Eichenberger 1944) and some ceramics from the Deer Track site near Quincy, Illinois (White 1985). This may be the result of regional interaction. The unnamed wares appear to have been manufactured in the Three Rivers region from ca. A.D. 650-800 (Benn ed. 1987).

These corded wares appear to have been replaced in the Three Rivers region between A.D. 800 and 950 by plain surfaced ceramics either lacking decoration, or decorated with single cord impressions. Benn (ed. 1987, 1988) believes that this plain pottery is probably Minott's (Logan 1976), as it is in east-central Iowa. Fokken and Finn (1984) use Minott's to describe such corded wares in the Michaels Creek locality, as does Markman (1988) at Putney Landing. In Illinois, this plain pottery is called Maples Mills (Cole and Deuel 1937) or Canton ware (Fowler 1955). Green and Wallace (1991) use Canton ware to describe Late Woodland ceramics from the Gast Farm site. One of the problems with ceramics of this time period is that they are often represented by only tiny sherds for which it is difficult to assign an accurate type designation. Another is that Canton ware and Minott's ceramics appear to be very closely related, and type designations have tended to follow state lines in the past, much like in Weaver and Linn wares (Benn ed. 1987).

As Benn (ed. 1988) has pointed out, both the corded and plain wares were produced contemporaneously with several other characteristic Late Woodland traits. Stanley and Hoppin (1987) describe a stone tool technology emphasizing small cores, hafted flake tools, and triangular points. Mortuary facilities consisted of low mounds that mainly contained domestic items, small features, and rocks, a marked contrast to the earlier Havana tradition burial mounds. Finally, maize production in significant quantities was added to the native horticultural complex by the end of this time period (Benn ed. 1988). Small sites are found on all parts of the Mississippi Valley floor, and this fits well with the idea of population

fissioning into smaller productive units than in Middle Woodland times (Benn ed. 1988; Dudzik 1974; Billeck and Benchley 1982).

The Late Woodland occupation of interior eastern Iowa is equally poorly known. Logan (1959, 1976) defined the Minott's focus in Linn and Jackson counties and Logan included the focus in the Effigy Mound aspect, abandoning Keyes' unpublished proposed Maquoketa aspect (cf. Cassidy 1954; Logan 1959, 1976; Benn 1976, 1980). Logan's Minott's focus was characterized by the presence of both Madison ware and Minott's ceramics and small triangular and side-notched projectile points. As originally defined by Logan (1959, 1976), the Minott's focus consisted of components at the Minott's Rock Shelter (13LN210) (Keyes 1943), two of the Gingerstairs Rock Shelters in Palisades-Kepler State Park, Spring Hollow Rock Shelters No. 2 and 3, and the Crabtown Rock Shelter. Based on his excavations in the Coralville Reservoir, W. Caldwell (1961) tentatively added the upper component at Woodpecker Cave (13JH202) to the Minott's focus. Interestingly, Woodpecker Cave also produced Great Oasis (Wilford 1945; Johnson 1969) ceramics (A. Anderson 1971b). Great Oasis is a Late Woodland/Late Prehistoric cultural manifestation native to the northwestern quarter of the state, and the presence of Great Oasis ceramics in Johnson County is indicative of widespread interaction between the woodlands and plains. Roper (1986) has also recently reported Great Oasis ceramics from Lake Red Rock in southeastern Iowa. A. Anderson (1971b) added the Walters site (13JH42) to the focus as well and noted that further study would probably result in it being designated as a phase in the Willey and Phillips (1958) system. Benn (1976; 1980) states that the Sandy Beach site (13JH43) (A. Anderson 1971a) and the Rock Run Shelter (13CD10) (R. Alex 1968) also probably belong to the focus.

Benn (1976; 1980) also notes that the Robert Battey (13JK21) and Henry Schnoor (13JK20) Rockshelters (Jaehrig 1975) in Jackson County contained assemblages similar to those of the Minott's focus. Madison ware has been reported from the Keystone Rock Shelter (13JK23) (D. Anderson 1987a), and this may be representative of a Minott's focus occupation. Benn (1980) further states that following further study of materials in the Keyes Collection at the State Historical Society in Iowa City, a Minott's phase will probably be named for Late Woodland complexes in east-central Iowa showing Maples Mills influences. He also states that it should not be placed in the Effigy Mound tradition. In Iowa, effigy mounds are restricted to the so-called "driftless area," or Paleozoic Plateau of northeast Iowa, and are solely associated with Madison ware. The appearance of Minott's ceramics appears to postdate A.D. 700, and most dates are between A.D. 800 and 1000 (Benn 1980). The reported presence of Madison ware in burial mounds at Jollyville Hill (13LE12) in Lee County (A. Anderson 1969) (although Riggle [1981] notes similarity in some of these ceramics to Canton ware) and Minott's ceramics at sites 13LA250 (Perry 1982), 13LA55 and 13LA56 (Fokken and Finn 1984), and 13LA38 (Benn ed. 1987) in Louisa County would seem to extend the range of the Minott's focus farther to the south. Unfortunately, very little is known about this poorly defined manifestation, other than it shows a very close affinity to the Maples Mills manifestation of Illinois (cf. Riggle 1981).

The Walters site (13JH42) also contained evidence of a house structure (A. Anderson 1971b). No postmolds were evident at the site, but a concentration of artifacts was found associated with a concentration of daub. A. Anderson (1971b) interpreted this as representing an oval-shaped, wattle and daub house structure. At the Sweeting site (13WS61), Lensink (1986) encountered a number of small postmolds and pit features interpreted as a wickiup like structure.

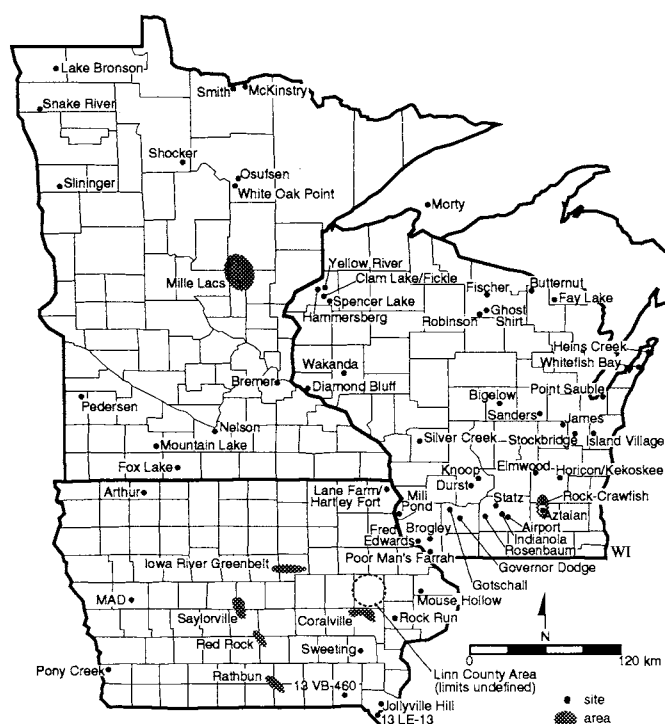


Figure 18. Late Woodland sites.

Overlapping in distribution with the Minott's focus to the north and east is Iowa's Effigy Mound manifestation, the Keyes phase (Benn 1976, 1980). This is the equivalent of Stoltman's (1990) Eastman phase in southwestern Wisconsin. The Keyes phase is characterized by small triangular projectile points, Madison ware ceramics, a native horticultural complex, with the addition of maize (Tiffany 1974; Benn 1976, 1978, 1979, 1980), and most importantly the presence of effigy mounds. The Keyes phase represents the northeast Iowa variant of the Effigy Mound tradition (Baerreis 1966; Hurley 1975) of Wisconsin, Minnesota, Iowa, and Illinois. The ceramics of the Keyes phase consist of nearly 80% Madison Fabric Impressed, with nearly all the remaining ceramics consisting of Madison Plain. Unlike Wisconsin Effigy mound manifestations, the Keyes phase largely lacks collared types of ceramics. Mallam (1976a) proposed a settlement model for the Keyes phase in which small family-band groups of hunter/collectors, supplemented with limited horticulture, spent most of the year dispersed into various inland family-band territories. However, during the summer, these family-bands coalesced into larger villages in the Mississippi River Valley as lineage bands, for the construction of effigy mounds and other ceremonial and funerary activities. Benn (1979; Benn et al. 1978b, 1993) feels that these groups were drawn to the Mississippi and other large river valleys of northeast Iowa during the summer by the abundant available resources, and that this pattern of aggregation and dispersal has great time depth in the Driftless Area of northeast Iowa.

Benn (1979) notes that territorial relationships with family-bands could have served two functions. First, they ensured that each family band would have access to adequate resources for their continued survival. Second, they geographically defined the important kinship units in the region, the family bands as breeding isolates, and the lineage bands, which were exogamic kin units. By creating marriage ties between lineage bands, peace could be more easily maintained within the region. Finally, identification with a lineage insured the autonomy of the family-band territories. The need to renew interlineage ties, the need for renewal of

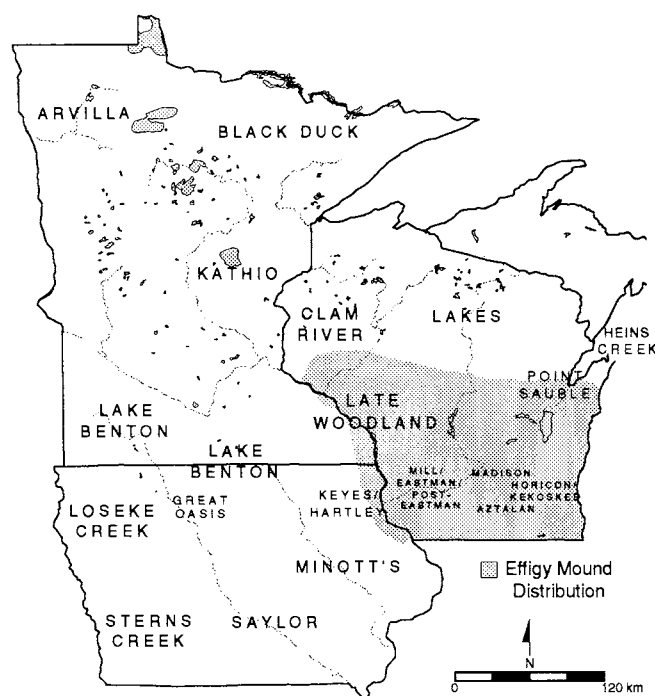


Figure 19. Late Woodland phases.

the universe, and the abundant resources of the Mississippi River Valley would have provided strong incentives for the summer establishment of large villages, and communal mound construction at the boundaries between lineage-band territories (Benn 1979). It is likely that the animal forms of the mounds relate to clan totems and the ancestors of the clans of the lineage bands who produced them (Benn 1979). Benn (1979) dates the Keyes phase from ca. A.D. 650 to A.D. 1200, rejecting Hurley's (1975) Early and Late Effigy Mound periods.

Collins (1991) has recently proposed that Late Woodland mound and village sites in the Iowa River Greenbelt area be included in the Keyes phase. Despite the lack of effigy mounds in the region, the primary defining characteristic of the Keyes phase, Collins argues for a long standing connection between the Iowa River Valley and northeast Iowa going back as far as the Prairie phase. Collins (1991) feels that the lack of high quality chert resources in the Quad State region led to the establishment of ties to the Iowa River Greenbelt area early in the Woodland period due to its abundant, high quality, Maynes Creek Chert, and that these ties were maintained throughout the Keyes phase.

Perry (1993) also considers site 13IW216 to represent a possible Keyes phase habitation site of the type visualized by Mallam (1976a) for family-bands during their dispersion along inland drainageways. Perry points out that although effigy mounds are lacking in interior eastern Iowa, linear mounds also built by Keyes phase people are present and tend to cluster in the vicinity of villages yielding Madison ware.

Tiffany (1986b) has recently redefined Minott's Cord Impressed ceramics to include castellated forms, which were excluded by Logan (1959, 1976) in his original type description. Further, he proposed elevating the Keyes and Minott's phases to variant status in the manner of Plains archeology. In characterizing ceramics from this time period from sites 13WS61 and 13WS126, Tiffany (1986b:244) states that, "ceramically, both sites meet the criteria of components of an unnamed phase in an unnamed local sequence of the Minott's variant of an unnamed Late Woodland period cultural tradition. Such is the 'state of



the art' in Late Woodland archeology." From his discussion, it is unclear exactly what he intended to include in the variant as proposed, and his suggestion does not appear to have been well accepted.

In the post-A.D. 800 time period in Illinois and Wisconsin, a variety of collared ceramics appear (e.g. Starved Rock Collared (Hall 1962a, 1987), Aztalan Collared (Baerreis and Freeman 1958), and Point Sauble Collared (Freeman 1956)). Collared rims also show up in Langford assemblages in northern Illinois (Jeske 1990). This is also the time period of growing Mississippian influence throughout the region, and these collared wares are often found in association with Mississippian influenced ceramics. Collared and Middle Mississippian ceramics are extremely rare in eastern Iowa. Roper (1986) has recently reported recovering three collared rims from Lake Red Rock. The Mouse Hollow Rock Shelter (13JK59) contained Ramey Incised and collared ceramics (Logan 1976; Benn ed. 1988). The Gast Farm site (13LA12) has produced grit-tempered collared rims that Benn (ed. 1988) compares to the Langford tradition of northern Illinois (J. Brown et al. 1967) and to Aztalan Collared, as well as Ramey Incised or Powell Plain ceramics.

An extremely interesting site is the Hartley Fort (13AM103), on the Hartley Terrace along the upper Iowa River in extreme northeastern Iowa (McKusick 1964c; Tiffany 1982b). The Hartley Terrace contains a number of other important sites to Iowa's prehistory. These are:

- (1) the Grant Village (13AM201) and the Lane Enclosure (13AM200), both Oneota sites; (2) a stone-lined burial chamber (13AM195) described by Thomas (1887, 1894); (3) two Woodland cemeteries, the Brown's Hill Mound Group (13AM89) and the Lane Farm Mound Group (13AM104). [Tiffany 1982b:133]

The Hartley Fort consists of an enclosure rampart and village site containing eight conical mounds. McKusick (1964b) excavated the rampart, the village area inside the rampart, and several of the mounds. Based on his findings, he recognized two components, an earlier Hartley focus (now phase) component and the Late Woodland occupation that constructed the rampart and village. The later occupation was an Orr phase Oneota cemetery. McKusick (1964b) believed that the mounds had been constructed by Orr phase peoples after the village's abandonment, but Tiffany (1982b) feels that the Oneota burials McKusick encountered in the mounds were likely intrusive, and that the mounds predated the Hartley phase occupation of the site.

Tiffany (1982b) analyzed the ceramics from the Hartley phase component of the site and named two new wares, Hartley ware, and French Creek ware, and four new types, Hartley Plain, Hartley Tool Impressed, Hartley Crosshatched, and French Creek Cord Impressed. Both wares are grit-tempered with plain interiors and plain or smoothed over cordmarked exteriors. The vessels are globular jars with rounded bottoms and shoulders, although a few exhibited carinated shoulders. Three sherds had trailed lines over the smoothed over cordmarks (Tiffany 1982b). Rim forms of Hartley ware are, "short, straight sided, flared rims, flat lips, and constricted necks (Tiffany 1982b:140)," while French Creek ware is characterized by, "high, straight rims, flat and often bevelled lips and constricted necks (Tiffany 1982b:141). Hartley Cross-Hatched rims display twisted cord impression cross-hatching on the vessel lips. It is similar to Initial Middle Missouri Plains Village types such as Mitchell Modified Lip (Hurt 1954), and Linden Everted Rim (Knudson 1967) from the Cambria site in Minnesota. Tiffany (1978b, 1982b) reports recovering Hartley Cross-Hatched ceramics from the Chan-ya-ta site (13BV1), an Initial Middle Missouri Mill Creek village site in Buena Vista County in northwest Iowa. Hartley Tool Impressed has tool impressions on the exterior lip/rim juncture, and is similar to Kimball Modified Lip ceramics

of the Mill Creek culture (Ives 1962), while Hartley Plain is similar to Sanford Plain of Mill Creek culture. D. Anderson (1987a) has recently reported on the presence of a Hartley Tool Impressed rim sherd from the Keystone Rock Shelter site (13JK23) in Jackson County. Direct imports of Hartley ware from the Hartley Fort have recently been reported from the Woodland-Mississippian hybrid Fred Edwards site (47 Gt-377) in southwestern Wisconsin (Stoltman 1991; Finney 1993). French Creek Cord Impressed ceramics exhibit geometric single cord impressions on the rims, some channelled rims, occasional lugs or nodes on the lip, and some castellated rims. It appears to be similar to Chamberlain ware of the Mill Creek culture, but the castellated rims show continued Late Woodland influence from Maples Mills and Minott's ceramics (Tiffany 1982b).

In addition to the Hartley and French Creek wares, the Hartley phase component also produced actual specimens of Mitchell and Kimball Modified Lip ceramics, Mill Creek Seed Jars, and shell-tempered Powell Plain and Ramey Incised sherds. The assemblage also included grit-tempered, locally made copies of Mississippian ceramic forms. All in all, the Hartley Fort ceramic assemblage paints a picture of intense interregional interaction and trade during the late Late Woodland/Mississippian interface, and is indicative of what Benn (ed. 1988) has termed the "Mississippianization" process operating on late Late Woodland populations throughout the upper Midwest. Tiffany (1982b) feels that the Hartley phase postdates the Keyes phase in the Quad-State region, but is likely contemporaneous with the later portion of the Minott's focus (phase).

Benn (ed. 1987) believes that rim form is a key to recognizing the Mississippianization of Late Woodland cultures. The co-occurrence of collared and castellated rims with Mississippian influenced ceramics indicates to him that they were both "products of a broad process of culture change now known as Emergent Mississippian" (Benn ed. 1987:253). A shift to more expedient stone tools during the Late Woodland period, concentrating on local cherts, also points to a shift in labor allocation, and maize horticulture gained increasing importance in the subsistence patterns of Late Woodland people during the period from A.D. 600 to A.D. 800 (Benn ed. 1987). Maize was found at Hadfield's Cave (13JN3) (Benn 1980), the FTD site (13AM210) (Benn 1978), and the Sweeting site (13WS61) in Washington County (Lensink 1986; Billeck 1987). Mound building also became less complex over time, and appears to have waned after A.D. 1000. Benn (ed. 1987) sees all these changes as reflective of an intense shift in the Late Woodland mode of production, and concomitant social changes. As Benn (ed. 1987:256) states:

The Late Woodland period commenced when people began using the environment more as an instrument of production and less as a source for natural resources. There is no precise time when this transformation occurred, since the processes of change came as a feedback cycle. Barbara Bender (1985:56) recognizes the period of change as the time when "social closure" (i.e. the perception of "crowding") impinged on the ability of producers to settle debts in exchange systems. For people of the late Middle Woodland period the economic transformation involved breaking out of traditional subsistence patterns which connected a corporate labor control system to patches of dense natural resources. Many kin groups must have abandoned familiar patches of natural resources to exploit the same resources in smaller interior valleys, and many kin groups in all kinds of territories must have intensified their horticultural production by supplementing with maize. The size and territorial needs of the corporate productive unit decreased because of fissioning and because adequate production could



be obtained from improvements in the instrument of production (i.e. a horticultural environment).

With modifications in the labor processes there were substantive changes in integration systems that related Late Woodland descent groups. The evidence for close interaction among Late Woodlanders is seen in common motifs in ceramic designs. In eastern Iowa there are numerous mound groups that attest to periodic congregations of productive units (Mallam 1976a). This appears to have been peaceable interaction—human bones with arrow wounds are very rare—which maintained a dispersed population in family territories. That interaction was more often coercive to the southeast in Illinois is probable, since mounds in the southern Illinois Valley have yielded a number of arrow inflicted wounds in human burials.

In the Saylorville Reservoir area of the Des Moines River Drainage, Benn and Rogers (1985) recognize at least two unnamed Late Woodland manifestations, as well as the beginnings of Great Oasis culture (Wilford 1945) during this time period from A.D. 700-1100. Great Oasis will be discussed more fully later. The time period dates One Late Woodland manifestation is represented by two types of an unnamed ware, Cord Roughened and Cord Impressed that have:

thin walls, curved rims and evenly spaced corded decorations that are attributes seen in Loseke ware (Kivett 1952). This is also a ware whose types lack definitive attributes because of small sample sizes, but it is a ware that is distributed across the northwestern quadrant of Iowa and into eastern Nebraska and adjacent southern South Dakota (Benn 1982b). The Saylorville specimens are unlike the variety of Loseke ware from the Arthur site at Lake East Okoboji in that the latter have cordwrapped-stick decorations that the former lack. Otherwise, Loseke ware and the Saylorville cord impressed potteries are essentially the same. Turning east, the evenly spaced corded decorations on Saylorville rims are the same treatment that is present on Lane Farm Cord Impressed (Logan 1976; Benn 1978) in northeast Iowa. (Both the Arthur site and Saylorville collections contain one Lane Farm rocker-stamped sherd.) The relationship between Saylorville pottery and Madison Cord/Fabric Impressed of northeastern Iowa is less close, because the latter has more complex decorations often composed of grouped cords (Benn 1978, 1980). [Benn and Rogers 1985:53]

These ceramics have been reported from the Brassica Bench site (13PK251) (Thies 1989), the DeArmond/Barrier Dam site (13PK154) (Osborn and Gradwohl 1980), Darr-es-Shalom (13PK149), 13PK194, 13PK251, and 13BN103 (Osborn and Gradwohl 1981).

The other Late Woodland manifestation in the Saylorville Lake area is characterized by Saylor ware and has thus far only been identified at the Saylorvillage site (13PK165) in Saylorville Reservoir (Osborn, Gradwohl, and Thies 1978, 1989), although Moffat, Koldhoff, and McCorvie (1988; Moffat et al. 1990) report the recovery of very similar rims from the Cormorant site (13MA387) in the Red Rock Reservoir downstream. Saylor ware is similar in vessel form to the other Late Woodland types in the region has thicker vessel walls, squared orifices, and castellated rims. Nested chevron decorations of thick cord impressions are found on the rims (Benn and Rogers 1985). Benn and Rogers (1985) compare Saylor ware to Minnot's ware of southeastern Iowa (Benn 1980; Riggle 1981). Both Saylor ware and the unnamed Late Woodland types represent components in a Late Woodland horizon featuring cord-impressed rims (Benn 1982b; Osborn, Gradwohl, and Thies 1989). As Benn and Rogers (1985:53) describe it:

Loseke ware, Saylor ware, Minotts and other Midwestern cord decorated ceramics belong to a Late Woodland horizon involving change and rapid spread of a relatively simple decorative style. This occurred all across the Prairie Peninsula around A.D. 500-800. The earlier, eastern members of this horizon style are Lane Farm Cord Impressed followed by Madison ware in northeast Iowa and southwest Wisconsin (Benn 1978), and Maples Mills Cord Impressed in southwest Illinois and southeast Iowa (Riggle 1981). No doubt, the influence of these earlier ceramic traditions was responsible for the appearance of cord impressed decoration on the western prairies. But, this stylistic influence was the material manifestation of more profound cultural changes, which were internally inspired and compelled in cultures of the central Des Moines valley and western prairies (Benn 1983:83). The Great Oasis phase also was part of this general change.

Great Oasis is a Late Woodland/Late Prehistoric cultural manifestation thought to be ancestral to Plains Villager cultures known as the Initial variant of the Middle Missouri tradition (D. Henning 1971a; Henning and Henning 1978; Tiffany 1983; Benn 1982b). From the limited data available it appears that Late Woodland and Great Oasis Groups in the central Des Moines River Valley shared similar subsistence and settlement patterns. Benn and Rogers (1985) suggest that Great Oasis and Late Woodland peoples were for a time contemporary, exploiting the same ecozones in separate territories. D. Henning (1982a) has suggested that both groups had an endogamous band organization, made up of exogamous, patrilineal clans. Great Oasis will be discussed more fully in a later section.

From excavations at sites 13PK23 (P. Emerson and H. Finney 1984) and at the Saylorvillage site (13PK165) (Osborn, Gradwohl, and Thies 1978, 1989), it appears that Late Woodland people in the Saylorville area lived in wattle and daub structures set on the ground surface (Benn and Rogers 1985). This appears similar to the structure defined at the Walters site (13JH42) in the Coralville Reservoir (A. Anderson 1971b), and the wickiup structure encountered at the Sweeting site (13WS61) in Washington County (Lensink 1986). Faunal remains at the Saylorvillage site included small mammals, birds, and an ungulate tooth, either wapiti or bison. Floral remains consisted of maize kernels, a cucurbit seed, black walnut shells, an acorn shell, a hazelnut, and a sunflower seed (Osborn, Gradwohl, and Thies 1989).

Downstream from the Saylorville Reservoir in the Red Rock Reservoir area, a large number of Late Woodland sites have recently been located and tested (Roper 1986; Rogers and Koldehoff 1987; Stanley, J. Anderson, and Rogers 1988; Moffat, Koldehoff, and McCorvie 1988; Moffat et al. 1990). The main occupation at the Cormorant site (13MA387) appears to fit with Benn and Rogers' (1985) unnamed phase in the Saylorville Reservoir (Moffat, Koldehoff, and McCorvie 1988; Moffat et al. 1990). However, a castellated rimsherd with nested chevrons that appears very similar to Saylor ware was recovered. Several concentrations of daub were located at the Cormorant site as well, but no postmolds were apparent (Roper 1986; Moffat, Koldehoff, and McCorvie 1988). It is likely that these concentrations represent structures similar to those from the Saylorvillage site (13PK165). Only recent animal bones (goat, chicken, cottontail) were recovered from the Cormorant site (Moffat, Cremin, and Kelly 1988). Floral remains recovered included maize, hickory nuts, walnuts, butternuts, hazelnuts, black cherry, plum, knotweed, and ground nut. The site has been interpreted as a Late Woodland base camp (Roper 1986; Moffat, Koldehoff, and McCorvie 1988). Two other sites (13MA324-A, and 13MA385) in Lake Red Rock were identified as

bivouacs or temporary base camps (Stanley, J. Anderson, and Rogers 1988; Moffat et al. 1990). Unfortunately, both sites had been greatly impacted by erosion, and preservation of organic remains was poor, so neither can confidently be linked with individual Late Woodland phases defined at Saylorville (Moffat et al. 1990).

#### North Central Woodland

Although they overlap in time with Arthur Cord Roughened ceramics, the Late Woodland in the Prairie Lakes region of north-central Iowa and southern Minnesota is characterized by Lake Benton Series ceramics (Hudak 1976; Anfinson 1977; Anfinson 1987; Benn 1982a, 1982b). Anfinson (1987) dates the Lake Benton phase between A.D. 700 and A.D. 1200, but Benn (1982b) sees Lake Benton ending by around A.D. 800. The most common type, Lake Benton Cordwrapped Stick, "has subconoidal vessel forms with constricted necks, gently flaring shoulders, and slightly curved rims. Most rims are insloping or vertically oriented. Lips tend to be cord roughened (Benn 1982b:175)." Decoration consists of cordwrapped stick stamping in three zones on the rim. This is a technique common to ceramics found to the north in central Minnesota but rare to the south and west (Benn 1982b). Lake Benton Plain and Dentate Stamped vessels are also present in the Arthur site assemblage (Benn 1982b). Lake Benton ceramics have been identified in private collections in north-central Iowa as well as Winnebago and Hancock counties (Benn 1982b). Benn (1982b) sees Lake Benton ceramics deriving from Fox Lake Series, with Arthur Cord Roughened representing perhaps a separate tradition. The Arthur site (13DK27) assemblage also contains examples of Loseke ware similar to the types Missouri Bluffs Cord Impressed (Keyes 1949), and Feye Cord Impressed (Kivett 1952). These types are common to the south and west of the Prairie Lakes region and represent the same decorative horizon style as Saylor ware, Madison ware, and Minott's ceramics to the east. It is of note that a sherd nearly identical to Lane Farm Cord Impressed, the possible antecedent of Madison ware, was found at the Arthur site (Benn 1982b). The Lake Benton occupation of the Arthur site appears to represent the most intensive utilization of the site area, although it is still interpreted as representing a seasonal resource extraction site (Tiffany 1982a).

Anfinson (1987) notes that subsistence and settlement patterns do not change in the Prairie Lake region during the Late Woodland time period. Main village sites tend to be adjacent to lakes, and on islands and peninsulas. Interregional trade appears to be very rare, and subsistence appears to rely on local upland and lowland resources. However, the presence of Loseke ware at the Arthur sites suggests interaction with people to the south and west of the region (Benn 1982a, 1982b). There is at this point no evidence for the use of horticulture in the Prairie Lakes region during Late Woodland times. While mound construction appears to wane during Late Woodland times in the Eastern Woodlands, it appears to increase on the plains and in the Prairie Lakes region. Mounds consist of simple low conical forms with multiple secondary burials with few grave goods located within shallow pits. Mounds contain both sexes in all age groups, with little differentiation. This may reflect a basically egalitarian social organization (Anfinson 1987).

#### Plains Woodland

In western Iowa, the late Late Woodland time period is represented by an unnamed phase of the Loseke variant of the Mid-America Woodland tradition (Benn 1986; ed. 1990). As might be imagined, the Loseke variant is characterized by the presence of Loseke ware (Kivett 1952; Benn 1983, ed. 1990), a redefinition of the types Feye Cord Impressed and Cord Roughened (Kivett 1952), Ellis Cord Impressed, Scalp Cord Impressed

(Hurt 1952), and Missouri Bluffs Cord Impressed (Keyes 1949) (Benn ed. 1990). Loseke ware is a western expression of the style of single cord or fabric impressed decorated ceramics that spread across the upper Midwest during Late Woodland times (Osborn, Gradwohl, and Thies 1978, 1989; Benn 1980, 1982b, 1983, ed. 1990). Other wares representing this style to the east include Saylor ware, Madison ware, Canton ware, and Minott's ceramics. The Loseke variant appears to have been contemporaneous, at least for a time, with Great Oasis people in northwestern Iowa. Although the variant is poorly known, Benn (ed. 1990) believes that it dates to between A.D. 700 and A.D. 900.

Loseke ware vessels tend to have a globular vessel form, and rims may be flared. Benn (ed. 1990) believes that these changes relate to a shift from setting heavy conoidal pots within a fire, to suspending the vessel over the fire through the use of a suspension collar. He feels that Late Woodland and Plains Villager potters' emphasis on lip form has a great deal to do with this shift. This shift may be related to a need for more portable simmering vessels with thin walls for more resistance to thermal stress, caused by more intensive reliance on the cultivation of hard starchy seeded plants and maize horticulture (Benn ed. 1990). Some Loseke ware rims share many traits with Great Oasis ceramics, and Benn (ed. 1990) feels that this suggests that Loseke variant and Great Oasis people were contemporary, and that the shift to dependence on maize was driving the ceramics of both groups in the same directions. Unfortunately, the Loseke component at one of the MAD sites (13CF102) was ephemeral, and yielded only a single acorn, Chenopods, and a few walnuts in terms of floral remains. Faunal remains consisted nearly entirely of deer and bison (Benn ed. 1990). The transition to maize horticulture on the prairie/plains is very poorly documented, as flotation techniques have not been applied to many sites of this time period. However, maize was recovered from the Lawson site (25PT12) (Kivett 1952), a Loseke occupation in eastern Nebraska (Benn ed. 1990).

In southwestern Iowa and southeastern Nebraska, another ceramic tradition appears during this time period, characterized by Sterns Creek ceramics (Sterns 1915a, 1915b; Strong 1935). Originally defined as a culture (Strong 1935), Sterns Creek has since been defined as an aspect (Keyes 1949), and as a focus (Kivett 1952) in the Midwestern Taxonomic System. More recently, L. Brown (1967a) defined a Sterns Creek phase in the Willey and Phillips system. Benn (1986:27) included the Sterns Creek phase within the Loseke variant, but more recently (Benn ed. 1990:144), he refers to it as the Sterns Creek variant. For many years, Sterns Creek was thought to date to the early Late Woodland period, being the local equivalent of Weaver ware (Strong 1935; Keyes 1949; Tiffany 1977g). Benn (ed. 1990), however, notes that there are typological difficulties in dating it to that time period. More recently (Haas 1983), a suite of radiocarbon dates has been obtained from the Walker Gilmore site (25CC28), the type site of Sterns Creek. These dates cluster around A.D. 1225, with an early date of A.D. 940 (Benn ed. 1990). Benn (ed. 1990: Figure 6.14) appears to extend the range of dates back to A.D. 850. Sterns Creek ceramics show little similarity to ceramics of the Loseke variant, and Benn (ed. 1990) suggests that they are likely more closely related to ceramics of the Pomona focus (Witty 1967, 1981; Wilmeth 1972) or variant (K. Brown 1985; B. Logan 1988) to the south.

Sterns Creek subsistence appears to be a mixture of hunting and gathering and horticulture (Tiffany 1977g). Maize and beans appear to be lacking from Sterns Creek assemblages (Tiffany 1977g). Woodland species predominate over bison in the faunal assemblages, suggesting a woodland/riverine subsistence orientation. At the Thomas site (13ML204), L. Brown (1967a) encountered a basin-shaped house depression, measuring 14 ft. (4.25 m) X 17 ft. (5.18 m) and containing

several pit features. No floral or faunal remains are reported from the Thomas site. Tiffany (1977g) reported on the artifacts from the Sharp's site (13ML42), but his analysis was restricted to examining the materials in the collections of D. D. Davis and Fred Delavan and limited testing of the site in 1969, and hence no floral or faunal materials are reported. Much as Loseke people were likely contemporaneous with and interacting with Great Oasis Sterns Creek folk were contemporaneous with and interacting with Central Plains tradition Nebraska phase Glenwood villagers.

It appears likely that groups like Loseke and Sterns Creek and Great Oasis and Nebraska phase in their earliest manifestations continued the settlement and subsistence system described above for the preceding Boyer variant, forming a "patchwork" of local bands cooperating on communal bison hunts, exchanging produce, sharing territories, and forming trade partnerships. This is indicated by much evidence of exchange as at the Arthur site (13DK27) where both Loseke and Lake Benton ceramics are found (Benn 1982a) and by the spread of Loseke ware across both the Prairie Plains and the Prairie Lake region of Iowa. Widespread interaction during this time period is also indicated by the presence of Great Oasis ceramics at Woodpecker Cave (13JH202) (Caldwell 1961, illustrated but not discussed as such; A. Anderson 1971b) in Johnson County and in the Lake Red Rock area in south-central Iowa (Roper 1986; Rogers and Koldehoff 1987; Moffat, Koldhoff, and McCorvie 1988, 1990), well outside the region of Great Oasis occupation. There is also no evidence for warfare during this time period (Benn 1983). This is in contrast to the later Plains Villager inhabitants of the region who adopted a different ideology and kin organization that led to cooperation turning into antagonistic competition (Benn ed. 1990).

#### Southern Iowa Woodland

As with all previous time periods, very little is known about Late Woodland in the south-central part of Iowa (Cook 1975a; Gourley 1983a). In the Lake Rathbun region on the Chariton River, several of the mounds excavated by L. Brown (1967b) are undoubtedly Late Woodland, but Brown simply describes the ceramics as similar to Lake Michigan ware, an archaic term, encompassing at least three distinct ware groupings. Benn and Howde (1981) recovered no diagnostic ceramics from site 13AN52. In the Salt River Drainage of northeastern Missouri, Donham (1982) sees the Weaver equivalent Ralls phase continuing up until A.D. 1000. Chapman (1980) notes Ralls phase components in the Chariton River Valley as well as Randolph phase sites such as proposed by Roper (1992) for site 13LC17. Donham's (1982) succeeding phase, the Perry phase, dating from A.D. 1000 to 1400 contains cord impressed ceramics similar to Maples Mills types, but also contains, "plain, burnished Mississippian-like vessels with globular bodies and insloping incurvate rims with very short necks (Donham 1982:129). This would appear to support Riggle's (1981:13) assertion that:

In light of this broad view, the origins of Maples Mills appear to be in place development in the central Mississippi River valley. Influence from the north and west appears to be relatively strong as it appears to be more economical to view the "northland" as the source of considerable influence on cultures to the south in the Mississippi valley (i.e., southeastern Iowa and far western Illinois) and to view Maples Mills in the Illinois valley as a relatively late, if not abbreviated and probably Mississippianized facsimile of a more regional pattern of behavior.

It is of note that no such Mississippian influences have yet been reported for southern Iowa. Collins (1989) has recently suggested that the Des Moines River rapids may have served as a prehistoric boundary

marker on the west side of the river during Oneota and Mississippian times. Perhaps such a situation obtained during late Late Woodland times as well. Clearly, much more work is needed in this region before we can develop a clear understanding of its late Late Woodland occupation.

## Wisconsin

### Early Woodland

Early Woodland sites in Wisconsin include both habitation and mortuary sites. As in the Late Archaic, however, the artifact associations of mortuary sites rarely are similar to habitation sites. Early Woodland habitation sites contain diagnostic ceramics and projectile points that indicate two phases of Early Woodland development similar to those found elsewhere in the Midwest. Early Woodland mortuary sites appear to be associated only with the earlier phase.

Early Woodland mortuary sites in eastern and southern Wisconsin have been identified as Red Ocher (Ritzenthaler and Quimby 1962). Some archeologists classify Red Ocher mortuary sites as Late Archaic (Stoltman 1986a; Overstreet 1980), and others suggest it is transitional between Late Archaic and Early Woodland (Ritzenthaler and Quimby 1962). Esarey (1986) has demonstrated that Red Ocher mortuary sites can be associated with the early Early Woodland Marion phase ceramics (Marion Thick) and lithics (Kramer stemmed points) in the Illinois River Valley, where they are also associated with burial mounds. In Iowa the Red Ocher Ryan focus or phase includes mortuary sites in mounds and Marion Thick ceramics (Benn 1979; Tiffany 1986). In Wisconsin, however, Red Ocher mortuary sites and caches have not included diagnostic Marion phase ceramics, although straight-stemmed Kramer-like points are present (Halsey 1972). Wisconsin Red Ocher mortuary sites are often found in sand and gravel glacial outwash knolls and terraces, but not in mounds. Material remains include red ochre concentrations, caches of ovate chert blades, blue-gray chert stemmed and Turkey-tail points, white chert stemmed blades, marine shell beads, copper beads, and a limited range of copper point and knife types. Most Red Ocher sites have been found and reported by amateur archeologists, and only one Red Ocher mortuary site in Wisconsin has been excavated professionally in the last 30 years (Overstreet 1980).

Probably the best known Red Ocher cemetery is the Riverside site which is located on the Michigan side of the Menominee River just outside northeast Wisconsin (Hruska 1967). The site was located in a sand dune area which was being impacted by sand quarrying and modern cemetery development. The site included both habitation debris and burials in pits. Fifty-three burial pits were excavated and included flexed burials, bundle burials, and cremated remains of adults and children. No extended burials were identified. Associated grave goods included a few copper artifacts including crescent knives, stemmed points, awls, and numerous beads. Fabric, bark, and yarn were sometimes preserved when they were in contact with copper artifacts. Chert artifacts included several caches of ovate and stemmed blades, and ritually broken and burned blue-grey chert points. Red ochre was present in the majority of graves. No ceramics were found in any burial pits, but an extensive Early and Late Woodland occupation is indicated by the ceramics and lithics from the habitation debris and refuse pits across the site area. The excavator concluded that the cemetery probably dated from Late Archaic Old Copper to Early Woodland Red Ocher, but he seemed to believe that the habitation debris was unrelated to the burials. The five radiocarbon dates from charcoal and charred wood at the site range

from  $2460 \pm 140$  B.P. (510 B.C.) to  $1950 \pm 130$  (A.D. 1) (Hruska 1967) and fit within an Early Woodland time range for Wisconsin.

The Convent Knoll site (47 Wk-327) is a recently excavated Red Ocher cemetery in southeast Wisconsin (Overstreet 1980). The site was found during road construction and consisted of four burial pits situated on a sand and gravel ridge of glacial outwash. Burial 1 was a flexed adult male who was killed by a stemmed point found imbedded in a vertebra. Cutmarks on the cranium suggest the individual had been scalped. Grave goods included a Hixton ovate blade, a copper celt, marine shell beads, and red ocher. Burial 2 was an infant buried with a large, white chert stemmed blade, a corner-notched white chert point, a copper awl, an antler billet, a marine shell bead necklace, and red ocher. Feature 4 was a mass grave which contained five flexed, adult male burials covered with red ocher. Several of the individuals had been killed by projectile points found in the limb and torso areas, and some had been decapitated or dismembered. Grave goods consisted of marine shell beads and tubes which appear to have been items of personal adornment, such as necklaces and earrings. The excavator believed that all the individuals were killed during a single event. Because the individuals in the mass grave are less carefully treated, he also suggested two different social groups may be represented. While evidence of violent death has been noted in other cemeteries from the same general time period such as Price III (Freeman 1966) and Riverside (Hruska 1967), Convent Knoll is the only site where the majority of the burial population appears to have died from internecine warfare.

The Hilgen Spring Park Mounds (47 Oz-7) in southeast Wisconsin have been reported as Early Woodland burial mounds (Van Langen and Kehoe 1971; Kehoe 1975). Two of the three mounds were excavated and revealed burials and rock concentrations. The mound fill and submound midden and features included thick, Early Woodland pottery along with a contracting stem point, stone gorget, lithic debris, bone, charcoal, and shell habitation debris. A Middle Woodland Monona stemmed point was also found in a submound context. Radiocarbon dates from the submound midden and rock features range from  $2790 \pm 65$  B.P. (840 B.C.) to  $2410 \pm 55$  B.P. (460 B.C.). These dates fit the range of dates from other Midwestern early Early Woodland sites (Boszhardt et al. 1986:247). It has been suggested, however, that while the dates apply to an Early Woodland occupation, the mounds may actually be later, possibly Middle Woodland, constructions which have incorporated and buried the Early Woodland occupation of the site (Boszhardt et al. 1986). Since no other Early Woodland burial mounds have been clearly identified in Wisconsin, it seems possible that the Hilgen Springs Park mounds are not Early Woodland in age.

Habitation sites relating to the early phase of the Early Woodland are identified on the basis of thick, grit-tempered pottery, usually classified as Marion Thick, and straight stemmed Kramer points. Although Marion Thick ceramics were defined in the central Illinois River Valley, similar thick ceramics appear across the northeast Woodlands and date earliest in New York (Emerson 1986). As noted in the Iowa discussion, Kramer points may have a wider geographic distribution than Marion Thick ceramics. While ceramics resembling Marion Thick and Kramer points have been found on plowed sites across southern Wisconsin, few cohesive early Early Woodland occupations have been excavated and reported (C.I. Mason 1964; Rusch 1988; Boszhardt 1990; R. P. Mason and C. L. Mason 1991; Goldstein 1993; Overstreet 1993d; Salzer n.d.). The Hilgen Spring Park site (47 Oz-7) includes an early Early Woodland habitation site that had rock features and hearths associated with thick grit-tempered ceramics (Van Langen and Kehoe

1971). The three radiocarbon dates from Hilgen Spring range from  $2790 \pm 65$  to  $2410 \pm 55$  (840 B.C. to 460 B.C.) (Kehoe 1975; Boszhardt 1982).

In southwest Wisconsin, Stoltman has recently proposed the Indian Isle phase as representing the earliest Early Woodland in the Prairie du Chien area (Stoltman 1990). Stoltman proposed that Indian Isle is a regional variant of Marion culture that dates from 300 to 100 B.C. Because there are no Red Ocher mortuary sites in the Prairie du Chien area, Stoltman suggested that Indian Isle should be considered separate from the Ryan phase manifestations of Iowa. Indian Isle ceramics are thick, grit-tempered, cylindrical jars with fingernail and punctated decorations over a cordmarked exterior surface. Unlike Marion Thick, they do not have interior cordmarking. Although most of the Indian Isle components are from multicomponent, surface sites, Stoltman noted one stratified site where Indian Isle ceramics are stratigraphically below later Prairie phase Early Woodland materials. Stoltman suggested that Indian Isle phase sites are confined to the Mississippi River floodplain, and there is a high potential for finding buried components in these geomorphic contexts. Consequently, it is difficult to characterize settlement patterning for the phase. No subsistence data are available for the phase.

The later Early Woodland manifestation in Wisconsin is characterized by the presence of incised-over-cordmarked ceramics and Waubesa contracting stem points, along with other stemmed point varieties. The ceramic and lithic assemblages are similar to what has been called Black Sand culture or horizon in Illinois (Farnsworth 1986), and similar assemblages have been reported for Iowa, Minnesota, and Michigan. A number of variants of the incised-over-cordmarked ceramic series have been named in Wisconsin including Dane Incised in southern Wisconsin (Baerreis 1953; Keslin 1958), Prairie Incised in southwestern Wisconsin (Stoltman 1986b), and Deer Creek Incised (Salzer n.d.), Beach Incised and Waubesa Incised (Salkin 1986) in southeast Wisconsin. The pottery is grit or sand tempered and often has a sandy paste. Parallel incised lines in horizontal bands and/or chevrons may cover the upper third to the majority of the vessel, and nodes and punctates may also occur. Cordmarked vessels sometimes with fingernail or punctate decorations, but without incised lines, also occur on the later Early Woodland sites.

In southeast Wisconsin the Lake Farms phase has been identified as a late Early Woodland occupation at the multicomponent Beach site (47 Da-459) (Salkin 1986). The site is located on the silt loam shore of Lake Waubesa near its inlet and an extensive wetland. The site consisted of a dark, black midden which varied in thickness and was excavated as a single level. The Early Woodland occupation was coincident with the midden and included incised-over-cordmarked ceramics, a variety of stemmed Woodland point types, and several side-notched Archaic points. The majority of lithic debris and tools including scrapers, knives and drills were recovered from the midden. The B-Horizon underlying the midden was also excavated and yielded numerous side-notched Late Archaic points, a variety of knives, scrapers, and drills, as well as the majority of faunal remains from the site. Apparently most of the bone was in small fragments and calcined. A limited amount of floral remains was also recovered from the site. Analysis of the floral and faunal remains suggested that the Late Archaic and Early Woodland occupants were exploiting the same wetland margin and aquatic resources including deer, small mammals, waterfowl, turtles, and fish. Hazelnut, acorn, and unidentified seeds were recovered from a few contexts, but the midden and subsoil were not systematically sampled for floral remains. The single radiocarbon date from an Early Woodland pit feature at the site was  $1930 \pm 70$  B.P. (A.D. 20). The Beach site is unusual for the southeast Wisconsin region because there was no subsequent Middle or Late Woodland occupation of the locale.

Lynne Goldstein, who conducted a long term, probabilistic survey along the Rock and Crawfish rivers in southeast Wisconsin, has noted that Early Woodland sites in the region are located in the same locales as later Middle and Late Woodland sites (Goldstein 1987a, 1993). Preferred locations for Woodland sites tend to be along interior bends of rivers near stream confluences where wetlands are nearby. Preferred vegetation associations are a combination of marshes with oak openings and oak forest. Goldstein suggested that wetland resources are particularly important in the region because they provide abundant and storable resources in winter months when resources elsewhere are scarce. Goldstein proposed that the Woodland site locales were occupied repeatedly in the fall and winter. She suggested that Woodland peoples may have traveled outside the region during other seasons.

Beyond the Crawfish/Rock area of southeast Wisconsin, late Early Woodland sites appear to have a strong association with wetland settings associated with lakes or streams/rivers. Sites in these environments include Canoe (47 Da-457) (Salkin 1986), Airport Village (47 Da-2) (Baerreis 1953a), Outlet (47 Da-3) (Whiteford 1949; Bakken 1950), Highsmith (47 Je-4) (Salzer n.d.), Kutz (47 Je-243) (Salzer 1981), Cooper's Shores (47 Ro-2) (Salzer n.d.), and Hahn I (47 Do-1) (Keslin 1958).

In southwest Wisconsin late Early Woodland has been designated as the Prairie phase in the Prairie du Chien area (Stoltman 1986b, 1990). Ceramics, classified as Prairie Incised (Stoltman 1986b) (formerly known as Spring Hollow Incised [Logan 1976; Benn 1978, 1979]) were sand tempered, cordmarked, and decorated with incised lines, fingernail and tool impressions and bosses. Projectile points included Waubesa contracting stem. Radiocarbon dates from two Prairie phase floodplain sites are  $1880 \pm 80$  B.P. (A.D. 70) and  $1890 \pm 80$  B.P. (A.D. 60) (Stoltman 1990). The majority of the known sites are in the floodplain, while a few are on Mississippi River terraces. The only known upland sites produced Waubesa points, but no ceramics (Arzigian 1981). The floodplain sites are often associated with shell middens and appear to be summer occupations. The Prairie phase component at the Mill Pond site (47 Cr-186) produced abundant shellfish remains along with fish from backwater pools and the main channel, aquatic turtles, migratory waterfowl, deer, and small mammals (Theiler 1987).

On the northern fringe of southwest Wisconsin, the Silver Creek sites (47 Mo-1 to 5) are located along sandy terraces of a tributary of the La Crosse River at Fort McCoy in Monroe County. Hurley (1974) identified these sites as Early, Middle and Late Woodland nonmound villages and camp sites. Unfortunately, the multiple components are mixed in the deposits of these habitation sites. A late Early Woodland presence is suggested by stemmed projectile points and several ceramic types. Tomah Fingernail Impressed has been identified as a local variant of Prairie phase Early Woodland (Boszhardt et al. 1986). Other Silver Creek ceramics can be classified as early or transitional Middle Woodland including Windrow Cord Impressed which occurs with incising (Boszhardt et al. 1986), and Sister Creeks Punctated (Hurley 1974). Silver Creek I (47 Mo-1) was the largest site and included several small pit features and one large, shallow pit identified as a house. No postmold patterns or diagnostic materials were found associated with the house. A radiocarbon sample from charcoal in the feature fill produced a date of  $2150 \pm 80$  B.P. (200 B.C.) (Wis-163) (Hurley 1974). Hurley concluded that the house dates to the Middle Woodland occupation, but the weak context of the radiocarbon sample and the absence of diagnostic artifacts suggest that this feature cannot be reliably dated.

Incised-over-cordmarked ceramics, along with stemmed and contracting stemmed points, have also been reported into northeast Wisconsin. Overstreet (1993d) and J. Richards (1993a) described Early

Woodland ceramics from the Henschel site (47 Sb-29) along the Sheboygan Marsh, and suggested that the site was a warm season base camp (Overstreet 1993d). The Bachmann site along the Onion River included an Early Woodland component which was proposed as a winter hunting camp (Rusch 1988; Penman 1988). Overstreet also reported incised-over-cordmarked ceramics associated with what he interpreted as a small house at two sites along Lake Poygan. He proposed these sites to be short term, extractive camps (Overstreet 1993d). It seems likely, however, that if houses were present, the sites were occupied for a longer period of time than would be expected at an extractive locus.

Even farther north incised-over-cordmarked ceramics have been reported along both sides of Green Bay and in the interior uplands. Dane Incised sherds were reported from the lower levels of several stratified sites in the Door Peninsula (R.J. Mason 1966, 1991; Dirst 1995a, 1995b). Mason considered the ceramics to be associated with the early part of the Middle Woodland North Bay culture. Similar ceramics were also reported from several sites along the Menominee River on the west side of Green Bay just across the Michigan border (Buckmaster 1979). One of these sites was the midden at the Riverside Cemetery (Hruska 1966). In northern Wisconsin incised or finger-trailed-over-cordmarked ceramics are associated with Middle Woodland Nokomis phase sites along the upper Wisconsin River watershed (Salzer 1969, 1974; C. I. Mason 1981; Moffat et al. 1991, 1993). Although many investigators believe that the northern Wisconsin trailed-over-cordmarked ceramics are associated with northern Middle Woodland manifestations (R. Mason 1966, 1991, 1992; Salzer 1974), others argue that the stratigraphic and radiocarbon records suggests the ceramics may be as early as 500 B.C. (Overstreet 1993d; Dirst 1995a, 1995b).

In northwest Wisconsin, Salzer reports finding Fox Lake ceramics at the Hammersberg site in Burnett County which ties this Early Woodland manifestation to southern Minnesota (Kolb 1988). This is the only Early or Initial Woodland site tested in the region. Unfortunately, no site report is available.

The radiocarbon record for the later Early Woodland in Wisconsin is not strong, and only a few samples have been reported from sites which have been adequately described. While Black Sand ceramics in the Illinois River Valley date to 2550-2200 B.P. (600-150 B.C.) (Farnsworth 1986), incised-over-cordmarked ceramics date considerably later in Wisconsin.

The single radiocarbon date from an Early Woodland pit feature at the Beach site in southeast Wisconsin was  $1930 \pm 70$  B.P. (A.D. 20) (Salkin 1986). Radiocarbon dates from southwest Wisconsin Prairie phase floodplain sites range from  $1960 \pm 80$  B.P. (10 B.C.) (Boszhardt 1982) to  $1880 \pm 80$  B.P. (A.D. 70) (Stoltman 1990). The generally later dates suggest that what archeologists call Early Woodland may be time transgressive. The co-occurrence of incised-over cordmarked ceramics with Middle Woodland types on many sites also suggests that these Early Woodland "diagnostics" may be Middle Woodland in time and culture in Wisconsin.

Overstreet has suggested that a few early dates from northeast Wisconsin indicate a possible northeastern origin for incised-over-cordmarked ceramics in Wisconsin (Overstreet 1993d). He noted that incised-over-cordmarked ceramics have been reported in association with North Bay assemblages, and that early North Bay dates should not be rejected. North Bay was defined at the stratified Mero site (47 Dr-83) in the Door Peninsula, and was identified as a Middle Woodland culture (R.J. Mason 1966). Recently Mason has reviewed the radiocarbon record for sites in the region (R.J. Mason 1992). Mason discounted two early dates from North Bay sites which range from  $2540 \pm 270$  B.P. to  $2470 \pm 65$  (590-520 B.C.). He accepted a cluster of six dates which range

from 2015±120 B.P. to 1730±110 (65 B.C.-A.D. 220). Many of the dates in the cluster came from AMS dating of charred materials on North Bay sherds. No incised-over-cordmarked sherds were directly dated in this sample, however. Dirst recently reported a radiocarbon date on charred organics from an incised vessel of 2145±50 B.P. (195 B.C.) (Dirst 1995a, 1995b). The sherd was from the later of two stratified North Bay occupation levels at the Shanty Bay site (47 Dr-11) in Door County. Dirst suggested the incised ceramics represent ties to the south (1995b).

Late Early Woodland sites in Wisconsin are found in several regions of the state, but little is known about settlement and subsistence for the era. In eastern Wisconsin habitation sites tend to be associated with floodplain and wetland settings. The limited subsistence data reveals a reliance on deer, small mammals, birds, turtle, fish, and shellfish along with nuts and seeds. In southwestern Wisconsin habitation sites are found in sandy floodplains, and upland sites with only lithic diagnostics have also been reported. A few floodplain sites have produced subsistence data suggesting a reliance on shellfish, fish, deer, small mammals, and turtles. No domesticates have been reported for Wisconsin during Early Woodland times. No mortuary sites have been reported for later Early Woodland in Wisconsin.

## Middle Woodland

There are marked differences in the archeological record between the north and south in Wisconsin during Middle Woodland times. The differences in lifeways and material culture appear to be linked to the environmental differences between the northern mixed hardwood forest, and the deciduous forest and prairie opening area of the south. Middle Woodland seems to develop out of a local Early Woodland base in the south, but in the north Middle Woodland is considered the Initial Woodland occupation.

Up until the late 1950s and early 1960s there was considerable confusion about the relationships of several Wisconsin prehistoric "cultures" to the Middle and Late Woodland manifestations known elsewhere in the Midwest. While there was evidence at some sites for influences from the Middle Woodland Hopewell cultures of Ohio and Illinois, there were also many sites which had numerous conical, linear, and animal effigy mounds which were believed to be the local expression of an indigenous Middle Woodland culture. This confusion stemmed from several factors. Up until the late 1950s, most reported excavations had been conducted in mounds. Although the mounds appeared to be burial mounds, few produced diagnostic grave goods, and many did not even contain burials. Furthermore, these early excavations did not adequately consider the context and complexities of site formation processes. In addition, the few habitation sites that were examined were mixed, multicomponent occupations. It was only after the advent of radiocarbon dating that some of the chronological problems began to be resolved. The excavation of several stratified sites in both southern (Wittry 1959b) and northern (R. J. Mason 1966) Wisconsin was also crucial in distinguishing Middle Woodland from Late Woodland occupations across the state.

Burial mounds appear in much of southern Wisconsin for the first time in Middle Woodland. The mounds often include submound tombs with extended primary burials, and secondary bundle burials. Grave goods are rare, but when they occur include items considered characteristic of the Hopewell Interaction Sphere. Large stone blades, conch shell, copper earspools, bear teeth, shell beads, ground stone pipes, exotic cherts, and occasionally pottery vessels decorated with Havana-Hopewell styles all suggest connections with the Hopewell cultures to the south. Recent research suggests, however, that the

Wisconsin assemblages represent local groups and traditions, and not influxes of people or organizational principles from Illinois. The southwest Wisconsin Middle Woodland sites appear to be most closely linked with the cultures of northeast Iowa and southeast Minnesota.

The spatial patterning of mound groups may reveal linkages among Woodland groups in Wisconsin. In many instances Middle Woodland mounds occur in mound groups which also contain Late Woodland mounds, and mounds with burials which cannot be placed in time. The infrequency of temporally diagnostic material with burials, and the clustering of mounds from several Woodland periods complicates the chronological placement of mounds and mound groups. This pattern of concordant sacred spaces, however, suggests that there may be cultural continuity over long periods of time in the region.

In northern Wisconsin no mounds have been reported with North Bay or Nokomis occupations, but they are present in northwest Wisconsin with Red Cedar phase sites. Here too, Late Woodland burial mounds are associated with mound groups containing Middle Woodland mounds.

Middle Woodland habitation sites are also variable across time and space during Middle Woodland. In southwest Wisconsin, where an early Middle Woodland Trempealeau phase has been identified, habitation sites are small, seasonal campsites found in a variety of locations. Sites are situated in floodplains, on major river terraces, at the mouths of secondary valleys where streams and marshes are present, and even in rockshelters. Early Middle Woodland materials are always found on multicomponent habitation sites, however, and have not been studied as isolated occupations. In southeast Wisconsin, early and later Middle Woodland occupations have not been distinguished in the multicomponent habitation sites and no stratified sites have been found. However in riverine settings, Middle Woodland sites are located in the same places as Early and Late Woodland sites, and subsistence pursuits are likely to have been similar.

Significant changes are evident in the site types and facilities present during the Middle Woodland period, however. Judging from the southwest Wisconsin record, these changes may occur during late Middle Woodland times. In southwest Wisconsin there is the first evidence for use of storage and refuse pits suggesting that storage of plant foods and other resources is important. The first evidence for domesticated plants in Wisconsin occurs at this time as well. Squash, sumpweed, and wild rice have been identified along with goosefoot, dock, knotweed, hickory, walnut, and acorn. The first houses and a multiple house community appear at the Millville site (47 Gt-53). Middle Woodland sites have been found regularly spaced on the landscape of the lower Wisconsin River. In southeast Wisconsin, no houses have been reported, but some Middle Woodland sites include substantial middens and storage/refuse pits. Important faunal resources include deer, elk, waterfowl, and fish. In addition, faunal assemblages suggest that bear, puma, wolf, raccoon, and other mammals may have served in a technological or ritual realm, rather than as subsistence items.

In northern Wisconsin, Middle Woodland also marks the first evidence for houses and storage facilities. A single pit house and associated storage/refuse pits have been identified at a Nokomis phase site. Other Nokomis sites have produced substantial middens and copper workshops. Houses have also been reported at a North Bay site on Washington Island, and other North Bay sites are characterized by substantial middens, some of which are stratified. No domesticated plants have been identified. Important faunal resources include deer, small mammals, and fish. The Middle Woodland archeological record in the northwoods looks very different from Late Archaic.



## Southwest Wisconsin

Warren Wittry excavated in a series of rockshelters in the Driftless area of southwestern Wisconsin in an attempt to provide some stratigraphic controls for the Woodland chronology of southern Wisconsin (Wittry 1959b). He was particularly interested in clarifying the relationship between Hopewell manifestations and Effigy Mound. Although most of the rockshelters appeared to have mixed deposits, Wittry was able to propose a seriation of ceramic styles from the Durst Rockshelter (47 Sk-2). His stratigraphic order has been supported by recent work, but the interpretation of Wittry's series has changed.

Briefly, Wittry found Middle Woodland ceramics similar to Illinois Havana ware as the earliest ceramic horizon in the rockshelters. He called this grit-tempered ware Denzer Stamped, and noted it was decorated with bands of cord wrapped stick stamping. It was accompanied by shell-tempered ceramics which were cordmarked and netmarked (Baraboo series), and by two grit-tempered, rocker stamped vessels. A slightly later type, Leland Cordmarked, was grit tempered and decorated with cord wrapped stick stamping along the lip and upper rim. Wittry observed that it resembled the late Middle Woodland Weaver ware of Illinois. Benn noted that much of the Durst ceramic assemblage would be classified as late Middle Woodland Linn ware today (Benn 1979:65). Postdating these Middle and late Middle Woodland assemblages were Madison ware ceramics including Madison Plain, and Madison Cord Impressed. Although Wittry called them late Middle Woodland, today they are considered early Late Woodland. Madison wares are almost the only ceramic types found in Effigy Mounds, which are now dated securely as Late Woodland. What Wittry considered to be Late Woodland in his rock shelters were collared ceramics, which today would be called late Late Woodland. Wittry also seriated the projectile points from his excavations and suggested a sequence of Raddatz Side-notched (Archaic), Durst Stemmed (Late Archaic), Monona Stemmed (Middle Woodland), and a group of small points in triangular, side-notched, and corner-notched forms associated with the late occupations of the shelter, which are presumably Late Woodland.

More recently, two Middle Woodland phases have been defined in southwest Wisconsin. The earlier is called the Trempealeau phase, and the later is called Millville (Stoltman 1990, 1992b). The Trempealeau phase was named after McKern's work in several Hopewell-like Middle Woodland mound groups along the Mississippi River in Trempealeau County (McKern 1931, 1942). The Millville phase was named after Freeman's work at a late Middle Woodland village site in Grant County (Freeman 1969).

An abundance of Middle Woodland burial mounds has been reported along the Mississippi River trench in southwest Wisconsin (Stoltman 1979; Theler and Stevenson 1984). The large and small conical mounds occur in groups or clusters located along terraces edges and the floodplain (Boszhardt 1990). Without actually excavating the mounds, however, it is difficult to assign a definite age since Late Woodland and possibly even Oneota mounds and mound groups are also present in the region.

A series of excavations were conducted into mounds of the area in the late nineteenth century (Thomas 1894; Squier 1905, 1914) and in the 1920s and 1930s (McKern 1931). Excavated sites include the Shrake, Nicholls, and Schwert (47 Tr-31) mound groups in Trempealeau County, and the White Mound Group in Vernon County. Recently, in the La Crosse area two Middle Woodland mortuary areas have been excavated at the multicomponent Overhead site (47 Lc-20) (Theler and Stevenson 1984), and at the North Shore site (Boszhardt 1990). The mortuary

practices and material culture from these excavations suggest connections with the Hopewell Interaction Sphere of Illinois and Ohio, and have been classified as Trempealeau phase Middle Woodland (McKern 1931; McKern 1942; Stoltman 1979, 1990).

Trempealeau phase submound tombs were roofed with bark structures and contained extended and secondary bundle burials. Secondary bundle burials were also found in the mound fill. Grave goods accompanying the burials varied from place to place and included large chipped stone blades made from chert, quartzite, chalcedony, and obsidian; copper beads, earspools, celts, pendants, and pan pipes; silver covered buttons; stone pipes; drilled bear canines; and shell beads. Many burials and some mounds contained no grave goods, however. Ceramics associated with the mounds either as grave goods or in debris contexts included stamped and zoned varieties related to both Illinois (Naples Stamped, Havana Zoned) and Iowa (Levsen Stamped). The types of artifacts associated with the mounds suggest that the mounds date to a relatively limited time range. The obsidian and chalcedony artifacts suggest the mounds may date to a 100 year period between A.D. 100-350 (Braun et al. 1982). It appears that southwest Wisconsin resources incorporated into the Hopewellian exchange network included galena which ultimately was deposited in burial mounds in northern Alabama (Walthall 1980).

The grave goods and crypt burials of the Middle Woodland mounds suggest a ranked society with ascribed status to some researchers (Stoltman 1979). Others, however, believe the mound oriented mortuary program was available to most individuals in the society, and reflects an egalitarian system (Benn 1979). In fact, the variability present in what appear to be Middle Woodland mounds in southwest Wisconsin is more similar to northeastern Iowa mortuary sites, than to Illinois Havana Hopewell (Benn 1979). The crypt burials evident in Illinois Hopewell (Brown 1979) are similar to those in southwest Wisconsin and Iowa and indicate a smaller population and less complexly organized corporate group than is evident in Ohio Hopewell.

Stoltman has dated the Trempealeau phase to about A.D. 100-200 (Stoltman 1990:246). Trempealeau phase sites are identified by diagnostic ceramics and stone tools which are similar to the Havana series in Illinois and Iowa. Projectile point styles include the Snyder-Manker series and also Monona stemmed. What appear to be short term habitation sites or seasonal camps have been reported from both the Mississippi floodplain and terrace contexts in the Prairie du Chien area, but none have been found in the uplands. Trempealeau phase materials may be represented in the Durst Rockshelter (47 Sk-2) near the Wisconsin River (Wittry 1959b). Unfortunately, no single component sites are known, and all excavated Trempealeau materials have come from mixed contexts. Consequently, no subsistence data, chronometric dates, or features are known for the phase. In Grant County Middle Woodland ceramics are also reported from mixed contexts on multicomponent terrace sites (Geier 1978; Overstreet 1988). In the La Crosse area, short term Middle Woodland occupations have been reported at Mississippi River terrace sites and upland rockshelters (Theler and Stevenson 1984).

The late Middle Woodland phase in southwest Wisconsin has been called Millville (Stoltman 1990) after the Millville site in Grant County (Freeman 1969). The Millville site (47 Gt-53) was a substantial late Middle Woodland village located on a terrace along the Wisconsin River. The village was situated at the intersection of a tributary stream with the River floodplain, near wetlands and upland resources. Other Middle Woodland habitation sites in the region were located in similar settings (Freeman 1969:85-86).



The Millville site covered 1/4 acre and consisted of 14 houses and associated pits arranged around a small courtyard. The single post, oval shaped houses were constructed in shallow basins. Numerous storage, cooking, and/or refuse pit features were present and appeared to be associated both with individual houses and common areas. Refuse pits and fire basins were often found along the interior walls of the houses, suggesting a winter occupation. Few pit features, and no house basins overlapped, which suggests the site represents a single episode occupation. Fill in the house basins indicates that they were occupied for enough time for a midden to develop, since pit features originated from beneath and within the basin middens (Freeman 1969:40). Two graves containing the flexed remains of three adult women were found, and none included grave goods. The remains of two infants were also found in refuse pits. The nine radiocarbon dates, taken from wood charcoal in feature fill, ranged from  $1820 \pm 55$  to  $1580 \pm 55$  B.P. (A.D. 130-370), and fit well within a late Middle Woodland time range.

Material remains from the Millville site included expanding stem projectile points similar to Steuben points of the late Middle Woodland Weaver assemblages in Illinois. Other lithic tools included scrapers, knives, large bifaces, utilized flakes and a limestone gorget. Ceramics were predominantly grit tempered and were classified by the excavator provisionally as Havana and Weaver wares indicative of a Late Middle Woodland occupation. Decorative techniques included dentate stamping, cord wrapped stick stamping, rocker stamping, and plain stamping applied in bands and zones. The presence of some interior channeled rims suggested a Hopewell influence. Bone tools were made predominantly on deer bone and included awls, a needle, and knapping tools. Fragments of a turtle carapace bowls were also identified (Pillaert 1969).

Flotation samples were not taken at the Millville site, but a rich faunal assemblage was recovered (Pillaert 1969). Deer remains dominated the assemblage, but elk were also important, and raccoons were present. The deer were hunted in the fall-winter months between August and February, judging from the antler (Pillaert 1969) and mandible conditions (Theler and Pillaert 1983). Elk remains often consisted of scapulae, suggesting a preference for a particular cut of meat, or for raw material for a potential bone tool. Low frequencies of domestic dog, wolf, woodchuck, mink, badger, otter, bobcat, gray squirrel, beaver, and muskrat were also found. The mammals found in low numbers may have been used as ritual items or clothing rather than for subsistence. A few examples of turkey, grouse, turtles, and various fish and mussels were recovered. The only reported plant remains were wood charcoal and hickory nuts (Freeman 1969:86).

In the Prairie du Chien area, Stoltman has dated the Millville phase to A.D. 200-500 (1990:247). No Millville phase mounds or cemeteries have been identified. The fine paste, thin walled Late Middle Woodland ceramics in the area were classified as Linn ware by Stoltman because they are so similar to the Iowa series (Stoltman 1979; Benn 1979). Dentate stamping, cord wrapped stick stamping, exterior punctates, and interior rim channeling are common. Stemmed projectile points similar to Steuben are characteristic of the phase. Habitation sites have been reported on Mississippi River floodplain, terraces, alluvial fans, and on terraces of secondary stream channels, often at considerable distance from backwater sloughs. Millville phase habitation sites include shell and refuse middens and the first evidence for storage/refuse pits in the region. Millville ceramics at the Pedretti III site (47 Cr-127) have been dated to A.D.  $460 \pm 80$  and A.D.  $490 \pm 60$  (Stoltman 1990:249).

Subsistence data from Prairie du Chien area Millville phase sites include the earliest evidence for cultivated plants in Wisconsin (Arzigian

1987). Prairie du Chien area sites have produced squash rinds and sumpweed. Wild rice was also recovered from a possible Millville phase feature along the floodplain. Starchy seeds include goosefoot, dock, and knotweed. Nut shells of hickory, walnut, and acorn indicate that upland resources were also being exploited. Faunal resources identified at Millville sites include deer, fish, and shellfish (Theler 1987).

Sites which can be classified as Millville phase also have been reported in interior parts of southwest Wisconsin. The late Middle Woodland occupation at the Durst Rockshelter (47 Sk-2) in Sauk County (Wittry 1959b) produced typical Linn ware ceramics (Benn 1979). The Gotschall Rockshelter (47 Ia-80) in Iowa County near the Wisconsin River also has stratified deposits associated with a Millville phase occupation (Salzer 1987a). Four radiocarbon assays from these carefully excavated Middle Woodland deposits range from 1610 to  $1670 \pm 70$  B.P. or A.D. 280-340 (Salzer 1987a:434-435).

Small late Middle Woodland sites are reported in the Mississippi floodplain, upland rockshelters, and along inland river valley bottomlands in west-central Wisconsin (Boszhardt 1990). Mound building appears to have continued during this time, but burial mounds are smaller than Trempealeau phase mounds, and are located along the uplands overlooking major river valleys (Boszhardt 1990; Mead 1979).

The Silver Creek sites (47 Mo-1 to 5) are located along a tributary of the La Crosse River near Fort McCoy in Monroe County. Hurley (1974) identified these sites as Early, Middle and Late Woodland nonmound villages and camp sites. Silver Creek I (47 Mo-1) was the largest site and included several small pit features and one large, shallow pit identified as a house. Both the ceramics and lithics indicated the site was multicomponent. No diagnostic materials were found associated with the house, and a radiocarbon sample from charcoal in the fill produced a date of  $2150 \pm 80$  B.P. (200 B.C.) (Wis-163). The context of the charcoal sample, however, does not reliably date the feature. Silver Creek II (47 Mo-2) was small and had a predominantly Middle Woodland occupation including Havana and Hopewell ceramics and lithics, but no Late Woodland material. The cordmarked, bossed, and stamped ceramics from these sites appear to be a regional expression of Havana ware and are Middle Woodland in age (Theler and Stevenson 1984). Three sites with Middle Woodland components are reported at Fort McCoy (47 Mo-4, 107, 117) (Salkin 1994).

Farther to the north, Millville phase sites producing Linn ware have been reported in Pepin and Eau Claire counties (Barth 1985:10). Untyped Middle Woodland ceramics have also been reported in Pierce, Pepin and Chippewa counties (Barth 1985:11). Some ceramics at the Wakanda Park Mound Group (47 Dn-1) suggest a Middle Woodland component possibly affiliated with the Red Cedar variant may be present at this Late Woodland site (Barth 1985:11).

#### Southeast Wisconsin

Few Middle Woodland mounds have been excavated in southeast Wisconsin, although many probably existed in the region before they were destroyed by farming and urban development. Some excavations of conical mounds in the region have revealed submound pits or tombs, but the absence of associated grave goods makes it difficult to assign a definite cultural affiliation.

For example, the Outlet site (47 Da-3) in Dane County originally consisted of as many as 66 mounds including conical, oval, and linear forms (Baerreis and Bender 1984). Ceramics from the site area and mound fill indicate the site was occupied during Early, Middle, and Late Woodland times and the linear mounds and smaller conicals are probably Late Woodland in age. Excavation of a large mound at the site revealed

a rectangular sub mound pit containing 13 individuals (Whiteford 1949; Bakken 1950). Eleven of the burials were extended primary burials of adults and two were secondary bundle reburials. No grave goods were found in the pit or the mound, although white clay was found associated with the faces of two burials. The burials were believed to be Middle Woodland due to their general arrangement and association with a large mound. The white clay was also reminiscent of the clay masks reported by Cooper at the Middle Woodland Red Cedar focus mounds (Cooper 1933).

Two other mounds have also been excavated in the Outlet site mound group. One low mound included an extended adult male within the mound fill, but no submound burials or grave goods (Bakken 1950). Ceramics in the mound fill and beneath the mound included Early and Middle Woodland varieties. A third mound revealed burials in both the mound fill and in a shallow submound basin (Baerreis and Bender 1984). The mound fill burials were primary flexed burials with no accompanying grave goods. The submound burials consisted of a mass of disarticulated and partially articulated individuals ranging from infants to adults. Some of the adults had been partially burned. A large Hixton blade, resembling the Trempealeau Hopewell blades, was found at the edge of the burial pit. This grave good suggested the pit burials were Middle Woodland in age, and were contemporary with the Trempealeau phase of western Wisconsin. Ceramic sherds in the mound fill were Early and Middle Woodland in age, suggesting the mound was Middle Woodland. Three radiocarbon dates from samples of human bone ranged from  $1960 \pm 80$  to  $1360 \pm 70$  B.P. (A.D. 10-550), which overlap both early and later Middle Woodland time ranges suggested for the southwestern part of Wisconsin. Baerreis and Bender also report that carbon isotope analysis indicates that a slight amount of maize was present in the diet of the individuals in the mound. This is the earliest indication of maize in Wisconsin.

Many other mounds in southeastern Wisconsin probably were Middle Woodland in age, but few have been investigated using modern archeological techniques. Consequently, little data exists that would confirm their age. Furthermore, the paucity of grave goods in mounds makes it difficult to assign a date. Mounds excavated before the 1940s which appear to have been Middle Woodland or Hopewell include some at Big Bend along the Fox River (Wood 1936). Other mounds in the Big Bend area were Late Woodland in age, however (Mayer 1962). The presence of stone platform pipes similar to Hopewell pipes in collections from the region, however, suggest that Middle Woodland burials were present (West 1905).

The southeastern Wisconsin regional expression of Middle Woodland has been called Waukesha phase or focus (McKern 1945; Salzer n.d., 1986a). In addition to the mound sites that have tentatively been identified as Middle Woodland burial mounds, several sizeable habitation sites have been reported. Salzer used two of these, the Highsmith site (47 Je-4) and the Cooper's Shore site (47 Ro-2) to suggest a more comprehensive picture of the Waukesha phase than McKern's original description (Salzer n.d.).

Southeast Wisconsin Middle Woodland sites can be recognized by both ceramic and lithic materials (Salzer n.d.; Goldstein 1992). Ceramics include relatively thick walled, cordmarked or plain surfaced, grit-tempered conoidal vessels decorated with various stamped motifs including dentate stamping, rocker stamping, punctates/nodes, or cord wrapped stick stamping. Incised line decoration is also present. The ceramics resemble Havana pottery in Illinois, but do not include the full range of Havana decorative techniques. The most common varieties in the region appear to be Shorewood Cord Roughened which sometimes includes bosses on a cordmarked surface, and Kegonsa Stamped, which

is decorated with bosses and cordwrapped stick stamping. Lithics include points in the Snyders-Mankers series, Monona stemmed, and a variety of other stemmed forms. Raw materials include exotic cherts from southern Illinois (Cobden/Dongola), North Dakota (Knife River chalcedony), and other places closer to the region (Hixton). Lamellar chert blades, a common item in Illinois Havana sites, are often found on southeast Wisconsin Middle Woodland sites.

Salzer noted that Waukesha phase sites are highly variable in terms of location, size, and appearance (Salzer n.d.). Substantial habitation sites with middens and pit features have been found both along low riverine terraces and on high bluff tops along lake shores. The Highsmith site (47 Je-4), located along a low terrace of the Rock River, produced substantial Middle Woodland midden and pit features (Salzer n.d., 1964). Some habitation sites are also associated with mounded mortuary areas and earthwork enclosures have also been reported. No houses or structures have been identified in association with Middle Woodland habitation sites in southeast Wisconsin. Salzer concludes that the Waukesha phase represents a local development of Middle Woodland out of an indigenous Early Woodland culture, rather than an influx of people from the Illinois Havana area. Ties to other regions are suggested by the occasional occurrence of exotic artifacts or raw materials.

Goldstein observed that single component Middle Woodland sites are rare in southeast Wisconsin, and most sites should be considered Woodland because they have Early, Middle, and Late Woodland occupations. While Goldstein's observations are based on a probabilistic sample of sites along the Rock and Crawfish rivers, they seem to apply across the region as well. Even Middle Woodland mound groups often include Late Woodland burial mounds. This concordance of Woodland site locales "suggests a similar strategy in site location selection and/or a relatively continuous occupation" (Goldstein 1992:155). Within the Crawfish/Rock River sample Goldstein noted that large sites tend to be located near productive wetlands and stream confluences in oak forests or oak openings. Sites with Woodland pottery are usually situated above the floodplain on an interior bend of the river. After an extensive analysis of the resource potential of the region Goldstein suggested that these preferred locations reflect the use of marsh and swamp resources in cold seasons (Goldstein and Kind 1987, Goldstein 1987a).

Recently, a possible isolated Middle Woodland component has been identified in a buried context on an alluvial terrace remnant at the Late Woodland Barnes Creek site (47 Kn-41) in Kenosha County (Goldstein 1995). Similar post-Algoma terrace remnants along the drainages emptying into Lake Michigan may provide a good geomorphic context for identifying stratified Woodland sites in southeast Wisconsin.

Information on faunal remains has been reported from the Cooper's Shore site (47 Ro-2), located at the outlet of Lake Koshkonong on the Rock River. The site included a Middle to late Middle Woodland midden and refuse pits (Salzer n.d.; Lippold 1973). The varied faunal remains were dominated by deer, which appear to have been butchered off-site with only the legs and head (and probably the skin) being returned to the residential base. Low frequencies of elk, bison, beaver, muskrat, raccoon, domestic dog, wolf, bear, puma, and several other small mammals were also found. Some of the mammals found in low frequencies do not appear to have been part of the diet, however. For example, the puma was represented by a tooth and a terminal phalanx, the jackrabbit by a maxilla, the raccoons by skulls and perforated mandibles (Lippold 1973). These elements suggest the animal remains could have been attached to skins and served as garments or medicine bags. Unfortunately, the bison, elk, wolf, and bear elements were not identified and their role at the site is not clear. A variety of water birds,

fish, turtles, and mussels were also identified at the site, reflecting its aquatic setting.

#### Northern Wisconsin

Northern Wisconsin has produced a series of Middle Woodland cultures that James Fitting has lumped under the term Lake Forest Middle Woodland (Fitting 1970). These include from east to west North Bay, Nokomis, and Laurel cultures. They share similar environments of a mixed northern deciduous forest and a well watered landscape, and appear to have relied for subsistence on deer, moose, bear, beaver, raccoon, and fish. These cultural groups have also been referred to as Northern Tier Middle Woodland (R. J. Mason 1967). Recently taking a broad upper Great Lakes perspective, however, Mason lumped North Bay and Nokomis with Middle Woodland cultures to the east under the term Middle Tier, and classified Laurel, which extends to the north of Lake Superior and west into the Boundary waters of Minnesota and Ontario as Northern Tier (R. J. Mason 1981).

*North Bay.* A series of stratified sites in Door County have provided important temporal, material culture, and subsistence information on Middle Woodland and later occupations. The sites are situated along the east shore of the Door Peninsula where episodic beach and dune formation events have buried prehistoric occupations. Stratified, multicomponent habitation sites have been identified in a variety of settings. The Rock Island II site (47 Dr-128) is located on an island off the tip of the peninsula (R. J. Mason 1986b, 1990b, 1991). The Porte des Morts site (47 Dr-81) is situated on the mainland at the end of the peninsula (R. J. Mason 1967; C. I. Mason 1970). Sites occur along the east shore of the peninsula south almost to Sturgeon Bay and include Mero (47 Dr-83), Heins Creek (47 Dr-2) (R. J. Mason 1966), and Whitefish Bay View (47 Dr-167) (Dirst 1987, 1993). Stratified sites such as Shanty Bay (47 Dr-11) (Dirst 1995a) are also found occasionally on the Green Bay shoreline. The stratified deposits revealed a series of occupations including Middle Woodland (North Bay), late Middle Woodland/Early Late Woodland (Heins Creek), early Late Woodland (Madison), late Late Woodland (Point Sauble, Aztalan), and upper Mississippian/Oneota (Mero complex/Grand River/Green Bay phase). Some of the sites also revealed historic Indian and Euro-American occupations.

The Middle Woodland occupation of northeast Wisconsin has been called North Bay (R. J. Mason 1966, 1967). It is identified primarily by its grit-tempered ceramic assemblage which includes plain surfaced pottery decorated with dentate, linear, corded (pseudo-scallop), and cord wrapped stick stamping in banded patterns. Other decorative techniques include incising and punctates, which may be related to Early Woodland decoration styles. Single cord impressions and cord wrapped stick stamping are also occasionally present on North Bay sites and continue into Late Woodland ceramics. North Bay has stylistic similarities to contemporary Middle Woodland ceramic traditions across the upper Great Lakes (R. J. Mason 1981, 1991). On the islands off the tip of the Door Peninsula, North Bay ceramic styles grade into Laurel styles (R. J. Mason 1991; Brose 1970). Ties to more southern Middle Woodland are also evident in Havana-Hopewell ceramics found at some North Bay sites (R. J. Mason 1976, 1990a). Sites with substantial North Bay components have been reported from Green Bay into the Door Peninsula and along the Menominee River west of Green Bay (Buckmaster 1979). Sites with occasional North Bay ceramics have been reported from Lake Winnebago on the south (R. J. Mason 1990a), and to the west as far as Vilas County (Salzer 1974).

Many of the radiocarbon dates for North Bay sites come from excellent contexts, including charred food residues from the surface of

pot sherds. AMS dates on North Bay sherds range from 1830±80 (A.D. 120) to 1730±110 (A.D. 220) (uncalibrated), or a calibrated range from A.D. 82 to 425 (R. J. Mason 1992). Mason (1991) finds questionable at least two earlier standard radiocarbon dates, one from food residue and one from wood charcoal, which extend the beginning of North Bay to as early as 590 B.C. (2540±270 B.P.). Dirst suggests a radiocarbon date of 2145±50 (195 B.C.) on an incised sherd in a North Bay occupation level at Shanty Bay extends the beginning of North Bay into the 500 B.C. range (Dirst 1995a, 1995b). Mason, however, believes that dating North Bay to the first three centuries A.D. corresponds well with the dates of similar Middle Woodland cultures in the upper Great Lakes (Mason 1991).

North Bay nonceramic material culture also appears to be similar to other Middle Woodland cultures in the region. Lithic tools include side-notched, corner-notched, and stemmed points made on local cherts, knives, scrapers, choppers, wedges, and bifaces. Bone and antler tools include toggle head harpoons, awls, and pins/leister prongs/fish gorges (R. J. Mason 1991; Dirst 1994). Copper tools include fish hooks, awls, and punches.

The North Bay faunal assemblages include deer, beaver, fish (walleye, sturgeon, channel catfish, drum, small and large mouthed bass) turtle and birds (R. J. Mason 1966:113-114). Fish remains suggest a spring/summer, rather than a fall occupation, since spring spawning fish are represented. Because flotation has not been used to recover fish or charred plant remains at North Bay sites, there is little comparative data on subsistence practices. Cleland (1982) suggested that Middle Woodland fishing technology along Lake Michigan involved the use of weirs and seines to collect Spring spawning fish in shallow waters, and also individual capture techniques such as spearing, gaffing, and angling.

North Bay houses have been reported at the Richter site (47 Dr-80) on Washington Island off the tip of the Door Peninsula (Salzer 1986a; R. J. Mason 1991, 1992; Overstreet 1993d; Boszhardt 1982). The houses have not been described, but are reportedly shallow basins for temporary structures (Salzer 1986a:274). Oval, single post houses have been reported just north of Richter associated with the Laurel occupation of Summer Island, Michigan (Brose 1970b). No evidence for postmolds or house basins have been found at Mero, Porte des Morts, Rock Island, or Whitefish Bay View with the Middle Woodland components. The presence of middens and general absence of structures at North Bay sites suggests the occupations may have been during the warm seasons.

Few burials have been reported at North Bay sites, and no burial mounds are known. A burial pit was found at the Richter site (47 Dr-80) on Washington Island (Peske and Peters 1976). The large (3.0x1.5 m, 0.5 m deep) pit included three flexed adults (two females, one male) at the bottom, and one flexed adolescent (male) near the top. The pit appears to have been lined with organic material, and the two levels represent separate burial episodes. Although no grave goods accompanied the burials, the pit fill and surrounding site included North Bay ceramics. A pit feature at Porte des Morts (47 Dr-81) measuring about 5 feet in diameter and 20 inches deep contained fragmentary human remains which appear to have been buried in a container such as a basket or bag (R. J. Mason 1967). The pit feature also contained animal bone, and North Bay ceramic and lithic debris. The human remains present in the refuse pit appear to be those body parts which are not accorded formal burial treatment in other northern Middle Woodland groups such as Laurel (R. J. Mason 1981; Stoltman 1973).

North Bay sites tend to be found on sandy beaches along bays of Lake Michigan. Lacustrine and wind deposited sediments separate sequential Middle Woodland occupations at several of these sites. Water rolled North Bay ceramics and lithics at some lake shore sites also suggest

that fluctuating lake levels have inundated the early Middle Woodland surface. The lake level changes reflect regional climatic variation in rainfall and temperature. These climatic changes also may have affected the distribution of human groups on both sides of Lake Michigan (Larsen 1985c).

*Nokomis*. The Nokomis phase was defined as the Middle Woodland occupation in north-central Wisconsin based on survey and test excavation investigations in Oneida and Vilas counties (Salzer 1969, 1974). The region is characterized by numerous small lakes in undulating glacial terrain. Nokomis phase sites were found to be more numerous than in the preceding Late Archaic Burnt Rollways phase. Middle Woodland sites were found along rivers, at lake outlets, inlets, and northern shorelines, and on islands. At least one site, the Squirrel Dam site (47 On-21) was 10 acres in size.

The ceramics from Nokomis phase sites are the first described for the region. Distinctive grit-tempered jars are cordmarked and are decorated with horizontal bands of finger-trailing. The style resembles Early Woodland incised over cordmarked, but the associated material culture resembles northern Middle Woodland. Other Nokomis phase ceramics are similar to North Bay and exhibit an emphasis on cord wrapped stick stamping on smoothed surfaces. Sherds which appear to be North Bay, Laurel, and Havana are also found in small numbers on Nokomis phase sites. Nokomis Trilled ceramics have been reported on sites as far south as the Big and Little Eau Pleine rivers in Marathon County (C. I. Mason 1981; Brazeau et al. 1990; Moffat et al. 1991).

Nokomis phase lithic debris includes a notable amount of nonlocal material including Dongola chert from southern Illinois, Hixton from west-central Wisconsin, red chert from Barron County, and Knife River chert from North Dakota. The presence of both Knife River debitage and tools is similar to its distribution at Minnesota sites and contrasts with the predominance of tools only in the more classic Hopewellian sites in southern Wisconsin, Illinois, and Ohio (Clark 1984). An obsidian biface was recently found at the Squirrel Dam site (Moffat et al. 1993), and the material originates in Wyoming. The nonlocal lithics suggest that Nokomis groups participated in a wide ranging exchange system, possibly linked to the Hopewell Interaction Sphere of Havana peoples to the south. The stone tool assemblage includes corner-notched and stemmed points, knives, scrapers, choppers, and hammerstones.

Salzer's excavations at the Squirrel Dam site (47 On-21) revealed a copper workshop area which included copper tools and wastage. Copper has been found on many Nokomis phase sites in the region. Some archeologists have suggested that much of what has been called Old Copper may be Middle Woodland rather than Late Archaic, and the Nokomis phase copper workshop supports this possibility. Nokomis phase copper artifacts include stemmed and socketed points, awls, chisels, punches, beads, and blanks.

One Nokomis phase house was excavated at the Robinson site (47 On-27/Li-1) (Salzer 1969, 1974, 1986a). It was oval in plan view and semisubterranean, measuring 9 x 11 feet. Its flat floor was 3 feet deep and interior posts supported the roof. Although the solid architecture suggests it may have been a winter residence, no interior hearth was located. The house was associated with deep storage and refuse pits nearby, and all contained Nokomis phase refuse. Lakes phase Late Woodland burials were found interred in the abandoned Nokomis phase house depression.

Recently several Nokomis phase sites have been investigated and flotation samples taken to examine floral and faunal remains from the sites. The Nokomis phase occupation at the Squirrel Dam site (47 On-

21) produced carbonized starchy seeds (goosefoot and knotweed) and blueberries and blackberries (Arzigian 1993). Also present were cherry and pine cone. Charred wood was abundant but not identified to species. Blueberry, cherry, elderberry, and hazel nut were reported from limited testing of Nokomis components at two additional sites in Oneida and Vilas counties (Arzigian 1991).

Theler (1993) described faunal remains from the Nokomis component of the Squirrel Dam site. Numerous unidentifiable calcined mammal bones were present. The majority of identifiable bones came from beaver (particularly from the beaver extremities). Other species present in small amounts included muskrat, deer, and moose. Turtle was abundant, suggesting a warm season occupation, although the carapaces could have been curated and used as bowls. Identifiable fish remains included only pike, and bird bones were also present but not identifiable as to species. Beaver and turtle were also found during limited testing of a Nokomis phase component in Oneida County (Theler 1991). A late Middle Woodland component at 47 On-180 produced remains of sucker and walleye, as well as beaver and turtle (Theler 1991).

No burials have been found associated with Nokomis phase components, and no Nokomis phase mounds have been identified. No radiocarbon dates have been reported for the phase, but ceramic cross dating suggests a date of approximately A.D. 200.

To the south of the Nokomis phase sites in Menominee and Shawano counties, Middle Woodland ceramics and lithic tools suggest the potential for another Middle Woodland manifestation (Barrett and Skinner 1932; Salzer 1986a).

*Laurel*. There are no substantial Laurel sites in Wisconsin, but a Laurel presence is suggested at several sites at the northern end of Lake Michigan (R. J. Mason 1981, 1991). Laurel occupations have been described on Summer Island, just off the tip of the Door Peninsula in Michigan (Brose 1970a, 1970b), and along the south shore of Lake Superior (Janzen 1968). Laurel sites are known primarily from the boundary waters area of northern Minnesota and western Ontario, where they include habitation areas and mounded burials (Stoltman 1973, 1974).

#### Northwest Wisconsin

Middle Woodland sites in northwest Wisconsin are not well known or described. The first Middle Woodland to be reported in the region was the Red Cedar variant of Wisconsin Hopewell (Cooper 1933; McKern 1942). Although Middle Woodland habitation sites are known in the region, primarily mound site excavations have been reported in the literature. The Red Cedar variant was defined by Leland Cooper from excavations at the Cyrus Thomas Mound Group on Rice Lake (one of many Rice Lakes) along the Red Cedar River in Barron County. Secondary bundle burials were interred in both a rectangular submound pit, and on a low rectangular platform under conical mounds. In some cases most bones were present, but in others the bundle burial included only long bones and skull fragments. Red ocher accompanied one burial, and evidence for cremation fires was present in several burials. Clay funerary masks were placed on the faces or skulls of two individuals before they were cremated. Grave goods were rare and included a cut and drilled canid mandible and a bear tooth. A fire basin containing ash, charcoal, and burned animal bones was reported at the base of one mound. Although no ceramics were directly associated with the burials, Middle Woodland ceramics were found underlying the mounds. The grit-tempered potsherds were decorated with dentate stamping, cord wrapped stick stamping, bosses, and zoned incised and dentate stamping and show relationships to both northern Middle Woodland and

Trempealeu/Havana-like ceramics (Salzer 1986a). Red Cedar sites have been reported as far south as Dunn County (Barth 1985:11).

A Middle Woodland presence is also indicated in Burnett County by dentate stamped pottery called St. Croix Stamped, which extends into the Snake River region of Minnesota (Caine 1974). Several other varieties of incised, dentate, and corded stamped ceramics also occur in association with the Middle Woodland deposits. Although Middle Woodland habitation sites are known for the region in Wisconsin, only mound excavations have been described (Cooper 1964). A date of A.D.  $340 \pm 135$  was reported for a pit feature in a late Middle Woodland mound at the Altern site (Cooper 1964), but the associated ceramics may be Late Woodland (Van Dyke and Oerichbauer 1988). Thermoluminescence dates have been obtained from ceramics at multicomponent Middle and Late Woodland sites in nearby Sawyer and Washburn counties (Lynott and Perry 1984). Unfortunately, the context and nature of the ceramics dated are unclear, and the dates, which range from  $80 \pm 110$  B.C. to A.D.  $550 \pm 130$  are not useful for clarifying local chronology. The nature and distribution of related Middle Woodland sites in northwest Wisconsin are also unclear (Van Dyke and Oerichbauer 1988; Kolb 1988).

## Late Woodland

Cultural continuities from Middle to Late Woodland are evident in the archeological record of northern and southern Wisconsin, and each region maintains its own distinctiveness through time. In general, Late Woodland can be viewed as a period of population growth and reorganization. Whereas in Middle Woodland sites tend to focus along major rivers and waterways, Late Woodland sites tend to be more dispersed across the landscape. Changes in material culture include new ceramic varieties, and the bow and arrow first appear clearly in the archeological record. Although Late Woodland groups are usually considered to be hunter-gatherers, maize begins to appear consistently at later Late Woodland sites, and harvest and cultivation of a variety of plants is increasingly important.

In some areas of Wisconsin it may be possible to distinguish two Late Woodland groups. One made cord and fabric impressed pottery jars, built the effigy mounds for burial of the dead, and was slightly earlier in time than the second. The second group made collared pottery vessels which were plain and cord impressed, may not have buried their dead in mounds, constructed fortified villages, and appeared slightly later in time. The two groups may have overlapped in time, may have used the same sites, and may or may not have been related. The Late Woodland groups who used collared ceramics appear to have interacted with, or even lived with, other Late Prehistoric occupants of the region such as Middle Mississippian or Onoeta peoples. The social and economic dynamics of the Late Prehistoric period were complex throughout the region, and the archeological record has been interpreted in many ways.

Although Late Woodland burial mounds are found throughout state, there are south to north differences. In the south Effigy Mound distribution follows the deciduous forest and extends into the unglaciated areas of southwest Wisconsin and northeast Iowa. In northern Wisconsin effigies are rare and burial mounds consist of large and small conicals, along with linear and tapered forms. Late Woodland mound construction consisted of a single episode in the south, while in northwest Wisconsin, Clam River mounds were accretional and constructed in several different episodes. Secondary bundle burials, interment of selected bones, and mass burial of secondary remains are common throughout the state in Late Woodland times. This suggests that a multistage burial program was practiced, and final interment may have been scheduled to coincide with seasonal or social events.

Throughout the state, Late Woodland appears to have been a time of population increase, and sites are found in a variety of new locations on the landscape. There is little evidence, however, for large, settled villages. Rather, sites appear to reflect a repeated, but short term use of various resources and settings by small family groups. Even at those sites where houses have been reported, the remains do not appear to reflect long term occupations or large groups. There are no sites like the nucleated late Middle Woodland Millville sites in the archeological record for Late Woodland Wisconsin. The presence of palisaded settlements, particularly in the later Late Woodland of eastern Wisconsin, suggests that intergroup conflict may have been increasing.

There is evidence for subsistence shifts and intensified use of domesticated and harvestable resources during Late Woodland. The regular presence of storage facilities such as pits, and the use of increasingly thin-walled pottery vessels suggest new strategies for storing and preparing food. In southwest Wisconsin maize was a part of the diet, along with nuts, squash, and seeds. While deer continued as the primary meat source, shellfish were being harvested in new ways along the Mississippi River. Maize also became part of the diet during late Late Woodland times in southeastern Wisconsin. In coastal northern Wisconsin, fish harvesting intensified and included fall spawning species. In inland areas of the north, many parts of the landscape appear to be used for the first time and a flexible, seasonal round is suggested by the data. Also in the north, wild rice appears in the archeological record, and maize is present late in the period. Deer, moose, beaver, fish, nuts and berries were also important subsistence items.

Sacred space was clearly marked in a variety of ways by Late Woodland peoples. Mortuary areas were denoted by the construction of mounds in animal and geometric forms. Rock art presented in human, animal, and abstract forms appears to date to this period and later. These visual labels on the landscape may denote territorial and resource claims or may serve as maps.

The Late Woodland period does not so much end as merge with what we are calling the Late Prehistoric period, when what appear to be new populations intrude on the region. While it is tempting to derive the origins of these new cultures from Woodland groups to the east and Mississippian groups to the south, the archeological record is fuzzy and does not speak clearly to the archeologist. What appear to be intrusive cultures may owe their origins to indigenous populations responding to new opportunities and reconstituting themselves in an interregional transformation to maize based horticulture, at least in southern Wisconsin. In the northwoods, a similar shift to harvesting wild rice occurred which involved new storage and processing technologies.

## Effigy Mound

The Late Woodland period in Wisconsin is known especially for its mounded mortuary sites. Late Woodland burial mounds come in a variety of forms and sizes and include conical, linear, and animal shapes. The presence of animal or effigy shapes has led to the labeling of Late Woodland culture in Wisconsin, at least by some archeologists, as Effigy Mound. It is beyond the scope of this review to detail the history of Effigy Mound research in Wisconsin, but it is important to note that our understandings of Effigy Mound have changed over time, and that there are still different views about what Late Woodland is from one researcher to the next.

Exploration of the effigy mounds of southern Wisconsin began in the mid-nineteenth century with a number of mapping and excavation projects (Squier and Davis 1848; Lapham 1855; Thomas 1894). A primary concern of the times was to determine whether or not American Indians

constructed the mounds found across America's Midwest. Another concern was to map as many mounds and mound groups as possible before they were destroyed by farming and development.

By the mid-twentieth century, hundreds of mounds had been reported, and probably most of them had been looted. Charles E. Brown of the State Historical Society of Wisconsin and Samuel A. Barrett and Will C. McKern of the Milwaukee Public Museum were important figures in the early twentieth century explorations of mounds and mound groups. Research questions focused on how the mounds were constructed, who built them, how were they related to historic Indian groups (particularly the Winnebago) and to earlier prehistoric groups, and where the habitation sites were (Maxwell 1950; Rowe 1956).

Following the advent of radiocarbon dating in the 1950s, the chronological placement of effigy mounds in the Late Woodland period was clarified to a degree (Wittry 1959; Hurley 1975), but many questions remain about the groups who constructed them and what the mounds can reveal about the lifeways, organization, and belief systems of those groups (Storck 1974; Mallam 1976, 1984; Peterson 1984; Musil 1982; Benn 1979; Ghere Paulus 1991; Goldstein 1995). There is general agreement, however, that the mounds were built by Woodland peoples prior to A.D. 1200, and that the mounds are not directly linked to the Late Prehistoric Oneota or the Historic Winnebago.

Recently Goldstein (1995b) has summarized the general features of effigy mounds. Mound forms include conical, linear, oval, and effigies such as bird, panther, turtle, reptile/lizard, bear, human, and other mammals. Mounds usually occur in groups which vary in number from 2-10, 25-40, 60-80, and sometimes more than 100. Conical and linear forms are most common, and single or multiple effigies may be found in mound groups. No consistent patterning has been identified in the arrangements of mounds or varieties of effigies present. Mounds and mound groups tend to be situated on prominent geographic features overlooking rivers, lakes, or wetlands, and the mounds are often aligned with the local topography.

The mounds are usually under 2 m in height, but linear forms and effigies with tails can range from 20 m to over 50 m in length. Mound construction techniques are variable and may involve placing a mound on the existing ground surface, removing the A horizon prior to mound construction, or removing the A and B horizons to construct an intaglio of the effigy form and then filling the area to create the mound. Mounds appear to have been constructed as a single event, although intrusive burials from later time periods may be present. Effigy mounds were burial mounds for the most part, but in many cases burials have not been found in the mounds. Burials are practically always present in mound groups, however (Riggs 1980).

The majority of burials are secondary bundle burials, but primary flexed burials, cremations, and scattered bone fragments are also common (Goldstein 1995b). Single or multiple burials may be present in a submound pit, on the mound floor, or in the mound fill. Burials are usually found at the mound center, heart, or head. Grave goods and furniture are not associated with burials per se, but are often associated with the mound. Hearth areas called fireplaces or altars are commonly found as stone constructions with evidence of fire. "Cists" may also be present as indicated by clay and stone lined basin-shaped pits. Grave goods are uncommon and may include a single pottery vessel, projectile point, pipe, or bone or copper tool near the fireplace or central burial area or in the mound fill. Individuals buried in mounds include subadults, women, and men. Ghere Paulus (1991) noted that males and females appear to have equal access to mound burial, but nonmound burial areas include predominantly males, subadults, and elderly. These data suggest

that adult females may have had enhanced access to mound burial. The high incidence of secondary burials in mounds suggests that bodies were curated elsewhere for a period before interment.

One frustrating aspect of effigy mound groups is that they are often constructed at some distance from habitation sites. Consequently, it is difficult to associate the mounds with particular camps or residential sites of Late Woodland groups.

The paucity of cultural remains in effigy mounds has also made it difficult for archeologists to place them in a chronological or cultural framework. While the radiocarbon record for effigy mounds and related sites is relatively abundant (see Boszhardt 1977; Hurley 1975) the context for many samples is poorly described, and the dates at the extremes of the range are debatable (Benn 1979). Based on his research in central Wisconsin, Hurley suggested that Effigy Mound tradition could be divided into Early, Middle, and Late periods ranging in age from A.D. 300 to A.D. 1642 (Hurley 1975). Most other estimates for the age of effigy mounds are more conservative and include A.D. 750-1050 (Stoltman 1990, 1992b) and A.D. 650-1200 (Benn 1979; Goldstein 1995b; Salkin 1987).

The function of effigy mounds and mound groups has been a subject of speculation and discussion since the nineteenth century. The effigy forms have suggested to many investigators that the animal symbols may represent clan, lineage, or family totems. Some investigators tried to correlate the effigy forms with clan names of historic groups in the area such as the Winnebago and Menominee (Radin 1916; Rowe 1956; Hall 1993). Other archeologists have viewed the mound groups as marking locales where families or bands of Late Woodland hunter-gatherers came together seasonally in an annual aggregation and dispersal cycle (Mallam 1976; Benn 1979; Goldstein 1995b). The role of mound building in the symbolic and ideological frameworks of Late Woodland peoples has also been addressed (Benn et al. 1993; Hall 1976). However else they may have functioned, it is clear that effigy mounds marked sacred space.

Recently, Goldstein (1995b) proposed that some of the variability in effigy mound forms and distributions can be understood by taking a multidimensional and regional perspective. She suggests that mound groups not only served as gathering places in the dispersal and aggregation cycle, but also may have been used as maps reflecting local resources. In Southeast Wisconsin, she sees a correlation between the variety of effigy forms and the diversity of plant and animal resources in a region. In addition, Goldstein notes that while bird effigies are fairly uniformly distributed, turtle effigies are more common in areas with abundant wetlands, and panthers are more common in the eastern counties of the region where resources are less diverse and wetlands are more restricted.

#### Southwest Wisconsin

Our understanding of Late Woodland archeology in southwest Wisconsin has been enhanced by recent ongoing research by the University of Wisconsin-Madison (Stoltman 1990, 1992b). Information from stratified and unstratified sites has provided a chronological framework for changes in material culture, settlement, and subsistence in the region. Stoltman has proposed three late Woodland phases: Mill phase, Eastman phase, and Post-Eastman phase.

The recently proposed Mill phase dates approximately to A.D. 500-700 (Stoltman 1990, 1992b). The phase is recognized by a distinctive ceramic type, Lane Farm Cord Impressed (Logan 1976), which has a rocker-stamped body resembling Middle Woodland wares, and a cord-impressed rim resembling Late Woodland ceramic varieties. Although Lane Form Cord Impressed has been suspected of being a transitional



ware, until recently it had always been found on mixed, multicomponent sites. Recently, however, it has been found in tight stratigraphic context above Millville phase materials and below the later Eastman phase occupation at the Mill Coulee Shell Heap (47 Cr-100), a Mississippi River terrace shell midden. Radiocarbon samples produced dates of A.D. 750 and  $770 \pm 70$  for the occupation (Stoltman 1990:251). A similar sequence was reported at the Mill Pond site (47 Cr-186) on the floodplain. Even earlier dates for Lane Farm Cord Impressed have been suggested by Stoltman, but the archeological contexts for these materials have not been described. The dates include A.D.  $620 \pm 70$  from Pedretti III (47 Cr-127) (Stoltman 1992b:I-29; Boszhardt 1982), and A.D.  $350 \pm 55$  from Governor Dodge Rockshelter (47 Ia-01) (Stoltman 1979:138; Boszhardt 1977). No burials or burial mounds have been identified with the Mill phase in Wisconsin, but in Iowa Lane Farm Cord Impressed ceramics were found with bundle burials in conical mounds at the Lane Farm site. So far, no subsistence data are available for Mill phase sites, and the lithic assemblage has not been defined. Site settings appear to be similar to the earlier Millville phase sites in the region, but Mill phase materials are also reported from rockshelters in the interior.

Stoltman suggests the subsequent Eastman phase dates to A.D. 750-1050 (1990, 1992b). The Eastman phase is the regional expression of Effigy Mound culture in this part of southwest Wisconsin. It is similar to the Horicon phase in eastern Wisconsin (Salkin 1987) and the Keyes phase of northeast Iowa (Benn 1980). Probably hundreds of effigy mounds were constructed prehistorically (Peterson 1984). Many mounds have been excavated in the region (Thomas 1894; Rowe 1956; Penman 1985), but little information has been gained since most mounds have been looted, or had little archeological information to offer in the first place (Stoltman 1992b). A recent mound excavation in Grant County has provided a radiocarbon date of A.D.  $920 \pm 70$  for Mound 2 at Poor Man's Farrah (47 Gt-366) (Penman 1985:18). What appears to be an early Late Woodland mound in Richland County has provided a radiocarbon date of about A.D.  $770 \pm 40$  (Mead 1979:135).

The ceramic marker of the Eastman phase is Madison ware (*sensu* Witty 1959b) which is a thin walled, grit-tempered, cord-marked jar. Decorated varieties include Madison Cord Impressed, with single cord impressions (Baerreis 1953), and Madison Fabric Impressed made with a woven fabric collar (Hurley 1975; Benn 1980). Madison Plain (Keslin 1958; Witty 1959b) is cordmarked, and may have interior lip decoration (Hurley 1975). Madison ware ceramics are found throughout the Effigy Mound area of southern Wisconsin and beyond into Illinois, Iowa, and Minnesota. Eastman phase lithics include notched and unnotched small triangular projectile points, which suggest the bow and arrow were the predominant tools for hunting and possibly defense.

There are numerous, small habitation sites during this Late Woodland phase in the floodplains, terraces, and uplands of southwest Wisconsin. None of the sites are extensive, however, and no large, long term residential sites (*villages*) have been identified. It appears that Eastman phase people were mobile and lived in small groups which exploited a wide range of environments. There are a few extensive floodplain shell middens which appear to date to the Eastman phase. Stoltman (1990) suggests these sites were used for intensive processing of mussels, since firecracked rock is present in the middens. The absence of other cultural debris in the middens indicates they were not habitation areas, and Stoltman suggests the mussel meats were removed and taken elsewhere for consumption.

The Mill Pond site (47 Cr-186) is a Mississippi River floodplain site which included a Late Woodland occupation that fits into Stoltman's Eastman phase. Mill Pond produced important subsistence data and

radiocarbon dates (Theler 1987; Arzigian 1987). Theler (1987:88) reported that the Late Woodland component at the Mill Pond site included a midden with pit features and artifact concentrations, but little shell. Ceramics included Madison Plain and Cord Impressed, Minott's Cord Impressed, and Lane Farm Cord Impressed. The Lane Farm was probably earlier, and the later Madison and Minott's may be contemporary Late Woodland ceramic types. Lithics included small triangular and small side-notched points, bifaces, drills, and abundant lithic debris. Maize cupules and kernels were found in abundance in two pit features containing Madison and Minott's ceramics. Radiocarbon dates of the features produced dates of A.D.  $920 \pm 80$  with the Madison Cord Impressed and A.D.  $1090 \pm 80$  with the Minott's Cord Impressed (Theler 1987:88). Arzigian (1987) reported hickory, walnut, goosefoot, and knotweed in the midden, as well as maize. Faunal remains suggest a reliance on large mammals, particularly deer. Fish are also abundant in some features, along with some mussels. The presence of wolf cranial and mandible fragments suggest a nonsubsistence use of this animal for clothing or ritual. Theler (1987) concluded both cold weather and warm weather occupations were represented, but suggested the site was not occupied continuously.

The maize from the Mill Pond site is the earliest reported in this part of Wisconsin. In Iowa the Keyes phase occupation at Hadfield's Cave also produced maize, along with sunflower, wild rice, and *Chenopodium* (Benn 1980). The Keyes phase is associated with Madison fabric impressed ceramics and effigy mounds in eastern Iowa.

Maize has also been reported from the Brogley Rockshelter in southwestern Wisconsin (47 Gt-156) (Tiffany 1974). The maize was recovered from small flotation samples from the multicomponent Woodland occupation. Although Middle and early and late Late Woodland ceramics were present, the stratigraphy of the shelter has not been analyzed and Tiffany indicated he could not identify which component was associated with the maize. He also noted the presence of sunflower and wild rice with the Woodland occupation. Tiffany concluded that the rockshelter was occupied in the fall and winter seasons during both the Archaic and Woodland occupations. The Woodland peoples utilized a very different suite of plants from Archaic peoples, however. A wide variety of seeds and nuts are present in the Archaic levels. The variety of wild plants brought to the shelter was reduced during the Woodland occupation, and domesticates and harvestable seeds appeared.

Even though maize and other potentially domesticated plants are present at Eastman phase sites, it does not appear that early Late Woodland peoples were intensive agriculturalists. Most investigators characterize these groups as being hunter-gatherers who lived in small dispersed groups which periodically congregated at mound groups for ritual and funerary activities (Storck 1974; Mallam 1976; Benn 1979, 1980; Stoltman 1990, 1992b; Goldstein 1995). Limited horticultural activities may have supplemented the wild resource diet in southwest Wisconsin and northeast Iowa.

Several rock shelter sites in the interior of southwest Wisconsin have also produced Madison ware ceramics indicative of an early Late Woodland occupation similar to the Eastman phase sites of the Mississippi River trench. In addition to the Brogley Rockshelter, these include the Durst Rockshelter (47 Sk-2) (Witty 1959b), Preston Rockshelter (47 Gt-157) (Stoltman 1992b; Boszhardt 1982), Mayland Cave (47 Ia-38) (Storck 1972), and the Gotschall Rockshelter (47 Ia-80) (Salzer 1987a).

The carefully excavated Gotschall site promises to provide significant new information on site formation processes and the structure of



rockshelter utilization for Archaic, Woodland, and Late Prehistoric occupations. Gotschall also contains impressive rock art including animal and human figures rendered in styles which appear to blend northern traditions and southern Mississippian motifs. Salzer (1987) convincingly argues the panels recount legends which are known in more recent times from the Ioway and Winnebago. Although the stories and art styles appear to be related to Late Prehistoric Oneota or Mississippian peoples, Salzer found pigments, burned areas, and debris distributions which suggest the panels were created by early Late Woodland peoples between A.D. 700 and A.D. 1000. Recently Salzer has discovered a carved and tattooed stone human head associated with Late Prehistoric deposits which emphasizes the important ritual nature of the shelter (Salzer 1996).

As the Gotschall Shelter suggests, sacred space during Late Woodland and Late Prehistoric times may have been marked in a variety of ways. While mound building was a means of publicly marking important sacred and social space, rock art appears to have marked less publicly visible areas. Large numbers of rock art sites have been recorded in the unglaciated area of southwest Wisconsin (Birmingham and Green 1987; Salzer 1987b; Stiles-Hanson 1987; Lowe 1987; Behm 1987). Although it has not been possible to precisely date many of these sites, the Gotschall data suggest that rock art was created by Late Woodland and Oneota peoples.

Stoltman's Post Eastman phase dates from approximately A.D. 1050 to historic times. During this period much of the Prairie du Chien area appears to be vacant. Theler (1987) reports late Late Woodland collared sherds (Point Sauble) from the Mill Pond site in a pit with shell and bone. A few shell-tempered sherds found in the region suggest an ephemeral Middle Mississippian and Oneota presence (Stoltman 1990). No substantial sites are present near the Mississippi River trench. Farther inland in southwest Wisconsin there is a site unit intrusion of late Late Woodland and Middle Mississippian peoples at the Fred Edwards site (47 Gt-377) along the Grant River (Finney and Stoltman 1991). This phenomenon is described in the Late Prehistoric chapter.

Late Woodland collared ceramics of the post-Eastman phase are found in southwest Wisconsin in rockshelters near the glaciated region that include Knoop Rockshelter (47 Sk-3) (Wittry 1959b), Mayland Cave (47 Ia-38) (Storck 1972), Rosenbaum Rockshelter (47 Da-411) (Stoltman 1976), and Gotschall Rockshelter (47 Ia-80) (Salzer 1987a). Radiocarbon dates from the fill of a pit feature at Rosenbaum suggest that Aztalan Collared ceramics there dated to A.D. 1000 (Stoltman 1976:21). At Gotschall, collared ceramics were found indirectly associated with a hearth which dated to A.D. 900-1000 (Salzer 1987a:434), and they may be associated with the groups that produced the Mississippian-like rock art of the shelter (Salzer 1996).

In west-central Wisconsin, effigy mounds are concentrated along the uplands at the mouth of the Wisconsin River, but few are found along the Mississippi Valley bluffs in the La Crosse and Trempealeau areas (Boschardt 1990). Mounds and mound groups are reported along the bluffs farther north in Buffalo County (Penman 1981). The Diamond Bluff site (47 Pi-2) is a multicomponent habitation site and mound group including effigy mounds along the Mississippi River at the far north end of the region in Pierce County (Maxwell 1950; Rodell 1991) (Diamond Bluff is sometimes referred to as the Mero site, but there is also a Mero site in Door County in northeast Wisconsin). Additional Late Woodland mounds and mound groups are also situated inland along smaller rivers on hills slopes and glacial lake plains (Boschardt 1990). Late Woodland habitation sites appear to be abundant, but are represented by only a few artifacts, often on multicomponent sites. Consequently, we have

little understanding of Late Woodland subsistence and settlement in the region.

Numerous small sites with Late Woodland components have been reported in the Fort McCoy area of Monroe County. Three of Hurley's Silver Creek sites included Late Woodland components (47 Mo-2, 3, 5), and several other lithic scatters with occasional ceramics have been identified as Late Woodland (Salkin 1994a; Penny et al. 1994; Caldwell 1994). One mound group on the base, West Prairie Mound Group (47 Mo-7), has been classified as Late Woodland, but recent investigations revealed that the moundlike features are natural (Mier, Kolb, and Richards 1996). While Late Woodland components are the most commonly identified at Fort McCoy, none of the occupations appear to have been substantial.

### Southeast Wisconsin

William Hurley proposed a synthesis of Effigy Mound culture in the 1970s based on his excavations at the Bigelow (47 Pt-29) and Sanders (47 Wp-26, 47 Wp-70) sites in east-central Wisconsin (Hurley 1975). The sites are located on the northern fringe of southeast Wisconsin effigy mound distributions. Hurley excavated both mounds and habitation areas and found burials, pits features, postmolds, and several house basins. The fill of the mounds, pit features, and houses contained a variety of ceramics including Dane Incised, Madison ware, collared wares, and shell-tempered Oneota ceramics. Radiocarbon dates were obtained from charcoal in fill contexts. The sites do not appear to have been clearly stratified, and Hurley concluded that artifacts found together in fill contexts were contemporary with each other and with whatever charcoal was in the fill. Consequently, he proposed that Dane Incised, Madison ware, collared wares, and Oneota ceramics were contemporary and associated with Effigy Mound culture at these sites from about A.D. 600 to A.D. 1000 (1975:331-343). He also proposed that the Effigy Mound tradition could be divided into three periods: Early (A.D. 300-700), Middle (A.D. 700-1100), and Late (A.D. 1100-1642). Hurley does not seem to have addressed the possibility of complex site formation processes at work on sites occupied over several centuries by different cultural groups. His conclusions about the contemporaneity of various artifact types have not been widely accepted, nor has his tripartite division of a long lived Effigy Mound tradition.

More recently, two phases of Late Woodland have been proposed for southeast Wisconsin by Philip Salkin (1987). Salkin suggested that the archeological record of this formerly glaciated region reflects two distinct Late Woodland phases, which overlap in time and space. The slightly earlier manifestation he called the Horicon phase, and the later is the Kekoskee phase.

Salkin dated the slightly earlier Horicon phase to around A.D. 650-1200 (1987). Horicon phase sites include seasonally occupied, small camps located in a variety of settings along wetlands and waterways and also in the uplands. Large seasonal base camps are found in resource rich areas. Burial mounds and mound groups appear to have been built by Horicon phase peoples, but they are seldom directly associated with habitation sites or habitation debris. Salkin reported a burial mound and secondary burial pits at the Luedke site (47 Do-393), the Horicon phase habitation type site (Salkin 1993). Luedke could be interpreted as a specialized mortuary camp rather than a typical habitation site. There is little evidence for houses at Horicon phase sites, and refuse pits appear to be small and shallow. Horicon phase material culture includes Madison ware ceramics along with small notched, stemmed, and triangular projectile points indicative of the bow and arrow. Subsistence remains from Horicon phase sites suggests seasonal exploitation of a

variety of wild resources through hunting, fishing, and collecting. There is little evidence for the use of domesticated plants in southeast Wisconsin. Salkin concluded that Horicon phase peoples were hunter-gatherers who lived in small groups which periodically came together in resource-rich zones to construct mounds. Sites associated with the Horicon phase include Luedke (47 Do-393) (Salkin 1987, 1993), Weisner I and II (47 Do-394, 395) (Salkin 1993), Horicon (47 Do-5) (Keslin 1958), and Airport Village (47 Da-2) (Baerreis 1953; Salkin 1994).

Along the Crawfish and Rock rivers in Dodge and Jefferson counties, Goldstein reported that Late Woodland sites with Madison ware ceramics are found on low river terraces close to wetlands and river confluences (Goldstein 1987a:240-257). Vegetation around the sites consists of oak forest and oak openings. Late Woodland sites usually include evidence of earlier Woodland occupations as well. Test excavations indicated that site organization consists of ceramic debris near the river, lithic debris away from the river, and a few areas of burned rock and sediments. Plowing has destroyed the living surfaces and archeological context of most sites (Goldstein 1987a:106-120). Goldstein suggested that these Woodland sites may have been occupied seasonally in fall-winter in order to exploit the rich and storable resources of the wetlands, and that the warm season range of these prehistoric groups was outside the survey area (Goldstein 1987a:245-250). Similar Late Woodland settlement location patterns are evident along the shores of Lake Koshkonong where numerous extensive Effigy Mound groups have also been reported (Goldstein 1987a:247; Musil 1986).

Several types of sacred sites have been reported in association with the marshes of Crawfish and Rock River drainages (Goldstein 1987a). Although it is difficult to specify the age of these sites because they are not associated with temporally diagnostic material remains, they emphasize the important symbolic and social aspects of wetlands and wetland resources in the region. We have already noted that effigy mound groups are associated with wetlands and waterways. In addition at least one rock art site, the Hensler Petroglyph, has been reported (Goldstein 1983, 1987b; Steinbring and Farvour 1987). Islands in wetlands may also be symbolically important as is suggested by the earthworks and pits on Eagle Island (Goldstein 1981, 1982, 1987a).

Salkin's Kekoskee phase dates to approximately A.D. 800-1300 (Salkin 1987). Kekoskee phase sites include large habitation sites along wetlands and waterways which appear to be occupied for much of the year. Small camps and extractive sites are also reported, but no burial mounds and few burials have been associated with Kekoskee phase material. Houses have been reported at Kekoskee phase sites including semisubterranean structures with long, narrow entryways (Salkin 1989, 1993). No postmolds have been associated with these keyhole-shaped structures. Salkin proposed some house interior features were wall trenches, but subsequent excavations at the Statz site (47 Da-642) suggest the features may be midden deposits in the structure basin (Meinholz 1993) (see below). Some sites have produced evidence for a fence or palisade around the site area. Storage and/or refuse pits are numerous and sometimes large. Kekoskee phase sites reveal a variety of ceramic types including Madison ware and several collared wares such as Hahn Cord Impressed (Keslin 1958), Aztalan Collared (Baerreis and Freeman 1958), and Point Sauble Collared (Freeman 1956; Baerreis and Freeman 1958), and occasional shell-tempered Oneota ceramics which Salkin believes are trade wares or late intrusions (Salkin 1993). Projectile points appear to be limited to small triangular forms. Subsistence remains include deer and carbonized maize, squash, nuts, and seeds. Tobacco seeds have also been recovered, along with clay pipes.

Sites associated with the Kekoskee phase include Weisner III and IV (47 Do-399,400) (Salkin 1993), Elmwood Island (47 Do-47) (Salkin 1989), Stricker Pond (Salkin 1987), Hahn (47 Do-2) (Keslin 1958), Dietz (47 Da-12) (Dietz et al. 1956), and Statz (47 Da-642) (Meinholz 1993). Salkin also includes Aztalan (47 Je-1) (Barrett 1933; Richards 1992) and nearby sites in the phase along with Camp Indianola (47 Da-533) (Dirst 1988). The heavy palisade wall and Middle Mississippian occupation at Aztalan, however, appear very unlike other Kekoskee phase sites. Camp Indianola has a palisade similar to Weisner III along with associated triangular points, but no Late Woodland ceramics or habitation area have been found at the site. Recently another possible palisaded Late Woodland village has been reported at the Stockbridge Harbor site (47 Ct-133) on the East side of Lake Winnebago (Dirst 1995c). According to Salkin, Kekoskee phase sites may be found throughout the glaciated portions of eastern Wisconsin as far north as the Door Peninsula (Salkin 1993:236; R. J. Mason 1966).

There is little agreement regarding the origin and significance of collared wares among Wisconsin archeologists. Salkin argues that the introduction of collared wares and keyhole houses ties the Kekoskee phase sites into wider regional developments whose origins can be traced east to the New York, Ontario, and Pennsylvania areas (Salkin 1987, 1989, 1993, 1994). Mason (1966, 1981) suggests that the collared ceramic varieties are closely related to the uncollared Madison wares, and to wider regional developments in the eastern Great Lakes (R. J. Mason 1966, 1981). Other investigators look toward northern Illinois for local antecedents, particularly in relation to the collared wares associated with the Middle Mississippian manifestations at the Aztalan and Fred Edwards sites (Goldstein 1991a, 1991b; Hall 1986; Richards 1992; Finney and Stoltman 1991).

Although it is confusing to have two "phases" with such substantial overlap in time, space, and material culture, Salkin has made an important distinction between sites which produce only Madison wares and those which produce both Madison wares and collared wares. It appears that, as elsewhere in Wisconsin, Madison ceramics began earlier than the collared wares, and after collared wares appeared, the two coexisted for a period of time. Later Kekoskee phase sites appear to have higher proportions of collared wares, and Madison wares become less popular after A.D. 1000 (Salkin 1989, 1993). The dearth of stratified sites in southeast Wisconsin, and the tendency for Woodland occupations to recur in the same location, make it difficult to sort out the timing and meaning of changes in material culture, however.

Another important point Salkin makes is that effigy mounds appear to have been built by people with Madison ware pottery, since these are the only vessel types found accompanying burials and on mound floors. However, while collared vessels are not present in primary mound contexts, collared rim sherds have been found in the fill of some Late Woodland mounds, and some collared sherds may even predate mound construction (Hurley 1975; Green and Behm 1980). This suggests that collared wares may have been in use while effigy mounds were being built. The relationship of collared wares to effigy mounds needs far more detailed research than is possible here.

In order to explore the relationship of the Horicon and Kekoskee phases in greater detail, we can compare some of the data recently reported for the Weisner III site (47 Do-399), one of Salkin's type sites for the Kekoskee phase (Salkin 1993), and the Statz site (47 Da-642), which appears to have elements of both phases associated with keyhole structures (Meinholz 1993).

Weisner III (47 Do-399) is located on a low terrace of the Rock River and measures at least 32 x 8 m. The site produced two keyhole houses

(A and B), over 40 pit features, and a fence or palisade enclosing the site area. Ceramics include Madison wares (Madison Cord Impressed, Madison Plain, Madison Smoothed [Salkin 1989], and unnamed varieties), collared wares (Point Sauble Collared, Hahn Cord Impressed, and unnamed varieties), and shell-tempered Oneota ceramics (Carcajou Curvilinear, Carcajou Plain). The site produced maize from one feature and one postmold, as well as wild plant and animal resources from several pit features.

The three radiocarbon dates at Weisner III range from A.D. 760  $\pm$  80 to A.D. 870  $\pm$  80. The samples were from charcoal in feature fill and may not reliably date all materials in each feature. All the dates overlap in their one sigma range and average to A.D. 823. The samples are from pit features containing Madison wares. One Point Sauble collared rim was found in a pit dated to A.D. 760 (Feature 29). No pit features containing Oneota or shell-tempered ceramics were dated. Neither house was directly dated. The only pit feature containing maize at the site (Feature 45) included Madison ware ceramics and was not dated through radiocarbon. Salkin concluded that the site dates the early portion of the Kekoskee phase, and that the shell-tempered ceramics may be later intrusions (Salkin 1993:221, 223).

The spatial arrangements of houses, pits, and the palisade at Weisner III suggest there may be several episodes of occupation at the site. House B was a burned, rectangular structure with its entrance ramp to the south facing the river. The house had no diagnostic ceramics in direct association with its floor or fill. House B was superimposed on Feature 55, a pit feature containing Madison ware ceramics. Feature 24, a large pit feature, may have been contemporary with House B or was superimposed on it. Feature 24 contained a Madison Plain vessel and was dated to A.D. 870  $\pm$  80. Feature 54 was superimposed on House B and contained Madison Cord Impressed and Point Sauble Collared vessels, as well as Madison ware sherds.

The south facing ramp of House B abutted the palisade wall. This arrangement suggests the house could not have been entered if the wall were in place. It appears the wall was erected after House B was abandoned and/or burned. House A, located about 6 m to the east of House B, has its entryway facing away from the palisade. House A may have been erected after or during construction of the palisade wall.

House A was squarish structure with a northwest facing ramp. Ceramics associated with the house fill include two Madison Cord Impressed vessels, and one Madison Cord Impressed vessel which was found in the ramp. Feature 19 was a sub floor pit feature contemporary with House A. It contained a Madison Cord Impressed vessel, and an untyped grit-tempered, cord wrapped stick and cord impressed vessel. One sherd from this vessel was also found in Feature 54, which postdated House B. This indicates that House A also dated later than House B, as was suggested by the spatial relationships of the houses to the palisade wall.

It appears that Weisner III may represent a transforming event in the Late Woodland history of southeast Wisconsin. The two key hole houses are associated with predominantly Madison ware ceramics. The introduction of collared wares appears to follow the burning of the earlier house and to coincide with erection and maintenance of a defensive wall. It is not clear whether the collared ware represents a new population intrusion, trade, or in situ changes in ceramic style.

The presence of a possible third group in the region is suggested by the plain and decorated shell-tempered Oneota ceramics at Weisner III, although it is not clear what the date or significance of shell-tempered ceramics might be.

The Statz site (47 Da-642), another Late Woodland site with keyhole structures, has recently been reported in southeast Wisconsin (Meinholz 1993). This multicomponent site is located along a glacial outwash ridge and toe slope bordering the Waunakee Marsh wetlands and Six Mile Creek in northern Dane County. The Late Woodland occupation of the site included six keyhole house basins and over 140 pit features. The distribution of structures suggests the buildings were paired in three clusters, each associated with its own activity areas of pit features and postmolds. The ramp entrances to the houses face the marsh. No evidence for a palisade wall was found. Meinholz suggests the structure pairs represent household units (1993:153).

Careful excavation of the Statz site house basins revealed that some were reoccupied several times. In some of the houses a dark zone encircling the edge of the basin in plan view was shown to be organically enriched midden deposits which line the basin slopes and floor and are associated with the initial occupation of the structure. This midden zone may be what Salkin interpreted as a wall trench in the plan view of his structure basins at Weisner III. No postmolds were found associated with the Statz site structures.

At the Statz site the lensing and debris distributions suggested to Meinholz that the houses were occupied seasonally rather than year around, and were probably used for sleeping rather than for the full range of household activities. Ceramic vessels found in the keyhole structures included Madison ware jars and other vessels that resemble Madison ware, but do not fit into established types. Aztalan Collared ceramics were found in only one upslope portion of the site (Area III) in two structures (Feature 90 and 144) and an associated midden. The ceramic distribution suggests this area may have been occupied slightly later in time than the structure clusters located downslope. The small quantities of maize from the site also came from the upslope area. No other domesticates were recovered. The higher and drier upslope location of later Late Woodland structures may be a response to fluctuating water tables and lake levels that have been documented elsewhere in the Lake Michigan basin during Middle and Late Woodland times (Mason 1966; Larsen 1985a, 1985b, 1985c; Lovis 1990).

Radiocarbon dates reported from the Late Woodland component at the Statz site range from A.D. 620 to A.D. 1500 and cluster between A.D. 700-800 and A.D. 1000 (Meinholz 1993:146-148,152). Many of the radiocarbon samples were taken from charcoal in fill contexts. Two samples, however, were obtained from more precise contexts. One, from a hearth on the floor of a structure (F 134) containing Madison ware ceramics, dated to A.D. 910  $\pm$  50 (Wis 2210). Another, from a burned layer marking the destruction of a structure (F 144) containing maize, Aztalan Collared and Madison ware ceramics, dated to A.D. 1060  $\pm$  50 (Wis 2211). These dates may bracket the introduction of collared wares and maize into this region about A.D. 950-1000. Keyhole houses appear to be used both before and after this time.

The events represented at the Weisner III and Statz sites reflect the beginning of region wide changes involving increasing population sizes, the construction of houses at residential bases, intensification of maize horticulture, increasing conflict as evidenced by the construction of defensive walls, and the presence of what appear to be several different cultural groups. These relationships will be discussed again in the Late Prehistoric chapter.

As in southwest Wisconsin, there appears to be an episode of site unit intrusion into southeast Wisconsin represented by the Aztalan site (47 Je-2) in Jefferson County (Barrett 1933; Baerreis 1958; Peters 1976; Hurley 1977; Hall 1986; Goldstein 1991a; Richards 1985, 1992). Aztalan is a large, fortified village with platform mounds located along the

Crawfish River. At Aztalan Late Woodland Madison ware and Aztalan Collared are found along with Middle Mississippian ceramics which are shell and grit tempered (Baerreis and Freeman 1958; Bleed 1970). The site and its region will be discussed in greater detail in the Late Prehistoric chapter.

#### Northern Wisconsin

The Late Woodland period in northern Wisconsin is also associated with burial mounds and mound groups, but they are rarely in effigy forms. Conical mounds of varying sizes are most common, but linear mounds and tapered or "catfish effigy" mounds have also been reported in the northeast and north-central parts of the state (Salzer 1969, 1974; Barrett and Skinner 1932).

As in the Middle Woodland period, Late Woodland cultures and archeological phases vary from east to west across the northern part of Wisconsin with Heins Creek/Point Sauble in the northeast, Lakes phase in north-central, and Clam River/Blackduck in the northwest.

#### Northeast Wisconsin

Ronald J. Mason has been instrumental in deciphering Woodland cultural developments in the Door Peninsula of northeastern Wisconsin. Many of the sites he and Carol I. Mason have described have been stratified due to lake level fluctuations and dune formations, and have revealed local sequences from North Bay Middle Woodland through Heins Creek and later Late Woodland into late prehistoric and protohistoric times (R. J. Mason 1966, 1967, 1990b, 1992; C. I. Mason 1970).

The Heins Creek complex is an early Late Woodland manifestation which developed from the local Middle Woodland North Bay between about A.D. 400 and A.D. 700 (R. J. Mason 1966, 1990, 1992). This development parallels similar ceramic and cultural changes in the Point Peninsula/Owasco series in the eastern Great Lakes (R. J. Mason 1981). In the Door Peninsula Heins Creek is identified by the presence of triangular points and cordmarked vessels decorated with cord wrapped stick stamping (or corded stamping in Mason's terms). Much of the stone tool assemblage consists of expedient flake tools used for scraping and cutting, and even some projectile points exhibit little formal preparation. Bone tools include harpoons, awls, and pins, as well as antler conical points. Faunal remains indicate a reliance on mammals including deer, bear, muskrat, and beaver, migratory water fowl, and especially fish including sturgeon, catfish, walleye, and sucker. The fish remains suggest collecting during spring and summer (Cleland 1982) while the birds indicate a summer and fall occupation. No structures have been reported for Heins Creek sites, and no maize or other domesticates have been recovered.

Important Heins Creek occupations in Door County include the Heins Creek, Mero, and Rock Island II sites (R.J. Mason 1966, 1990; Wells 1969) and Shanty Bay (47 Dr-11) (Dirst 1995a). Heins Creek occupations have also been reported to the south at the Island Village (47 Mn-101) (Kreisa 1992) and the Stockbridge Harbor (47 Ct-133) (Dirst 1995c) sites.

Many Late Woodland occupations in northeast Wisconsin also include cord impressed Madison ware and collared ceramics which appear to be slightly later than initial Heins Creek. In the Door Peninsula Mason has suggested that Point Sauble Collared, which typically has a cord decorated collar and lower neck, can be considered a developmental part of the Madison ware series. This collared type was first defined at the Point Sauble site in the lower Door Peninsula along the Green Bay shoreline (Hall 1950; Freeman 1956). Mason (1992) has obtained radiocarbon dates from charred organics on a series of Door County

Late Woodland sherds as follows: Heins Creek complex A.D. 720±150; Point Sauble Collared A.D. 747±68; Madison Cord Impressed A.D. 916±69; Aztalan Collared A.D. 945±55 and A.D. 1004±58 (In keeping with the dates used elsewhere in this paper, these are the uncalibrated dates, although Mason also presented calibrated data). Mason's dates suggest that, at least in Door County, the Madison wares and collared ceramics are intimately related temporally and possibly culturally.

Other archeologists (Goldstein 1991a, 1991b; Dirst 1995c, and others) consider the uncollared Madison wares to be separate from Point Sauble (Freeman 1956, Baerreis and Freeman 1958) and related collared ceramic varieties such as Hahn Cord Impressed (Keslin 1958) and Aztalan Collared (Baerreis and Freeman 1958). At the Whitefish Bay View site (47 Dr-167) in Door County, for example, stratigraphic data suggest the presence of a slightly earlier Late Woodland occupation with uncollared Madison ware, followed by an occupation with only Point Sauble collared ceramics (Dirst 1987:110). No Aztalan Collared ceramics were found in either occupation at the Whitefish Bay View site.

Numerous conical burial mounds have been reported in the Door Peninsula, particularly along the shore of Green Bay south of Sturgeon Bay (Overstreet 1980; Dirst 1993, 1995a; Benchley et al. 1994). Most of the mounds were destroyed before professional archeological investigations could determine their nature and age. Consequently, it is not known what types of ceramics might have been associated with the mounds. Recent investigations at several sites with previously reported mounds revealed multicomponent Woodland and Oneota habitation areas (Dirst 1993; Benchley et al. 1994).

Late Woodland sites with Madison and/or collared wares in the Door Peninsula include Liebmann (47 Dr-) (Benchley et al. 1995), Heins Creek, Mero, Point Sauble (Hall 1950, Freeman 1956), Gibson Rockshelter (47 Br-1) (Hall et al. 1945), Shanty Bay (47 Dr-11) (Dirst 1995a), and Whitefish Bay View (47 Dr-167) (Dirst 1993). Dirst (1995b) suggests sites with these ceramics are more common in the lower Peninsula than in northern Door County. Other northeast Wisconsin sites with this ceramic assemblage include James Island (R. J. Mason 1968), Stockbridge Harbor (47 Ct-133) (Dirst 1995c), and Island Village (47 Mn-101) (Kreisa 1992).

Because the Late Woodland occupations are often overlain by and mixed with Late Prehistoric Oneota occupations, there is little clear data on subsistence and settlement for the later Door Peninsula Late Woodland sites. Habitation sites are found along small bays, near river mouths, and in sandy terrace and dune areas on both sides of the Peninsula. No Late Woodland houses have been recognized. No maize or other domesticated plants have been identified. At the Whitefish Bay View site an early Late Woodland occupation produced features which contained lake trout, blackberry, plum/cherry, and honeysuckle (Dirst 1987:62-63). Cleland (1982) has suggested that lake trout and whitefish, which spawn in late fall over off-shore rocky shoals, were harvested in Late Woodland times after gill nets began to be used. Late Woodland occupations in rockshelters along the Niagara Escarpment may indicate these locales were used seasonally or as sacred places.

In the Menominee River watershed along the boundary between Wisconsin and the Upper Peninsula, Buckmaster suggested that the Late Woodland settlement pattern is substantially different from earlier Middle Woodland and Archaic occupations (1979). Relatively large sites focusing on fish resources are located near the mouth of the river and at major confluences. These residential bases included evidence of structures and appear to have been occupied in warm seasons. Secondary hunting and collecting camps were also found in the vicinity. Numerous sites with low debris density were situated along the middle reaches of the drainage and may have been fall and/or spring encampments. The upper

reaches of the drainage included numerous small sites located along the margins of inland lakes. These may have been interior winter hunting camps.

The seasonality of inland camps in the northeast region is difficult to specify because sites often do not include faunal and floral remains, and many even lack temporally diagnostic artifacts (Franzen 1986, 1987, Benchley and Whitman 1989, Benchley 1989a). The settings of many of these small sites along wetlands suggest they were used as winter hunting camps or stations. It appears that Late Woodland groups in northeast Wisconsin were flexible in social organization and scheduling the seasonal collection of resources. Some kin groups may even have remained in coastal areas to exploit the deep water fall/winter fishery (Cleland 1982).

#### North-central Wisconsin

The Late Woodland manifestation of north-central Wisconsin has been termed the Lakes phase. The phase was defined by Robert Salzer of Beloit College based on a survey and testing program in Oneida and Vilas counties (Salzer 1969, 1974). The region is characterized by numerous small lakes and undulating terrain. Salzer suggested the phase dates from A.D. 700 to A.D. 1400 during which there is a marked increase in the number and variety of sites in the region.

Burial mounds appear for the first time and include groups of conical mounds. Linear and tapered or catfish effigy mounds have also been reported. The mortuary program is varied and includes flexed, secondary bundle, and cremated remains, as well as ossuaries, and unrounded burial areas (Salzer 1986b).

Lakes phase habitation sites are identified by the presence of triangular projectile points and abundant quartz lithic debris, as well as Late Woodland ceramics including Heins Creek, Madison ware, and collared wares including Point Sauble and Aztalan Collared. Shell and grit-tempered Oneota ceramics also occur on Lakes phase sites and may represent trade items. The ceramics suggest the phase extended over a substantial period of time, and some archeologists suggest the Oneota materials may represent a late occupation by non-Late Woodland groups (Moffat et al. 1992, 1993; Van Dyke 1987; Bruhy n.d.). Copper tools include awls, fish hooks, and small knives. No bone tools have been reported.

Lakes phase sites are found along lake shores, at lake outlets, on peninsulas, on islands, along rivers at rapids, and at the confluences of streams and rivers. Sites range in size from less than 1 acre to over 40 acres, and probably represent a variety of settlement types. Salzer suggested the settlement locales reflect intensified exploitation of lake settings, which may indicate a reliance on wild rice. Although fish and deer remains were noted at Lakes phase sites, subsistence data was not systematically collected in the 1960s investigations. Recently Benchley has suggested that small inland sites along wetlands and rivers may represent seasonal extractive locations and temporary camps, some of which may have been small winter occupations (Benchley and Whitman 1989; Benchley 1989a).

Important Lakes phase sites in Oneida County include the Robinson site (47 On-27) (Salzer 1969, 1974; Moffat et al. 1992), Fischer's Island (47 On-51) (Moffat et al. 1993), and Ghost Shirt Island V (47 On-148) (Moffat et al. 1992) which is located near the Robinson site. Important Lakes phase sites to the east in the headwaters of the Menominee River include the Butternut Lake site in Forest County (47 Fr-122) (Bruhy and Wackman 1980b), and the Fay Lake sites in Florence County (Van Dyke 1987).

Recent test excavations on Lakes phase and late prehistoric sites have produced important information on subsistence pursuits at several

Vilas and Oneida County sites (Moffat et al. 1991, 1992, 1993). Calcined bone from these sites includes identifiable remains of beaver, muskrat, deer, turtle, bird, fish (pike, sucker, walleye), and shellfish (Theler 1991, 1992, 1993). Plant remains which occur commonly include blueberry, black/raspberry, cherry, elderberry, hazelnut, and hawthorn. Wild rice has been found in abundance at several sites in Oneida County, and corn has been recovered from Oneida and Vilas County sites (Arzigian 1992, 1993). Arzigian noted that the wild rice from northern Wisconsin is in some of the best documented contexts in the upper Midwest, and that it does not appear in earlier contexts in the region.

#### Northwest Wisconsin

There are apparently several Late Woodland groups present in the northwestern Wisconsin region during Late Woodland times, but few archeological sites have been excavated and described.

Mounds in conical and linear forms are found singly and in groups. Excavations suggest some mounds are Late Woodland in age, but others are Middle Woodland. Two large, Late Woodland conical mounds (Spencer Lake [47 Bt-2] and Clam Lake or Mound Beach [47 Bt-1]) were excavated in the 1930s and provided the basis for the definition of the Clam River phase or focus (McKern 1963; Salzer 1986b). The mounds were built in at least three episodes, with burials associated with each construction stage. Red other deposits were associated with some construction episodes and burials. Burials included individual secondary bundles, fragmentary remains, and mass deposits of secondary burials in pits and in the mound fill. Some long bones had perforated ends suggesting a regular, ritual postmortem treatment involving accessing the marrow. The remains of birchbark and elm bark containers and wrappings were found, sometimes in direct association with bundled bones. Pottery containers in the mounds were grit tempered, cordmarked, and decorated with cord and filament wrapped stick stamping and cord impressions. These materials have been used to define Clam River ware which is found from northwest Wisconsin into Minnesota (Caine 1974). Miniature vessels were also found in the mounds, as were pottery pipes. Lithic grave associations included small triangular projectile points, and a few scrapers and drills.

The presence of a horse skull in the Spencer Lake Mound (47 Bt-2) led the excavators to initially believe that the mounds were early Historic in age. It was subsequently determined that the skull had been placed in the mound in the 1920s (Ritzenthaler 1964), and the skull was not described in the final report of investigations (McKern 1963). A series of radiocarbon dates on charcoal from the Spencer Lake Mound (47 Bt-2) ranges in age from A.D. 490±120 to A.D. 900±50 (Ritzenthaler 1966; Boszhardt 1977). A date on charred bone from the mound was A.D. 1110±100 (Ritzenthaler 1968, Boszhardt 1977).

The Wakanda Park Mound Group (47 Dn-1), located to the south of the Clam River area in Dunn County, may represent a northern extension of Effigy Mound in northwest Wisconsin. The mound group consisted of conical and linear mounds which were excavated in the 1950s (Wittry 1959c). The very skimpy ceramic assemblage described for the mounds indicates that both Middle and Late Woodland mounds were present (Barth 1985). A grit-tempered Oneota or Middle Mississippian jar was found in an intrusive pit in one of the mounds, suggesting the site was used by Late Prehistoric peoples as well. One radiocarbon date from an oval Late Woodland mound containing Madison Cord Impressed ceramics was A.D. 1200±200 (Wittry 1959c:112).

The Diamond Bluff Mound Group (47 Pi-2), as well as several smaller groups in Pierce and Dunn counties include effigy mounds as well as conicals and linears (Barth 1985). These mound groups lie along the

northern edge of the deciduous forest-prairie zones. Excavations at Diamond Bluff revealed both grit and shell-tempered ceramics associated with the mounds and apparently intrusive burials (Maxwell 1950). The shell-tempered Oneota ceramics, which fit into the Silvernale phase of the Red Wing locality (see Late Prehistoric chapter), suggest that in this area of Wisconsin, effigy mound builders and Oneota peoples were contemporary. The Diamond Bluff site included at least two small Late Woodland habitation areas, which produced both Madison and Clam River wares (Wendt and Dobbs 1989; Rodell 1991). Several extensive Oneota habitation areas which produced houses and storage pits have also been reported at the site (Wendt and Dobbs 1989; Rodell 1991).

Relatively few Late Woodland habitation sites have been excavated and reported in northwestern Wisconsin, and little is known regarding subsistence or settlement for the region. Ceramics indicate the presence of three Late Woodland ceramic traditions: Madison/Effigy Mound, Clam River, and Blackduck. There is considerable disagreement over the identification and nature of these ceramics, however (VanDyke and Oerichbauer 1988). Shell-tempered, cordmarked ceramics referred to as Sandy Lake ware appear to postdate the Late Woodland occupations. Sites which have Clam River Late Woodland occupations in the region include Fickle (47 Bt-25) (Kolb 1988), Hammersberg (47 Bt-27) (Salzer n.d., Kolb 1988), Yellow River Swamp (47 Bt-36) (Van Dyke and Oerichbauer 1988) and possibly Plum Creek Bridge (47 Pe-38) (Ford 1982; Van Dyke and Oerichbauer 1988).

Blackduck ceramics are rare in northwest Wisconsin, and Blackduck culture is better known and described at sites across northern Minnesota (Harrison 1990) where Blackduck habitation sites produce abundant ceramics and evidence for hunting, fishing, and collecting wild rice. Some sites include low burials mounds. The ceramics are grit tempered and decorated with bands of cord wrapped stick impressions and punctates on the constricted neck and flaring rim. In Wisconsin a few Blackduck sites have been identified in Burnett County (Kowalski 1982), and Blackduck ceramics are also present in the Apostle Islands at the Morty site (47 As-40), Ashland County (Salzer 1980; Kolb 1988). The Late Woodland occupation of the Apostle Islands reflects a series of short term occupations which may have been hunting and fishing stations (Salzer 1980; Birmingham and Salzer 1980).

## Minnesota

The Woodland tradition (Woodland) of Minnesota prehistory is better known than the preceding Archaic and Paleoindian traditions of the state. Minimally, Woodland is characterized by the initial appearance of pottery vessels in Minnesota and the construction of earthen mounds. The preeminent cultural trends during this stage include increasing population growth, an intensification of regional identity and local groups, increasingly efficient use of local raw materials and food resources, and the intrusion of ideas, materials, and technologies from other regions into Minnesota. The beginning of the Woodland is poorly understood in Minnesota, which may result from some overlap with the preceding Archaic tradition. Similarly, the end of the Woodland is contemporary with other non-Woodland traditions as well.

Woodland was originally developed to describe the cultures of the lower Midwest, particularly in the Ohio Valley (Griffin 1946), and was used to refer to cultures that seemed to fit into the Algonkian or Eastern Woodland culture area. Woodland was identifiable through the presence of material culture traits such as ceramics and earthen mounds, and was presumably accompanied by a stable subsistence economy and sedentism. Associated with Woodland groups was a series of burial traits,

including cremation burials, the construction of earthen mounds, and distinctive grave furniture which developed out of earlier, Late Archaic, patterns (Griffin 1964: 235). Clearly recognized as diagnostic of the Early Woodland is the broad ceramic tradition which includes types such as Marion Thick, Fayette Thick, and Schultz Thick (cf. Emerson and Farnsworth eds. 1986).

There has been an ongoing debate about the applicability of the Woodland concept to Minnesota archeology. Although earthen mound construction appears relatively early, it remains unclear whether this is contemporary with, or related to, the adoption of pottery. Radiocarbon dates are lacking for most early ceramic and mound sites, and in much of the state, ceramics appear to be adopted into a continuing Archaic hunting and gathering lifestyle. Evidence is lacking for the broad societal changes implied in the burial traits of the Woodland elsewhere in the Midwest. Finally, the development of horticulture and a shift to a more sedentary settlement pattern does not appear until very late in Minnesota.

Woodland has been used to describe many Minnesota sites about which very little is known. The diffuse nature of the Woodland concept as it has been applied in Minnesota has resulted in cumbersome or imprecise terminology (e.g. "Prairie Woodland", "early Late Middle Woodland"). In a discussion of the Mille Lacs Lake region of Minnesota, Caine-Hohman (1983:64) has observed:

[T]he use of the traditional cultural-historical divisions developed for Woodland obscures, rather than clarifies, the developmental processes at work in the northern and central regions of Minnesota. . . Although, if necessary, one can easily make correspondences with the former terminology (Archaic, Early, Middle, and Late Woodland) . . .

This rings especially true for cultural-historic divisions developed in the archeology of regions to the south. Although a few traits of ceramic decoration and projectile point manufacture are shared with broad regional traditions such as Marion and Hopewell, the active participation in pan-regional interaction spheres (cf. Caldwell and Hall 1964) or widespread belief systems has yet to be demonstrated. Minnesota remains peripheral to much of what is happening to the south with interaction evident primarily in a few decorative modes on prehistoric ceramics.

The division of the Woodland into the Early, Middle, and Late Woodland has not been systematically employed in Minnesota. One has to remember the initial division of Early from Middle Woodland was an arbitrary division of an otherwise continuous ceramic sequence employed to accommodate a growing body of data (Griffin 1964: 239). In Minnesota, the volume of data has never reached a scale that it requires arbitrary divisions of this sort, and continuity appears to be the rule rather than dramatic change (cf. Anfinson 1987). Early, Middle, and Late Woodland are not clear as evolutionary, historical, or adaptive traditions in Minnesota. Where divisions of this sort are employed in the literature, they appear to be more an artifact of theoretical paradigms rather than any reflection of the data at hand.

Early Woodland is defined by the appearance of the first ceramics in the Midwest. These ceramics are normally thick with cordmarking on vessel exteriors and interiors. Fayette and Marion Thick are the types associated with Early Woodland in the lower Midwest and La Moille Thick in Minnesota appears to be a variant on this theme. Early Woodland is very poorly known in Minnesota and La Moille sites are restricted to the deciduous forest zone in the southeastern quarter of the state. La Moille ceramics have only been recovered at the La Moille rockshelter, and are also reported from surface collections. It is unknown whether they are associated with mound construction.



In addition to 'thick' ceramics, Woodland is associated with the cultivation of plant foods, particularly squash and maize, and a suite of distinctive chipped and groundstone industries. Fragments of squash were recovered from a peat level radiocarbon dated to 1750 B.C. at the King Coulee site in Wabasha County (Anfinson and Wright 1990), and may be related to an Early Woodland occupation, but recovery of floral remains is sadly lacking for most Woodland sites in Minnesota. The only Woodland associated recovery of corn has been at the Nelson site (21BE24) in association with Madison-like ceramics (Anfinson and Wright 1988).

A variety of notched and stemmed projectile points are well documented for Woodland sites, many of which bear similarities to Archaic forms known elsewhere in the Midwest. The temporal relationships of these projectile point types on the northern plains have been described by Kehoe (1974) and applied to adjacent areas of the Eastern Woodlands. Gibbon and Caine (1976) report on the absence of diagnostic Middle Woodland projectile points for Minnesota and suggest that affinities in lithic assemblages may be found in northern environmental zones.

The initial appearance of ceramics to the north of the Minnesota River is unrelated to the Early Woodland as presently defined by Marion-like ceramics. One potentially early ceramic type is Brainerd Net Impressed (Birk 1979). A recent series of radiocarbon dates for Brainerd Net Impressed ceramics from sites in Mahnomon, Hubbard, and Cass counties suggests contemporaneity with Marion, and represent a technologically distinct Initial Woodland ceramic sequence in north-central Minnesota. All three of these AMS dates are from residues scraped from Brainerd sherds, and they suggest a preliminary range for the style between 3100-2400 B.P. (Hagglund 1994; Kluth and Kluth 1994; M. Justin, personal communication 1994).

The distribution of Brainerd is relatively widespread, and a cursory review of site locations identified Brainerd ware or net impressed sherds at sites in a minimum of eleven Minnesota counties and one Wisconsin site. In the early literature net impressed ceramics were at sites assigned to the Malmo, Laurel, Kathio, Blackduck, and Arvilla foci (Wilford 1955). This includes sites in the Mississippi, Rainy, and Red River drainages associated with a variety of vegetation types. Brainerd sites include locales clearly associated with wild rice procurement during later prehistoric and historic occupations. Both location and faunal remains suggest that Brainerd and later Woodland occupants hunted for bison on the prairies of western and southwestern Minnesota. The widespread distribution of Brainerd aids in interpretations of its potentially early temporal position.

Brainerd ware is clearly related to the construction of mounds, as excavations at the Silinger (21NR1) and the McKinstry (21KC2) mound groups each recovered net impressed sherds in mound fill (Johnson 1973; Stoltman 1973). A net impressed bowl was recovered at the King Mound (21CW2) although its association with burials in the mound is unclear (Johnson 1971; Wilford et al 1969). At the Gull Lake Dam site (21CA27) a complete Brainerd vessel was associated with a possible cremation in a submound burial pit (Johnson 1971). Although this burial was not radiocarbon dated, this burial mode was excavated at the Mornson Mound Group (210T2) and produced a corrected radiocarbon date of 800 B.C. ± 200 (Anfinson and Wright 1990). The mound excavations at Mornson did not recover Brainerd ceramics, although they were found at the nearby Dead River site (210T51), and this date is one of the only available radiocarbon assays which overlaps with the recent dates for Brainerd ware.

The reliability of the Mornson Mound date has been questioned in the literature, largely because of a paucity of contemporary dates for Minnesota sites. "The earliest reliably dated mound burial in Minnesota is the Anderson site (21MLI) in the east-central part of the state (Anfinson and Wright 1990)." Both of these sites and the Gull Lake Dam site described above were assigned to the Malmo focus, using the McKern Taxonomic System (Wilford et al 1969). Malmo was defined through the presence of burials in circular mounds containing cremations in submound pits (as evidenced by layers of charred branches or logs) and an association with straight-stemmed, side-notched, and corner-notched projectile points. Malmo ceramics are only vaguely defined, having grit temper and a smooth body treatment sometimes decorated with punctations, bosses, and incised lines (Anfinson 1979). A vessel recovered in the Graham Lake Mound (210T5) was conoidal in form with exterior bosses, and Anfinson (1979) notes the occasional presence of beveling on the interior lip of some Malmo vessels.

Some cultural divisions seem applicable to the Woodland of Minnesota. For example, the Lake Forest Middle Woodland includes the Laurel culture of the Rainy River area (Fitting 1970). Laurel was initially recorded as the Laurel focus of the Rainy River aspect by Wilford (1941, 1955). Stoltman (1973) completed a thorough re analysis of Wilford's data and redefined the Laurel culture and accompanying phases for sites in northern Minnesota.

Laurel has been radiocarbon dated to a period only slightly later than Malmo sites with several dates providing a range between 100 B.C. and 900 A.D. (Anderson 1979). Lake Forest Middle Woodland extends from the prairie margin in northern Minnesota eastward through Wisconsin, Michigan, Ontario and into western New York (Fitting 1970, 1978; Mason 1981). This regional tradition shows similarities to the southern Middle Woodland traditions, especially in ceramic modes. However, Lake Forest Middle Woodland has distinctive differences from Havana and Hopewell. This is in part because of a heavy reliance on fishing and an aquatic subsistence base and the accompanying differences in lithic technologies. Lake Forest Middle Woodland sites are therefore found in areas rich in aquatic resources such as lake margins and river settings with abundant fisheries. Many, if not all, of the Havana-related cultures of Minnesota could be seen as parts of the Lake Forest Middle Woodland (Gibbon and Caine 1976).

It is important to recognize that Lake Forest and other adaptations utilized environmental zones other than the extreme northern reaches of the state. Although clearly associated with northern Minnesota, Laurel is known from sites to the south and west as far as Otter Tail County, where Michlovic recovered Brainerd, Laurel, Cambria, and primarily Blackduck ceramics at the Dead River site (210T51). The site contained abundant evidence for the use of aquatic resources as well as bison and other mammal remains. The presence of bison remains on Laurel sites such as Dead River and Lake Brontson (21KTI) is suggestive of a settlement pattern which included procurement of bison and other resources in Prairie regions (Michlovic 1979; Anfinson, Michlovic, and Stein 1978). The recovery of bison remains from Laurel sites near the Rainy River is noteworthy, as this indicates at least a portion of the animals was being transported eastward into the boreal forest (Lukens 1973).

Numerous ceramic styles with decorative modes similar to those of Havana and Hopewell complexes have been described in the regions south of Laurel in Minnesota. The similarities of these ceramic modes has been suggestive of participation in the Hopewell Interaction Sphere, although diagnostic lithic tools and ritual items are missing from Minnesota artifact assemblages (Gibbon and Caine 1976). This suggests stronger affinities to northern traditions such as Laurel, and the



incorporation of many of these styles into the Western Woodland Algonkian Configuration has been suggested (Lenius and Olinyk 1990). Minimally, these styles may fit more comfortably into a broad tradition such as the Lake Forest Middle Woodland (Gibbon and Caine 1976). The later Woodland cultures of Northern Minnesota may ultimately be fit into frameworks developed by Canadian archeologists (Lenius and Olinyk 1990), although their nomenclature has not yet gained widespread acceptance. If this does happen, it may include the incorporation of Onamia, St. Croix, Blackduck, Kathio, and Clam River ceramics, which share broad stylistic similarities and seem as much defined by geography as material differences.

Onamia and St. Croix have become synonymous in the last few years. They seem to represent ceramic series contemporary to the latter part of the Middle Woodland and Early Late Woodland cultures in other parts of the Midwest (Caine 1966). In addition, they share broad stylistic similarities and distributions with Blackduck, Kathio, and Clam River ceramic types. All have decorative modes which commonly include cord wrapped stick decoration and cord-marked vessel exteriors on a globular vessel form. The differences between each of these ceramic types may ultimately prove to be largely due to age and local variations on a broad theme common to late prehistoric ceramics in the northern Great Lakes.

Havana is best known from central Illinois, where a series of spectacular burial mounds and villages have been investigated. In Minnesota, the study units Howard Lake and Havana-related appear to represent the northernmost extension of the Havana complex traits (see Struever 1964a, 1965). The only documented appearance of Havana or Hopewell traits other than ceramic modes is the Hopewell mounds excavated near Spring Lake (Gibbon and Caine 1976). Sorg ceramics may fit into Havana-related complexes of southeastern Minnesota, and a Sorg phase has been suggested for the region (Anfinson 1979).

Late Woodland is, by and large, a shadowy period of time represented principally by various series of ceramics that are not well known or defined in Minnesota. As mentioned above, temporal boundaries in Minnesota are poorly defined, and the placement of materials from the state into the cultural-historic stages proposed elsewhere leads to shadowy distinctions such as Late Middle Woodland and Early Late Woodland (Caine 1966). Many of these cultures may develop as part of the Lake Forest Middle Woodland and continue into what is temporally known as Late Woodland elsewhere. Rather than using cultural stages and their accompanying interpretive baggage, several archeologists have begun using the term Late Prehistoric to refer to developments such as Blackduck and Sandy Lake, beginning around 1,100 years ago (ca. A.D. 900) and continuing until the time of initial contact between American Indian people and Europeans (Johnson 1979; Anfinson 1987b).

The archeological cultures for this period are better known than for the preceding stages of the Woodland in Minnesota, but numerous questions remain to be answered. In general, our knowledge of these cultures is written with a broad brush, and in only a very few areas of the state have intense local research programs been initiated to develop tight local sequences and models.

In northern Minnesota, the Blackduck culture appears around 1,200 years ago (ca. A.D. 800) and appears to represent the first intensive use of wild rice as a food resource. In extreme northern Minnesota, Blackduck seems to persist until the time of European contact. In the Mississippi headwaters and other regions of northern Minnesota, however, Blackduck is replaced by groups producing Sandy Lake ceramics beginning around 800 or 900 years ago (ca. A.D. 1100-1200). In many portions of the state, Sandy Lake ceramics persist until the arrival of Europeans.

Although it is tempting to see a rather straightforward prehistoric sequence that encompasses most of northern Minnesota, this is perhaps not really the case. In extreme northern Minnesota, Selkirk ceramics are occasionally found and these may be associated with the ancestors of the Assinboine. In eastern Minnesota, the apparent absence of Sandy Lake or Oneota ceramics in the Snake River Valley (cf. Caine 1974; Birk 1977b) is puzzling. Similarly, Sandy Lake ceramics are now documented from the Red River Valley, as well as a new type Michlovic (1987:62) has termed Red River ware. However, there appears to be a complex interaction in the northwestern portion of Minnesota between cultures of the northeastern Plains and the lake-forest region of northern Minnesota.

## Major Themes and Trends for the Woodland

Several major trends are apparent during the Woodland tradition. These include the intensification of food production (maize horticulture in the south, wild rice in the north), introduction of new technology for tool use and manufacture, significant population increases and the emergence of well defined regional complexes, the tentative association of archeological complexes with known historic groups of American Indian people, interaction and influence with the highly developed Middle Mississippian cultures of the lower Midwest, and the interrelationship between human adaptations in the state and changing climate.

The intensification of food production during the late prehistoric period represents perhaps the most significant innovation in Minnesota prehistory for several thousands of years. Increased food production may represent one of several variables which provided an energy surplus that allowed population to increase significantly. It is during the Late Prehistoric that we see a dramatic increase in the numbers of archeological sites, as well as features designed for the processing and storage of food products. Further, the adoption of maize horticulture and wild rice utilization presumably resulted in major changes in social organization, gender roles, land tenure (at least on a small scale), settlement pattern, and the exploitation of various environmental zones throughout the state.

In southern Minnesota, maize appears first during the Late Woodland and is best known from the Nelson site (21BE24) in the Blue Earth River Valley (Scullin n.d.). Maize does not seem to have played a particularly important role in Late Woodland subsistence, but between 900 and 1,000 years ago (A.D. 1000-1100) maize cultivation explodes. This rapid intensification is clearly related to the emergence of Oneota and Plains Village (e.g. Cambria, Great Oasis) cultures in southern Minnesota.

In northern Minnesota, the utilization of wild rice is believed to follow a similar pattern at about the same period. Although wild rice has been a topic of interest for a number of years, the literature on prehistoric utilization of wild rice remains relatively sparse (Jenks 1900; Johnson 1969a; 1969b; Yourd 1988). In a recent paper Lofstrom (1987) has provided a provocative model that relates changes in social organization, population size, and the emergence of wild rice. Although this model remains to be tested, it provides a strong synthetic point of beginning for the evaluation of wild rice in relationship to other major cultural trends.

Yourd (1988) has suggested the presence of wild rice in its current habitat back to the period around 3,000 years ago. It has also been recovered from features containing Laurel ceramics (Anfinson and Wright 1990). Many of the wild rice sites identified by Johnson contain not only Blackduck and Sandy Lake ceramics, but also Brainerd and Laurel. Although Johnson interpreted the sites as ricing locations with activities

geared towards the procurement and processing of the resource, he did not believe that the earlier occupations were associated with wild rice. In light of Yourd's environmental data and the recovery of rice with Laurel ceramics, the extrapolation further back in time may occur. It remains clear that the systematic processing of rice in specialized pits or "ricing jigs" is not evident for the earlier periods, but the utilization of the resource seems likely for much of the period back to 3000 B.P., if not earlier.

There are numerous changes in technology during the Late Prehistoric period and most of these are linked to food production. Although use of the bow and arrow may be first identified during the Late Woodland and Transitional Woodland contexts, its widespread use is best documented during the Late Prehistoric. Similarly, there are a variety of changes in ceramic technology. These are most clearly seen in the Oneota and Mississippian-like ceramics of southern Minnesota, where the use of freshwater shell as a tempering agent appears about 1,000 years ago, presumably diffusing up the Mississippi River from the lower Midwest. Changes in vessel form from the conoidai jar to one with a globular form having a constricted neck is presumably a Late Prehistoric development.

Other technological innovations relate directly to the increased production and storage of maize and wild rice. Unlike the products of a hunting and gathering life way, grains must be processed and stored in a particular fashion or they become inedible. Some of these innovations are apparent in the archeological record (e.g. bell-shaped storage pits for corn, ricing jigs for processing rice) while many others must be inferred.

During the preceding ceramic/mound stage, a pattern of slowly increasing regional identity and population growth is apparent. This trend is continued and accelerates during the Late Prehistoric period. Population growth, however, does not appear to continue in a straightforward linear fashion. Rather, population growth may ebb and flow in specific regions over time.

The increasing regional identity of archeological cultures during the Late Prehistoric is a particularly fascinating and complex topic. No synthetic studies of this problem have yet appeared. However, an examination of the relationship between regional identity, perceived movement of populations over time, adaptation to (and utilization of) specific environmental zones, increasing pressure on available food (and other) resources, increasingly structured social organization, and expanding competition for particular territories are all variables that need to be included in such a study.

It is in the Woodland tradition that we see the development of regional identities, but numerous sites are found which represent Woodland "cultures" outside of their core areas. This suggests that although regional traditions are visible in the archeological record, they do not necessarily represent specific adaptations to a single resource area. Woodland cultures were utilizing resources in a variety of settings. This may be especially so for Woodland cultures whose settlement pattern included forays into prairie ecotones for the procurement of bison and other resources.

It is during the Late Prehistoric that it becomes possible to link, in at least a tenuous fashion, archeological cultures with historic groups of American Indian people. Such linkages in most cases remain tentative hypotheses. However, further work may strengthen this particular type of study.

A final theme for this period is the interrelationship between human groups and changing environmental conditions. Griffin (1961) suggested that the expansion of Mississippian-like cultures into the upper

Mississippi Valley was the result of a shift to climatic conditions more conducive to corn horticulture some 1,100 years ago. The subsequent (perceived) disappearance of these cultures in the upper Valley was attributed to a subsequent deterioration of climate which made corn horticulture untenable. Baerreis and Bryson (1965) refined Griffin's hypothesis and provided more substantive climatic data as a framework. Although the interrelationship between climate and the rise and decline of Mill Creek culture in northwestern Iowa has been the subject of some study (Baerreis and Bryson 1968), a major interdisciplinary effort to evaluate this topic in Minnesota has yet to be undertaken. Baerreis, Bryson and Kutzbach (1976) provide a review of studies of climate and culture in the western Great Lakes region.

These theories have been discussed, and largely dismissed by Anfinson and Wright (1990). They have noted significant delays between the environmental and cultural events discussed by Baerreis and Bryson and suggested that a causal relationship would have more immediate effects. They have suggested that although environmental changes may have affected the subsistence and settlement patterns of prehistoric populations, a cause and effect relationship cannot be demonstrated.

For the purposes of this overview, the Woodland is fit into three principal geographic areas based on the broad cultural affinities discussed above. These areas are not intended to represent cultural regions such as those described by Anfinson (1990). Rather, they are units of convenience with which to present the available data. The three geographic areas herein represent broad regions containing numerous described ceramic styles and a few tentative archeological "cultures." They are broadly characterized by affinities between neighboring regions.

Southeastern Minnesota is distinctive as it shares a number of extra-regional connections to archeological cultures defined for the lower Mississippi Valley and other regions to the southeast. Southwestern Minnesota is distinctive in its environment and drainage from the rest of the state, and the material culture of Woodland groups in this region shares broad similarities with cultures of northwestern Iowa and the cultures of the upper Missouri River. Northern and Central Minnesota contain a wide variety of archeological cultures, many of which share similarities in ceramic modes found to the south, but the material culture of these groups are interrelated more to each other within the region, and to cultures restricted to the Northern Great Lakes than to cultures from the south.

## Southeastern Minnesota (Mississippi Valley)

### Early Woodland

Early Woodland is a well defined archeological complex of the Eastern Woodlands that contains the first ceramics present in many areas of North America. A general lack of data has hindered the development of a coherent Early Woodland for Minnesota. There is some difficulty in using the initial appearance of pottery as the basis for a definition of Early Woodland in Minnesota, as pottery appears at different times in different areas, and many of the early ceramics are contemporary with Middle Woodland complexes described elsewhere. Other sites and ceramic types have been radiocarbon dated to the Early Woodland period, but do not share the Early Woodland traits so well known for areas to south and east. Early Woodland will be used here only to refer to complexes in Minnesota that fit into the sequence as defined elsewhere in the Midwest, and not as a referent to the first appearance of pottery throughout the state.

Our knowledge of Early Woodland in Minnesota remains fragmentary (cf. Farnsworth and Emerson 1986). In fact, Griffin (1986:612) observes that:

Investigations of artifact materials in the Early Woodland time range in Minnesota have not yet progressed far enough to allow a characterization of the material to compare with contemporary groups from the south. It is apparent ... however, that most of the period markers that appear farther south and east are not present in Minnesota. The earliest ceramics have features which suggest they are a later derivative of early pottery in southern Wisconsin and Illinois.

Early Woodland in Minnesota is known principally from Lloyd Wilford's (1954c) excavations at the La Moille Rockshelter near Winona. This rockshelter was situated near the base of bluffs overlooking the Mississippi River. More than 17 feet of deposits were present at the shelter and Wilford excavated a small portion of these. Most of the materials from the site were Archaic and the shelter appears to have represented a seasonal station for fishing and other river-related activities. The Early Woodland presence at the rockshelter is represented by one ceramic vessel. Wilford defined a ceramic type called La Moille Thick using the attributes of this vessel. La Moille Thick is similar to the other 'thick' ceramics in the Midwest of the Ohio Valley. The La Moille vessel is a wide-mouthed jar with a conoidal base. The walls of the vessel are thick (10-15 cm) and has a flat lip decorated with punctations and a flat rim decorated with fingernail impressions (Hudak and Johnson 1975).

"Thick" ceramics are also known from several other sites in the state, including the Schilling site (21WAD). Small samples of ceramics similar to Marion Thick have been recovered at Schilling (Birk 1973), but these made up only a small portion of the recovered materials. However, extensive excavations that might characterize other aspects of Early Woodland have not yet been conducted.

Gibbon (1986:89) suggests that "it is probably meaningless to talk of an Early Woodland period for Minnesota." Given the minimal excavation and survey data available for Early Woodland sites (e.g. those with La Moille Thick ceramics), this statement is premature. It reinforces, however, the need to differentiate between the content of archeological complexes and the chronology of these complexes.

The chronology of the Early Woodland complex in Minnesota remains conjectural. Similar artifacts in the Ohio River Valley are dated to between 3,000 and 2,500 years ago. It is probable that Early Woodland in Minnesota is somewhat later and may date between perhaps 2,500 to 2,000 years ago.

The distribution of Early Woodland in Minnesota is very poorly known. Based on existing information, and the assumption that Early Woodland represents an adaptation primarily to the eastern deciduous forest, this complex should be found along the Mississippi River from the Twin Cities southward, along tributaries of the Mississippi in southeastern Minnesota, and perhaps westward to the Blue Earth River valley.

*Sorg phase.* The Sorg phase appears to be defined by the Sorg ceramic style, a Havana-influenced pottery type recovered from several sites in southwestern Minnesota (Anfinson 1979). The criteria for the definition of Sorg as an archeological phase are unknown, as it is essentially one of several Havana-influenced ceramic styles with a limited context based entirely on early archeological fieldwork. Little is known about the subsistence and settlement patterns or nonceramic artifact types of the Sorg phase. Like much of the Woodland in Minnesota, a variety of stemmed and notched projectile points have been found in Sorg contexts. Two of the known Sorg sites are rockshelters, and are in

this way similar to La Moille. The remainder of the sites identified with Sorg components are in riverine settings.

Sorg has not been radiocarbon dated, but it has been tentatively assigned to the period between 200 B.C.-A.D. 300 based on similarities in ceramic definition with materials from the Havana site in Illinois (Anfinson 1979). Sorg is best known for sites in the vicinity of Spring Lake in Ramsey County. Although not clearly associated with "true" Hopewell, the Sorg phase is known locally from the vicinity of Spring Lake where a Hopewell mound was excavated during the late nineteenth century.

#### Late Woodland

The Late Woodland is defined here to encompass the area of deciduous forest in southeastern Minnesota. This concept of a distinct Late Woodland period is of limited use when defining, like several others in this report, a broad context that is designed to be subdivided as more information on this period of time becomes available. Late Woodland in southeastern Minnesota appears to share some relationship with Effigy Mound complexes better known in neighboring Wisconsin and Iowa, and may ultimately be subdivided in a manner similar to that used by Hurley (1975). As such, Late Woodland may encompass a period with greater time depth than that used in other regions, extending into what is temporally referred to as Middle Woodland elsewhere.

In its simplest form, the thematic basis for this context is that it encompasses the period of time between the demise of the Havana-related cultures and the appearance of Oneota in southeastern Minnesota. It is possible that there are non-Havana-related cultures that are included in this study unit which need to be defined further. Similarly, it is probable that at least some of these groups are contemporary with early Oneota.

Late Woodland cultures are, in general, not well understood throughout the Midwest (cf. Fitting 1978:51-57). In Minnesota, our knowledge about these groups is particularly sketchy. This may be due in part to relatively low population densities during this period, but is also a function of the few sites that have been discovered and excavated. There is increasing evidence that many of the Late Woodland sites are situated in the floodplain of the Mississippi and other streams, and are therefore not easily discovered or investigated. Likewise, there is also evidence that Late Woodland components will be found buried under colluvium in coulees and ravines. At the King Coulee site (21WB56) ceramics decorated with a variety of incised lines and triangular punctates described as Madison Triangular Punctate were recovered and attributed to a Late Woodland component (L. Gonsior, personal communication 1994).

The subsistence base of Late Woodland appears to be a mix of hunting and gathering, which represents a stable and effective adaptation to the deciduous woodland and riverine environments of the southeastern portion of Minnesota. Late Woodland settlement patterns and population density remain largely unknown. Although subsistence data for Late Woodland in Minnesota is conspicuous by its absence, recent work in southwestern Wisconsin and northeastern Iowa provides a working model for Late Woodland subsistence practices. Thelet (1987: 121-122) states that:

The model of Woodland stage subsistence presented here is a bipartite system having fall-winter-early spring and summer components to the seasonal round. The seasonal cycle is propelled by scheduling the optimal periods for harvest of a few select animal taxa. A pattern of upland, fall-winter site occupation is identified .... The subsistence activities at these

sites focused on the procurement and processing of large mammals. This pattern was well developed by the Late Archaic and shows no appreciable change during the Woodland tradition. It is suggested that this represents an effective adaptation to a specific, seasonally desirable resource, the white-tailed deer .... A number of sites located on the floodplain of the Mississippi River in southwestern Wisconsin are attributed to summer occupations during the Woodland tradition. The analysis of subsistence remains from these sites indicates a focus on seasonally available resources, particularly freshwater mussels and fish.

Although maize cultivation is normally associated with the later Oneota cultures of Minnesota, there is evidence that maize was being grown and utilized in a limited fashion by at least some Late Woodland groups. Scullin (n.d.) has reported the presence of maize at the Nelson site (21BE24) in Blue Earth County. No radiocarbon dates are available for this site, but Scullin (n.d.:8) suggests that the site dates between A.D. 900 and 1000. The maize from the Nelson site was examined by L.W. Blake and H.C. Cutler who observed that 8, 10, 12, and possibly 14-rowed corn was grown at the site. Blake and Cutler state:

The sample of corn from the Nelson site is an intermediate to the early and the later kinds of corn in eastern United States. For the time and place, absence of small corn grains and lack of a tendency toward grains which are wider than long appears to be unusual. These may be due to the small and possibly unrepresentative nature of the sample. On the other hand, very little corn of the time period of this site has been found in northernmost, Midwestern states. (Appendix in Scullin n.d.)

The artifact assemblages for Late Woodland in southwestern Minnesota remain poorly defined, but should bear strong similarities to assemblages in Wisconsin and Iowa. There are a number of ceramic types that should be present. These include the Lane Farm, Madison, and Minott Cord Impressed series (see Baerreis 1953; Hurley 1975; Logan 1976; Benn 1978, 1979, 1980). Detailed ceramic studies for Late Woodland sites in southwestern Minnesota are presently lacking, and both relationships and differences with the Late Woodland of neighboring states are unknown.

Two Late Woodland ceramic types have been defined for Minnesota. These include Nininger Cordwrapped Stick Impressed (Johnson 1959:22) which appears to be a variant of Madison. Bremer Triangular Punctate (Jenson 1959:29) was recognized at the Bremer Village site (21DK6) in Dakota County.

The lithic assemblages of Late Woodland remain poorly known, but appear to contain a number of scrapers and a variety of small projectile points, including both notched and unnotched triangular points. These last forms are presumably associated with the introduction of the bow and arrow during the later portions of Late Woodland.

Burial modes of Late Woodland peoples in southeastern Minnesota are also poorly known. However, it appears that burial in conical mounds was important. In Iowa and Wisconsin effigy mounds (e.g., mounds in the forms of snakes, bears, panthers, etc.) contain Late Woodland burials. However, Oneota groups also buried their dead in effigy mounds (Maxwell 1950) and there is not a straightforward correlation between the presence of effigy mounds and Late Woodland groups.

The temporal range for Late Woodland remains essentially unknown. Presumably it postdates the Havana-related cultures and continues until ca. 900 years ago (A.D. 1100). Late Woodland groups appear to be, in part, contemporary with early Oneota.

The distribution of Late Woodland complexes in southeastern Minnesota remains poorly known. Based on available information, it would appear that these sites will be found from Dakota or Ramsey counties down the Mississippi River to Houston County, and west to the Blue Earth River valley.

## Southwestern Minnesota

*Fox Lake phase.* Fox Lake represents the first appearance of ceramics in the prairie regions of southern and southwestern Minnesota. Fox Lake was first recognized by Lloyd Wilford (1955a) and more recent work by Hudak (1974, 1976), Benn (1982a, 1982b) and Anfinson (1987: 106-135) have shed additional light on this complex. However, the number of carefully excavated sites remains few, and the internal development of Fox Lake is poorly known. It is perhaps most appropriately described as Initial Woodland, as it represents the appearance of ceramics in the Prairie Lakes region of Minnesota, but is contemporary with cultures described as Middle Woodland to the south.

Anfinson (1987:112) characterizes Fox Lake ceramics as:

moderate to small sized conoidal to subconoidal vessels with bold exterior cordmarking that is usually vertically oriented, but occasionally oblique or horizontally oriented; the horizontally cordmarked vessels are often partially smoothed and a few Fox Lake rims feature complete smoothing. Vessel walls are relatively thick (6-12 mm) and the paste is sand-tempered. . . About two-thirds of the vessels feature some exterior rim decoration notably trailing, bossing, punctating, and dentate or cordwrapped stick stamping. . . Occasional interior decoration features short, vertically oriented tool or cordwrapped stick impressions in a single band immediately below the lip.

Hudak (1976) and Benn (1982b) have suggested models for subdividing Fox Lake ceramics into different types (see also Bonney 1962, 1965). According to Benn (1982b: 168):

In sum, the Fox Lake series is a time transgressive category that, when studied more thoroughly in the future, will prove to have some unconformable characters among its several predictable attributes. Regular patterns are evident in the gradual shift from conoidal to subconoidal ('necked') forms and in the narrowing of trailed lines. In addition, trailed designs become more complicated through time, and other traits are added (e.g. surface smoothing, cordwrapped-stick stamps, punctates). There will be unconformities, however, in the combinations of these traits when comparing site collections, especially in the traits of rim form, width of trailed lines, horizontal cord roughening, and cordwrapped-stick stamps. The most pertinent unconformities will show up in the temporal context of these traits and their combinations, for it is doubtful that attributes revolved in and out of popularity with uniformity in the Prairie Lakes subarea.

Munson (1982:646-647) has suggested that Fox Lake may be related to Black Sand and has argued that the Black Sand tradition began somewhere in the northwestern Midwest, expanded into the central Illinois River Valley (ca. 2,300-2,400 B.P.) and subsequently retreated to the northwest and participated in only a limited way in the Hopewell Interaction Sphere. Fox Lake does share broad morphological similarities with Black Sand, Prairie Incised, Dane Incised, and other incised-over-cordmarked ceramics described for the upper Midwest. The present level of data is unfortunately, not sufficient to pursue Munson's hypothesis.

The lithic assemblages of Fox Lake sites contain an assortment of scrapers, utilized flakes, bifaces, and other common nondiagnostic tools. Hudak (1974) has described the projectile points from the Pedersen site and mentioned stemmed, side-notched, corner-notched, and unnotched triangular varieties (see also Anfinson 1987: 120-126). Lithics share similarities in both raw material and form to materials from the prairies to the west.

Fox Lake settlement patterning is known at a gross level, and Fox Lake sites are most commonly situated on the margins of lakes in the prairie. Fox Lake subsistence appears to rely heavily on bison coupled with the seasonal utilization of aquatic plants and animals from lakes, as well the use of other mammals such as deer (Shane 1978; 1982).

Benn (1982b: 169) suggests that the Fox Lake ceramic series dates between about 2,200 to 1,500 years ago (200 B.C.-A.D. 500), although Anfinson (1987:106) would extend the range of Fox Lake to 1,300 years ago. This would place Fox Lake within the Middle Woodland period, as described for sites in the Lower Mississippi Valley, or contemporary with Prairie Incised which has been described as Early Woodland in southwestern Wisconsin. These ages are based principally on a limited number of radiocarbon dates from several different sites. This relatively long period of time for a single phase suggests that far more work is needed to refine both the chronology and internal development of Fox Lake.

Fox Lake sites are found in the prairie area of southern and southwestern Minnesota. The distribution of Fox Lake sites extends into eastern South Dakota and northwestern Iowa. They are typically found along the margins of lakes in the prairie region of Minnesota, but are also found along rivers and streams. Little work has been accomplished in delineating specific settlement types for Fox Lake.

*Lake Benton.* Lake Benton is best known as a ceramic series that is distributed through southwestern Minnesota and extends well into north-central Iowa. Lake Benton ceramics are thin-walled, wide-mouthed jars with flat to slightly rounded lips, straight or everted rims, rounded shoulders and conoidal bottoms. Decoration on Lake Benton ceramics include both cordwrapped paddle and cordwrapped stick impressions. Several different types for Lake Benton have been proposed, including Lake Benton Cordwrapped Stick Impressed and Lake Benton Vertical Cordmarked (Anfinson 1979).

According to Benn (1982b: 177):

The origin of the Lake Benton series seems to be in the Fox Lake ceramic tradition, and its development parallels the rise in central Minnesota of ceramics with bands of stamped and punched decorations on the rim (e.g. St. Croix). . . The Lake Benton series ceramics dominate the pottery industry in the Prairie Lakes region until at least A.D. 800 and perhaps later. The one radiocarbon date on this series is from the Pedersen site, A.D. 1245±80 (I-8982; Hudak 1976:3), but it seems too late for pottery with subconoidal body forms.

Anfinson (1987: 143-158) has argued that Lake Benton represents a distinct phase that dates between A.D. 700 and 1200. In Anfinson's view (1987:143):

In the Prairie lake region, change is less evident at this time, certainly less evident than in the Midwest. While there may be a shift to the bow and arrow and increasing but still limited use of burial mounds, the subsistence-settlement pattern does not appear to change and the ceramics evidence only gradually shifts in decorative styles and technique preferences. By A.D. 700, however, more dramatic changes are evident in the ceramic technology and the use of burial mounds appears to be

widespread. These changes in ceramics and mortuary practices mark the end of the Fox Lake phase and the beginning of the Lake Benton phase. The Lake Benton phase probably survives well into the Late Prehistoric period, co-existing with and probably interacting with Plains Village and Oneota complexes.

Lake Benton is based principally on excavated data from the Pedersen, Mountain Lake, and Arthur sites. As the two quotations above point out, there is significant divergence in the interpretation of the material content and timing of Lake Benton. As Benn (1982b:185) notes:

The numbers of radiocarbon dates and excavated, stratified sites are barely sufficient to generate a skeletal picture of prehistory in the Prairie Lakes subarea. The cultural sequence described herein was only made possible because Woodland sequences and cultural evolution outside this subarea are better known. The ceramic sequence in the Prairie Lakes subarea is similar to that in other parts of the Prairie Peninsula, but there is a lag in the sequence until ca. A.D. 700. This lag not only appears in the transversion of the Fox Lake series, but it also is manifested in the relative lateness of Lake Benton ceramics. Because the Fox Lake and Lake Benton series are confined to the Prairie Lakes subarea, it is entirely possible that a restrictive Woodland adaptation to this sub-area is being reflected in ceramic styles and technology.

Considerably more information is needed on Lake Benton. The work of Benn (1982b) and Anfinson (1987) provide a base for developing testable models and hypotheses about Lake Benton and this period of time in southwestern Minnesota. Lake Benton is later than Fox Lake, but only one radiocarbon date is available for Lake Benton (I-8982, A.D. 1245±80). However, Benn suggests that Lake Benton ends by perhaps A.D. 800. Anfinson views Lake Benton as persisting much later in time.

#### Central and Northern Minnesota

*Brainerd.* This historic context is based principally on the Brainerd series of ceramics. The type Brainerd Net Impressed was first identified by Johnson (1971a:52) and the delineation of Brainerd as a ceramic ware was accomplished by Lugenbeal (1978). Brainerd ceramics are tempered with sand and/or crushed granite. The form is subconoidal, although a variant form may be a shallow, round-based bowl with a straight rim. Interior rim decoration occurs occasionally, exterior rim decoration occurs in perhaps half the sherds that have been examined, and 80% of the lips in the samples that have been studied are plain (Johnson 1971a:52; Birk 1979). There are two distinct types of Brainerd ware. Brainerd Net-Impressed has an exterior surface treatment that shows evidence of net impressions, fabric-like impressions (perhaps from dragging net over the surface), and occasional smoothing. Brainerd Horizontally Corded has exteriors that were produced with fine cords impressed horizontally or obliquely. Brainerd ware cord impressions are not the result of paddling (Lugenbeal 1978:47; Birk 1979:45). Neumann (1978; 1984) has suggested that another type named Gull Lake Net Impressed exists, although the utility of this designation remains a matter of debate.

Brainerd remains poorly understood. Initial evaluation of this ceramic series has provided some important information, but remains based on a relatively small sample. Information about associated subsistence and settlement practices, lithic assemblages, and the like, remain conjectural. The most cogent summary of Brainerd is that of Lugenbeal, who concludes that:

Stratigraphic evidence in southern Blackduck sites (Osufsen and White Oak point) hints that Brainerd ware has greater antiquity than Blackduck or Sandy Lake pottery in these sites. Whether Brainerd ware overlaps Blackduck in these sites cannot be determined from the available evidence .... Stratigraphic evidence in the Rainy River region and Manitoba (McKinstry Mound 2, Lockport, Cemetery point) shows clearly that Brainerd ware is contemporaneous with Laurel ware. The Laurel pottery of Lockport possesses all of the earmarks of late Laurel; however, the Laurel ceramics of McKinstry Mound 2 belong to the Middle Laurel McKinstry phase (Stoltman 1973:119) and the Laurel ceramics of Cemetery point are typical of the early Laurel Pike Bay phase (Stoltman 1973:114). Consequently, the origin of Brainerd ware may predate the A.D. 600-800 temporal range suggested for Brainerd Net Impressed (Johnson 1971a:53). Full components characterized by Brainerd ware are only found south of the Rainy River region. Significantly, Laurel components have not been found south of the Rainy River region .... Brainerd ware is stylistically unrelated to Blackduck. Of the two pre-Blackduck wares found in northern Minnesota associated with Blackduck (Brainerd and Laurel), it is Laurel that has much the stronger similarities to Blackduck.

The temporal range of Brainerd ware is very poorly known. Johnson (1971a:53) has suggested that it dates between 1,200 to 1,400 years ago (A.D. 600-800). Lugenbeal (1978:51) argues that it may be somewhat earlier. A recent series of radiocarbon dates for Brainerd Net Impressed ceramics from sites in Mahanomen, Hubbard, and Cass counties suggest they could be substantially older. All three of these AMS dates are from residues scraped from Brainerd sherds, and they suggest a preliminary range for the style between 3 100-2400 B.P. (Hagglund 1994; Kluth and Kluth 1994; M. Justin, personal communication 1994).

The geographic distribution of Brainerd is poorly known. Lugenbeal (1978:51) suggests that full components containing Brainerd ware are found in north-central Minnesota south of the Rainy River region, while occasional Brainerd sherds are found in the Rainy River area. A cursory review of site locations identified Brainerd ware, or net impressed sherds, at sites in a minimum of eleven Minnesota counties and one Wisconsin site. In the early literature net impressed ceramics were with sites assigned to the Malmo, Laurel, Kathio, Blackduck, and Arvilla Foci (Wilford 1955). This includes sites in the Mississippi, Rainy, and Red River drainages associated with a variety of vegetation types. Brainerd sites include locales clearly associated with wild rice procurement during later prehistoric and historic occupations. Both location and faunal remains suggest that Brainerd and later Woodland occupants hunted for bison on the prairies of Western and Southwestern Minnesota. The widespread distribution of Brainerd aids in interpretations of its potentially early temporal position.

Brainerd ware is clearly associated with mounds, as excavations at the Slilinger (21NR1) and the McKinstry (21KC2) mound groups each recovered net impressed sherds in mound fill (Johnson 1973; Stoltman 1973). A net impressed bowl was found at the King Mound (21CW2) although its association with burials in the mound is unclear (Johnson 1971; Wilford et al 1969). At the Gull Lake Dam site (21CA27) a complete Brainerd vessel was associated with a possible cremation in a submound burial pit (Johnson 1971). Although this burial was not radiocarbon dated, this burial mode was excavated at the Morrison Mound Group (21OT2) and produced a corrected radiocarbon date of 800 B.C.±200 (Anfinson and Wright 1990). The Mornson Mound and Gull Lake Dam sites are associated with Malmo discussed below.

*Malmo.* Malmo has been provisionally defined as a ceramic phase. Malmo was originally defined by Wilford (1941; 1955) within the Mille Lacs aspect (Lake Michigan phase, Woodland Pattern). Mille Lacs has in recent years been considered a ceramic sequence, although this may simply be an incorporation of Wilford's aspect into a contemporary lexicon. The definition of the ceramics is based upon materials from the Graham Lake, Malmo Mounds and Brower sites. The ceramics are grit-tempered, smooth surfaced, conoidal or subconoidal with little decoration. The decoration, when present includes punctates and bosses, occasional incising and dentate stamping. At the Brower site, there are some decorative modes that are similar to the Havana modes present on Howard Lake ceramics. Malmo ceramics are the first ceramics that appear in east-central Minnesota. If Stoltman's (1973) analysis of Laurel as moving from south to north to the Rainy River region is correct, Malmo must, at least in its initial phases, antecede Laurel. Probably associated with Malmo are small conical burial mounds like the Anderson Mound at the Brower site and the Mornson Mounds in Ottertail County that have shallow central burial pits over which lay partially burned interlaced branches or logs.

So little is known of the culture content and the spatial and temporal distribution of Malmo that it is impossible to say at this time if Malmo is merely a ceramic phase or if it is an archeological culture comparable to Laurel and therefore divisible into phases. The presence of Havana decorative modes at the Brower site suggests the latter, for Havana appears to be a brief horizon style in Minnesota that intrudes into the east-central region. Fitting (1970: 129142) uses the term Lake Forest Middle Woodland to describe a widely distributed group of cultures with similarities in material culture and a similar ecological base. Malmo appears to fit within this broader regional tradition.

At present, Malmo appears to span the period from about 2200 B.P. to 1800 B.P. (200 B.C.-A.D. 200). This temporal placement is based on a limited number of radiocarbon determinations and does not include the date recovered at the Mornson Mound. This would suggest a contemporaneity with Middle Woodland cultures to the south. The exact geographic distribution of Malmo is not known. It is represented in east-central Minnesota by both ceramics and burial mounds, but its larger distribution is virtually unknown except that burial mounds of the Anderson-Brower form do occur across central Minnesota into the prairie zone.

*Howard Lake.* Howard Lake was initially defined by Lloyd A. Wilford as the Howard Lake focus (Wilford 1955), and although the terminology has changed since Wilford's time, the Howard Lake appellation persists as the title of an archeological unit that we now know is the most northern regional expression of what Stuart Struever (1964a) has termed the Hopewell Interaction Sphere.

The relationships of the Howard Lake complex with Havana may be explained by a model in which the Howard Lake mounds and associated habitation sites were directly involved in the logistics network described by Struever (1964a). That network supplied exotic raw materials to the more southerly classic Hopewellian populations of central Illinois and in the course of that process of interaction, stylistic concepts were interchanged. Thus, the dentate stamping, the zoning of decorative motifs, and other distinctive Havana ceramic decorations moved north as stylistic concepts which found expression in Howard Lake ceramics. However, as noted by Gibbon and Caine (1976), Havana-influenced ceramic modes cannot be distinguished as "Havana" or "Hopewell," as



they are not associated with the remainder of the material culture associated with these phenomena to the south.

The relationships between Howard Lake and the Illinois Havana Hopewell is only evident in the ceramic assemblage. Vessel morphology and decoration (including dentate and check stamping) are similar. Anfinson (1979:96) describes Howard Lake ceramics as:

...smooth surfaced, thick-walled, wide-mouthed jars with beveled lips, straight to slightly outflaring rims, slightly constricted necks and conoidal bottoms. The decoration on Howard Lake vessels is primarily on the exterior rim and shoulder but occasional decoration appears on the interior rim, the lip and even the mid-body area. The most common decorative modes are straight dentate stamps, ovoid stamps, trailed lines and bosses impressed in a smooth surface. The dentate stamps are usually used in alternating oblique and horizontal bands on the rim or in panels on the lower rim or shoulder. Trailed lines are used primarily to delineate either horizontal or vertical zoning. The use of fairly large, smooth areas on some sherds emphasizes 'panel-zoning'. The use of external cordwrapped stick impressions is rare and when it appears it is in a herringbone pattern on the rim.

Wilford (1937: 123; 1955b: 131) argued that the beveled lip on Howard Lake vessels is one of the distinctive hallmarks of this particular ceramic sequence. It is notable that the definition provided above includes all of the hallmarks of the Malmo series of ceramics and that the two types are visibly similar. The precise difference between the two ceramic types may ultimately rest on the presence or absence of a beveled lip.

No radiometric dates have been obtained for any of the sites containing Howard Lake. However, based on comparisons with other known Havana Hopewell sites, it is presumed that Howard Lake sites date somewhere between 2,400 and 1,700 years ago.

Although Havana-like ceramics are found in many areas of east-central and southeastern Minnesota, the precise distribution of Howard Lake remains very poorly known. The principal concentration of Howard Lake sites is within the Howard Lake Archeological District around and near the margins of Howard Lake in southeastern Anoka County.

*Havana-related.* Howard Lake (see above) is perhaps the best defined Havana-related complex in Minnesota. However, there is evidence that there are other Havana-related complexes in the state as well. These are scattered along the Mississippi south from the Anoka Sandplain, although there may be other Havana-related complexes in east-central Minnesota and northwestern Wisconsin. Sorg ceramics (Johnson 1959) are clearly Havana-related and are found at several sites along the Mississippi River. The Trempeleau focus is also Havana-related and may have expressions in Minnesota (McKern 1931).

The significance of these poorly known Havana-related cultures lies principally in their relationship to one another and the Havana regional variant of Hopewell found in the middle reaches of the Illinois River Valley below Peoria, Illinois. Ceramic affinities with Illinois Havana ceramics define this relationship, and other aspects of the Havana assemblage as defined by projectile point styles and distinctive burial goods are absent. All of the Havana-related ceramic styles defined for the state fit better into what Fitting (1970: 129-142) refers to as Lake Forest Middle Woodland. These ceramic styles are widely distributed and associated with a similar material culture and ecological base.

The participation of these groups in the logistics network described by Struever (1964a) cannot be demonstrated by the presence of diagnostic stone tools, distinctive grave goods, or imported ceramic

vessels. The ceramic styles are similar in decorative modes to Hopewell and Havana groups, and tools made of exotic raw materials are known, but these materials were probably not acquired through direct participation in the Hopewell Interaction sphere. Minnesota sites with Havana-influenced ceramics are lacking the diagnostic materials which evidence Havana elsewhere in the Midwest.

Chronology for Havana-related sites is unknown and determining chronology for these complexes is a particularly important task. Inferred dates from the Illinois Havana complexes would place Sorg and others between around 2,200 and 1,700 years ago. However, there is no certainty that these dates are correct for the Minnesota material.

Geographic distribution of Havana-related complexes is very poorly known. In general, sites associated with this study unit appear to be found from the Twin Cities southward along the Mississippi River, particularly in Dakota, Washington, and Goodhue counties. However, a few ceramic pieces with Havana-like decoration have been found as far west as the Humphrey site (21FAi) in Fanbault County, MN. The recent discovery of a Howard Lake-like vessel in northwestern Wisconsin also suggests that the distribution of these complexes may be far more widespread than has been assumed.

*Arvilla Complex.* Development of the Arvilla complex began with A.E. Jenks' examination of burials and grave goods from the Lake Agassiz Campbell Beach deposits in 1908. The most detailed statement of the contents of Arvilla is by Elden Johnson (1973:3) who describes Arvilla as:

a burial complex distributed across central Minnesota by A.D. 600, persisting and reaching its greatest elaboration in the Red River Valley of the North, and probably cutting across distinct archeological phase .... [T]he complex is characterized by linear and circular burial mounds underlain by deep pits with complete and disarticulated primary burials, secondary burials, and a variety of associated grave goods. Among the latter are numerous ornaments of shell, bone, antler, and teeth. Utilitarian objects of bone and antler are common but chipped stone tools are rare. Pottery vessels as grave goods are uncommon, though pottery elbow pipes are more numerous.

Because Arvilla is defined as a burial complex, its relationship to other archeological phases is a matter that requires further research. Johnson (1973:66) suggests that:

My interpretation of the Arvilla complex is that it is a diagnostic cultural complex consisting of linear and circular mounds containing subsoil pits with flexed and disarticulated primary and secondary bundle burials. Associated with the burials are both utilitarian and ornamental grave goods. This complex developed rapidly about A.D. 500 to 600 in a geographic area extending west from the St. Croix River to the Red River and then north along the Red River. The complex developed at a time when marine shell ornaments moved into the area via both the Mississippi and Missouri River basins from the south, and the complex developed in a region where the antecedent burial mode was one of secondary bundle burials in shallow pits underlying circular mounds. The complex disappeared by A.D. 900 in the southern portions of this geographic area but may have persisted for several centuries in the Red River basin of Manitoba. The Arvilla complex contains an artifact assemblage that is northern, and the intrusion of marine shell trade goods of southern origins should not obscure this fact.

Ossenbarg (1974:28-29) argues that Arvilla represents the remains of the ancestral Cheyenne people. Michlovic et. al. (1977) take issue



with this identification. St. Croix ceramics have been linked with Arvilla and may represent the habitation portion of this burial complex (Johnson 1973:66). Caine-Hohman (1983:253-255) suggests that:

One clue to distribution [of St. Croix pottery] lies in the Arvilla Burial complex where both Blackduck and St. Croix pottery is found, although never in the same burials. It should be noted that Arvilla has an eastern 'cousin' (to use a normative perspective) in the Wayne culture of Michigan. The similarities between the two are most striking (Halsey 1981). Wayne is found in a 'Late Middle Woodland' context, and further reinforces Johnson's suggestion the spread of Arvilla is an east-to-west phenomena .... Arvilla is the religious ideological manifestation of an interaction sphere which unites populations experiencing increasing social segmentation due to population increases. St. Croix pottery serves as a distinctive informational signal associated with the spread of this complex and probably operating in both the religious and social systems.

Snortland-Coles (1983) and Thompson (1985) have provided more recent reassessments of Arvilla. Hudson (1974) reported a burial complex in Nobles County of extreme southwestern Minnesota that contained shell ornaments that may be related to Arvilla.

Based on available radiocarbon evidence, it appears that Arvilla dates between ca. 1,500 B.P. and 1,100 B.P., although it may persist somewhat later in the northern portions of the Red River Valley. Arvilla is geographically distributed throughout central Minnesota into the Red River Valley, with the Red River Valley being the location of the 'classic' and most widespread Arvilla manifestations.

#### Transitional Woodland (Central Minnesota)

This context is intended as a composite study unit that will, with further work, undoubtedly be refined and subdivided. The context subsumes developments in the central portion of Minnesota between the period 1,500 to 1,000 years ago.

The predominate ceramic types for this context are the St. Croix Stamped ceramic series and the Onamia series. St. Croix ceramics were initially defined by Elden Johnson and Leland Cooper (in Caine 1966). Onamia ceramics were initially defined by Elden Johnson (in Helmen 1964; in Bleed 1969; Johnson 1971; see also Caine 1969; George 1979; Ready 1979). These ceramics have recently been the subject of an extensive analysis (Caine-Hohman 1983).

This study unit subsumes the Isle phase and subsequent Vineland phase defined by Elden Johnson. The results of Johnson's extensive research in central Minnesota have not yet been fully published. Caine-Hohman (1983:65-67) describes these phases as follows:

a Transitional time period, from approximately A.D. 500 to A.D. 800 is defined by Johnson. This period encompasses the developments of the Isle phase, represented by components at ML-9, ML-10, ML-12, ML-16, and ML18 .... This phase is characterized by St. Croix pottery, small side-notched projectile points, and the construction of linear and conical mounds. Four phases have been delineated for the Late Prehistoric period, or from approximately A.D. 800 to 1650. The first two phases, the Vineland and the Wahkon, appear to represent developmental continuity with previous phases. The earliest, the Vineland phase, shows the development of the Kathio and Onamia pottery types, use of small side-notched and unnotched triangular points, and the construction of conical mounds. Excavations show a semisubterranean, rectangular house type. During this phase a shift from diffuse to focal subsistence strategy is evident, with wild rice intensification accompanying a demographic

increase. By the later Wahkon phase, Onamia ceramics are no longer present.

Caine-Hohman (1983:241) suggests that, at least from a typological point of view, Onamia, and St. Croix are part of the same ceramic series. Two tentative St. Croix types and one Onamia type have been proposed by Caine-Hohman in addition to the types proposed by Ready (1979). Further, Hudak (1976) has noted the similarity of his Series A ceramics from the Pedersen site (21LN2) to Onamia ceramics from Mille Lacs.

The similarity of these materials has led to the suggestion that the St. Croix/Onamia series are indeed closely related to Hudak's Series A, also known as Lake Benton. These forms represent two members of a broad horizon of cordwrapped, stick-stamped ceramics found throughout southern and central Minnesota. Moreover, the southern Minnesota ceramics may represent materials left by groups during seasonal movement from the woodlands of central Minnesota into the prairies of southern and southwestern Minnesota.

During the time period of the Transitional context, a number of changes in population density, burial modes, subsistence and settlement practices (?), and regional identity (?) took place. Gibbon and Caine (1980) have reviewed these developments and proposed several hypotheses about cultural change during this period. Caine-Hohman (1983:252-255) carries this discussion further:

St. Croix pottery clearly has connections with other named types in Minnesota. St. Croix shows close connections with Laurel dentate in decorative modes as defined by the type/variety method, as well as in styles. According to Lugenbeal (1976), if dating of late Laurel is at all accurate, apparently St. Croix and Laurel ceramic types overlap for a considerable time period. In northern Minnesota, Laurel types are replaced by Blackduck ceramics. Early Blackduck ceramics show many similarities with St. Croix. . . . One of the factors in the apparent distribution of the St. Croix pottery type may be its overlap with Late Laurel dentate stamp and early Blackduck bossed. St. Croix sherds found north of the Mille Lacs area are probably classed with one or the other of these types. . . . As previously discussed, sherds from White Oak point which are classified as Blackduck bossed by Lugenbeal would probably be classed as St. Croix stamped if they were found on a Mille Lacs site. . . . One clue to distribution lies in the Arvilla Burial complex where both Blackduck and St. Croix pottery is found, although never in the same burials. It should be noted that Arvilla has an eastern 'cousin'. . . in the Wayne culture of Michigan . . . Wayne is found in a 'Late Middle Woodland' context, and further reinforces Johnson's suggestion that the spread of Arvilla is an east-to-west phenomena. . . This movement of a religious burial complex suggests related social changes of considerable magnitude.

Tight dating of ceramic complexes and archeological cultures for the Transitional Woodland context remains elusive and is one of the premier study questions for this context. Based on available evidence, this context should date between 1,500 and 1,000 years ago (A.D. 500-1000). St. Croix and Onamia ceramics are found throughout central Minnesota into the Red River Valley, and in north-central Minnesota.

*Kathio.* The Kathio phase is best known from east-central Minnesota where it probably dates between A.D. 900 and 1300. The ceramics are grit-tempered, cordmarked globular vessels with expanding rims. There are no handles or lugs. Decoration is limited to the constricted neck and lip surface, the decorative mode is cordwrapped dowel, and the motifs are horizontal bands encircling the vessel and/or oblique impressions on the lip surface. Kathio ceramics are related to the Madison

cordmarked, Clam River, Blackduck, and Lake Benton ceramic series. All of these appear to be contemporary units and have a distribution from south-central Wisconsin west and northwest to southern Manitoba.

The associated artifact assemblage includes Eastern triangular points, snub-nosed endscrapers, deer ulna awls, rectangular semisubteranean houses (at Petaga Point). The faunal and floral assemblages suggest a forest/prairie adaptation and an intensifying use of wild rice.

Lloyd Wilford first defined Kathio as a focus in his Mille Lacs aspect and saw Kathio as terminal Woodland and as the late prehistoric complex associated with the Eastern Dakota. Wilford and W.C. McKern, who defined his Clam River focus at the same time, made the Dakota association on the basis of the overlap of the early historic period distribution of the Eastern Dakota and the geographic position of Kathio and Clam River, and the secondary bundle burial mode discovered in mounds in that same geographic zone. The burial mound Kathio/Clam River attribution was based on reasoning that the historic Dakota exposed platform burial mode extended back into the late prehistoric period and in that period, the remains of those exposed burials were subsequently collected and buried in mounds as disarticulated secondary burials. The absence of grave goods in the mound fill supported their view as it was assumed that grave goods were placed only with the exposed burial.

Michlovic makes the note that "...the Moose Bay mound in the Qu'Appelle Valley of Eastern Saskatchewan, materials were recovered relating to the Kathio focus of central Minnesota (Hanna 1976:64)" (Michlovic 1990:48). This is not to say that the distribution of Kathio is this widespread, but only that the range of Kathio interaction extended well into the Eastern Plains, and beyond the Minnesota border. This is important in emphasizing that Kathio and related regional entities had an important role in long distance interaction, although it is not to the southeast.

Kathio is best known from Mille Lacs where it appears in the sequence following St. Croix stamped ceramics and precedes Sandy Lake ceramics. It is believed to date to the period between 1100-650 B.P. (A.D. 900-1300). At Mille Lacs it is present at the Aquipaguetin Island, Vineland Bay, Petaga Point, Cooper, Malmo, and Garnson sites. It is probably also found elsewhere in central Minnesota.

*Laurel.* Perhaps the best general description of Laurel is that provided by Stoltman (1973:3):

What generally characterizes the Laurel culture, besides its Middle Woodland age and northerly geographic position, is a hunting and gathering way of life focusing, no doubt in a seasonal rhythm, mainly upon fish, moose, and beaver. In addition most Laurel sites are characterized by a distinctive assemblage of artifacts that includes the earliest ceramics in the area, a lithic industry typified by numerous end-scrappers and stemmed and notched projectile points, and a bone-antler industry whose hallmarks are cut beaver incisors and socketed and perforated antler harpoons. The ceramics were tempered with crushed rock, had their exterior surfaces smoothed but rarely if ever cord-marked, and had the upper rim area decorated mainly with a variety of dentate stamps, often applied in a push-pull or stab-and-drag fashion. Native copper was commonly worked into awls, beads, and other simple forms in sites of the Lake Superior basin, but the use of this metal decreased in the more westerly sites of the culture.

Stoltman (1973:114-118) proposes the Laurel culture has three phases that are regionally and/or temporally distinct. These phases are:

the Pike Bay phase along the southernmost border of the Laurel presence in Minnesota; the McKinstry phase; and the Smith phase.

Fitting (1970: 129-142) uses the term Lake Forest Middle Woodland to describe a widely distributed group of cultures with similarities in material culture and subsistence base. In Michigan he included a regional variant of Laurel within Lake Forest. As such, Laurel is the single representative of Lake Forest Middle Woodland by definition, although other groups described above might be included as well.

Laurel is clearly an adaptation to the systematic procurement of aquatic resources, and subsistence data from the Rainy River area suggests sturgeon and other species of fishes made up a significant portion of the Laurel peoples diet. Wild rice (*Zizania aquatica*) has been recovered in Laurel contexts (Anfinson and Wright 1990), although the extent to which the resource was utilized is unknown. In addition, bison remains are known from Laurel sites on the Rainy River as well as on the prairies and prairie margins in the western part of the state.

A detailed chronology of Laurel has yet to be worked out. However, a series of radiocarbon dates are available that provide a base for an initial chronology. Some argue that Laurel dates between about 2,200 and 1,200 years ago, while a more conservative reading of the evidence would suggest a span of time between ca. 2,000 B.P. and 1,500 B.P.

In Minnesota, Laurel is most commonly found in the northeastern quarter of the state, although it has been recovered in Kittson County in the extreme northwest and southwest as far as Otter Tail County. The best known Laurel sites are along the Rainy River and Rainy Lake in Koochiching County. However, Laurel has a broader distribution throughout eastern North America. According to Stoltman (1973:3):

This culture extends in space from the eastern margins of the Great Plains in east-central Saskatchewan (Woodbury 1962) eastward across southern Manitoba, northern Minnesota, and contiguous Ontario, around the North Shore of Lake Superior, and southward into the upper Peninsula of Michigan to at least Summer Island in Lake Michigan (Brose 1970). The precise eastern limits of the Laurel culture are difficult to define because of considerable interaction in southeastern Ontario along the north shore of Lake Huron and Georgian Bay with the more easterly centered, closely related, Point Peninsula culture (Johnston 1968; Griffin 1964:224; Ritchie 1965:203-213; Wright 1967: 109117). The northern limits of the Laurel culture are even more difficult to ascertain, mainly because of a paucity of research, but it seems clear that as one moves northward out of the Transitional Lake Forest Formation (Weaver and Clements 1979) into the boreal forest, the incidence and size of Laurel sites diminishes greatly. To the south the Laurel culture penetrates only the northernmost tip of Michigan's Lower Peninsula (Fitting 1970: 138), is unreported from Vilas County (Salzer: personal communication) or elsewhere in northern Wisconsin (although evidence of contact is clear in the North Bay culture of the Door Peninsula—(Mason 1966, 1967), and is unknown in Minnesota south of the northernmost counties bordering on Canada (Streiff 1972:35).

*Blackduck.* Blackduck is a distinctive series of ceramics found in northern Minnesota and Ontario, and the term applied to the archeological culture associated with these ceramics. Blackduck was initially defined by Lloyd Wilford on the basis of his work at the Shocker habitation site (21BL) and the Osufsen burial mound (211C2) (Wilford 1941). Subsequent work by MacNeish (1958), McPherron (1967), Evans (1961a, 1961b, 1961c) and Lugenbeal (1976, 1978) have refined and expanded the definition of Blackduck.

Blackduck ceramics are complex and there appears to be considerable variation in this series through time and space. In general, Blackduck pottery is globular in form and tempered with grit. The surface

of Blackduck vessels is commonly cordmarked, although fabric impressions are also found, especially in the Rainy River region. There are a variety of decorative techniques that are used on Blackduck vessels, and these include punctations, application of cordwrapped stick impressions, punctates, and bosses (Peters 1988). As such they share broad stylistic similarities with other varieties of, presumably contemporary, ceramics from other parts of Minnesota to the south as well as materials known for neighboring states.

Several different typological schemes for Blackduck ceramics have been proposed, but none of these has yet been proven to be useful and Blackduck typology needs reevaluation (Lugenbeal 1976:275-316; see also Lugenbeal 1978, 1979:28). Based on analysis of Blackduck materials from the Smith site (21KC3) Lugenbeal has separated Blackduck ceramics at that site into early and late phases.

Early phase Blackduck vessels are predominately cordmarked and paddled and interior rim decoration consisting of a row of long oblique cordwrapped stick impressions were common, as were other decorations. One distinctive group of vessels in the early phase was bossed, and characteristically had a tendency toward long rims and necks and flatly angled shoulders. Late phase vessels were usually not cordmarked or paddled but instead had body surfaces that were marked with fabric impressions. Less than 20% of these vessels had interior rim decoration, but other characteristics of the rim and lip decoration were distinctive (Lugenbeal 1979:28).

Lugenbeal (1979:24) has summarized other aspects of Blackduck culture as follows:

Evidence indicates a hunting and gathering subsistence base with marked seasonality involving intensive exploitation of fish during the warmer periods of the year. Evidence for wild rice utilization has been found at the Scott site and Nett Lake sites, but his association with the Blackduck as opposed to Sandy Lake occupations of these sites is not conclusive. Blackduck sites often contain burial mounds, although the circular mounds are modest in size compared to many of the Middle Woodland Laurel mounds. Blackduck burials are usually found in these mounds and occur 1) in pits excavated below the floor of the mounds, 2) on the floor of the mounds, and 3) in the fill of the mounds. The majority of the mound burials are interpreted as primary, partially flexed, burials in the sitting or semi-sitting position. Blackduck burials have been found unassociated with burial mounds at the Shocker site, perhaps occurring in a very slight natural elevation, and frequently occur as intrusions into Laurel mounds in the Rainy River region. Burial goods occur with a portion of the burials (e.g. 12 of 45 burials at the Osufsen burial mound). When burial goods occur, they consist most frequently of small mortuary pots, but harpoons, beads, knives, and other artifacts have on occasion been found. Skeletons are sometimes placed on birch bark mats or wrapped in birch bark. The artifacts associated with Blackduck pottery in northern Minnesota sites have been described by Evans (1961a). However, the sites described by Evans are multicomponent sites and the relationship of the nonceramic artifacts to the Blackduck component is never beyond question. Evans lists the following artifact types:

Projectile points - small triangular and small triangular side-notched Oval and lunate knives Side scrapers Trapezoidal end scrapers Oval end scrapers or thumbnail scrapers Tubular-shaped drills Steatite and clay pipes Bone awls or needles Unilaterally barbed harpoons made of mammal bones Flakers

Bone spatulas Cut beaver incisors Bear canine ornaments Native copper fishhooks, gorges, and beads

Only the Smith site contains sufficiently well defined natural stratigraphy to allow relatively unambiguous assignment of nonceramic artifacts to the Blackduck component. The most diagnostic nonceramic artifacts in Blackduck occupations are the small triangular and side-notched projectile points and the unilaterally barbed harpoons.

Blackduck ceramics are the most common prehistoric complex found in the Rainy River region, and the headwaters of the Mississippi River. More than 3,000 Blackduck vessels are known in extant collections (Lugenbeal 1979:26). However, many of the details of Blackduck subsistence, settlement patterning, and development remain poorly known. The regional variation in Blackduck suggests that there may be significant differences in the development of this archeological culture in various regions of Minnesota. This state of affairs is due in part to the multicomponent and mixed nature of many Blackduck sites. Discovery and excavation of single component Blackduck sites, or sites with stratigraphically separate Blackduck components, is essential. Likewise, rigorous analysis and model-building for Blackduck is a task that needs to be more broadly attempted.

Based on existing radiocarbon dates, Blackduck appears to exist between roughly A.D. 800 and A.D. 1400. However, in the Mississippi Headwaters area, it appears that Blackduck occurs only during the first half of this temporal range. In northern Minnesota, particularly along the Rainy River, Blackduck persists much later in time. In this region, it appears that Blackduck is, at least in part, contemporary with Sandy Lake (Wanikan culture?). Lugenbeal (1979:23) comments that historic materials have been found associated with Blackduck ceramics in parts of Ontario north and northwest of Lake Superior, but that no historic contact materials have yet been definitely associated with Blackduck ceramics in Minnesota.

Blackduck is widely distributed across the lake-forest biome and extends from northwestern Michigan and the upper Peninsula westward to east-central Saskatchewan. In Minnesota, Blackduck is widely distributed across the state, with a particularly heavy concentration of sites in the Rainy River region, and numerous sites throughout the Mississippi Headwaters area.

## 7 The Late Prehistoric Period, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

In Late Prehistoric times, radical changes occurred across much of the Northeast Woodlands region. Most groups adopted maize horticulture and settled in relatively permanent villages where the storage of foodstuffs was emphasized. Wild rice became increasingly important as a harvestable resource in the northern portions of the study area. Across much of the region, thin walled, shell-tempered pottery replaced the grit-tempered paste of earlier Woodland ceramics, and decorative techniques and styles also changed. The origin and meaning of these changes is a subject of continuing debate among archeologists. The end of the Late Prehistoric period is also poorly understood, and in most areas it is not at all clear how American Indian groups identified at European contact are related to the pre-European archeological remains of the region.

### Iowa

The Late Prehistoric time period (ca. A.D. 900 to the time of initial European contact) was one of sweeping changes in social organization, subsistence, and technology throughout the upper Midwest. Cultural groups occupying Iowa during this time period include Great Oasis, Mill Creek, Glenwood, and Oneota cultures. Late Woodland cultural groups also persisted into the earlier portion of this time period. Late Prehistoric cultures tend to display a great deal of regional distinctiveness and are characterized by a reliance upon maize horticulture, a more sedentary lifestyle than their Late Woodland predecessors, a "clustering" of village locations, and a ranked, tribal, social organization of the types encountered by the first Europeans to visit the region.

Dobbs (1982), Gibbon (1982), and Benn (ed. 1988) refer to the transition from Late Woodland to Late Prehistoric lifeways as the "Mississippianization" process (see also Gibbon 1974). These characteristics reached their fullest expression at the enormous Middle Mississippian site of Cahokia in the American Bottom region (Fowler ed. 1973; Fowler 1989). While at one time, Cahokia was considered the capital of a state level society (Conrad and Harn 1972; P. O'Brien 1972; 1989), the consensus now seems to be that it was a high level chiefdom (Emerson and Lewis eds. 1991; Stoltman ed. 1991). Also recently, people have begun to question whether it was the large permanently occupied city of 10,000 to 40,000 people envisioned by Fowler (1975; Fowler and Hall 1978) and others, suggesting that it may have served as a large ceremonial center only at certain times of the year and maintained a relatively small permanent population (cf. P. O'Brien 1989; Milner 1990, 1991). Whatever its social organization and population level, its unique status as the largest, most complex archeological site north of Mexico cannot be denied, and its farflung influences and interactions throughout the Southeast and upper Midwest represent the most dominant theme in the Late Prehistoric time period of eastern North America (see Emerson and Lewis eds. 1991; Stoltman ed. 1991).

There are no Middle Mississippian sites in Iowa (Tiffany 1991a), but Middle Mississippian sherds have been found in Late Woodland contexts at the Hartley Fort (13AM103; Tiffany 1982b), Mouse Hollow Rock Shelter (13JK59; Logan 1976), Waterville Rockshelter (13AM124; Tiffany 1991b), the Sweeting site (13WS61; Tiffany 1986b), and the Gast Farm site (13LA12; Benn ed. 1988). Other Mississippian artifacts appearing in Late Woodland contexts in Iowa include a hooded water bottle from the Aicher Mound Group (13JH1; Tiffany 1991a) and a shell gorget with

a coiled rattlesnake with a feline head from Hadfield's Cave (13JN3; Benn 1980). These manifestations may relate to Tiffany's (1982b, 1991a) Hartley phase.

Mississippian contact with Great Oasis is suggested by the presence of *Anculosa* and marine shell beads on Great Oasis sites, and by the presence of Great Oasis sherds at the Eveland Spoon River Mississippian site, and at Cahokia itself (D. Henning 1967, 1991; Harn 1991; Tiffany 1991a). Some Mississippian influence is detectable in Glenwood culture sites as well. Glenwood is the term applied to Iowa components of the Nebraska phase of the Central Plains tradition (L. Brown 1966a; 1967a; Gradwohl 1969). Some shell-tempered ceramics are found on Glenwood sites, but these are usually either Oneota sherds or local copies (Anderson and Anderson 1960; Zimmerman 1977a; Tiffany 1991a). Tiffany (1991a:189) states that:

Mississippian or Mississippian-influenced traits in the Glenwood culture include earspools, red-slipped sherds, effigy lugs and handles, pottery figurines, side- and basal-notched projectile points, discoidals, beakers, bowls, seed jars, one red-slipped high-neck waterbottle, and limited examples of Southern Cult iconography.

Henning (1967) also reports the presence of Nebraska phase ceramics at the Eveland site in Fulton County, Illinois, and in the same features as Mississippian materials in a site just south of St. Joseph, Missouri. Wood, et al. (1995:70) state that, "South of St. Joseph the Nebraska-phase sites merge—at the moment, imperceptibly—with sites of the Steed-Kisker phase." It seems likely that Mississippian artifacts associated with Glenwood sites are the result of contact with Oneota and Steed-Kisker groups, rather than from more direct contact with the Mississippian heartland.

The most Mississippian-influenced group in Iowa is the Mill Creek culture of northwest Iowa. This culture consists of a series of phases, which, along with the closely related Over focus of South Dakota, can be assigned to the Initial variant of the Middle Missouri tradition (D. Anderson 1969; Tiffany 1983). In fact, Mill Creek displays so many Mississippian characteristics that Griffin (1946, 1960) proposed a direct migration of people from Cahokia via Aztalan in Wisconsin and Cambria in Minnesota to northwestern Iowa for the origins of Mill Creek (Tiffany 1983). As Fugle (1957:346-347) notes:

The close similarity of Mill Creek with the Middle Mississippi phase is borne out by such items as stone pulley type earspools, chunky stones, profuse amounts of marine shells for ornamentation, stone hoes (rare), triangular shaped retouched drills, double conoidal elbow pipes, shell columella pendants, the scalloped shell disc gorget and the use of wattle and daub in house construction.

To this trait list can be added the presence of Long Nose God masquette earrings in Mill Creek contexts (D. Anderson 1975a; D. Anderson et al. 1979). However, stratigraphic studies (D. Henning 1967) and an increasing number of radiocarbon dates have clearly demonstrated that Mill Creek culture was developing coevally in northwest Iowa with the developing Middle Mississippian societies in the American Bottom (Tiffany 1991b).

The final Late Prehistoric group present in Iowa is another group showing strong Mississippian influences, but whose relationship with groups in the American Bottom is equally confusing. This is the Upper

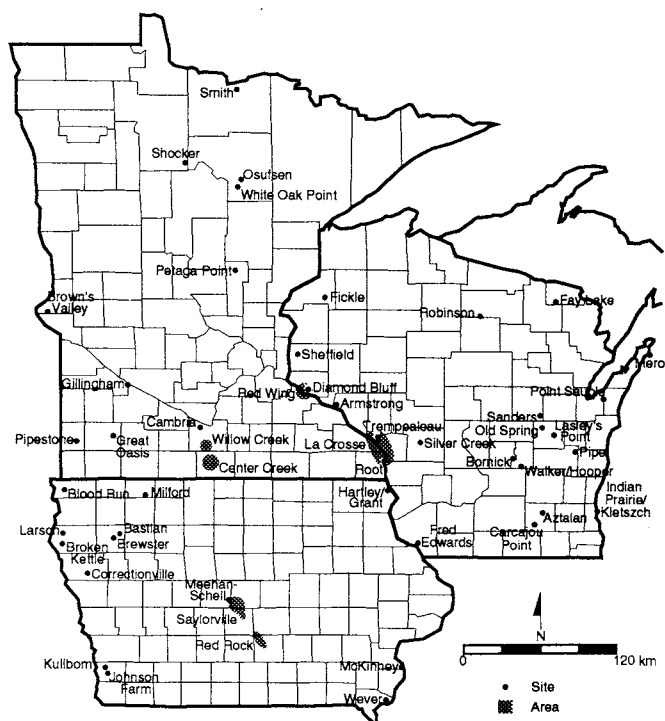


Figure 20. Late Prehistoric sites.

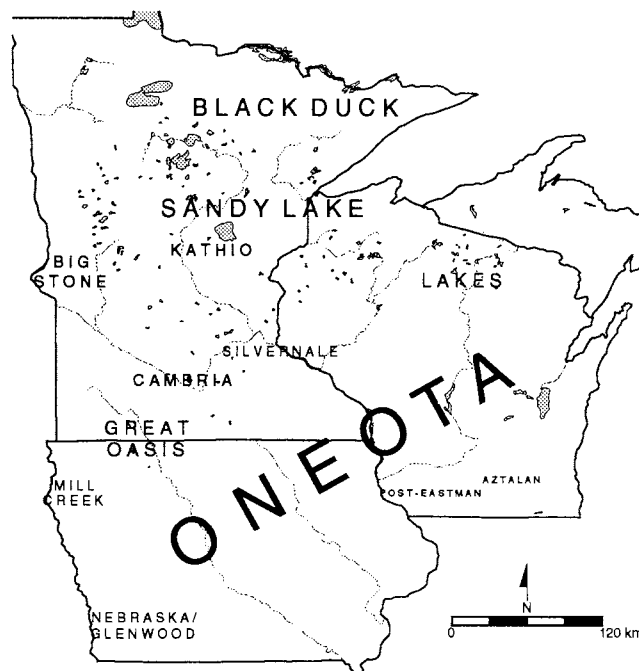


Figure 21. Late Prehistoric phases.

Mississippian cultural manifestation known as Oneota. Much as with Mill Creek, early theories on the development of Oneota emphasized the migrations of populations of Old Village (Stirling and Moorehead phases in the current terminology) Mississippian peoples from the American Bottom to areas such as Aztalan, Diamond Bluff/Silvernale, Spoon River, and Apple River localities of Illinois, and the subsequent development of adaptation to the more northerly forests and prairies, forming Oneota culture (e.g. Griffin 1937, 1960; McKern 1945; Ritzenthaler 1953). Recent dating has demonstrated that the earliest Oneota sites are as early as Emergent Mississippian manifestations in the American Bottom (cf. Baerreis and Bryson 1965; D. Henning 1970; Gibbon 1972a, 1982; Dobbs 1982; J. Brown 1982). Since these dates have become available, most people have favored some sort of in situ development model (cf. Ford and Willey 1941; Baerreis and Bryson 1965; D. Henning 1970; Gibbon 1972a; Hurley 1975; Overstreet 1976). However, Overstreet (1989) revived a migration model for the development of Oneota, with American Bottom residents fleeing the consolidation of power during the Emergent Mississippian period, moving north, and developing into Oneota. He seems to have backed away from this position more recently (Overstreet 1995). While Oneota culture is essentially defined on the basis of shell-tempered ceramics (D. Henning 1970), Tiffany (1979, 1982c:1) points out that:

The character of Oneota assemblages is seen as reflecting traits generally found among Late Woodland period groups in the northern Mississippi valley, Mississippian groups to the south, and Plains Village cultures to the west (Tiffany 1979:89; Wedel 1959:122). This is undoubtedly due to the intermediate geographic position of Classic Oneota sites among the aforementioned groups.

While there is a great deal of evidence for contact and trade between Oneota and Glenwood groups, there is virtually none for contact

between Oneota and Mill Creek or Great Oasis. Indeed, later Mill Creek villages tend to be fortified, and many have postulated an adversarial relationship between Mill Creek and Oneota (D. Anderson 1969, 1975b; L. Alex 1980). Each of these Late Prehistoric groups will be discussed in more detail below.

### Great Oasis

Great Oasis was defined by Lloyd Wilford (1945), based on his excavations at the Great Oasis, or Low Village site (21MU2), in southwestern Minnesota (Johnston 1967; Johnson 1969; D. Henning 1971a; Anfinson 1979). The taxonomic placement of Great Oasis is still the subject of some debate: a Plains focus of an aspect of the Mississippi Pattern (Wilford 1945); Great Oasis aspect (D. Henning 1971a; Tiffany 1983, 1991a); Great Oasis phase of the Plains Village tradition (Anfinson 1979, 1987); Great Oasis phase of the Initial Variant of the Middle Missouri tradition (Henning and Henning 1978; D. Henning 1991); or "a regional Late Woodland pottery complex (Tiffany 1983, 1991a). Benn and Rogers (1985) choose to refer to Great Oasis as a phase, but do not enter the debate over whether it belongs in the Middle Missouri tradition or some Woodland classification.

Using ceramic attribute analysis, Edwards (1993) attempted to determine whether Great Oasis ceramics from divergent regions represented a single cultural entity or were made by loosely related communities (i.e., separate phases) as a result of interaction and exchange. While his analysis showed the first scenario to be unlikely, he was unable to definitely accept the second. Meanwhile, E. Henning and D. Henning (1982) appear to tentatively define several Great Oasis phases or variants. They name the Prairie Lakes variant for sites in southwestern Minnesota and southeastern South Dakota and the Sioux variant in the river valleys of northwest Iowa and southeast South Dakota. They note that the materials from the Des Moines River Valley, while

similar to manifestations in the Little Sioux Valley, may represent another phase or variant. Meanwhile, D. Henning (1982a) has recently defined a Perry Creek phase, which consists of two sites (the Larson site, 13PM61, and 13PM60 in the Perry Creek drainage) dating to A.D. 1230 that represent an apparent shared occupation by Great Oasis and Mill Creek people.

Great Oasis sites have been demonstrated to occupy a large region of northwest Iowa, southwest Minnesota, and eastern South Dakota, extending into extreme southeastern North Dakota (D. Henning 1971a; Anfinson 1979). Anfinson (1987), however, notes that the Great Oasis type site is somewhat of an anomaly in the Prairie Lake region and is the only major Great Oasis village in Minnesota. He suggests that it may represent a temporary exile or colonization attempt on the part of Great Oasis groups developing in northwest and north-central Iowa.

The few radiocarbon dates from Great Oasis sites range from A.D. 800 to 1260, with most dates clustering between A.D. 950 and A.D. 1120 (Edwards 1993). This means that Great Oasis people were, for a time, contemporaneous with the later portion of the Loseke variant, as well as the earlier portion of the Mill Creek occupation of the region. Great Oasis ceramics are divided into two wares, Great Oasis High Rim and Great Oasis Wedge Lip (Henning and Henning 1978). The geometric trailed lines on Great Oasis High Rim ceramics are very similar to the corded designs on Loseke ceramics (Henning and Henning 1978).

Benn (ed. 1990) notes four areas of comparison for Great Oasis High Rim and Loseke ware. These are:

- (1) Diligent attention was paid to the technical qualities of vessel manufacture. The pastes are characteristically fine grained and tempered with crushed rock (usually granite). Walls are compact, dense, even surfaced, and sometimes very thin (ca. 4 mm). Exterior surface finish on the body consists of malleating with a paddle wrapped with fine cord.
- (2) Globular vessel forms predominate. Some Loseke vessels are slightly elongated (Kivett 1952:Plate XXIXA), but the thickened, pointed bases of earlier Woodland wares are gone.
- (3) Loseke rims may be vertical or flaring, while Great Oasis rims are flaring. In both groups the upper rim (there is no lower rim in Great Oasis) is straight and contains the decoration, and there is no decoration below the upper rim. The rim-shoulder juncture is sharply defined. In other words, in both groups the shoulders expand and are left plain, while upper rim decorations are emphasized. Most Great Oasis rims are parallel sided or thickened (wedged) at the lip. Loseke rims are usually parallel sided and sometimes slightly tapered toward the lip (also occurring in a few Great Oasis rims (Henning and Henning 1978:18), but some Loseke rims have wedge lips (e.g., Lawson site; Kivett 1952).
- (4) The precisely trailed motifs of Great Oasis and carefully impressed cords of Loseke ware have decorations organized in tripartite patterns or some variation thereof: notches or oblique lines at the lip-rim juncture; a central horizontal band; and a lower, often triangular (chevron) element. The chevron may be imposed on the central band, or it may replace the horizontal line motif. Some designs are virtually identical in both groups (e.g., A-1, A-2, B-1, B-2, B-5 in Johnson 1969:Figure 2). [Benn ed. 1990:141-142]

According to Benn (ed. 1990), ceramic collections from the upper Des Moines River valley contain Loseke ceramics with Great Oasis-like rims and lips with single cord impressions in parallel rows and triangles, while a few sherds exhibit narrow trailed chevrons over parallel cord impressions. Similar combinations of cord impressions and trailed lines are found at Scalp Creek (Hurt 1952) and the Hitchell site (Johnston

1967) in South Dakota. These similarities, and the apparent contemporaneity of Loseke and Great Oasis, have led D. Henning (1982a) to suggest that the two groups maintained a tandem relationship by exploiting separate territories in the same ecozones. It is of note that while Great Oasis Wedge Lip can comprise up to 50% of the ceramic sample in Iowa sites, it is virtually absent from Minnesota and South Dakota sites (Henning and Henning 1978). For this reason, it seems likely that this ware is unrelated to Loseke developments that overlap in distribution with Great Oasis and possibly derives from more southerly or easterly sources. E. Henning (1981) suggests that it may be related to low rim Minnott's types or some of the plain ceramics from the Sterns Creek component at the Walker-Gilmore site and Woodland ceramics from the Kansas City region.

Benn and Rogers (1985) further note that the settlement patterns of Great Oasis and Loseke variant groups on the Des Moines Lobe are the same. Both groups appear to occupy small settlements, with wattle and daub structures on the ground surface in the central Des Moines River Valley (Late Woodland: 13PK23 (P. Emerson and H. Finney 1984); Saylorvillage (13PK165; Osborn et al. 1978, 1989); Great Oasis: Meehan-Schell (13BN110; Gradwohl 1975). However, at the Broken Kettle West site (13PM25; Baerreis et al. 1970) in extreme northwest Iowa, Henning and Henning (1978:12) describe rectangular, semisubterranean houses with southeast trending entrances, and four corner posts with a center post. Ludwickson et al. (1981) point out that the houses at Broken Kettle West are likely the exception rather than the rule, and that lighter structures (such as those found at Meehan-Schell) were likely more typical (Edwards 1993).

Subsistence remains from Late Woodland and Great Oasis contexts are also very similar (Benn and Rogers 1985). Trash pits at the Late Woodland Saylorvillage site and at the Meehan-Schell Great Oasis site both yielded maize, squash seeds, sunflower, nuts, and chenopods (Gradwohl 1974; Osborn, Gradwohl, and Thies 1978, 1989; Benn and Rogers 1985). The extent to which Great Oasis people were reliant upon maize horticulture remains a topic of speculation and may show regional or temporal variability. While corn kernels are common on Great Oasis sites, cobs are rare. This lack of cobs, and the scarcity of scapula hoes, has led the Hennings (E. Henning 1981; D. Henning 1980) to postulate that Great Oasis people were trading for corn with Mill Creek horticulturists in northwestern Iowa. According to Anfinson (1979), Great Oasis groups in Minnesota maintained a more Woodland-like hunting and gathering lifestyle, and he reports no evidence for Great Oasis horticulture in the state. Meanwhile, Mead (1981) contends that corn (as well as sunflower and *Chenopodium*) was being grown by the occupants of the Meehan-Schell site. D. Henning (1982a) predicts that Great Oasis groups also shared the predicted Loseke social organization of, "tightly-knit, endogamous bands of exogamous, patrilineal clans [Henning 1982a:284], in contrast to the matrilineal descent and matrilineal residence of Mill Creek peoples [Ibid.; Anderson 1981[b]:117] (Benn and Rogers 1985:29)." Benn (ed. 1990) thinks that these two groups, along with others, were part of a "patchwork" of cultures with varying reliance upon maize horticulture occupying the Prairie Lakes-Western Prairie Peninsula ecotone during this time period.

One significant feature found in Great Oasis contexts but not in Late Woodland is evidence for trade in exotic prestige items. Trade items consist solely of freshwater and marine shell as beads, "crosses," and blanks (Knauth 1963; Gradwohl 1974; D. Henning 1982a; King 1982; Benn and Rogers 1985). D. Henning (1967) and Gibbon (1974) have proposed that groups like Great Oasis may well have served as "middlemen" between nodes in the Mississippian exchange network



(see also Hall 1967; and Kelly 1991) and groups more distant, such as Mill Creek. R. Alex (1971) and Tiffany (1987;1991b), however, propose that Mill Creek communities served as gateway centers between the Mississippian exchange network and other contemporary groups. More recently, D. Henning (1991), assuming that Great Oasis developed earlier than Mill Creek and was partially ancestral to it, proposed that Great Oasis people developed a trading relationship with Emergent Mississippian groups in the American Bottom, and that those who developed into Mill Creek enhanced this relationship with Middle Mississippian groups.

Whatever the relationship, some contact between Great Oasis and Middle Mississippian communities is indicated by the presence of Great Oasis ceramics at the Spoon River Mississippian Eveland site and at Cahokia itself (Henning 1967; Harn 1991). Benn and Rogers (1985) see the six shell "crosses" found with the West Des Moines Burials (13PK1; Knauth 1963) as abstractions of Mississippian and Oneota "birdmen" and point out that the exchange of exotic items is how high status individuals can increase their authority. They think that Great Oasis groups in the region may have come to dominate other Late Woodland groups and to have ultimately led to the demise of Late Woodland cultural patterns.

Great Oasis ceramics have many similarities to some types of Mill Creek pottery. Most people now think that Mill Creek developed from Great Oasis, although Great Oasis continued as a distinct cultural entity throughout most of the time span of Mill Creek (D. Henning 1967; Henning and Henning 1978; R. Alex 1981a; Tiffany 1982d, 1983, 1991a). It is also significant that several large Mill Creek villages are separated by only a few hundred yards from Great Oasis village sites (E. Henning 1981; D. Henning and E. Henning 1982). Although Mill Creek and Great Oasis villages are separate entities, Great Oasis ceramics are found on Mill Creek sites, and Mill Creek ceramics are found on Great Oasis sites.

The exceptions are two sites in the Perry Creek drainage. Two of these, the Larson site (13PM61; McAlister 1972; D. Henning 1980, 1982a), and 13PM60, dating to just after A.D. 1200, displayed a mixture of the two cultures, and a large amount of exotic material. D. Henning and E. Henning (1982) state that it is clear that late in the Great Oasis sequence, Great Oasis and Mill Creek people were living together at one site, the Larson site. They suggest that this may be a consequence of the drier Pacific climatic episode, and by the incursion of Oneota groups into the region after ca. A.D. 1100 (Harvey 1979). D. Henning (1982a) has grouped these two sites into the Perry Creek phase.

Noting the lacustrine orientation of Great Oasis sites in the Prairie Lakes region, as well as the lack of evidence for horticulture (Anfinson 1979, 1987), and the more riverine orientation of northwest Iowa and South Dakota sites, R. Alex (1981a) developed a hypothesis that those groups located in areas suitable for horticulture and with access to the western bison herds, continued the trend toward Mississippianization, becoming settled, intensive maize horticulturists. As interaction with the American Bottom region intensified, these groups became Initial Middle Missouri groups such as Mill Creek. Meanwhile, in areas less favorable to horticulture and with abundant bison herds, Great Oasis groups continued in the Woodland hunting and gathering pattern. Tiffany (1982d, 1983) presents a similar "view that those Great Oasis groups that came under Mississippian influence became Mill Creek/Initial variant cultures, and those that did not (or did not accept Mississippian ideas in the same way) continued the more conservative Great Oasis lifeway (Tiffany 1983;97)."

## Mill Creek

While it was once widely held that Mill Creek and Cambria in Minnesota were ancestral to the Initial variant of the Middle Missouri tradition (Lehmer 1971), it now seems well accepted (at least among Mill Creek scholars) that Mill Creek, along with the closely related Over focus of South Dakota and Cambria in Minnesota, should be considered a part of the Initial variant of the Middle Missouri tradition (cf. Fugle 1962; Ives 1962; Knudson 1967; D. Henning 1967, 1971b; D. Anderson 1969, 1981b; Tiffany 1982d, 1983, 1991a). E. Henning (1985) defined a Mill Creek/Over study unit, dating from A.D. 850 to 1300 for Iowa's State Plan (RP3), claiming that the separation of Mill Creek from the Over focus was the result of state boundaries. Tiffany (1983), however, has recently proposed adding two regional variants to the temporal Initial variant: the Chamberlain variant, containing Anderson, Grand Detour, and Swanson phases, and the Mill Creek variant, containing Lower James, Brandon, Cambria, Big Sioux, and Little Sioux phases. The Over focus would be divided into the Swanson, Lower James, and Brandon phases. Tiffany dates these variants between A.D. 900 and A.D. 1300. For a more complete taxonomic history, see D. Anderson (1969, 1981b) and Tiffany (1982d, 1983).

According to Tiffany (1991b:319):

Mill Creek sites are typically small, compact villages 1 ha or less in extent characterized by middens up to 3 m or more in depth. Most are located on alluvial terraces in the valleys of the Big Sioux and Little Sioux rivers and their tributaries where two major regional variants, the Big Sioux and Little Sioux phases have been recognized ([D.] Anderson 1969; [D.] Henning 1971[b]). Some Mill Creek sites, apparently those in the latter portion of the sequence, like Wittrock, were fortified ([D.] Anderson 1986). Others may also have been fortified, but years of cultivation have obscured the evidence.

Mill Creek houses are semisubterranean, rectangular structures with either internal or external entryways. Village plans from the Chan-ya-ta (13BV1), Wittrock (13OB4), and Kimball (13PM4) sites suggest the houses were laid out in rows (Tiffany 1982[d]:4). Mill Creek house size and form, however, are generally more variable than at other sites of the Middle Missouri tradition (Tiffany 1982[d]:30). . . . Wattle and daub houses with earthen banked exterior walls were found at the Mitchell site of the Lower James phase and the Chan-ya-ta site of the Little Sioux phase ([R.] Alex 1973; Baerreis and Alex 1974; Tiffany 1982[d]:27).

The manner of formation of the deep midden deposits, containing large amounts of soil and few artifacts, has been a matter of some debate over the years. Baerreis and Alex (1974) argue that, because of the practice of banking large quantities of soil around the exteriors of houses, the middens could accumulate very rapidly through the collapse of a few houses, and that the middens do not necessarily represent the slow accumulation of habitation debris over a long term occupation. They and Tiffany (1982d) argue against the previously accepted "stability" model of Mill Creek settlement, in which the midden deposits were considered to be similar to Near Eastern tells, building up over many years of occupation (cf. Fugle 1962). Tiffany (1982d) proposed a settlement model in which villages were occupied until local resources were depleted, were then abandoned, with some villages reoccupied at a later time after local resources had recuperated.

D. Anderson (1985), however, questions the ceramic sequence for Mill Creek village occupation developed by Vis and Henning (1969; see



also Flanders 1960), stating that it is only dating the abandonment of villages. By reinterpreting the material from the Brewster site (13CK15: D. Anderson 1973, 1981b; Dallman 1983; L. Alex 1973; Conrad and Koeppen 1972; Scott 1979; Stains 1972; Tiffany 1982d), he demonstrates that, contrary to Tiffany's (1982d) interpretation of the site as having two short term occupations, the data represent a developmental sequence indicating a single, long term occupation. D. Anderson (1985, 1986) further notes that there appear to be more than one type of Mill Creek village site. Some display long term occupation, such as Phipps (13CK21), Brewster (13CK15), Kimball (13PM4), and Broken Kettle (13PM1), while others appear to be shorter term occupations or ephemeral sites like the Skadeland site (13CK402; Zimmerman 1971a). While he notes that Tiffany's (1982d) mobility model (sequential/developmental) is a good first step in developing a better understanding of Mill Creek settlement, he contends that the situation need not be an either/or matter between the stability and mobility models. He argues that while some sites may have been abandoned and reoccupied, others were continuously occupied. As populations grew, smaller villages "budded" off from the main villages. Finally at the late end of the sequence, groups reconsolidated at the main villages and built fortifications (D. Anderson 1985, 1986, 1987b).

Recently, D. Anderson (1985, 1987b) has proposed a systems model to explain the origin, development, and departure from the region of Mill Creek culture. He sees Mill Creek developing out of local Late Woodland groups influenced by increased summer rainfall during the Neo-Atlantic climatic episode beginning around A.D. 900, the introduction of new horticultural techniques and new strains of corn, regional population increase, and contacts with Lohmann phase Mississippian chiefdoms in the American Bottom, as well as contacts with developing Initial variant Middle Missouri groups to the north and west. Continuing contacts with Mississippian groups throughout the Stirling and Moorehead phases contributed to broadening of ideology, elaboration of sociopolitical forms, and subsistence intensification. During this period of time budding and relocation of main villages took place due to population increase and overexploitation of local resources.

Finally, D. Anderson postulates that the combination of increasing desiccation during the Pacific climatic episode, beginning around A.D. 1200, the decline of Cahokia during the Sand Prairie phase, leading to the loss of an influential trading partner, and the expansion of Correctionville phase Oneota populations into the region led to consolidation and fortification of Mill Creek villages and eventual Mill Creek resettlement outside the region, perhaps joining other Middle Missouri groups to the north and west. Following his analysis of the Wittrock site materials from all published and unpublished sources, D. Anderson (1986) proposed several changes to his (1985, 1987b) model. The evidence from Wittrock, dating late in the Mill Creek sequence around A.D. 1200-1300, indicate that rather than subsistence intensification in the Pacific climatic episode there was a marked subsistence shift toward bison utilization. Similarly, rather than the increase in ritual activity during the Pacific, ritual activity appears to have decreased. As D. Anderson (1986:236) states:

The near disappearance of effigy forms, status symbols, fertility objects, and pipes leaves us with a picture of an isolated, struggling community, having difficulty with their own cultural adaptation and with their increasingly aggressive neighbors. If even a portion of this scenario is true, it is no wonder the Mill Creek people eventually relocated beyond the region.

Whatever the reason, Mill Creek people appear to have left northwest Iowa by around A.D. 1300, likely joining other Initial variant

groups to the northwest, and it is likely that their descendants became part of the Initial Coalescent tradition and came into history as the Mandan and Hidatsa of the upper Missouri River region.

D. Anderson's (1985, 1986, 1987b) model follows, in a slightly less deterministic manner, a long string of interpretations emphasizing climatic change as responsible for Mill Creek abandonment of northwest Iowa. This hypothesis was developed as a result of the University of Wisconsin-Madison's excavations of Mill Creek and Great Oasis sites in northwest Iowa during the 1960s (Baerreis and Bryson 1965, 1967; D. Henning, ed. 1968/1969; Dallman 1983; Baerreis et al. 1970). Today most researchers have rejected the deterministic application of this model, emphasizing social factors and competition with Oneota groups for bison herds as being more responsible for the Mill Creek departure.

Recently, Lensink (1993) has called into question the assumptions made about climatic change by Baerreis and Bryson. Their main evidence for a drier climate after A.D. 1200 relied on changes in pollen frequency over time and on the ratio of deer to bison remains at the Phipps site. Citing recent studies indicating that the Northeast Plains may have been cooler and moister after A.D. 1200 than in the preceding time period, Lensink points out that Zalucha (1982) contended that the pollen record at the Phipps site had been incorrectly interpreted by James and Nichols (1969), and that the record shows no signs of climatic change. Zalucha argued that the decrease in composite pollen observed in the sequence is not an indicator of drying conditions since composites are not limited to wet conditions. Further, he argues that the observed decline in oak pollen is likely a reflection of deforestation of the immediate site vicinity by the Mill Creek inhabitants themselves. In respect to the ungulate remains, Lensink (1993) notes that Frankforter's (1969) analysis of the Phipps site materials relied on an extremely small sample in most levels. He further notes that the trend observed toward greater bison utilization in relation to deer after A.D. 1200 observed at the Phipps site was not replicated in the much larger sample from the Kimball site. In fact, the exact opposite appears to be the case, with deer increasing in relation to bison after A.D. 1200.

In addition, Lensink points out that when Dallman (1983) analyzed the faunal remains from the Brewster site, when percentages of identified specimens were used, as was the case with Frankforter's analyses, the results resembled the Phipps site trend, but that when percentages of minimum numbers of individuals were compared the trend was more like that from the Kimball site. When Dallman reanalyzed the Phipps materials, the trends reported by Frankforter were much less pronounced, and no sharp break could be detected at A.D. 1200. Lensink (1993) argues that increased utilization of bison over time among Mill Creek groups is more likely the result of local game depletion in the vicinity of the villages, leading the occupants to travel longer distances and consequently focusing on large "high yield" game like bison. He attributes the decline in bison after A.D. 1200 to increased competition from Oneota groups for bison.

Mill Creek ceramics consist of four wares: Sanford ware, Chamberlain ware, Foreman ware, and Mill Creek ware (or Group) (Ives 1962; D. Henning ed. 1969; Vis and Henning 1969; D. Anderson 1981b). All are tempered with crushed granite and share a common paste. Sanford ware contains the types Mitchell Modified Lip, Kimball Modified Lip, and Sanford Plain. Henning and Henning (1978) regard Sanford ware as being derived from Great Oasis Wedge Lip ceramics. Chamberlain ware consists of Chamberlain Incised, Chamberlain Incised Triangle, and Chamberlain Crosshatched. Chamberlain ware has high straight rims that are very similar to Great Oasis High Rim ceramics, and it is likely that the two forms diverged from a common origin (Henning and

Henning 1978; D. Anderson 1981b). Foreman ware apparently has no Great Oasis antecedents (Henning and Henning 1978), features S-shaped rims, and contains the types Foreman Incised, Foreman Incised Triangle, Foreman Crosshatched, and Foreman Plain (D. Anderson 1981b). The Mill Creek Group is a catchall category designed by Ives (1962) to include forms showing Middle Mississippian influence (D. Anderson 1981b). Types include Mill Creek Bowl, Mill Creek High Rim Jar, and Mill Creek Seed Jar. D. Anderson (1981b) also includes Mill Creek Miniature Vessels in this category.

Tiffany (1982d), however, favors redefining Mill Creek ware as including only those grit-tempered vessels that appear to be copies of Ramey and Powell Plain ceramics, while considering the other Mill Creek types separately. Mill Creek Bowls have flared to incurving walls and sometimes feature lugs and effigy handles, Seed Jars have no rims, and constricted necks. Mill Creek High Rim vessels have wide mouths and nearly vertical rims. D. Anderson (1981b) states that they may be related to seed jars, as both often have suspension holes near the mouths. They also appear similar to undecorated Chamberlain ware vessels. Mill Creek sites also produce small quantities of Mississippian trade ceramics, hooded water bottles, and locally made grit-tempered copies of Mississippian ceramics (D. Anderson 1981b; Tiffany 1982d, 1991a).

Aside from the Mississippian items found on Mill Creek sites, the idea of trade and contact between Mill Creek villagers and Mississippian groups is supported by the presence of Mill Creek ceramics at the Eveland site (Hall 1967; D. Henning 1967; Harn 1975, 1991), at Cahokia (Hall 1967; D. Henning 1967), and at the confluence of Pleasant Creek with the Mississippi River just west of the Apple River Mississippian manifestation of northwest Illinois (Tiffany 1991a). Evidence for trading contacts with late Late Woodland groups is indicated by the presence of Mississippian and Mill Creek ceramics at the Hartley Fort (13AM103; Tiffany 1982d, 1982b, 1983, 1991a, 1991b), and Mill Creek ceramics at the mouth of the Maquoketa River at the Sixteen Rock Shelter (13AM122), the Waterville Rock Shelter (13AM124), and the O'Regan Terrace (13AM21) (Tiffany 1983, 1991a). Also, Hartley ware has been found at the Chan-ya-ta (13BV1) Mill Creek site (Tiffany 1982d, 1982b, 1991a, 1991b).

Mill Creek ceramics have also been reported from Pipestone National Monument (Sigstad 1970). As noted earlier, D. Anderson (1985, 1986, 1987) has recently proposed a systems model of Mill Creek origins, interactions, and disappearance in northwest Iowa, in which interaction with Cahokia is a "prime mover." D. Anderson (1987) postulated that Mill Creek people possibly exchanged bison hides and corn with Mississippian groups for Mississippian status items. D. Henning (1967) and R. Alex (1971) saw marine shell as the prime commodity obtained by Mill Creek groups, with other elements of Mississippian material culture, and, possibly, ideology, coming along for the ride.

Recently, Tiffany (1987, 1991a, 1991b) following R. Alex (1971) has argued that Mill Creek groups were "gateway communities" (see also Hall 1967; Kelly 1991), collecting bison hides and dried meat from northern plains groups. These goods were then transported to Cahokia where they were exchanged for whole marine shells, which were taken back to the Mill Creek villages for manufacture into artifacts to be exchanged with other northern plains group for hides and meat. Tiffany (1991b) uses ethnohistoric accounts of the Mandans to develop his arguments for the deep-rooted nature of trading relationships among northern plains tribes, as well as the importance of shell. The Mandan are considered to be the descendants of Middle Missouri Plains Village peoples, and served as brokers between more nomadic plains groups and the European fur traders. It is of some note that, historically, the

Mandan played a version of the Chunkey game, something totally alien to the northern Plains. Within Mandan society, status was gained through the purchase of medicine bundles, ceremonial information, and special knowledge. As Tiffany (1991b:327-328) states:

The Mandan had a number of loosely age-graded, secular societies for both men and women. The criterion for membership in a secular society was not age but collective purchase by a group of individuals of the songs, rites, paraphernalia, and so forth. These societies served as the means for establishing an individual's position in the social structure as well as defining the composite behavior and responsibilities expected by Mandan society for individuals of a general age.

The transfer ritual in a Mandan secular society or the exchange of bundles or valued information provides an important key to understanding Mandan intertribal relations. A superordinate-subordinate, fictive kin relationship (father-son) was established between buyer and seller. Gifts were exchanged as well as the ritual, bundle, or commodity being purchased. In addition, the buyer's wife was surrendered to the ceremonial father. Mandans spent their lives in the accumulation of prestige through wealth, bundles, inheritance, prowess in warfare, and the giving and taking of sexual favors.

Tiffany (1991b) proposes that a similar process would have taken place in the course of Mill Creek exchange with Cahokia. The Mill Creek traders (always fictive sons to the Mississippian fathers), would engage in ceremonial exchange of gifts (including women) for "a wide spectrum of Mississippian rituals, paraphernalia, iconography, and ceremonial artifacts. Following this, a commodity exchange would have taken place involving the trade of bison hides and dried meat for marine shell, pottery, and utility items (Tiffany 1991b:328). To evaluate his model, Tiffany (1991b) examines faunal remains, population estimates, and Mississippian ceramics for five Mill Creek sites. Through his analyses, Tiffany concludes that more meat and hides were being processed at Mill Creek sites than would have been required for the estimated population and temporal duration for the sites in question. He further concluded that the amount of shell and Mississippian ceramics found on Mill Creek sites fits well with estimates of the number of elite families within each village, which were likely to have trading partners among the Cahokia elite. He then proposes several possible routes through which this trade might have taken place, appearing to favor the idea of river travel, either down the Big or Little Sioux rivers to the Missouri River, or down the Raccoon, or the West Branch of the Des Moines River, to the Des Moines River, and then down the Mississippi. His visualized mode of transport consists of groups of the equivalent of the bull boats used historically by the Mandan. While such a scenario is intriguing, population estimates, and duration of occupation of sites are always problematic, and, since the materials supposedly traded by Mill Creek groups are biodegradable and nearly impossible to source, it seems unlikely that the evidence to fully support this model will be forthcoming from the American Bottom.

## Glenwood

In the hills along the west side of the Missouri River, from northern Nebraska to northern Kansas, northwestern Missouri and southwestern Iowa, and along tributary streams into interior eastern Nebraska, during the Late Prehistoric period, a semisedentary horticultural group developed that is known as the Nebraska phase of the Central Plains tradition. Although Krause (1969) designated Nebraska culture as a

variant, and it is still referred to as such in the literature, Blakeslee and Caldwell (1979) have argued convincingly against this designation, and the phase designation appears to be the more accepted of the two in the literature.

Although largely centered in Nebraska, the Nebraska phase was first described in the late 1800s in Mills County, Iowa by Proudfit (1881; 1886) and Dean (1883). Later, concentrating on the metropolitan Omaha area, Gilder (1926) named this manifestation the Nebraska culture (Blakeslee and Caldwell 1979). Research continued from the 1920s through the 1940s in the vicinity of Glenwood in Mills County, Iowa (Stems 1915a; Blakeslee and Caldwell 1979; Rowe 1922, 1951, 1952a, 1952b; Davis and Rowe 1960; Crismon and Green 1992). Keyes (1949, 1951) noted similarities of the Glenwood materials to those of the Nebraska "culture" and named the Iowa manifestations the Glenwood focus of the Nebraska aspect. Keyes imagined that following additional survey efforts the Glenwood site distribution on the Iowa side of the Missouri would match the distribution of Nebraska phase sites on the Nebraska side. E. Henning (1985) expected a distribution for Glenwood sites ranging from Woodbury County to south of the Missouri border. However, while isolated sites may well be located in other areas of western Iowa (cf. Benn 1986), subsequent surveys have failed to locate Glenwood remains outside of the immediate vicinity of Glenwood where at least 100 lodge sites have been located. Hotopp (1982) has postulated that this concentration of sites in the Keg and Pony Creek Valleys and at the openings of hollows into the Missouri River floodplain relates to the prehistoric distribution of timber resources in the region, noting both the large number of logs needed for earthlodge construction and the reconstruction of historic timber distributions from GLO records. Such timber resources were not reported from other areas of western Iowa at that time.

In 1955, Ives published a study of Glenwood ceramics based on sherds in the collection of D. D. Davis. He used names for wares that Gunnerson (1952) had used for groups within an unnamed ware for Nebraska sites (Blakeslee and Caldwell 1979). Gunnerson's group names are McVey, Beckman, Swoboda (Ives' Swaboda), and Debilka. A. Anderson (1961, Anderson and Anderson 1960) used a slightly modified version of Ives' classification for an analysis of ceramics from 12 house sites excavated by Orr, three houses at the Kullbom Village site (13ML10) excavated by Rowe, Davis, and others, and one house at the Kullbom site partially excavated by students from the University of Iowa, and finished by Rowe, Davis, and friends. Unfortunately, as Blakeslee and Caldwell (1979) have pointed out, Ives' and A. Anderson's types do not exactly correspond to Gunnerson's types, and all three classifications suffer from internal inconsistencies and other problems. In their analysis of Nebraska phase ceramics, they abandon all of these classifications, and develop one of their own. However, older classifications remain in use, and the reader should be aware of the problems involved in their application.

Using the ceramics described above, A. Anderson (1961) defined the Glenwood locality and developed a seriation sequence for sites within it. He defined three phases of occupation: the Keg Creek phase, the Pony Creek phase, and the Kullbom phase. Since there were no radiocarbon dates available for any of the sites in A. Anderson's study, he was forced to rely on indirect seriation data. He used the presence of Correctionville phase Oneota ceramics (then believed to be protohistoric) at the Kullbom phase sites and the presence of Glenwood ceramics at the Correctionville site, as indicating that this phase represented the late end of the sequence. The higher proportion of collared rims in Keg Creek phase sites was considered at the time to be

a characteristic separating the earlier Upper Republican phase from the Nebraska phase. Based on correlations with dated sites in Nebraska, he dated the Keg Creek phase from A.D. 900-1000, the Pony Creek phase from A.D. 1100-1200, and the Kullbom phase as postdating A.D. 1500.

From 1962-1964, L. Brown (1967a) of the Smithsonian Institution River Basins Surveys with the assistance of Rowe and Davis conducted salvage excavations in the Pony Creek drainage. As a result of his excavations and recently available radiocarbon dates, Brown accepted A. Anderson's Kullbom and Pony Creek phases as local manifestations of his Subphase I and Subphase II of the Nebraska phase respectively, while the Keg Creek phase was considered questionable because of the small sample size upon which it was based. L. Brown, however, reversed the order of phases from that proposed by A. Anderson, noting that the Dixon Oneota site in the northwest had produced radiocarbon dates as early as A.D. 930±80, and that catlinite, considered a late trait, was present on Subphase II sites. Brown placed the Nebraska phase as likely dating from ca. A.D. 1150-1450.

In an attempt to resolve this difference, Zimmerman (1971b, 1977a) applied a different seriation technique to the materials reported by A. Anderson and L. Brown and recently excavated materials from the Highway 34 relocation project. He concluded that his results were inconclusive in clarifying Glenwood chronology, and that neither of the two sequences were particularly useful except as hypotheses to be tested. More recently, Hotopp (1978a, 1978b, 1982) utilizing a suite of 41 new dates carefully controlled for type of wood, portion of branch, context, and contamination recovered as a result of the Highway 34 relocation project has been able to narrow down the period of occupation of the Glenwood locality by Nebraska phase people to a relatively short time between A.D. 1050 and A.D. 1250.

Krause (1969) had proposed the existence of two phases within his proposed Nebraska variant, an earlier, more southerly Doniphan phase, and a later, more northerly Douglas phase with some overlap in space and time. Blakeslee and Caldwell (1979), however, after analyzing much unpublished material from sites excavated in the 1930s and 1940s in Nebraska, as well as all published sources, come to the conclusion that, rather than viewing the Nebraska phase as a single population unit displaying temporal variation, it is more appropriately described as two or three closely related, contemporary populations displaying regional variation. They note a definite distinction between those Nebraska phase groups immediately adjacent to the Missouri River and those occupying tributary streams to the west. They further note that the population in the Glenwood locality may represent a third distinct group.

In terms of subsistence, Glenwood people appear to have been heavily dependent upon the cultivation of corn, beans, and squash (L. Alex 1980; D. Anderson 1975b; Green, ed. 1990). However, faunal remains suggest that they were more reliant upon forest species than groups farther to the west, and bison made up only a small part of their diet. It is likely that hunting was concentrated in the woodlands immediately surrounding the Glenwood locality, and that the wide ranging bison hunting of their contemporaries was not a part of the Glenwood lifestyle (D. Anderson 1975; L. Alex 1980; Benn 1986). This may have been a factor in their apparent peaceful coexistence with other groups in the region, allowing their scattered, nonfortified existence while their bison hunting Mill Creek neighbors to the north required fortified villages. They were not in competition for bison with other groups such as Oneota and could develop friendly trading relationships (cf. Nansel 1989).

The Central Plains tradition appears to display a dual settlement distribution, and the Glenwood locality is no exception. Isolated lodges,

often in a linear arrangement on ridgetops and stream terraces, occur, as do small clusters of houses, or hamlets. Proudfit (1881) considered the clusters to be more common, while Orr considered isolated houses to be the norm (Hotopp 1978a, 1978b, 1982). As Hotopp points out, however, this may be partially explained by the effects of cultivation and alluviation having obscured many lodge depressions in the 50 years between the times of Proudfit and Orr. Gradwohl (1969) argues that the number of house clusters as opposed to isolated lodges has been obscured by the archeologist's habit of assigning site numbers to individual lodges and of only excavating in areas of visible house depressions. His work in eastern Nebraska demonstrated that often no surface depressions remained over lodge sites, and that excavations between house depressions sometimes yielded additional dwellings.

Rowe had earlier demonstrated that depressions were not always present at house site locations (Billeck and Rowe 1992). While Blakeslee and Caldwell (1979) think that Gradwohl overstated the case, clusters of lodges are generally conceded to be a part of the Nebraska phase settlement pattern, although questions about the contemporaneity of occupation of these clustered lodges persist (Billeck, personal communication). Lodge clusters in the Glenwood locality include the Allis Village site, the Kullbom Village site (13ML10), and the Old Fairgrounds or Johnson Farm site (13ML128, 129, and 130; Hotopp 1978a). Hotopp also notes that clustered lodge sites tend to be smaller than isolated lodges, that large lodges tend to be in more level or gently sloping areas, and that smaller lodges tend to be located on more rugged terrain, suggesting that the variation in house size is likely a result of topographic constraints.

Working with Upper Republican sites near Glen Elder, Kansas, Krause (1970) proposed a developmental sequence for the varying settlement distributions observed in the Central Plains tradition. He visualized a three-component settlement sequence, with the initial occupation around A.D. 800 with farming hamlets of large lodges on terraces of the Solomon River. Then, as a result of the presumed shift to drier conditions around A.D. 1250, settlements shifted to feeder streams with linear arrangements of smaller, less permanent lodges. The third component of the settlement system was represented by small seasonal hunting and fishing camps with no evidence for lodge construction (Hotopp 1978a, 1978b, 1982). Exploring similar questions for the Glenwood locality, A. Anderson and Zimmerman (1976) come to the opposite conclusion. They argue that the Glenwood people first occupied the locality in scattered lodges in the uplands and as a result of a drier climate after A.D. 1200 relocated into lodge clusters at the hillslope/bottomland contact. Like Krause and A. Anderson (1961) they postulated a long developmental sequence for the Glenwood locality, lasting from ca. A.D. 900 to 1300.

Subsequently, Zimmerman (1977b) developed this model into a computer simulation for Glenwood settlement patterns. Zimmerman (1977b:132) found that the best fit with the known distribution of sites was obtained when the following conditions were fed into the model:

1. Temporal duration was probably no longer than 150 years.
2. Climate change, if it occurred, had little or no impact on settlements.
3. Population levels were low, rarely exceeding 100 persons.
4. Large clusters of lodges were extremely rare; if they occurred, they resulted either from reuse or the close location of sisters. Probably no cluster at any point in time had more than four inhabited lodges.

While more seasonality studies are necessary to either support or refute the argument, Hotopp (1978a, 1978b, 1982) postulates that the

difference in settlement location apparent in the Glenwood locality may be the result of seasonal utilization of different parts of the landscape, with upland locales being utilized during the summer when cool summer breezes would have kept the lodge sites cooler and free of mosquitoes and with lowland locales being used in the winter when they would have shielded the occupants from the fierce winter winds. Hotopp notes that this pattern closely approximates the seasonal settlement pattern reported for the Hidatsa and other farming tribes of the Missouri River Valley, to whom the Nebraska phase people were likely partially ancestral.

## Oneota

The final Late Prehistoric group to occupy Iowa was the Oneota. Sites are widespread across the upper Midwest, extending from Indiana to Nebraska, and from Minnesota and Wisconsin to central Missouri. The definition of Oneota culture is based largely on the presence of shell-tempered ceramics, small triangular projectile points, "snub-nosed end scrapers, large villages with trash middens and storage pits, trade material such as catlinite and copper, European materials in Historic sites, cemeteries with burials in extended positions, [and] fortifications on some sites (Benn 1984b:6-7)." The use of catlinite for the manufacture of pipes and engraved tablets, possibly for tobacco preparation, is of particular note. Engravings on catlinite tablets give us a glimpse into Oneota symbolism. Tablets have been reported from the Bastian site (13CK28), a site near New Albin, in Allamakee County, and from the Blood Run site (13LO2). Several of the Bastian site tablets and the New Albin tablet are illustrated in Bray (1963), and the Blood Run specimen is illustrated in Harvey (1979). Of particular note is the fact that although the Oneota did not share the complex social organization of the contemporaneous Middle Mississippian societies to the south, they did share much Mississippian and Southeastern Ceremonial Complex symbolism and artifacts (Benn 1984b, 1989). Benn believes that this symbolism is a key to understanding Oneota social organization and the process of change from the preceding Late Woodland societies to Oneota society. Oneota people seem to have occupied the present state of Iowa since sometime between A.D. 900-1000, and probably are the ancestors of Chiwere Siouan-speaking groups such as the Ioway, Oto, and Missouri Indians, as well as the Winnebago, and possibly the Omaha, Dhegiha Siouan speakers, encountered by the first Europeans to enter the upper Midwest (Tiffany 1982c). Glenn (1974) was able to demonstrate statistically significant differences in the physical anthropology of Oneota populations from different phases, and she suggests that Oneota peoples were mixtures of several different population stocks.

The fact that Oneota remains likely represent several cultural groups is reinforced by the types of structures reported from Oneota sites. As Tiffany (1979:91) states:

Oneota house types include ovoid wigwams reported from the Walker-Hooper and Overhead sites in Wisconsin (Gibbon 1972[b]; Stoltman 1973) and large, Iroquois-type longhouses reported from the Anker and Oak Forest sites in Illinois (Bluhm and Liss 1961; Bluhm and Fenner 1961), and from the Grant site in northeast Iowa (McKusick 1973). In addition, a square, Central Plains type house has been reported from the Leary site in Nebraska (Hill and Wedel 1936:16-17;69), and rectangular structures with wall trenches were found in Wisconsin at Carcajou point by Hall (1962[b]:17-21) and at the Zimmerman and Fisher sites in Illinois (Gibbon 1972[a]:172). Mott Wedel (1959:42) also discusses an ovoid posthole pattern from a site

in northeastern Iowa which may represent an Oneota structure. A number of superstructures ranging from wattle and daub to bark covered summerhouses and mat covered wigwams are possible house types (Overstreet 1977:162).

Oneota occupations appear in clusters within widely separated localities, surrounded by vast areas lacking Oneota settlements (Benn 1984b, 1989). Upland, floodplain, and terrace sites are known (Tiffany 1982c; J. Brown 1982), and Tiffany (1982c) suggests a shift from a woodland/riverine orientation among early Oneota groups in Iowa toward a more prairie oriented lifestyle as bison hunting became much more important among later groups. Although it is evident that the Oneota were maize horticulturists, the extent of their reliance upon maize for subsistence is largely unknown. J. Brown (1982) suggests that although Oneota maize horticulture may have been nonintensive it may have been more productive than people have thought, and states that:

In this view Oneota represents a low population density system in which its food needs were easily met by a mixed hunting and agricultural economy. This economy owed as much to the productivity of native food resources as it did to corn agriculture. [J. Brown 1982:112]

Benn (1984b, 1989) has developed a complex model for Oneota social structure, and for the transition from the Late Woodland mode of production to the Oneota mode of production. The following is a greatly simplified description of Benn's model. Benn views the shift in modes of production as the result of emergent Oneota clan leaders achieving status through acts of warfare, and through developing trade relationships. This led to the development of social surplus, relationships of debt with members of the general populace, and the development of control of labor, material, and social surplus. The hegemony developed by the lineage leaders was reinforced by powerful hawk-impersonator symbolism including ceramic decorations. This led to the accumulation of labor which allowed the development of the unique labor-intensive Oneota economy based on swidden maize cultivation, wetland floral and faunal exploitation, and long-distance bison hunting, combined with warfare and predatory expansion. As Benn (1989a:253-254) states:

I contend it was not a substantial shift in the subsistence base that fostered Oneota culture. Rather, an internal reorganization of productive relations necessitated by historical process (sociopolitical interaction) redefined the roles of Late Woodland producers within descent groups. In this scenario, leadership roles were emphasized through associations with cosmic archetypes in order to organize labor to extract natural and horticultural resources and transform them into social-surplus. The symbols of aggressive leadership became embedded in bundle ceremonialism which carried the reproductive ideology of descent groups. Labor-value was attracted to and concentrated in the descent groups, bolstering their corporate awareness—a manifestation of hegemony. In short, the definitions of 'social distance' between interlinked descent groups and 'other bands' were changed by a pan-regional awareness of dominant productive relations. . . . The transformation from the Woodland to Oneota mode of production was relatively rapid, perhaps in a few generations. Concentrated labor was able to better defend its products, and the loose aggregate-band of Woodland derivation became the Oneota village of archeological parlance. From its 'heartland' of permanent village locales, the tribe could range over the

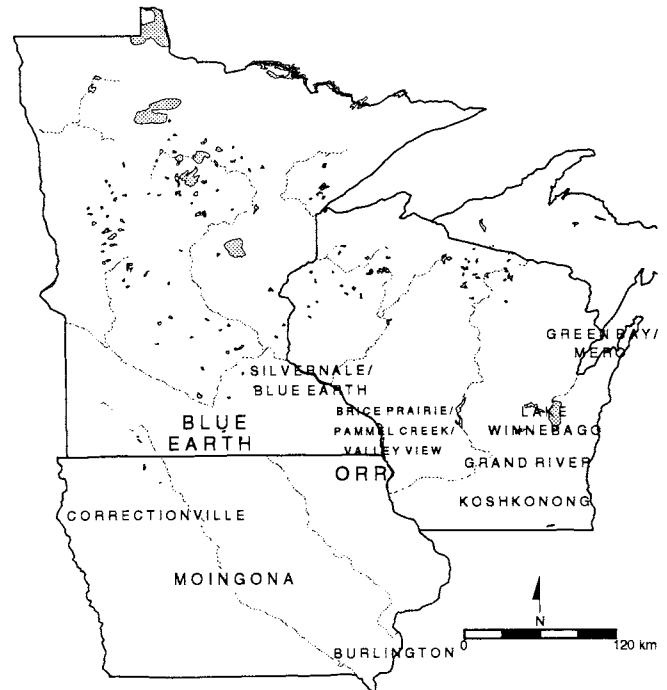


Figure 22. Oneota phases and ceramics.

former territories of Woodland bands because the village membership was large enough to undertake extended hunts and protect the base camp. Thus, the Historic Ioway tribe is recorded as ranging over all of Iowa with only colonially induced competition for space (Mott 1938[b]).

More recently Benn (1995) has critiqued his earlier formulations for being one-sided by ignoring gender relations. Noting the considerable amount of labor investment involved in fabric production, presumably by women, Benn sees the use of fabrics as decorations on Late Woodland ceramics as display of the productive power of women. Noting that native cultigens were originally domesticated by women, and that women produced nearly 75% of the calories in the Late Woodland diet, and the most reliable 75%, Benn visualizes Late Woodland societies as having a gender balanced social power structure with men controlling the exchange of surplus, and women running village life. Adding to women's authority was the fact that their horticultural activities dictated the seasonal schedule of their bands. With territorial packing, the introduction of maize horticulture, and the intensification of interregional exchange, the new, more labor-intensive Oneota mode of production developed. Benn correlates the decline of the Eastern Horticultural Complex at the expense of maize with the replacement of fabric and corded decorations on ceramics by trailed lines. He notes that after A.D. 850, single cords, showing less investment, had replaced fabrics on ceramics. He also notes the appearance at this time of corded triangles and chevrons; upper world (male) symbols on ceramics. This is also the time at which maize horticulture had begun to replace the Eastern Horticultural Complex. David Asch (Comments at the Oneota Archeology Conference in Iowa City, Iowa, March 4-5, 1994) notes that by A.D. 1300, only maize and the wild descendents of formerly cultivated native plants are found in Oneota assemblages. Benn believes that the dependence on maize for surplus production was used by male lineage heads to gain hegemony over women's labor. This new

hegemony was reflected in the shift to trailed lines on ceramics forming aggressive, male falcon impersonator symbols. In pursuing Benn's logic, the women's resistance to this shift may be symbolized in the use of scrolls and curvilinear elements on Emergent and Early Developmental Oneota ceramics. These are water, lower world, female symbols.

As is the case with Great Oasis, Oneota taxonomy remains controversial. Originally named Oneota culture by Keyes (1927a), based on Orr's work on northeast Iowa sites, it was later incorporated into the Midwestern Taxonomic Method as the Oneota aspect of the Upper Mississippi phase, containing three foci: Orr, Grand River, and Lake Winnebago, by McKern (1945). Later, as manifestations farther afield were identified, the Correctionville and Blue Earth foci were added to the aspect, while other individual sites like Leary, Ashland, and Stanton, Utz, and Huber became associated with the aspect as well. Following a conference in Columbia, Missouri, attended by Waldo Wedel, Mildred Mott Wedel, Carl Chapman, Robert Bray, Dale Henning, and Robert Hall, Hall (1962b) proposed that Oneota be defined as a tradition in the Willey and Phillips (1958) system and anticipated the day that the existing foci could be redefined as phases. Based on his work at Carcajou Point (47 Je-2), Hall (1962b) also proposed a new Koshkonong focus and proposed dividing the Oneota tradition into three chronological horizons: Emergent (ca. A.D. 700-1000), Developmental (ca. A.D. 1000-1300), and Classic (ca. A.D. 1300-1650). The Classic horizon would consist of "... Orr focus sites along the Upper Iowa River in northeastern Iowa and many related sites in the same and neighboring states, including Correctionville in Iowa (Mott 1938[b]), Leary in Nebraska (Hill and Wedel 1936) and Humphrey in Minnesota (Wilford 1945) (Hall 1962b:106)."

Viewing Oneota as developing out of Middle Mississippian societies to the south, Hall (1962) also included the Mississippian influenced Apple River and Silvernale foci within the Emergent and Developmental horizons of the new Oneota tradition, although they had never been a part of the Oneota aspect. Overstreet (1976, 1978, 1989) continued the three horizons usage and added a fourth, Historic horizon postdating A.D. 1650. In the process, he modified the Emergent horizon to represent "emergence of an Oneota culture which is developed in situ rather than 'referring to the character of Mississippi complexes undergoing a recognizable transition toward Oneota, particularly in the field of ceramics' (Hall 1962:180) (Overstreet 1976:40)." Hall (1962b) saw each of the foci within the tradition as representing local "group continuities," with the Lake Winnebago and Huber foci culminating in the Historic Winnebago and the Orr and Blue Earth foci culminating in Chiwere Siouan speakers.

Meanwhile, Wedel (1963a, 1963b) was quick to point out the taxonomic and terminological difficulties in applying Hall's system to western Oneota sites where the genetic relationships implicit in Hall's "group continuities" is often questionable at best. She also points out that although the participants in the Columbia Conference had agreed that such a system might prove useful in the future the current state of knowledge was not yet sufficient to warrant its application. Although hampered by inaccurate radiocarbon dates (William Green, personal communication), McKusick (1971, 1973) experienced similar difficulties in fitting his findings at the Grant site (13AM201) into Hall's horizons. In fact, now it appears likely that Oneota represents a number of different cultural groups, including Dhegiha Siouan Speakers, sharing a ceramic tradition (Tiffany 1991a). In addition, in the light of historic records, the distribution of Oneota sites may be the partial result of population movements through time. Adding to the confusion is the fact that many "large" Oneota villages appear to be the result of reoccupation of the

same area over hundreds of years, causing difficulties in delineating developmental sequences for ceramics.

Recently, Tiffany (1979, 1988b) has argued that while developmental sequences can be determined for Oneota ceramics in various regions, the genetic relationships implied by Hall's (1962b) concept of horizons cannot be demonstrated. Instead, he proposes three periods for Iowa Oneota sites; an Early period from A.D. 1000 to 1350, a Middle period from A.D. 1350-1550, and a Late period from A.D. 1550 to contact. Whatever the case, Hall's horizons have not been widely applied outside of Wisconsin. However, recently, Boszhardt (1989) has published a series of radiocarbon dates for Oneota sites in the La Crosse locality which appear to support Hall's (1962) horizons, although they may require some refinement. In addition, Boszhardt assigned the Correctionville, Burlington, and Moingona phases to the early Developmental horizon, and the Orr phase to the late Classic horizon.

Over the years, other foci and phases were added to Oneota in Iowa. Noting differences between Orr focus ceramics in northeast Iowa and materials from southeast Iowa, Keyes named the latter the Burlington focus. Following work in the Red Rock Reservoir area of central Iowa, Gradwohl (1967) proposed a Moingona phase for Oneota materials in this region. While Keyes had proposed a Correctionville focus (M. Wedel 1959:102), D. Henning (1970) proposed a Correctionville phase for northwestern Iowa Oneota sites which he linked with the Blue Earth phase of Minnesota, forming the Correctionville-Blue Earth phase. However, more recent work has shown these to be two distinct phases (Clark Dobbs, personal communication). D. Henning (1970) also greatly expanded the Orr phase far beyond M. Wedel's (1959) Orr focus which she confined to sites of the Upper Iowa River valley, even excluding such nearby sites as the Midway Village sites in southwest Wisconsin that she recognized as being earlier in time than the northeast Iowa Orr focus sites. Henning's new Orr phase included all sites with ceramics more similar to the Allamakee Trailled of the Orr focus than to that of other named foci or phases.

In practice, the name Orr phase has now been applied to sites from the Door Peninsula of Wisconsin to South Dakota, Nebraska, and Missouri. McKusick (1971, 1973) noted the problems in this shift in scope in terms of cultural interpretations, and in its use of the Willey and Phillips system, and noted that, while Henning was correct in recognizing the underlying similarities in these ceramics, he felt that the degree of affinity implied by a phase designation was not demonstrated. He suggested, instead, that the Orr focus be retained as constituted by M. Wedel, and that Henning's Orr phase be designated as a macrophase, or a subtradition. It would seem as though Henning's widespread application for the Orr phase (and the Correctionville-Blue Earth phase as well) would fit in very nicely with Hall's (1962) Developmental and Classic horizons. horizons appear to be an underutilized taxonomic unit, and are more appropriately applied to wide ranging stylistic patterns than are the phases that are often utilized (cf. my earlier discussion of the Archaic Titterington phase and the phases of the Middle Woodland Havana tradition). More recently, Tiffany (1988b) has expressed similar sentiments, arguing that Henning's concept of the Orr phase be recognized as a horizon style of ceramic decoration common throughout the Midwest during his proposed Late period, which would represent the Orr phase as conceived by D. Henning, and that the Orr focus be retained for northeastern Iowa. In fact, Tiffany (1991a:191) thinks that:

Interpretive problems with Oneota are compounded by the lack of taxonomically defined, dated components. Concepts



such as Orr or Blue Earth are now largely meaningless because they have been redefined to describe assemblages from many sites representing several hundred years in time and which are distributed over an enormous geographic area. . . . What is needed, as Gibbon states, is, "the breaking down of Oneota assemblages into their constituents in order to explore the complexity of spatial and social relationships that must have existed in the past (1982:87)."

D. Henning (1995a) has recently recognized the problems created by the expansion of the Orr phase.

#### Southeast Iowa Oneota

Gibbon (1982) notes that Tiffany (1979, 1988) has begun this process in the region previously characterized as the Burlington phase in southeastern Iowa. By comparing ceramics excavated by Straffin (1971b, 1972) at the Kingston (13DM3), Schmeiser (13DM101), and Kelley (13DM140) sites, materials excavated by Slattery and Horton (Slattery, Horton, and Ruppert 1975) at the McKinney site (13LA1), later supplemented by materials excavated by the Iowa Archeological Society and the Department of Anthropology at the University of Iowa (Tiffany 1988), and materials from other southeast Iowa Oneota sites in the repository of the Office of the State Archeologist, he was able to divide the former range of the Burlington phase into two regions, and four localities. The two regions are the Des Moines-Skunk region, consisting of the Lost Creek locality (Wever Terrace sites), and the Skunk-Iowa Region, encompassing the Spring Creek, Kingston, and Toolesboro localities.

Within the Kingston locality, Tiffany (1979) redefined the Burlington phase, restricting it to this locality, and to his proposed Early period. This was based upon the ceramics from the Kingston and Schmeiser sites, which he has named Schmeiser ware, and which he believes represent the earliest Oneota ceramics in the region. The Middle period in the Kingston locality is named the Kelley phase, based on ceramics from the Kelley site. The Late period, consisting of sites with ceramics similar to Allamakee Trained, may be represented by the Bailey Farm site (13DM2), and Bailey Farm is the name he chose for this possible phase. In the Toolesboro locality, no phases were named, but he places the early occupation of the McKinney site in the later portion of the Early period, sites 13LA84 and 13LA139 in the Middle period, and the late component at the McKinney site in the Late period. The Early period in the Spring Creek locality is represented by the Spring Creek site (13DM68), and later period sites are unknown at this time.

In the Lost Creek locality of the Des Moines-Skunk Region, the Burk (13LE92) and Lost Creek (13LE93) sites are postulated as Early period components while later components are again unknown. Other Early period sites in Iowa would include the Correctionville (13WD6) and Dixon (13WD8) sites, the Moingona phase sites in the central Des Moines River Valley. Middle period sites possibly include the Bastian site (13CK28) in northwest Iowa, and possibly the early components at the Lane Enclosure (13AM200) and the Midway Village (47 Lc-19), Orr focus sites in northeast Iowa and southwest Wisconsin. Late period sites include those of the Orr focus, the Milford site (13DK1), and the latest component at the Blood Run site complex (13LO2; 39LN2) in northwest Iowa and southeast South Dakota.

Following their test excavations on three Wever Terrace sites (13LE59, 13LE117, 13LE110) (Lost Creek locality), with dated features spanning the entire sequence of Tiffany's Early, Middle, and Late periods, Finn and Fokken (1986) attempted comparisons of ceramics from these sites with the ceramic styles proposed by Tiffany (1979) for each of

these time periods. Seemingly defeating Tiffany's purpose of defining locality-specific phases in southeast Iowa, they appear to extend the Burlington phase into the Lost Creek locality as well as the Kingston locality. In addition, they propose that since the Spring Creek locality is just on the other side of the Skunk River less than five miles north of the Lost Creek locality and that if these two locales were simultaneously occupied, the two groups would have been exploiting essentially the same environmental zones and were undoubtedly in contact. Thus a Green Bay Bottoms locality incorporating both of these site groupings might be more appropriate. Further, they question whether the proposed Kelley and Bailey Farm phases might actually represent a single phase, noting the occurrence of "Kelley-Like" ceramics at the Bailey Farm site and a mixture of the two ceramic types in a single dated feature at site 13LE110.

In terms of the ceramics of the Middle and Late periods, while a few differences are noted in general terms, the ceramics at the Wever Terrace sites appear to support Tiffany's observation that Kelley phase decorative motifs give way to ceramics more comparable to those from Bailey Farm and the late component at the McKinney site. In the Early period, however, major differences are noted for ceramics of the Wever Terrace sites and those of Schmeiser ware as described. While these differences may be due to the type of interlocality variation Tiffany (1979) was attempting to reveal by redefining the Burlington phase into a single small locality, Finn and Fokken (1986) question whether a small sample from a small, possibly special purpose Oneota site constitute an adequate basis for the definition of a ceramic ware, even for a small locality. In addition, they suggest that some of the attributes upon which Tiffany based his ceramic analysis may express variation as a result of vessel size or function and may not truly be representative of culturally meaningful stylistic variation. Dale Henning's recent large scale excavations at the Wever Terrace sites should prove helpful in answering some of these questions. D. Henning (1995b), following his excavations, an examination of the material utilized by Tiffany (1979) suggests that all three of Tiffany's proposed localities are encompassed in a region called the Mississippi Alluvial Plain that extends from Muscatine to Fort Madison. He is currently in the process of determining how occupations there fit into Hall's (1962) horizons.

Another interesting site in southeast Iowa is the Poison Ivy site (13LA84), in the Toolesboro locality (L. Alex 1978). This site was discovered eroding out of the bank of the Iowa River by participants in the Iowa Archeological Society's field school at the Helen Smith site. While the ceramics recovered appear to compare well with ceramics from the McKinney site, too small a sample was recovered to definitely assign the site to any of Tiffany's proposed periods. Of particular interest is the fact that a reworked Snyders point and a single obsidian flake were discovered in the apparently single component archeological deposit. Trace element analysis revealed that the flake was likely from one of two sources in Yellowstone National Park (Marcucci, Nelson, and Sidrys 1978). Although the site may be multicomponent, Marcucci (1977) has suggested that perhaps Oneota people collected exotics eroding from Havana sites in the area, incorporating them as prestige items. However, the lack of such materials from more completely excavated Oneota sites in the area, particularly the McKinney site immediately adjacent to Toolesboro Mounds, would seem to make this possibility less likely.

R. Alex (1971) developed a settlement typology for Iowa Oneota sites consisting of three site types: fortified, compact villages (<2 h), unfortified diffuse villages (2-120 h), and compact, unfortified villages (<2 h). Tiffany (1979, 1982c) notes that the diffuse villages should



probably really be considered as site areas, in which the entire area was never really occupied at one time, but the general region was reoccupied in slightly different location over time, giving the impression of a much larger village size than actually existed. He also noted that these types are not discrete. For instance, although the McKinney site (13LA1) and Blood Run site (13LO2/39LN2) both cover large areas, smaller fortified areas occur in both, and it seems likely that the earthworks at the McKinney site are Middle Woodland rather than Oneota in origin.

Recently, Collins (1989) noted the similarity between ceramic designs from western Oneota sites and the location of trails shown on early maps of the region and proposed that southeast Iowa Oneota sites served as a center for periodic coalescence of a hypothetical Oneota "confederacy" consisting of Orr phase sites in northeast Iowa, Moingona phase sites in central Iowa, the southeast Iowa sites, and sites along the Chariton and Grand rivers in Missouri. The preponderance of Burlington Chert in the lithic assemblages of Moingona phase sites reported by Moffat et al. (1990) and Perry (1992) would seem to lend support to the idea of some sort of close relationship between the central Des Moines Valley and southeast Iowa Oneota populations. D. Henning (1970:161) had earlier characterized the Utz site in the Chariton River region as being "a center for receipt of Oneota ideas over the Midwest from the fourteenth century. Pottery from Utz suggests strong relationships with peoples of the Orr and Correctionville-Blue Earth phases to a degree not seen on other Oneota components." Neither the Moingona phase nor the southeast Iowa sites were well known at the time of Henning's writing, and he considered the McKinney site to be an Orr phase component. However, Straffin (1971b) noted the similarities between the Missouri sites and ceramics from the Kingston site. Collins (1989) also noted the importance of the Des Moines Rapids in the Mississippi River as both a boundary and a crossroads during Historic times. It is his contention that these rapids served these same functions during the Late Prehistoric period as well, noting the apparent absence of Oneota and Mississippian sites in northeast Missouri below the rapids, and the large number of Oneota sites in southeast Iowa above the rapids. E. Henning (1985) combined the Moingona and Burlington phases into a single RP3 study unit. However, following Gibbon's (1982) and Tiffany's (1979) suggestions, it seems more appropriate to consider them separate phases.

### The Moingona Phase

Gradwohl (1967) first defined the Moingona phase in the Red Rock Reservoir area of the Des Moines River Valley in central Iowa. The phase was expanded by Gradwohl (1973 and 1974), based on excavations at the Mohler Farm (13MA30), Howard Goodhue (13PK1), Clarkson (13WA2; Osborn 1976, 1982), and Cribb's Crib sites (13WA105; DeVore 1984, 1990; originally called the Leftwick site by Keyes, see Collins 1990), testing at 13MA27 and 13MA45, and surface collections from 13MA10, 13MA19, 13MA21, 13MA24, 13WA3-4 (Bowers Farm), 13WA101, 13WA102 (Bartholomew), 13WA106 (James-Dutcher), 13WA108 (Carlisle Railroad Swing; called the Paddy site by Keyes, mistakenly identified as the Lohmann site, and assigned site number 13WA5 by McKusick and Ries 1962; Collins 1990), 13WA109 (Sautter), 13PK3 (Preston), 13PK9, and 13PK10 (Beattie Bottoms), all large village sites. The new phase designation was justified on the basis of differences in ceramics between these sites and those of other named phases. As Gradwohl (1974:95) notes:

Rims, for example, are rarely as short and sharply everted as those of Correctionville Trilled, nor are they generally as high as those of Allamakee Trilled as these types have been

summarized by Henning (1961:27-29). Trilled, nested chevrons characteristically decorate rim interiors. This motif often alternates with tool indentation on the upper or inner surface of the vessel lip. Alternating shoulder designs include both rectilinear and curvilinear motifs. Concentric circle, cross, and circle-cross motifs occur, in addition to a small number of linear trilled and punctated designs. Small, but perhaps significant, numbers of rim exteriors are decorated with parallel horizontal trails. Similarly a small but notable percentage of body exteriors exhibits cord-roughening. Appendages include strap, loop, and carinate handles and occasional lugs. Minority items include a few trilled and punctated bowl sherds, several red-slipped sherds, several effigy bowl sherds, one S-shaped rim with exterior trilled decoration, and one small vessel with a noded shoulder. Several ceramic pipes and possible bead fragments have also been found at Moingona phase sites.

Gradwohl, however, declined to apply any type names to Moingona phase ceramics, and despite several studies (Osborn 1976, 1982; Benn 1984b, 1991; De Vore 1984, 1990; Moffat et al. 1990), no types have been named. Osborn (1976, 1982) noted the similarity of Moingona phase ceramics to those from the Guthrey site in Missouri (D. Henning 1970) and the Kingston site (13DM3; Straffin 1971b) in southeast Iowa. She also notes the presence of hematite inclusions in a large percentage of the body sherds. De Vore (1984, 1990) noted iron oxide in sherds from the Cribb's Crib site (13WA105), but considered these to be natural inclusions in the clay. He also reports a small number of grit-tempered sherds in the Cribb's Crib assemblage, and Moffat et al. (1990) report grit-tempered and grit and shell-tempered sherds from the Wildcat Creek site (13MA209). Benn (1984b, 1991) notes the presence of crushed hematite in at least one sherd at the Christenson site (13PK407), and it is also present in ceramics from the Dawson site (13MA207; Moffat et al. 1990). Moffat et al. (1990) also note the presence of a high percentage of cordmarked sherds, up to 25% of the body sherds at the Wildcat Creek site (13MA209). While cordmarked sherds are uncommon in other Iowa Oneota manifestations, they appear to be an important part in the Moingona phase occupations (Moffat et al. 1990).

To Gradwohl (1974), the phase appeared to be restricted to the Red Rock Reservoir area southeast of Des Moines, as no Oneota materials had been recovered during his extensive surveys in the Saylorville Reservoir north of Des Moines. In addition, all the sites Gradwohl included in the original Moingona phase designation appeared to be large village sites. As Benn and Rogers (1985:57) describe it:

Oneota in the central valley belongs to the Moingona-Burlington phase (Gradwohl 1967, 1974:95; E. Henning 198[5]). Moingona is the classification attached to the large Oneota villages in the Red Rock vicinity and at the mouth of the Raccoon River about 10 miles south of the Saylorville Reservoir. These large villages on second terraces or ridge tops show all indications of having been permanent base camps. They contain quantities of hunting, horticultural and processing tools as well as huge amounts of bone and vegetable debris. The latter includes maize kernels and cobs, squash seeds and (tentatively) beans (Gradwohl 1974:95). Among the animal remains are deer, elk, bison, fish and shellfish.

However, subsequent surveys and tests in the Lake Red Rock (Roper 1986; Rogers and Koldehoff 1987; Stanley, J. Anderson, and Rogers 1988; Moffat et al. 1990) and Saylorville (Benn and Bettis 1981; P. Emerson et al. 1983; P. Emerson and H. Finney 1984; Bettis and Benn 1984; Benn and Harris 1983) regions revealed the presence of small seasonally

occupied sites as well as large villages and sites farther upstream than the Red Rock Reservoir region. The Christenson site (13PK407; Benn 1984b, 1991) appears to be one such seasonal residential encampment that Benn interprets as a winter campsite. Although the pattern of large base camps and seasonal extraction camps goes back to the Archaic, these seasonal Oneota encampments appear to be much larger than those of previous time periods reflecting the larger "aggregate-band" organization of Oneota society (Benn and Rogers 1985). The Wildcat Creek site (13MA209; Moffat et al. 1990) may also be such a site. Both appear to have been reoccupied at least twice. At the Christenson site, Benn (1984b, 1991) identified three activity loci which he interpreted as oval family size houses. Six similar structures were located at the Wildcat Creek site, although Moffat et al. (1990) interpret it as a central village. The Dawson (13MA209) and Norman Dille (13MA208) sites are likely also seasonal residential camps (Moffat et al. 1990). Stanley and Rogers (1988) recognized small short-term extraction camps as well at sites 13MA216, 13MA42, and 13MA330. Perry (1992) has recently suggested that site 13PK46 might be a seasonal village, a fourth type of site. Moffat et al. (1990) note a correlation between Moingona phase sites and Huntsville Silt Loam soils, reasoning that it is an easily tillable soil.

As a result of all of these investigations, a number of settlement models have been developed for the Moingona phase. As Moffat et al. (1990:44) state:

Roper. . . (1986) divide[s] the Oneota sites into three types: permanent villages, seasonal residential camps, and specialized activity loci. Stanley et al. (1988:126-129) recognize seven kinds of Oneota sites: procurement stations, bivouac #1, bivouac #2, temporary base camp, seasonal base camp, village, and mound or cemetery. Procurement stations are concerned with the extraction of specific resources, while mounds or cemeteries are specialized mortuary or ritual localities. The remaining five sites represent habitation localities occupied for varying lengths of time by social groups of varying sizes. These habitation sites are classified on the basis of, '... estimated site size, quantity of fire-cracked rock, presence or absence of ceramics, tool types and degree of use, which aspects of the lithic reduction sequence are present or absent, and professional judgement based on experience in the Des Moines River valley (Stanley et al. 1988:126)' Benn (1984[b]:10-11) refers only to seasonal encampments and villages. However, he also comments that, 'the settlement model for Oneota is incomplete' (Benn 1984[b]:127), implying that there might be other kinds of Oneota sites.

Benn and Rogers (1985) develop a model for Oneota settlement that has the permanent villages concentrated in the Lake Red Rock locality, the populations of which separated to seasonally occupied smaller sites away from the "heartland." As they (1985:59) state:

Perhaps aggregate-bands left the vicinity of the villages to minimize impacts on resources like firewood and deer. Large contingents of men and women may have dispersed into the spacious territory around villages to hunt solitary wapiti and herding bison on the prairies. Groups that left the villages would have been large enough to defend themselves and to transport processed meat back to the village caches to supplement the maize harvest. While the hunting bands were away, a substantial contingent [sic] of villagers would have remained to protect their investment in caches, structures, and equipment.

This is just the kind of exploitation pattern described by Benn (1984b, 1989) for the development and spread of Oneota throughout the upper Midwest.

Chronologically, Gradwohl (1974) was unable to tie the Moingona phase down in time, due to widely divergent dates from the same samples from the Mohler Farm (13MA30) site that were split and sent to Gakushuin University and the Smithsonian Institution, some differing by nearly 1000 years (A.D. 690±90 (GaK-699) and A.D. 1680±180 (SI-359)). Moffat et al. (1990) suggest that the very early dated samples may have been contaminated with coal, which is present in the bedrock in the region. They also note that the complete lack of European trade goods from Moingona phase sites makes the late dates unacceptable as well. Subsequently, radiocarbon samples from Mohler Farm, Howard Goodhue (13PK1), and Clarkson (13WA2) sites were sent to the University of Wisconsin radiocarbon lab. The Wisconsin dates cluster between A.D. 1000 and A.D. 1300, a much more acceptable time range (Osborn 1982). Subsequent dates from the Christenson site (13PK407; Benn 1984b, 1991), Wildcat Creek (13MA209; Roper 1986), and Norman Dille site (13MA208; Stanley, J. Anderson, and Rogers 1988) were also problematic. In reviewing all published radiocarbon dates from Moingona phase sites, Moffat et al. (1990:437) conclude that "there are 20 arguably acceptable radiocarbon dates for the Moingona phase from eight different sites." These dates cluster between A.D. 1100 and A.D. 1300. This time range is well in line with the Correctionville and Burlington phases, with which the Moingona phase shows the most ceramic similarity.

Information on Moingona phase mortuary practices is sparse. While individual burials and isolated fragments of human bone are found in Moingona phase sites, only at the Howard Goodhue site (13PK1) was a discrete burial area encountered. Gradwohl (1974) interprets a curved set of postholes as a mortuary enclosure or charnel house. In association with these postmolds were found the remains of 16 individuals, both supine extended and bundle burials. Several pebble concentrations, a feature of Orr phase burials, were also present.

Another important discovery to come from Moingona phase research was Gradwohl's (1982) use of controlled ethnographic analogy to recognize mussel shell tools from Moingona phase sites as prehistoric corn shelling implements. Similar implements have also been recognized in Nebraska phase assemblages from the Glenwood locality (Hirst 1987; Green et al. 1990).

Subsistence remains recovered from Moingona phase sites include maize, beans, cucurbits, tobacco, little barley, chenopods, sunflower and marshelder. Faunal remains include white-tailed deer, a few bison and elk remains, beaver, canids, abundant fish remains and mussel shells, and turtle. Bird remains were rare. In general, Moingona phase subsistence appears to reflect the riverine-forest orientation of southeast Iowa Oneota sites. Many of the bison remains were scapulae, and elk were mostly represented by antler fragments (Moffat et al. 1990).

#### Northwest Iowa Oneota

Much less is known about Oneota manifestations in northwest Iowa. Unfortunately, many of the largest village sites have been (and are continuing to be) destroyed by gravel pit operations. In addition, the northwest Iowa region does not appear to present the type of "group continuity" demonstrated for Oneota in other regions (cf. Hall 1962; D. Henning 1970; Straffin 1971; Arzigian et al. 1989). Early components are assigned to what D. Henning (1970; E. Henning 1985) referred to as the Correctionville-Blue Earth phase, although recent research has demonstrated that Blue Earth is a separate phase from Correctionville

(Clark Dobbs, personal communication). Historic Oneota components, on the other hand, appear much more similar to Orr phase materials from northeast Iowa, and are assigned to the Orr phase as defined by D. Henning (1970). Recent studies in southwest Wisconsin and southeast Minnesota have resulted in the recognition of a local developmental sequence for the Orr phase in the tri-state region (see Boszhardt 1989). Historic accounts also indicate that the Ioway, presumed descendants of the Orr phase, were present in northwest Iowa during the Historic time period (M. Wedel 1976, 1981).

According to M. Wedel (1959:102), Keyes termed Oneota sites along the Little Sioux River in northwest Iowa whose ceramics differed from the northeast Iowa Oneota sites the Correctionville focus. She notes the similarity of the Correctionville materials to those of the Blue Earth focus of southern Minnesota, also named by Keyes but formally defined by Wilford (1945), and suggests that the two might represent a single focus. During the 1950s, salvage excavations were carried out on the Correctionville site (13WD6 (see Nansel 1989 for a discussion of the site numbers for this site)), which was being destroyed by gravel quarrying operations, by the Sanford Museum, the Northwest Chapter of the Iowa Archeological Society, and Dale Henning of the State University of Iowa, as the University of Iowa was known at the time. D. Henning (1961) used the ceramics recovered and a some surface collected from the Dixon site (13WD8) for his 1960 Master's thesis research, subsequently published in the *Journal of the Iowa Archeological Society*. He named the ceramic type Correctionville Trilled of Correctionville Shell Tempered ware as the possible diagnostic ceramic type of a possible Correctionville or Blue Earth focus. He also named a second group, Correctionville Grit Tempered ware, but noted that the grit-tempered sherds made up only 1.4% of the ceramics from the Correctionville site.

D. Henning (1961) felt that the grit-tempered ceramics were important as some appeared similar to McVey vessels of the Nebraska phase. He also noted that Oneota ceramics similar to those from Correctionville had been reported from Nebraska phase sites in Iowa (A. Anderson 1961) and Nebraska (Hill and Cooper 1938). Subsequently, in his 1969 Ph.D. dissertation, later published in *The Missouri Archeologist*, D. Henning (1970) names the Correctionville-Blue Earth phase for sites in northwest Iowa and southern Minnesota, and includes the Shrake-Gillies site in Wisconsin. M. Wedel (1959) had earlier noted the similarities of Shrake-Gillies material to that of the Blue Earth focus. Today it seems clear that this similarity is due to temporal proximity rather than cultural proximity. Henning (1970) also noted that ceramics from the Bastian site (13CK28) appeared intermediate between the Correctionville Trilled ceramics of the Correctionville phase, and the Allamakee Trilled ceramics of the Orr phase. This makes sense if one remembers that Tiffany (1979) placed the Bastian site in his Middle period for Iowa Oneota. It seems likely that it corresponds in time to the Late/Transitional Developmental horizon proposed by Boszhardt (1989), and characterized by the Pammel Creek phase in the La Crosse locality. Harvey (1979) noted a time trend in Oneota sites in the Little Sioux River Valley. Earlier sites tended to be located to the south, with later sites occurring in more northerly reaches. She hypothesized that the northerly region was occupied by Mill Creek people while the southerly Oneota villages were occupied, and that the Oneota could only occupy the more northerly locations after the Mill Creek had left the area. According to Harvey (1979:39), the Correctionville phase comprises:

Burr Oak (13CY1) in Clay County southwest of Webb, east bank [of the Little Sioux River]; Bastian (13CK28) in Cherokee County

north of Cherokee and actually on east bank of Mill Creek above its junction with the Little Sioux; Correctionville (13WD6 and 13WD7), in Woodbury County south of Anthon, west bank; Dixon (13WD8) in Woodbury County south of Anthon, east bank. One other precontact site, Linscott, is located in Woodbury County west of Sloan, on the east bank of the Missouri River.

The Gothier site (13WD3) is also part of the Correctionville phase.

Around the same time that Dale Henning was conducting his doctoral fieldwork at the Utz (23SA2), Dowell (23SA183), and Guthrey (23SA131) sites in Missouri, Amy Henning (later Harvey) was conducting her doctoral research on northwest Iowa Oneota sites. These two projects, along with G. Richard Peske's unpublished excavations at Carcajou point (47 Je-2) in Wisconsin, made up Project Oneota at the Department of Anthropology and the Center for Climatic Research at the University of Wisconsin-Madison. The purpose of the project was to study Oneota sites in ecotonal locations in an attempt to discern pattern of subsistence or settlement change in response to climatic change (Harvey 1979). To this end, A. Henning's research focused on the Dixon site (13WD8), a precontact site, possibly occupied at the very end of Baerreis and Bryson's (1965) proposed Neo-Atlantic climatic episode or during the warmer and drier Pacific episode, and Blood Run (13LO2), a Historic site occupied during the Neo-Boreal episode or Little Ice Age.

At the Dixon site, a postmold pattern represented a rectangular structure about eight feet wide, and at least 30 feet long. The house had been truncated by a county road, so its original length could not be determined. Within the house were four large cache pits, three trash pits, and six hearths as well as several rock piles. Additional cache pits were salvaged along the banks of the Little Sioux River that has been channeled through the site. Unfortunately, only around 11% of the faunal remains recovered were identifiable to species. Of those, bison remains were the most prevalent followed by deer, wolf, coyote and mountain lion, dog, elk and fox. This ordering is based on the number of elements present, however, and not on minimum number of individuals represented. Bird and fish remains were also present, as was mussel shell. Harvey also noted that for the large mammals, lower limb bones and scapulae accounted for the plurality of identified elements, suggesting that the animals were killed and butchered at a location away from the village, and only elements of use as tools were brought back. Four scapula hoes were recovered. Of the chipped stone tools, scrapers of various types dominated the assemblage while six metates (three found in a cache) along with numerous fragments, manos, and rubbing stones were the most prevalent ground stone tools. Four scapula hoes were recovered. According to Harvey, the ceramics from Dixon differ slightly from those at the Correctionville site, and this may be because Dixon dates slightly earlier in time.

Harvey obtained 12 radiocarbon dates on materials from the site ranging from A.D. 850 to A.D. 1750 including standard deviations. However, aside from outliers, the dates tend to cluster between A.D. 1180 and A.D. 1460. Harvey interprets the prevalence of projectile points and scrapers as evidence that the occupants of the site relied heavily on bison hunting for subsistence although reliance on horticulture is inferred from the village's floodplain terrace location and the number of grinding stones recovered. She notes that later sites farther upstream are located on uplands overlooking the river valley. However, as Overstreet (1981) has noted, no mention is made of floral remains, and there appears to have been no effort to recover them. We are simply informed that, "Ash, charcoal, stone and bone items and pottery were

the usual inclusions [of cache pits] (Harvey 1979:73)." It must be remembered, however, that these excavations took place in 1964, well before the development of flotation techniques for the recovery of floral remains.

The other site investigated by Harvey was the Blood Run site complex (13LO2/39LN2). This large and very complex site, covering perhaps 1000 acres in Iowa and South Dakota, along the Big Sioux River at its confluence with Blood Run Creek, is difficult to fit into current Oneota taxonomy. D. Henning (1970) includes it in his definition of the Orr phase, and Boszhardt (1989) lists it as an Orr phase component in the Late Classic horizon. M. Wedel (1959) noting the presence of both Woodland and Oneota components and the paucity of material then known from the site excluded it from the Orr focus. Harvey (1979) noted differences between the ceramics from Blood Run and Allamakee Trained ceramics from northeast Iowa. Twenty-eight percent of the ceramics at Blood Run were grit tempered and the remainder were shell and grit tempered, while the northeast Iowa ceramics were shell tempered. Also, rim heights are lower on the Blood Run material and plain lips are more common than in Allamakee Trained ceramics. More recently, D. Henning (1987, 1992) recognized the difficulty of characterizing the Blood Run ceramic assemblage. Further complicating the taxonomic placement of Blood Run is the fact that while the Orr focus sites of Iowa, Wisconsin, and Minnesota are presumed to represent the Historic Ioway, "specific occupants of the Blood Run site during the Historic period were the 'Little Prairie Sioux' which includes the Omaha, Ioway, Oto, and Yankton Sioux Indian tribes ([M.] Wedel 1976, 1981) (Schermer 1987:9)."

Although long known to researchers, surprisingly little excavation has taken place at the Blood Run site and most has concentrated on the mounds. Both Harvey (1979) and Schermer (1987) contain excellent histories of the site's investigations, and the following follows them closely. A village is shown on the Delisle map of 1702 in the vicinity of Blood Run and labelled "Village des Maha," or the Omaha. Whereas the Ioway are shown as having a village in the vicinity of the Iowa Great Lakes, the notes from which Delisle compiled this map make it clear that the village was on Spirit Lake (M. Wedel 1974, 1976). However, Delisle does place an Ioway village on the Big Sioux River on a 1718 map (M. Wedel 1976). M. Wedel (1976) notes, from the historic accounts, that the Ioway occupation of the Big Sioux River was short lived, probably less than a year. Hyde (1873) refers to stone circles, earthworks, an enclosure, and a village site in this area (Schermer 1987). Fulton (1888) also mentions the site (Harvey 1979). Thomas (1891) included the site in his catalog, and (1894) mentioned about 275 mounds in the vicinity, and stone circles around 30 feet in diameter, outnumbering the mounds, an octagonal enclosure, and a large village site (Schermer 1987). Starr (1887, 1888) excavated four mounds, and provided more detailed reports, although he did not mention the enclosure (Schermer 1987). Pettigrew, of Sioux Falls, excavated several mounds at the site and made a sketch map of mounds and stone circles in a 20 acre area of the site in 1889. He (1901) also mentions earthworks enclosing about 10 acres.

Lewis produced a detailed map of the site in 1889. Later, Lewis (1890) noted 105 mounds north of the railroad tracks, one of which was an animal effigy about 55 1/2 feet long. He also mentions the enclosure south of the railroad tracks and numerous stone circles. According to Schermer (1987), his sketch of the effigy resembles a bison or a bear. A serpent effigy mound has also been reported in connection with the site. Harvey (1979) and Schermer (1987) also note, as did an earlier questionable account, the presence of a large boulder of Sioux Quartzite, measuring 4 x 3 x 3 feet, with "all of its visible surfaces . . .

covered with small conical depressions which suggest mechanical friction (Harvey 1979:137)." Keyes and Orr (1963) excavated several mounds and mapped the site in the 1930s (Schermer 1987).

Harvey (1979) made surface collections from the site, examined private collections, and excavated a burial mound. As noted earlier, she noted differences between Blood Run ceramics and those from Orr focus sites in northeast Iowa. Glass beads and copper ornaments were found associated with two of the burials, but most of the cultural material located in the mound fill appears to have been accidental inclusions derived from the surrounding village site debris. Here, once again, projectile points and scrapers dominated the chipped stone assemblage while manos dominated the ground stone assemblage. Three mortars were recovered along with nine grinding implement fragments. A catlinite plaque, several catlinite pipe fragments, and a catlinite cylinder were also recovered. Only one pipe fragment was from the mound excavation. No definite scapula hoes were recovered, although many bone tools were present. In terms of faunal remains, 60 of the 139 identified bone fragments were bison. Although no minimum number of individuals was reported, this led Harvey (1979) to presume that bison was the primary meat source. Other identified remains included "gray wolf, beaver, fish, plains pocket gopher, dog, striped skunk, deer, elk, and a large bird (Harvey 1979:142)." She also notes that shellfish likely made up a major portion of the diet. No mention is made of floral remains. She notes that it is impossible to determine the relative importance of hunting vs. horticulture in the subsistence of the Blood Run inhabitants, but Harvey hypothesizes that the onset of the Neo-Boreal led to an increase in Oneota dependence on bison hunting for subsistence with less reliance on horticulture. Overstreet (1981) has pointed out that her data are inadequate to support such a position and that there is no evidence for a subsistence shift among Oneota populations throughout the Neo-Atlantic, Pacific, and Neo-Boreal climatic episodes in eastern Wisconsin.

Following Harvey's 1964 excavations, little work was done at Blood Run for many years. In an attempt to evaluate its current condition for the Division of Historic Preservation, D. Henning (1982b) visited in 1980 and relocated 77 mounds (Schermer 1987). In 1984, Adrien Hannus of Augustana College in Sioux Falls reported on the effect of recent gravel quarrying operations that were exposing cache pits in a previously unrecognized village area of the site. Salvage excavations were undertaken in this area in 1985 by the Office of the State Archeologist, Luther College, and the Iowa Archeological Society. Two hundred possible features were identified, and 30 cache pits were excavated, as was a disturbed mound (D. Henning and D. Anderson 1985; D. Henning and Schermer 1985; Schermer 1987). As Schermer (1987:9) states:

Cultural material from the salvage excavations are still to be analyzed, but a preliminary inventory includes large amounts of bison bone, some elk and dog bones, and very few bones from smaller mammals, fish and birds; large numbers of bison scapula hoes, ceramics, projectile points, scrapers, knives, drills, worked pipestone, manos and metates, shaft abraders, grooved mauls and axes; charred corn and beans; brass or copper finger rings or earrings; and a preserved bison or elk hide. An initial evaluation of this material suggests a late summer-early fall use of the features excavated, intensive effort in ceremonial activities, trade in the form of exotic stone and European items, and a great deal of social exchange with groups that did not share the same language heritage. . . .

In 1986, a field school was held at the site by the Office of the State Archeologist, Luther College, Augustana College, and the Iowa

Archeological Society. During this season the concentration was on survey via controlled surface collecting and shovel testing. During computer analysis of the surface-collected areas, it became apparent that the locations of former mounds could be identified through concentrations of introduced rock (Schermer 1987). Several cache pits next to and at the edge of the gravel quarry were excavated and one of these contained a rolled copper awl and two dog skulls (Schermer 1987). As noted earlier, although Schermer (1987) states that classic Allamakee Trilled ceramics are present at Blood Run, D. Henning (1987:6) states that, "Pottery was found in almost every feature. It is not consistent in temper, form, decoration or. . . anything other than, usually, a very generalized relationship to one's broadest imagining of what Oneota pottery should be like." This heterogeneity may be the result of the interaction of a large number of groups at the site. In considering site specific questions for the Blood Run site, Schermer (1987:15-16) notes that:

According to Omaha legend, the Omaha 'built a village where the river (the Big Sioux) makes a loop, at a point where a small stream enters from a canyon which, the Omaha story says, has 'two' cliffs, like pinnacles, standing at its entrance, through which the wind rushes with such violence as to disturb the water.' When they built this village, according to the legend, the Omaha were living in bark houses. They had met and fought the Arikara, but had not yet adopted the earth lodge. The continued forays of the Omaha made the Arikara seek peace and it was in this village at the mouth of the canyon that peace was made among the Arikara, the Cheyenne, the Omaha, the Ponca, the Iowa, the Oto, and sought to be confirmed through the ceremony now know [sic] among the Omaha as the Wa' wa" (Fletcher and LaFlesch 197[0]:376).

She then wonders if Blood Run could represent this site. Recently, D. Henning (1992, 1995b) has completed a more detailed study of Blood Run ceramics. He does see Arikara influence in some of the ceramics and tentatively links some to the Omaha. In noting the differences between Blood Run ceramics and those from Orr and Correctionville phase sites, R. Alex (1981b) proposed a Blood Run variant, into which he placed his Olivet phase Oneota sites in the James River Valley of South Dakota.

Another important protohistoric Oneota site is the Milford or Big Bend site (13DK1), first collected by Keyes in 1921 (Tiffany and D. Anderson 1993). In 1978 the University of Iowa, the Office of the State Archeologist, and the Iowa Archeological Society conducted an archeological field school at the site, directed by Lise Spargo (1984). The site is located on an upland divide and nearly encircled by an incised meander of the Little Sioux River about 7 km southwest of West Okoboji Lake (Tiffany and D. Anderson 1993). At least five concentrations of Oneota materials occur on this landform. During the field school, three distinct clusters of material were investigated, all within 130 m of each other. Both the south and east concentrations revealed midden deposits possibly within excavated basins. Interestingly, only one storage pit was located. Pits are generally numerous on Oneota sites, and this appears anomalous. However, Tiffany and Anderson (1993) note that in this area, the Cary outwash of sand and gravel upon which the modern soil formed, are underlain by relatively impermeable Tazewell till, and that groundwater perches above the clay. The single storage pit was excavated through the Cary deposits to the top of the Tazewell surface. When the pit was excavated, it was noted that it rapidly filled with groundwater following rainstorms, and drained slowly. This would have

made it unsuitable for crop storage and likely explains the lack of other such features at the site (Tiffany and D. Anderson 1993).

Faunal remains recovered indicate a heavy reliance upon bison, with 34 individuals represented. The remains of seven deer and two elk were also recovered, as well as the remains of nine dogs. Other remains include river otter, skunk, mink, raccoon, porcupine, turtles, frog, and fish remains. Pocket gopher remains were also quite abundant, and it seems likely that they formed a rather minor food source. The faunal assemblage also includes the earliest occurrence of the *Eurasian Rattus* on the northern Plains. The area of sympatry of the mammalian fauna occurs in eastern Minnesota and northwest Wisconsin, consistent with the Neo-Boreal time of the site's occupation. Tiffany and D. Anderson (1993) interpret the faunal assemblage as representing a diverse subsistence strategy, with emphasis placed on bison. Fish and bison remains suggest that the site was occupied in the late summer or fall. Plant remains are represented by around 40 corn kernels, two nut shells, and a squash seed. Also, a cluster of three metates and a mano was found in a single square, and an additional metate was found at a different location in the East Concentration. Twenty-one bison scapula fragments were also recovered. Although they were too fragmentary to determine whether they had been used as scapula hoes, Tiffany and D. Anderson (1993) believe that such a usage was likely. As Tiffany and D. Anderson (1993:297-298) state:

The subsistence data from Milford suggest a mixed subsistence strategy organized around people who belong to one of many small, kin-based task groups called family bands by Benn ([ed.] 1990:216). There is a marked diversity in resource selection, but preference at Milford is on locally derived bison. Gibbon's (1972[a]:176-177) hypothesis that Oneota groups in general shifted to bison as their main meat resource after A.D. 1300 is supported by the Milford data. Although horticulture appears ancillary at Milford given the plant remains recovered, it is very difficult to accurately assess its importance in the Milford economy. Given the artifact assemblage, which includes milling stones and slabs, pottery, brass kettle fragments, and corn shellers, and the diversity of the faunal assemblage, a reasonable hypothesis is that the Milford Oneota were also planting and harvesting corn and other crops to cover any exigency.

Ceramics from the site are most similar to the Allamakee Trilled ceramics of the Orr focus of northeast Iowa and are comparable to those from Blood Run with the exception that the Milford ceramics are all shell tempered. They appear to be smaller and less well made than the Blood Run ceramics. The lithic assemblage is dominated by projectile points with a lower percentage of scrapers and bifaces. Spargo (1984) noted that this may suggest that hunting was more important than hide processing at the site. Along with locally available cherts, Knife River Flint and Bijou Hills Quartzite were also represented (Tiffany and D. Anderson 1993). The Darrell Frerichs collection from the site also contains 15 catlinite pipes, 58 catlinite pipe fragments, two catlinite pendants, and a catlinite effigy.

The Keyes Collection at the State Historical Society of Iowa also contains a small inscribed catlinite tablet fragment (Tiffany and D. Anderson 1993). Five possible shell corn-shellers were recovered during the 1978 excavations. Trade goods from the excavation and the Frerichs collection include metal fish hooks, gun parts, brass kettle parts, powder cans, knives, tinklers, shot, copper points, glass trade beads (some altered), and European gunflints. Aboriginal gunflints of local chert were also recovered. The Frerichs collection also includes two Jesuit rings and an Apostle spoon fragment. Two similar rings were recovered

during the 1978 excavations, but one was subsequently lost. Similar rings have also been reported from the Gillett Grove site (13CY2; Hull and Bargloff 1966; M. Wedel 1976; Harvey 1979). Tiffany and D. Anderson (1993) believe that trade goods were being obtained by the Milford site occupants indirectly through other Native American intermediaries or brought to the site by the occupants themselves, as there is no historical evidence for European traders being in the area at the time and no archeological evidence that pottery and stone tools were still being manufactured. Also, there is no evidence of a shift in subsistence to the collection and processing of small mammals for the fur trade. Although the Milford site would definitely fit within D. Henning's (1970) Orr phase, Tiffany and D. Anderson (1993) decline to include it in the Orr focus, since it cannot be definitely tied to the Ioway tribe and may represent a village of the Oto who were displaced from this region by the Ioway in the 1680s-1690s (M. Wedel 1986). Instead, they suggest assigning it to Tiffany's (1979) Late period or placing it in a temporal variant of the Oneota tradition as proposed by R. Alex (1981b).

#### Northeast Iowa Oneota

As mentioned earlier, the Northeast Iowa Orr focus can be considered the type locality for the Oneota tradition. The sites along the Upper Iowa River Valley and its tributary, Bear Creek, apparently first attracted "professional" attention when the Lane-Hartley Terrace was visited by Col. P. W. Norris under the auspices of Cyrus Thomas of the Bureau of American Ethnology of the Smithsonian Institution in 1882 (M. Wedel 1959). This terrace contains several sites important to Iowa prehistory, including the Hartley Fort (13AM103), the Lane Farm Mound Group (13AM104), the Brown's Hill Mound Group (13AM89), the Lane Enclosure (13AM200), also known as pottery circle, and the Grant Oneota village (13AM201) (Tiffany 1982b). Norris made a sketch map of the sites on the terrace, which was later published by Thomas (1887; 1894). The map is reproduced in McKusick (1973). He also "excavated" a large portion of the Lane Enclosure, and nearly 20 of the reported 100 mounds in the Lane Farm Group with a plow (M. Wedel 1959). Thomas (1887) concluded, from these "excavations" that the circular enclosure had originally been a palisade, and that it was built by earlier occupants of the terrace than those who left the abundant ceramics and other artifacts found within, atop, and outside the enclosure; ceramics we would now know as Oneota.

Following Norris' work on the Hartley Terrace there was no professional involvement in the area for many years, although amateur interest in the area was intense. As M. Wedel (1959:7) says:

It is not surprising that for years these river terraces and the numerous sites they bear have been a productive source of Indian artifacts for surface collectors. Deep and thorough cultivation revealed many kinds of artifacts as it destroyed earthworks, cemeteries and village sites. Stream erosion and gullying caused whole pots to wash out of banks. Some branded them 'heathen pots', according to Orr, and destroyed them; others became ardent relic hunters. In the 1880's and 1890's an active business developed along the Upper Iowa River, involving the digging, selling and trading of artifacts. Burials that were covered with rocks, and therefore easily detected, were looted systematically. Fortunately a few people were interested in more than the objects themselves and kept valuable notes on place and circumstance of occurrence.

As early as 1927, Keyes (1927a) named the cultural group that had produced the Lane-Hartley Terrace sites Oneota and suggested that they were the remains of Ioway villages. Also as a result of Orr's urging,

the Upper Iowa River sites were among the first investigated with the newfound federal funds. The Lane Enclosure was barely visible when Keyes and Orr visited the site in 1934. They excavated two trenches through the enclosure, and a third inside the enclosure to check Norris' findings that year, and five more trenches were put through the enclosure in 1936 (M. Wedel 1959). While no evidence for a palisade was found, it was discovered that pits were located over the entire enclosure area, both inside on the enclosure itself and outside the enclosure. No houses were identified, but this is likely because any evidence of them were plowed away years before (M. Wedel 1959). All pottery found was Oneota and a small number of trade goods were recovered. One pit had been lined with grass and five beans were found on the grass. Orr believed that the enclosure was of Oneota origin, while Keyes remained unsure although he eventually agreed with Orr about the sites on the Upper Iowa terraces (M. Wedel 1959). However, M. Wedel (1959) notes that such enclosures are not characteristic of Oneota in other areas, and that Oneota sites with enclosures are associated with Woodland sites. She concluded that, although no final word is possible, it seemed likely that the enclosures associated with northeast Iowa Oneota sites were of Woodland origin. Between 1934 and 1936, Keyes and Orr also investigated 10 mounds in the Lane Farm Group, in which they discovered Oneota burials which they considered intrusive into Woodland mounds (M. Wedel 1959).

About five miles upstream from the Lane-Hartley Terrace, is the Elephant Cemetery site (13AM59). Between 1895 and 1933, 14 burials were looted by local residents of the area. In 1934, Keyes and Orr excavated four trenches and 11 test pits at the site. These revealed a large Woodland village with intrusive Oneota burials (M. Wedel 1959). Another two miles upstream lies the O'Regan cemetery and village site. Keyes and Orr conducted extensive trenching on the terrace in 1934 (M. Wedel 1959) encountering 34 burials, 21 of which contained grave goods. European trade goods were found associated with five burials. Although a few Woodland sherds were present in the area, the majority of the ceramics recovered were Oneota (M. Wedel 1959). A further two miles upstream is the New Galena Mound Group. This mound group consisted of 31 circular and one oval mound when Orr mapped it at the turn of the century, but by 1934 only 15 mounds could be found. Keyes and Orr investigated five mounds in 1934, and 10 more in 1936. The excavations revealed that the mounds were Middle Woodland in origin, containing intrusive Oneota burials, and the village remains associated with the mound were Oneota as well. However, only mounds were excavated at the site, so little is known of the village deposits in this area (M. Wedel 1959).

Just north of the New Galena Group and separating Bear Creek from the Upper Iowa River is a high rocky ridge called the Hogback. On this ridge were three Woodland mounds. At least one of these mounds contained an intrusive Oneota burial. Orr also reported several burials located on the Hogback that had produced Oneota materials. One of these contained two silver bracelets with the word "Montreal" stamped on them (M. Wedel 1959). Two of the mounds were excavated by Keyes and Orr in 1936. One contained a burial with an Oneota pot associated with it, but the other burials lacked diagnostic grave goods and previous pothunting activities made it impossible to determine which others were Oneota in origin. Below the Hogback was a large terrace called the Flatiron Terrace (13AM1), which contained a large Oneota village. This terrace was completely destroyed by 1950 by highway construction and gravel quarrying operations. Fortunately, H. P. Field and Dale Henning were able to salvage a large amount of material



while the destruction was taking place (M. Wedel 1959; D. Henning 1961).

Upstream on Bear Creek and north of the Hogback site, the Burke site lies atop an erosional hill. In 1936, Keyes and Orr excavated a trench on the top of Burke's Hill, which revealed 13 burials. All but one of the burials contained grave goods, and three complete Oneota pots were found with burials (M. Wedel 1959). A further two miles up Bear Creek is the Woolstrom Cemetery site, and nearby is the Malone Terrace site (13AM6), and the Malone Rock Shelter (13AM50). Keyes and Orr trenched the Woolstrom site in 1936, uncovering four burials with Oneota grave goods (M. Wedel 1959). Also nearby is the Flynn Cemetery site (13AM51; Bray 1961; M. Wedel 1959; D. Henning 1961), salvaged in 1958 by Robert Bray of the Effigy Mounds National Monument, and Reynold Ruppé of the University of Iowa. In all, 10 burials were excavated at this site. Several contained large amounts of grave goods, including European trade items, and one burial included a possible trophy skull. Of particular interest was a burial that contained a raven skull with a bone disc inserted into its orbit, as well as a copper mace. The large amount of trade goods found with these burials is of particular note since stone tools and ceramics were also found. This would seem to indicate that the burials took place before trade goods were common enough to have replaced homemade tools.

At Keyes' suggestions, Mott (later Wedel 1938a, 1938b) used historical sources to link the Orr focus as proposed by Keyes and McKern to the historic locations of the Ioway Indians in her Master's thesis. Subsequently, she studied the materials recovered by Keyes and Orr, and prepared a detailed report on the material remains recovered from the Upper Iowa Oneota sites, in which she (M. Wedel 1959) provided a much needed definition of the Orr focus. Her definition of the Orr focus is restricted to the Upper Iowa River Valley in northeast Iowa and the Riceford Creek Valley in southeast Minnesota. As she states (M. Wedel 1959:121):

The Upper Iowa River and Riceford Creek sites, so far as present evidence indicates, have just what is expected of a focus: 'almost identical complexes, therefore demonstrating the contemporaneous existence of several communities, all of which have a single culture in common.' It may be that the Clay and Lyon County (Iowa) materials that look so similar to these and have European trade goods would also share a preponderant number of determinants. This is what should be designated the Orr focus.

The Midway site is left standing to one side. It is probably earlier in time than the Iowa-Minnesota Orr focus manifestations. Its relationship is somewhat like that of the 'in-between' Bartron site in Minnesota that may be Oneota but is not as definitely Blue Earth focus as are the Humphrey and Vosberg sites. There, however, the other influences are from outside the Oneota aspect, whereas the Midway site shows mixed Oneota influences. If Midway is retained in the Orr focus, then it must be recognized that its relation to the other sites is different from their apparent relationship to each other.

At the same time that Mildred Wedel was preparing her report for publication, Dale Henning (1961) was completing his Master's thesis at the University of Iowa, analyzing the ceramics from Keyes and Orr's excavations at the Lane-Hartley Terrace, those he salvaged from the Flatiron Terrace, some excavated from the Malone Rockshelter, and those from the Correctionville and Dixon sites. There appears to have been a great deal of communication between the two, and both published type descriptions of Allamakee Trained ceramics, the

characteristic ceramics of the Orr focus. Although M. Wedel's report is dated 1959, McKusick (1973) notes that it was not distributed until almost a year later, the same year that D. Henning completed his Master's thesis, later published in the *Journal of the Iowa Archeological Society* (D. Henning 1961). So, it would seem that they should both receive credit for naming the type. Henning also tentatively assigned the McKinney site and the Gillett Grove and Blood Run sites to the Orr focus. As noted earlier, in his Ph.D. dissertation, D. Henning (1970) named an Orr phase, incorporating the Orr focus, but greatly expanding its range to include any site incorporating Allamakee Trained-like ceramics and tentatively linked to any Chiwere-Winnebago Siouan speaking group. He extends the Orr phase both temporally and spatially to include the Anker and Oak Forest sites near Chicago, the Leary site in Nebraska, returns the Midway site to the Orr phase, and notes an Orr phase presence in the Chariton River region of Missouri. The recent criticisms of this approach were discussed earlier and need not be repeated here.

In the early 1960s, McKusick (1964b) returned to the Lane-Hartley Terrace, conducting excavations at the Hartley Fort described earlier. In 1970, while trenching in an attempt to investigate two rises at the northern edge of the Lane Farm Mound Group, which he initially thought might be remnants of the Lane Enclosure later correctly relocated 1/8 mile away, he was able to locate one of Norris' trenches in a mound, and, to his surprise, encountered postmolds forming a house corner (McKusick 1971, 1973). As the series of postmolds were followed, they revealed a series of eight houses analogous to but much larger and longer than the oval ended houses from the Anker and Oak Forest sites in Illinois (Bluhm and Fenner 1961; Bluhm and Liss 1961). The postmolds outlined immense longhouses as much as ninety feet long and 25 feet wide, a house type not previously reported from Oneota sites. This group of houses was named the Grant site (13AM201) after the landowner Grant Hartley. In addition, McKusick was able to obtain a series of radiocarbon dates from features at the Grant site that ranged from A.D. 980±95 (GX-1996) to A.D. 1080±180 (GX-1994). An intermediate date was A.D. 1005±115 (GX-1995). These early dates, the lack of trade goods, and ceramic differences between the Grant ceramics and those of other northeast Iowa Orr focus sites led McKusick to propose a Grant phase, characterized by the Grant ceramic type, which predated the Orr phase in the area.

As mentioned earlier, McKusick had long been critical of D. Henning's (1970) conception of the Orr phase. He had also long been critical of the type Allamakee Trained as it was defined. In 1964 (a), he contended that Lane enclosure ceramics were distinctive from the type Allamakee Trained, and, that further analysis of northeast Iowa assemblages would reveal that the type Allamakee Trained could be divided into several types. He also noted that the definition of Allamakee Trained ceramics was tied very closely to Henning's (1970) definition of the Orr phase. As McKusick (1973:61) states:

A potentially diverse group of components are now grouped within the Orr phase, ranging geographically from Blue Island culture occupying the eastern Lake Michigan frontier of the Oneota tradition near Indiana; through parts of Wisconsin, Minnesota, Iowa, Missouri, beyond the Mississippi Valley and its western tributaries; through the Missouri Valley westward into Kansas and Nebraska. To this distribution we may add southeastern South Dakota, the Oneota Ioway site identified by Mildred Wedel (Mott 1938[b]:302). Chronologically many of these various components are relatively late, after A.D. 1300, but others are early and may span five to seven centuries with the anticipation of adding a century more with further



radiocarbon dating. The pottery included within the proposed Orr phase has repeatedly been differentiated as aberrant, different, similar, or resembling the Allamakee Triled type from the Upper Iowa in the original reports where it is described, but seldom is it identical without substantial qualifications. Given this definition of the Orr phase the Grant pottery type does not exist. It is just a minor variant, more similar to Allamakee Triled than some other varieties in the phase.

Recently, Hollinger (1993; Boszhardt, Holz, and Nienow 1995) was able to redate McKusick's GX-1995 sample which had been dated to A.D. 1005 by Geochron Labs. The Illinois Geological Survey dated the sample to A.D. 1420±80 (ISGS-2581). Other samples from the Grant site submitted for dating ranged from A.D. 1190±70 to A.D. 1500±70. Thus, although dating later than McKusick had originally believed, the site is completely prehistoric and definitely predates the protohistoric sites of the Orr focus as defined. In addition, recent work in the LaCrosse locality of Wisconsin by the Mississippi Valley Archeology Center and the Museum Archeology Program of the State Historical Society of Wisconsin have resulted in the delineation of a "group continuity" in the region (Hall 1962 and D. Henning 1970), consisting of a series of temporal phases culminating in the classic Orr phase of the Upper Iowa River Valley (cf. Boszhardt 1989). Longhouses similar to those found at Grant have also been found in the LaCrosse locality (cf. O'Gorman 1991). A restudy of the Grant ceramics might help determine how this site fits into the Upper Mississippi River Valley sequence. Unfortunately, Finney (1993) has since applied the Grant type name to late Late Woodland ceramics in southwestern Wisconsin, and Boszhardt (1989) has developed a new series of type names for precontact Oneota ceramics in southwestern Wisconsin.

## Wisconsin

The Late Prehistoric period in Wisconsin begins around A.D. 900 and extends into the period of contact with Europeans in the Midwest during the seventeenth and eighteenth centuries. Late Woodland groups were present throughout the state at the beginning of the period, but a Woodland presence is difficult to identify by its end. At least two Mississippian manifestations have been recognized: Middle Mississippian and Upper Mississippian or Oneota. The Late Prehistoric period is marked by an increasing reliance on maize horticulture and a concomitant emphasis on settled village life throughout much of Wisconsin. Some archeologists have linked the spread of maize horticulture to a warming climatic period in the region (Griffin 1961; Baerreis and Bryson 1965; Baerreis, Bryson, and Kutzbach 1976). The decline or reorganization of Late Prehistoric Oneota groups has been linked to a deteriorating climate (Baerreis and Bryson 1965; Penman 1988; Green 1993) and possibly to the introduction of European diseases (Green 1993).

Middle Mississippian represents a clear infusion of ideology, technology, and in some cases people, from the south. Sites classified as Middle Mississippian in Wisconsin have direct ties to sites in northern and central Illinois. Several different scenarios have been proposed to describe and explain the presence of Mississippian-like sites in Wisconsin (Hall 1962; Stoltman 1986c, 1991a; Emerson 1991a; Brown 1982; Gibbon 1974, 1982, 1991; Green and Rodell 1994; Krause 1985; Goldstein 1991; Goldstein and Richards 1991; Richards 1992; and others). Although there is not much agreement among archeologists, one thing that is apparent is that the Mississippian presence is different in character and effect in each region of the state. This diversity suggests that Middle

Mississippian inroads were not a concerted effort directed by an organized or militaristic elite from Illinois. The Middle Mississippian occupation of Wisconsin appears to end by A.D. 1200. In other parts of the Midwest and Southeast, however, Middle Mississippian societies persisted into Historic times.

Sites classified as Oneota (also called Upper Mississippian) appear to be less complexly organized than Middle Mississippian, and are related to similar sites in Iowa, Minnesota, and northern Illinois. In Wisconsin Oneota sites appear at about the same time as Middle Mississippian sites. It is not clear if Oneota developed out of Middle Mississippian groups, out of local Late Woodland groups responding to a Middle Mississippian presence or to an intensified use of maize, or out of some as yet unidentified new population in the region. The archeological literature is replete with treatises on all sides of the question of Oneota origins, and the issue will not be resolved in this overview. The Oneota occupation of the state continued to protohistoric times, and possibly into history. Modern American Indian groups which may derive from Oneota culture in Wisconsin include the Winnebago (Ho Chunk), Ioway, Menomoni, and Santee Sioux.

## Middle Mississippian, A.D. 900-1400+

The Middle Mississippian presence in Wisconsin is believed to derive ultimately from developments at the Cahokia site near East St. Louis, Illinois. Cahokia was a large, complexly organized site occupied between around A.D. 900 and A.D. 1400. The Middle Mississippian people who built Cahokia numbered between 10,000 and 40,000 at A.D. 1000 by some estimates (Fowler 1975, Fowler and Hall 1978) and were organized as a complex chiefdom, although some archeologists believe the size, complexity, and duration of the site has been overestimated (Milner 1986, 1991). The Middle Mississippian tradition arose in the central Mississippi Valley and ultimately spread throughout much of the southeastern U.S. Its influence was also felt to the north and west, possibly through actual population movements, but more likely through indirect processes.

Cahokia and other Middle Mississippian settlements exhibit characteristic attributes including platform mounds which served as the base for important buildings, plazas, rectangular houses constructed with wall posts set in trenches, food storage facilities, fortification walls which have bastions, and a settlement system which included towns or ceremonial centers surrounded by subsidiary settlements and farmsteads. Middle Mississippian cemeteries were mounded or unmounded, and bodies were often interred in an extended position in rows. Middle Mississippian subsistence was based on the cultivation of maize, squash, starchy seeds, and sunflower as well as on wild plants and animals. Domesticated beans were not part of Middle Mississippian subsistence (Lopinot 1994).

Middle Mississippian material culture included finely made shell-tempered pottery vessels in a variety of forms and sizes such as jars, bowls, pans, beakers, cups, plates, and bottles. Lithic tools included triangular arrow points, large knife blades, microdrills, and stone hoes. Artifacts used for personal adornment and as markers of sociopolitical position were made from cut and engraved marine shell and worked copper. Middle Mississippian symbols preserved in ceramics, shell, and copper included the scroll motif possibly representing water or the underworld, hawk/falcon-human figure, falcon eye, sun, and quartered world.

Several Middle Mississippian phases have been documented in the Cahokia region (See Kelly 1991, for example. Hall [1991] recalibrated and tightened the Cahokia chronology, but since uncalibrated dates

have been used elsewhere in this overview, Hall's calibrated data are not presented here). What has been termed Emergent Mississippian marks the development of local Late Woodland groups into Mississippian society between A.D. 750 and A.D. 1000. During this time settlements change from small and dispersed to nucleated and structured, and exchange networks expand from the local area to outside regions including the central Mississippi valley. The Lohmann phase, the first "fully" Mississippian phase at Cahokia, dates from A.D. 1000 to A.D. 1050 and includes the appearance of numerous platform and burial mound constructions, wall trench houses, and locally made shell-tempered ceramics including Powell Plain jars and limestone-tempered Monks Mound Red seed jars. Extraregional exchange continues to include the central Mississippi Valley and may also extend to the lower Valley and the Caddoan area. The presence of Hixton silicified sandstone from several Lohmann phase contexts at Cahokia indicates that there were also extraregional ties to the north, particularly to Wisconsin, at this time.

The Stirling phase (A.D. 1050-1150) marks the height of population size and complexity at Cahokia. It may also mark the height of sociopolitical integration within the American Bottom and the maximum extent of Cahokia's interaction with areas to its north. The Stirling phase at Cahokia is characterized by intensive mound building, plaza definition, large public buildings, high density of residential structures, and finely made shell-tempered ceramics including Ramey Incised and Powell Plain jars, as well as bottles, seed jars, bowls, pans, and beakers. A massive palisade wall was constructed around the central portion of the site late in this period. Settlement appears to have become more nucleated at regional centers.

After the Stirling phase climax at Cahokia, the focus of Cahokian interactions shifts again to the south. The Moorehead phase (A.D. 1150-1250) witnesses the beginning of the Cahokia decline in regional dominance and population size. New ceramic vessel forms including plates and effigy bowls appear which suggest strong links to the south. Mound construction and residential use of the site continue, but on a reduced scale. Maize appears to become more important in the diet (Lopinot 1994). During the Sand Prairie phase (A.D. 1250-1400?) only the central portion of Cahokia is occupied by Middle Mississippians who live on the mounds, but no longer build them (Benchley 1974, 1981). Sand Prairie phase ceramics include distinctive broad rim plates and cordmarked jars. Sand Prairie phase sites are found well into the uplands along drainages on both sides of the Mississippi River (Benchley 1976; Woods and Holley 1991). During this period evidence of Oneota groups also appears in west central Illinois.

Understanding these developments is important for interpreting Wisconsin's late prehistory because Cahokia had both direct and indirect influences on the region, especially during Lohmann and Stirling times. The nature, timing, and effect of Cahokia's impact is a matter of constant discussion and reevaluation in the literature (Griffin 1960a; Hall 1962; Gibbon 1974; Brown 1974; Springer and Witkowski 1974; Stoltman 1986c, 1991a; Emerson 1991a, 1991b; Goldstein 1991a, Goldstein and Richards 1991; Richards 1992; Overstreet 1995). During the Moorehead and Sand Prairie phases there is little evidence of Cahokian connections anywhere in Wisconsin. Oneota culture in Wisconsin during this time, however, flourishes. The Oneota-like groups in the Cahokia region following the Sand Prairie phase may have moved south from more northern regions of Illinois, Wisconsin, Iowa and Minnesota.

## Southeast Wisconsin

The Aztalan site (47 Je-1) is often cited as an example of Middle Mississippian site unit intrusion from Cahokia into southeast Wisconsin (Griffin 1960a). Aztalan is a nucleated village on the Crawfish River in Jefferson County which includes platform mounds, a palisade, a plaza, wall trench houses, agricultural fields (Gallagher 1988), and shell and grit-tempered ceramics. The ceramic assemblage includes a variety of vessel forms including Middle Mississippian jars, bowls, pans and beakers (Bleed 1970; Richards 1992) along with collared and uncollared Late Woodland jars (Baerreis and Freeman 1958; Richards 1992). The palisade wall included a series of bastions and had been plastered with daub (Barrett 1933). The platform mounds served as the base for buildings (Barrett 1933; Maher 1958). On the northwest mound a charnel house contained at least 10 burials arranged in a row (Rowe 1958). No other cemetery has been identified for the site, although human bones have consistently been found in refuse pits at the site. While human remains in Aztalan refuse are often interpreted as subsistence related (Barrett 1933), they may instead represent part of a multistage mortuary program (Goldstein and Sullivan 1986).

The Aztalan site has been the focus of archeological investigations since the nineteenth century (Lapham 1855), and major excavations were undertaken in the 1920s by the Milwaukee Public Museum (Barrett 1933). The Wisconsin Archeological Survey sponsored excavations at the site in the 1950s to aid in its development as a state park (Baerreis 1958), and the State Historical Society of Wisconsin conducted investigations in the 1960s (Bleed 1970; Freeman 1986). More recently the University of Wisconsin-Milwaukee has conducted limited excavations at the site and extensive survey in the region to examine questions about the site's setting and development (Goldstein 1987, 1991a; Richards 1992).

It has been suggested that Aztalan may have been an extractive outpost (Peters 1976), a colony of Mississippian elite governing over a local Late Woodland population (Stoltman 1991a), or a settlement of refugees (Emerson 1991). The recent investigations in the Aztalan region demonstrate that it is not a typical Middle Mississippian site. Systematic survey along the Rock and Crawfish rivers has revealed only a few sites with shell-tempered ceramics and none represent a substantial Middle Mississippian occupation (Goldstein 1991a). One site on a hilltop just north of Aztalan has a platform mound but no habitation area has been reported. There is no evidence for a hierarchical arrangement of Middle Mississippian settlements and farmsteads indicative of a typical Middle Mississippian settlement system (Smith 1978; Goldstein 1987, 1991a). The Aztalan site appears to have been an outpost in its region.

Excavations at the site indicate that a substantial Late Woodland population was present (Baerreis and Freeman 1958; Bleed 1970; Peters 1976; Goldstein 1991a; Richards 1992). In fact, grit-tempered ceramics dominate the assemblage at Aztalan. The high frequency of cordmarked and cord decorated, grit-tempered collared wares called Aztalan Collared (Baerreis and Freeman 1958) and Starved Rock Collared (Hall 1987) suggest the site was settled by a late Late Woodland population that may have derived from north-central and northeastern Illinois (Douglas 1976; Hall 1962, 1986, 1987, 1991, Goldstein 1991a). It should be noted, however, that some collared wares at the site such as Point Sauble (Baerreis and Freeman 1958) may be closely related to Madison wares and may have a more northern and eastern origin (Mason 1966, 1981; Salkin 1987). Some investigators suggest that the Middle Mississippians at Aztalan may have accompanied or followed Late Woodland groups from northern Illinois, rather than coming directly from Cahokia (Hall 1986; Goldstein 1991a; Richards 1992). Recently, however, Richards

suggested that the Mississippian ceramics at Aztalan are more closely related to the Cahokia site than to any other site in Illinois (Richards 1992:389).

Goldstein and Richards (Goldstein and Richards 1991; Goldstein 1991a) have suggested that the Illinois derived groups may have settled at Aztalan because its physical setting was more like the preferred Mississippian landscape in northern Illinois than the forest and wetland dominated areas of much of the Rock River basin in Wisconsin. Richards has also suggested that Aztalan's placement may reflect the late Late Woodland population's preferences, rather than the subsequent Middle Mississippian's (Richards 1992:413). It also appears that other parts of the southeastern Wisconsin region may have been already occupied by Oneota and Late Woodland peoples which would have limited the choices open to incoming groups from the south (Goldstein 1991a; Richards 1992; Overstreet 1995).

Recent excavations in the plaza and a stratified midden at Aztalan indicate that the site's history and formation were complex processes (Richards 1992). The ceramic sequence suggests that the site's initial Late Woodland inhabitants made Madison ware. By A.D. 820 (1130 ± 55 B.P.) collared wares (Aztalan Collared [Baerreis and Freeman 1958] and Starved Rock Collared [Hall 1987]) were present and were associated with maize and squash remains (Richards 1992:182). This is the earliest dated maize in Wisconsin. Sometime prior to A.D. 1000 Mississippian vessel forms appeared, but the pots were grit tempered rather than shell tempered. These ceramics, provisionally labelled Hyer Plain (Richards 1992:348), appear to have been made locally by Middle Mississippian potters, presumably females, who were in residence at the site with the late Late Woodland settlers. Richards demonstrated that the Hyer Plain vessel forms correspond to late Lohmann phase ceramics at Cahokia. After A.D. 1000 there was a substantial Middle Mississippian presence at the site as evidenced by shell-tempered ceramics which are comparable to the Stirling phase assemblages from Cahokia (Richards 1992). This Middle Mississippian presence was responsible for the reconfiguration of the site from a Late Woodland settlement to a permanent, mounded, and fortified Mississippian site. The absence of later Mississippian ceramic types suggests that Aztalan did not persist beyond A.D. 1150 (Richards 1992). The end of the site may have come suddenly, as is suggested by the burned palisade wall (Barrett 1933).

Radiocarbon dates from Aztalan cover a wide range of time from A.D. 630 to A.D. 1720 (Peters 1976, Boszhardt 1977, Richards 1992). The dates were obtained by numerous investigators from a variety of contexts and have been processed by several different labs between the 1950s and the 1980s. Consequently, the dates vary in quality and reliability. While the earlier Aztalan dates may be associated with the Late Woodland occupation of the site, the later dates cannot be tied to any Late Mississippian or Historic material remains and should be considered aberrant. The majority of the Aztalan dates, however, have midpoints that range from A.D. 1000 to 1150 and appear to represent the Middle Mississippian occupation (Richards 1992).

In addition to the small sites in the Aztalan area, there are a few other Middle Mississippian-like sites in southeast Wisconsin. The Indian Prairie site along the Milwaukee River was reported as having a flat topped mound of unspecified shape along with effigy mounds, intaglios, and garden beds (Lapham 1855). Recent investigations along the Milwaukee River in the area have confirmed the presence of Late Woodland and Oneota material remains, but Middle Mississippian artifacts have not been recovered (James and Benchley 1980; James 1981).

The Klug Island site (47 Oz-67) along the Milwaukee River in Ozaukee County has produced evidence of a Late Woodland/Mississippian occupation (Goldstein 1989, 1994:176-196). The grit-tempered ceramics are variable in form and decoration, and appear to fit into the Madison, Hahn, Aztalan Collared, and Point Sauble series having cord impressed decorations and "thickened" rims. Shell-tempered jars at Klug Island have an Oneota paste and everted, notched and plain rims, but have sharp shoulders and narrow incised decoration which resemble Middle Mississippian forms. Test excavations at the site revealed evidence for an occupation surface, a possible single post structure, and a mounded burial feature. According to Goldstein, the material remains appear to represent a single component.

There have been other reports of Mississippian-like ceramics found on Late Woodland sites with collared ceramics in eastern Wisconsin (Hall 1962, Overstreet n.d.). These include the Watasa Lake Swamp site in Menominee County (Barrett and Skinner 1932), the Hamilton Brooks site (47 Gl-122) in Green Lake County (Hall 1962, 1967), and several other sites that have not been excavated or reported in the literature. While the ceramics reported from many of these sites are described as Ramey Incised and Powell Plain, it is apparent that most were made to resemble the Cahokia types, but were not made at Cahokia or by Cahokia potters. It is not clear exactly what these ceramics represent in terms of culture contact, change, and dynamics, but they do not represent an intrusion of Middle Mississippian populations from central Illinois.

At the Carcajou point site (47 Je-2) in Jefferson County, a wall trench structure and Mississippian-like ceramics occur in an early Oneota component (Hall 1962). The Mississippian-like ceramics resemble pottery found in western Wisconsin at Silvernale phase sites, and they do not appear to derive from a Cahokia source. The Carcajou point site will be discussed in the Oneota section of this chapter.

#### Southwest Wisconsin

Sites with Middle Mississippian materials are rare in southwest Wisconsin, but there are a few examples from along the Mississippi River valley.

The southernmost site with Middle Mississippian materials is located about five miles east of the Mississippi River trench in Grant County. The Fred Edwards site (47 Gt-377) (Finney and Stoltman 1991; Stoltman 1991, 1992b; Finney 1993) is situated on a terrace of the Grant River. The village site includes a central plaza, approximately 20 rectangular, single post houses, two possible sweat lodges, and over 100 storage/refuse pits. A single row of posts indicating the presence of a palisade wall or fence without bastions was identified at the margin of the site. Radiocarbon dates from the site range in age from A.D. 800 to 1300, but the excavators argue that the majority of dates cluster between A.D. 1050 and 1150, a time range contemporary with the Stirling phase at Cahokia. There are only a few examples of overlapping houses and pits at the site, supporting the conclusion that the occupation was relatively short term. Two of the larger structures at the site may have served as community structures. Analysis of debris distributions indicates that the settlement was composed of essentially egalitarian households, with no indication of craft specialists or accumulation of wealth. There are no other sites like Fred Edwards in southwestern Wisconsin, and it appears to be a site unit intrusion into the region.

The ceramics at Fred Edwards are diverse and suggest it was an intrusive Late Woodland village which included some type of Mississippian residents. The Late Woodland ceramics include locally made grit-tempered, cordmarked, cord impressed and collared wares. These ceramics resemble northern Illinois Canton ware more than the

Wisconsin Madison wares and have been designated the Grant series (Finney and Stoltman 1991). Nonlocal collared wares are also present, including a variant of Aztalan Collared, and Hartley series ceramics from Hartley's Fort in northeast Iowa (Stoltman 1991). Shell-tempered ceramics include varieties resembling Powell Plain, Ramey Incised, and Cahokia Red Filled, but some are locally manufactured. Nonlocal shell-tempered vessels resemble vessels from Hartley's Fort, Aztalan, and the Rench site in Illinois, but their source has not been identified (Stoltman 1991). Several hybrid ceramic vessels are also present including grit-tempered Mississippian forms and shell-tempered plain, cordmarked, and cord impressed Late Woodland forms.

The lithic material remains from Fred Edwards are also diverse. Lithic tools include not only triangular arrow points, but also abundant end scrapers which indicate hide processing was an important activity at the site. The excavators suggest the Fred Edwards inhabitants may have traded deer and elk hides into a Mississippian sphere (Finney and Stoltman 1991). A variety of lithic raw materials were present including Kaolin, Dongola, Burlington and Mill Creek cherts from the south and Hixton, catlinite/red pipestone, and Knife River chalcedony from the north and west. Minerals found include galena and hematite, which were probably exploited locally, and copper from the north.

Faunal and floral remains suggest the site was occupied during all seasons. A variety of cultivated plants were recovered including maize, squash, sunflower, maygrass, and tobacco. Other important food plants include knotweed, goosefoot, fruits and berries, hickory, walnut, and acorn (Arzigian 1987). Faunal remains at Fred Edwards are dominated by deer, elk, and beaver, but other small mammals and migratory waterfowl are also present (Finney and Stoltman 1991).

Although it has not produced Middle Mississippian cultural debris, the Gotschall Rockshelter (47 Ia-80) along the Wisconsin River in Iowa County may provide evidence of a Mississippian presence in this interior region of southwest Wisconsin (Salzer 1987, 1993). Material remains in the shelter reflect a late Late Woodland and Oneota occupation. Paintings on the walls of the shelter recount the story of Red Horn, which is known from Historic Winnebago (Ho Chunk) and Ioway legends. The Ioway and Winnebago are presumed descendants of Oneota rather than Middle Mississippian cultures. The Gotschall paintings include figures of Red Horn, a giant and giantess, a large bird, a turtle, and possibly other characters. The figures are rendered in several styles. Several figures including the turtle and portions of the large bird are massive, black figures with little internal detailing. Red Horn and the giants, however, are outline drawings, with careful detailing of headdresses, tattoos, clothing and implements. The style resembles iconography from Middle Mississippian sites such as Cahokia and Spiro (Oklahoma), and does not appear to be Late Woodland or Oneota in design. The headdress, tattoos, clothing, and forked eye of the large bird also resemble Middle Mississippian rather than Oneota or Late Woodland motifs. A carved sandstone human head with facial tattoos was also found in Late Prehistoric deposits at the shelter (Salzer 1996). Even though the rockshelter is undergoing extremely careful excavation, the complexities of archeological site formation processes, and of Late Prehistoric cultural dynamics in the region will make it very difficult to assign clear authorship to these remarkable figures.

The second locale with Middle Mississippian materials along the Mississippi River valley is at the town of Trempealeau in Trempealeau County. Four sites with Middle Mississippian indications have been reported on a bluff outlier next the Mississippi (Squier 1905, 1917; Green and Rodell 1994). A recent report by Green and Rodell (1994) summarized archival and field research at the Trempealeau locality. The

Little Bluff Platform Mound Complex (47 Tr-32) is a multiple-platform mound located on the summit of a narrow ridge. Coring has confirmed that the three platforms and connecting ramp are man made with the fill probably coming from adjoining borrow pits. No artifacts have been found associated with the mound. A second possible platform mound, the 3rd Street Mound, is located in the village of Trempealeau at the base of the bluff. Two Middle Mississippian habitation sites (Squier Garden [47 Tr-156], Stull [47 Tr-159]) have also been identified in the bluff base setting. These sites have produced a variety of early Middle Mississippian sherds, as well as a few from the lower Mississippi valley, all of which fit into the Lohmann phase at Cahokia (A.D. 1000-1050). The pottery includes predominantly red slipped sherds tempered with shell, limestone, and grog, and black slipped ceramics have also been reported. There do not appear to be Late Woodland or Stirling phase Mississippian ceramics associated with the habitation sites.

Green and Rodell (1994) concluded that the Trempealeau locality sites represent the earliest intrusion of Middle Mississippian into the upper Mississippi River Valley. The sites may represent an incursion of Cahokia elites who produced a highly visible Mississippian presence in a region already well known to local Late Woodland peoples. The early Mississippians may have been targeting local resources including Hixton silicified sandstone which outcrops in the region. At Cahokia Hixton is found almost exclusively during the Lohmann phase. Green and Rodell suggest that Trempealeau represents a symbolic expression of the expansion of chiefly Mississippian economic and information networks into the Upper Mississippi region. The incursion appears to be short lived, however, since Stirling phase materials are not present at Trempealeau.

A Stirling phase presence has been suggested for the Red Wing locality situated about 70 miles upriver from Trempealeau (Gibbon 1974). The Red Wing locality is centered on the confluence of the Cannon River with the Mississippi in Minnesota and Wisconsin. Several Mississippian-like and Oneota sites have been reported on high and low terraces bordering the waterways. Middle Mississippian attributes have been identified for the Silvernale phase sites of this locality (Gibbon 1991). These attributes include two possible platform mounds, abundant shell-tempered ceramics which resemble Stirling phase jars, and an occasional trinotched point, earspool, chunky stone, copper mace, and Long Nose God maskette. Silvernale phase ceramics include shell-tempered Oneota and "Middle Mississippian" jars, as well as grit-tempered Cambria sherds from western Minnesota. The Middle Mississippian ceramics are defined as having rolled and intermediate rims, angular and rounded shoulders, and an incised scroll design or "Ramey Motif" (Rodell 1991). Oneota vessels are defined as having high, everted rims, rounded shoulders, and chevron designs. However, design elements, shoulder shape, and rim forms can be found in many combinations and no temporal differences could be distinguished in analysis of the ceramics from Minnesota sites (Gibbon 1991; Gibbon and Dobbs 1991).

A broader view of Mississippian ceramic styles suggests that posing a simple dichotomy between Middle Mississippian and Oneota ceramics may not be appropriate. For example, the ceramics identified as Mississippian at the Red Wing sites do not represent anywhere near the range of ceramic variability found at Stirling phase Cahokia. The rolled rim is only one of several Stirling phase rim forms; the scroll motif is only one of a wide variety of curvilinear and linear motifs; Stirling phase vessels include several jar forms and sizes with angular and rounded shoulders, as well as bottles, pans, large and small bowls, cups, funnels, and beakers; and Stirling phase surface finishes are predominantly black

slipped and/or smudged (Fowler and Hall 1972; Holley 1989). In the later Moorehead and Sand Prairie phases at Cahokia jar forms shift to rounded shoulders and high, everted rims. These later Middle Mississippian vessels resemble contemporary Oneota forms. In the Apple River locality of northwestern Illinois, Emerson has suggested a local sequence from rolled to everted rims is related to general Mississippian ceramic trends and not to the emergence or influence of Oneota groups (Emerson 1991b).

In this author's opinion, there is nothing at the Red Wing sites which indicates a direct tie to Cahokia. Rather, the Silvernale phase appears to represent a cohesive, localized group which articulated with similar, but distinct societies on the Plains, in southern Wisconsin, and northern Illinois including Cambria, Apple River, Aztalan, and possibly Oneota groups. The ceramic styles suggest that this manifestation was contemporary with but related only indirectly to Stirling phase and later developments at Cahokia. Recent reanalysis of the Minnesota ceramics supports this view (Dobbs, this volume). As Gibbon repeatedly notes (1991), the Red Wing materials appear to be "Middle Mississippian" as Mississippian is understood by Minnesota archeologists. Perhaps that was also the case for the Minnesota "Mississippians" who were trying to represent themselves as part of what they understood as the Mississippian sphere, but who had never lived or worked at Cahokia.

The articulation of the Silvernale phase settlements with societies already present in the Red Wing area is a matter of some interest and debate. On the Minnesota side of the Mississippi, there is practically no evidence for Late Woodland settlements in the region at the beginning of the Silvernale phase (Gibbon and Dobbs 1991). Some archeologists suggest that the Silvernale phase intruded into an already established Blue Earth Oneota occupation (Gibbon and Dobbs 1991). The radiocarbon dates for the Blue Earth Bartron site (21 GD-2) appear to be generally contemporary with the Silvernale phase dates for the locality (eg. Dobbs 1982). Other archeologists, however, question the context and reliability of the radiocarbon record relating to Blue Earth at the Red Wing locality (Stoltman 1986c, Rodell 1991). The spatial segregation of Silvernale phase and Oneota materials at the palisaded Bryan site (21 GD-4) has been suggested to support the idea of sequential occupations (Gibbon and Dobbs 1991). The spatial differences could, however, represent two contemporary groups, with the Oneota peoples being excluded from the Silvernale phase area inside the palisade wall. The one Blue Earth date from the site (A.D. 1450  $\pm$  120 [Dobbs 1982:103]), however, is at least 200 years later than the Silvernale occupation, and suggests Oneota postdates the Silvernale phase at Bryan.

On the Wisconsin side of the Mississippi, there is evidence for Late Woodland settlements and mounds. It has been suggested that the Silvernale phase intruded into the Late Woodland occupation at the Diamond Bluff (Mero) site (Maxwell 1950; Rodell 1991). Oneota use of the Diamond Bluff area at the Adams site (47 Pi-12), however, appears to postdate the Silvernale phase (Rodell 1991, Gibbon and Dobbs 1991).

The Diamond Bluff site (47 Pi-2) (also called the Mero site after a former landowner) is located on the Diamond Bluff terrace along the Trimbelle River at the river's confluence with the Mississippi in Pierce County. The site has been investigated by several institutions since the late 1940s (Maxwell 1950; Rodell 1991; Wendt and Dobbs 1989; Gibbon and Dobbs 1991). The site includes an extensive mound group with over 300 conical, linear, and effigy mounds. The presence of middens beneath some of the excavated mounds suggests the mounds were built over former residential areas. Late Woodland ceramic varieties from mound and habitation contexts include Madison and Clam River wares (Rodell 1991:272). Several habitation areas have been identified on the

terrace, including two Late Woodland scatters and two Silvernale phase concentrations (Wendt and Dobbs 1989). The Silvernale phase occupation areas are devoid of mounds. Silvernale phase features include single post houses in deep basins, and numerous storage/refuse pits and postmolds (Rodell 1991; Dobbs, this volume). No palisade or platform mounds have been identified.

Mound excavations conducted in the 1940s at Diamond Bluff suggest that the Silvernale and Late Woodland occupations may have overlapped in time (Maxwell 1950; Rodell 1991). Excavation of a panther effigy mound produced a cremation burial accompanied by a Silvernale phase vessel, as well as shell-tempered vessels in the mound fill and submound contexts. There was no indication that the burials or ceramics were intrusive. Shell-tempered ceramics were found in the fill of several other mounds, as well. It appears that in the Red Wing locality, at least, effigy mounds were still being constructed while Silvernale phase peoples were in the area. Elsewhere in Wisconsin, however, Oneota burials are found to be intrusive into Late Woodland mounds.

Some of the conical mounds at Diamond Bluff may be related to the Silvernale occupation, rather than to Late Woodland (Wendt and Dobbs 1989). Archeologists have noted that the larger Silvernale sites in the Red Wing locality are all associated with large groups of conical mounds (Gibbon and Dobbs 1991). Like those at Diamond Bluff, the conicals are separated from the intensive habitation areas, and many appear to be refuse piles rather than mortuary features. Similar clusters of small conicals, apparently also refuse deposits rather than burial mounds, have been reported at one of the larger Mississippian-like Apple River sites in northwest Illinois (Emerson 1991b) and at Lasley's Point (47 Wn-8/96), a Lake Winnebago phase Oneota site in eastern Wisconsin (Peske 1966).

The material remains from Diamond Bluff are similar to other Red Wing locality sites (Rodell 1991). Ceramics include shell-tempered jars with a variety of Mississippian-like motifs and rim and vessel forms. Oneota-like motifs and rim and vessel forms are also present, but their chronological and spatial relationships to the Silvernale materials are unclear. Diamond Bluff lithics include notched and unnotched small triangular projectile points and end scrapers. A variety of bone tools were also found. Lithic raw materials consist of a variety of cherts, Hixton silicified sandstone, and Knife River chalcedony. Animal remains include deer, elk, bison, beaver, bear, and a variety of small mammals. Fish bone and shell reflect exploitation of the Mississippi and its backwaters. Floral remains include several corn varieties and plum seeds.

The radiocarbon record from Diamond Bluff is similar to other Red Wing locality sites. Five charcoal samples from the fill of two features produced uncorrected dates that range from A.D. 995 to A.D. 1195  $\pm$  55 and average A.D. 1090. The calibrated dates range from A.D. 1000 to almost 1300 (Rodell 1991). Five Silvernale features from the Silvernale and Bryan sites (Dobbs 1982:103) date from A.D. 1120 to A.D. 1300  $\pm$  130 and average A.D. 1190. The calibrated dates range from A.D. 1150 to 1300. The dates come from charcoal in feature fill, and these contexts make it difficult to specify what occupation or activity is being dated. The dates suggest general contemporaneity with Stirling and Moorehead phases at Cahokia, and with Blue Earth Oneota sites in western Wisconsin and eastern Minnesota.

#### Northern Wisconsin

There is practically no Middle Mississippian presence in northern Wisconsin. A rectangular platform was reported in the 1850s near Ontonogon in Michigan's Upper Peninsula (Lapham 1855:74). This author participated in a survey of the vicinity in the 1960s, but the mound

could not be relocated (Salzer 1969). Powell Plain and Ramey Incised-like ceramics have been reported at the Sand Point site (20 Bg-14) near Lake Superior in the Upper Peninsula (Dorothy 1980). These sites are located within an important prehistoric copper mining region that may have attracted Mississippian-like groups. Most of the mining activity in the area is suggested to have occurred during the Middle or Late Archaic, however. Ramey Incised pottery has also been reported on Lakes phase sites in northern Wisconsin, where it is suggested to represent trade wares rather than a Middle Mississippian occupation (Salzer 1969, 1974, 1986b). An unusual Middle Mississippian-like vessel was found in an intrusive pit in a Late Woodland mound at the Wakanda Park site (47 Dn-1) in Dunn County, northwestern Wisconsin. The vessel was a grit-tempered, angular shoulder jar with a "red painted" plain surface and parallel incised lines (Wittry 1959c) and may be related to Silvernale phase ceramics (Barth 1985). The intrusive context of this vessel, whatever its cultural affiliation, indicates that it postdates the Late Woodland occupation of the site.

### Oneota (A.D. 900/1000-1650)

Oneota is distinctive in Wisconsin in both its material remains and settlement patterns. Oneota sites typically exhibit shell-tempered, globular pots with everted rims and trailed decoration. Other characteristic material remains include triangular arrow points, small end scrapers, sandstone shaft abraders, and an extensive deer bone tool assemblage including scapula hoes and sickles. Bison and elk scapula hoes are also found. Shell spoons and pendants, copper pendants, and, in later phases, catlinite fragments and pipes are also found.

Oneota subsistence remains include corn, beans (for the first time), squash, sunflower, and tobacco as domesticates. Other important floral resources include wild rice, nuts, seeds, tubers, berries, and fruits. Faunal remains are dominated by deer and elk, but bear, beaver, muskrat, and other small mammals are also present. Fish remains are abundant at Oneota sites along with shellfish, turtle, and waterfowl. Although Oneota has been characterized as having a prairie edge adaptation to the west, Wisconsin Oneota site locations and subsistence remains indicate that woodland and wetland habitats were an important part of the Oneota adaptation.

Oneota sites were often extensive and intensely occupied. Large storage pits subsequently used for refuse are abundant at Oneota sites, and may reflect year around occupation of villages. Houses have been reported in a variety of shapes and sizes including single post oval, rectangular, and long house forms. A few wall trench houses have been found in early Oneota components. Some sites were surrounded or partitioned with single post fences. Oneota burials are found in habitation and cemetery areas, and rarely are reported in mounds. Garden beds (agricultural fields), sometimes enriched with habitation debris, have been directly and indirectly associated with Oneota occupations. Clustered Oneota settlements or localities have been identified in many parts of the state and may represent large contemporaneous social units or a series of shifting village sites. There is no evidence for any kind of hierarchical relationship among settlements, groups, or individuals, and social relations appear to have been relatively egalitarian.

Numerous phases or regional variants have been identified in Wisconsin dating from around A.D. 900 to A.D. 1600. The earliest Oneota sites are reported in eastern Wisconsin. McKern (1945) originally defined three foci in the Oneota aspect of Wisconsin which included Grand River and Lake Winnebago in the east, and Orr in the west. Hall later added the Koshkonong focus in eastern Wisconsin (Hall 1962). The

foci later were called phases after radiocarbon dating provided time depth to McKern's taxonomic system. In most localities there are marked continuities in Oneota culture and some local phase sequences have been proposed (Overstreet 1995; Boszhardt 1994). Some archeologists have also suggested that a horizon scheme can be applied to Wisconsin Oneota which suggests that different regions may have undergone parallel developments over time (Hall 1962, Overstreet 1978, 1995).

### Southeast Wisconsin

Southeast Wisconsin has produced evidence for long term occupation by Oneota peoples from approximately A.D. 900 to Historic times. Three phases (previously called focuses) have been identified for the region including Lake Koshkonong in the Jefferson County area, Grand River in the Green Lake and Marquette County area, and Lake Winnebago in the Winnebago County area (Gibbon 1986). Several provisional phases (McKern, Dandy) recently have been proposed (Overstreet 1995) but are not in widespread use. The apparent long regional continuity has been subdivided into horizons by several investigators (Hall 1962; Overstreet 1978, 1981, 1995), although others have suggested that many Wisconsin Oneota manifestations are contemporary rather than sequential (Gibbon 1986), and may reflect exploitation of different ecological niches (Gibbon 1972b). The proposed Oneota horizons include Emergent, Developmental, Classic, and Historic (Hall 1962; Overstreet 1981). The dates assigned to these horizons and their nature vary between and within authors.

In 1962 Robert L. Hall first suggested that a horizon scheme could be applied to the Wisconsin Oneota tradition (Hall 1962). Hall proposed that Emergent Oneota would be transitional from Middle Mississippian to Oneota, but he also suggested that the antecedents to shell-tempered ceramics could be found more locally in Wisconsin Middle Woodland. Emergent Oneota materials were identified at Carcajou Point (47 Je-2) and other sites on Lake Koshkonong in Jefferson County, Diamond Bluff (47 Pi-2) and Silvernale phase sites in Minnesota, and several sites along the Apple River in northwest Illinois. Hall suggested the Emergent horizon was contemporary with Old Village (Stirling) and dated to around A.D. 1000, but he was unwilling to say the materials he excavated at Carcajou Point came from Cahokia. It should be noted that Hall was writing before radiocarbon dates had been obtained for most Middle Mississippian or Oneota sites. Hall proposed that Developmental horizon material was present at the Bartron site (21 GD-2) in the Blue Earth focus, and at east central Wisconsin Grand River focus sites. He also suggested that Koshkonong Bold ceramics might be considered Developmental at the late Koshkonong focus at Carcajou Point and related sites, and at the Lasley's Point site (47 Wn-96) (1962:107). Hall's Classic horizon included Blue Earth and Orr focus sites in western Wisconsin, Iowa, and Minnesota, and Lake Winnebago focus materials in eastern Wisconsin.

Subsequently Overstreet (1976, 1978, 1981), in placing the Pipe site (47 Fd-2/10) in a regional context, elaborated on Hall's horizon scheme, adding dates and an Historic horizon. Overstreet's 1981 horizons included Emergent (A.D. 800-1000), Developmental (A.D. 1000-1300), Classic (A.D. 1300-1650), and Historic (post A.D. 1650). Overstreet did not identify any Emergent Oneota sites, but suggested the tradition developed out of Middle Woodland. Developmental Oneota (A.D. 1000-1300) included early Koshkonong, Grand River, and Green Bay phases and sites such as Carcajou (47 Je-2), Crescent Bay (47 Je-244), Pipe (47 Fd-2/10), Bornick (47 Mq-65), and Walker-Hooper (47 Gl-165). Developmental sites have predominantly plain ceramics with occasional curvilinear trailed and bold decorations. House forms are variable and include rectangular wall trench structures, single post oval wigwams,



and gabled open summer houses. Sites are large and periodically reoccupied. Overstreet's 1981 Classic horizon (A.D. 1300-1650) for eastern Wisconsin is spatially restricted to the Fox River drainage and includes sites of the Lake Winnebago phase such as Lasley's Point (47 Wn-96), Karow (47 Wn-57/198), Overton Meadow (47 Wn-106), and other Lake Winnebago phase sites. Ceramics are highly decorated with straight trailed lines and punctates. No house types have been identified. Sites are large sedentary villages along waterways and include agricultural fields, cemetery areas, and possible mounds and debris piles (Peske 1966). Overstreet viewed Classic Oneota in eastern Wisconsin as a period of greater complexity and integration than earlier times, and suggested the archeological material relates to the precontact Winnebago. Overstreet's Historic horizon relates to the postcontact Winnebago collapse, but no sites had been identified in 1981.

Overstreet investigated several Oneota sites in the 1980s and 1990s which were described in contract reports. These included the Old Spring site (47 Wn-350), identified as an Emergent site (Overstreet 1989a), the Baer I site (47 Wn-401), a Classic site (Overstreet and Richards 1992), and the Astor site (47 Br-243), an Historic horizon site (Overstreet 1989b, 1993e). In these reports he continued to use the horizon scheme, although the dates and nature of each horizon changed from report to report. Recently, Overstreet (1995) published a new synthesis and proposed three localities of Oneota occupation in eastern Wisconsin: Lake Koshkonong, Middle Fox River Passageway, and Door Peninsula. The Door Peninsula sites will be discussed in the Northeast Wisconsin section of this chapter.

Overstreet's 1995 Emergent Oneota dates to A.D. 950-1150, which begins before Lohmann and extends through Stirling phase at Cahokia. Sites now classed as Emergent include Carcajou Point (47 Je-2) and Crabapple Point (47 Je-93) (Spector 1974, 1975) in the Lake Koshkonong area, Old Spring (47 Wn-350), an early component at Lasley's Point (47 Wn-8/96) and several other sites in the Middle Fox River Passageway, and several sites in the Door Peninsula. Emergent horizon house forms now include rectangular, single post houses at Old Spring and Carcajou Point, as well as rectangular wall trench structures at Carcajou. He also illustrated a previously unreported palisade line extending through a residential area at Carcajou Point (Overstreet 1995; Peske n.d.). The arrangement of features, however, suggests this may be a fence or partition, rather than a defensive structure. Burials occur in house floors, pits, and midden contexts. Ceramics are typically undecorated with low everted rims and rounded shoulders. Decoration, when present, consists of curvilinear trailed lines and nested chevrons on the shoulder, and notched/punctated lips. Loop handles occur but are uncommon. In the lithic assemblage, small triangular points occur more frequently than end scrapers. Copper beads and tools are present, but rare. Subsistence remains include corn, fish, deer, and elk. Overstreet again suggested the origins of Emergent Oneota lie in late Middle Woodland occupations of southwest Wisconsin and northwest Illinois (1995).

In Overstreet's scheme sites apparently qualify as Emergent (A.D. 950-1150) if they have relatively early radiocarbon dates. For example, he uses the following sites and dates (Overstreet 1995:43): Carcajou Point - A.D. 890, 990, 1020; Crabapple Point - A.D. 980; Lasley's Point - A.D. 990; Old Spring - A.D. 1020, 1040. The early dates from these sites are not accepted by all archeologists, however (Stoltman 1986c). For example, the Crabapple Point site has Late Woodland, Lake Koshkonong phase Oneota, and Historic Winnebago components (Spector 1974, 1975). The single radiocarbon sample was derived from charcoal in the fill of a feature which contained both Madison ware and shell-tempered sherds (Spector 1974). The Crabapple Point date could therefore apply

to the Late Woodland rather than the Oneota component. The context of the A.D. 890 date from Carcajou Point has not been described (Boszhardt 1977). The contexts of the dates from Lasley's Point have not been described, but the series of eight radiocarbon samples includes dates from the late 1100s, 1200s, and 1400s. Only two components have been mentioned for the site, Early Woodland and Lake Winnebago phase Oneota (Peske 1966). It is not clear what the A.D. 990 Lasley's Point date relates to. Overstreet also neglects to mention dates from Overton Meadow (47 Wn-106) (A.D. 1110), Pipe (A.D. 1130), Old Spring (A.D. 1070, 1140), and Crescent Bay Hunt Club (47 Je-244) (A.D. 1140, 1150) which also fall within his Emergent time range (see Boszhardt, Holtz, and Nienow 1995). These and other omissions have serious implications that will be discussed below.

Overstreet's 1995 Developmental horizon dates to A.D. 1150-1350. The horizon includes predominantly Grand River phase sites along the east side of Lake Winnebago and the upper reaches of the Fox River in east central Wisconsin, along with Crescent Bay Hunt Club (47 Je-244) in the Lake Koshkonong locality. The best known Developmental sites are Walker-Hooper (47 Gl-165) (Jeske 1927, Gibbon 1972), Bornick (47 Mq-65) (Gibbon 1971), and Pipe (47 Fd-2/10) (Overstreet 1976, 1978, 1981). There is an apparent shift in house form from rectangular to oval or elongated oval, as is evidenced by houses at Pipe and Walker-Hooper. Walker-Hooper has a palisade, but only an interior fence/partition has been located at Pipe. Burials, which are commonly flexed (Kreisa 1993), may have been in mounds (Jeske 1927), and possible cemetery areas have been reported (Overstreet 1981). Ceramics, which are typical of the Grand River phase, are generally plain but include meandering trailed designs with bordering or zoned punctates. Nested chevrons are also recorded for some Grand River phase sites, however. Rims are relatively high and outflaring, and only occasionally are decorated with notches/punctates. Overstreet acknowledges it would be difficult to distinguish an Emergent from a Developmental ceramic assemblage (1995:44). The lithic assemblage is dominated by triangular points and bipolar cores and flaking debris become common. A variety of deer and elk bone tools are found. Copper beads and tools occur occasionally. Subsistence remains include domesticated beans along with corn, and wild foods such as deer, fish, and shellfish.

It is difficult to assess the validity and utility of Overstreet's 1995 Developmental horizon. There is considerable ambiguity in ceramic varieties which would fit the horizon, and the radiocarbon dates appear to be inconsistently applied. Most sites appear to be classified as Developmental based on their location (Fox River Passageway) and ceramic assemblage which places them in the Grand River phase.

Overstreet does not present the radiocarbon record for his Developmental horizon (A.D. 1150-1350) (Overstreet 1995:43). Grand River phase sites have been dated as follows (see Boszhardt et al. 1995): Pipe - A.D. 1130, 1205, 1260; Walker-Hooper - A.D. 1200, 1210, 1230, 1240; Bornick - A.D. 1290. In addition, several sites classified in the presumably later Lake Winnebago phase have produced radiocarbon dates within the Developmental horizon range including: Overton Meadow (47 Wn-106) (Dirst 1985b) - A.D. 1110; Lasley's Point (47 Wn-96) (Peske 1966) - A.D. 1170, 1220, 1270; Baer I (47 Wn-401) (Overstreet and Richards 1992) - A.D. 1190. Unfortunately the archeological contexts for the dates from Overton Meadow and Lasley's Point have not been published. The Baer I A.D. 1190 date came from a Lake Winnebago phase roasting pit which also contained Late Woodland sherds presumably of the Madison series (Overstreet and Richards 1992:29, 34, 75). The date may refer to an earlier Late Woodland occupation, as no Grand River ceramics were identified at Baer I. The numerous A.D. 1100-1200 dates from Lake



Winnebago phase sites may indicate the phase has a greater time depth than its classification as Classic horizon implies.

Only one site in the Lake Koshkonong locality is categorized as Developmental by Overstreet (1995). The Crescent Bay Hunt (Gun) Club has produced four radiocarbon dates ranging in age from A.D. 1140 to A.D. 1190 (Boszhardt et al. 1995), but the archeological context of the Crescent Bay dates has not been described (Boszhardt 1977). An unpublished manuscript on materials from the site (Gibbon n.d.) suggests the ceramics fit in both the Carcajou and Grand River plain and decorated series, placing the site in the Lake Koshkonong phase. A rectangular, single post structure was also found. Although the site's dates fit into the Developmental horizon, neither the ceramics nor the structure form fit Overstreet's 1995 criteria. Carcajou Point is no longer classified as Developmental in the 1995 scheme, even though much of its ceramic assemblage resembles Crescent Bay Hunt Club. Perhaps this is because it has not produced radiocarbon dates in the appropriate time range. It should be noted, however, that there are only four prehistoric radiocarbon dates from Carcajou Point, and three of them were processed before 1960 (Hall 1962), and may not be reliable.

A troublesome aspect of Overstreet's 1995 scheme is the exclusion of the Old Spring site from the Developmental horizon, since its radiocarbon record includes a cluster of six dates between 1140 and 1250 (Boszhardt et al. 1995). In fact, the 11 dates from the site range from A.D. 1020 to 1780, but only the dates of A.D. 1020 and 1040 are referenced by Overstreet (Overstreet 1989, 1995; Overstreet and Richards 1992). The contexts of the later dates have not been described. The suite of dates suggest Old Spring belongs primarily in the Developmental rather than the Emergent horizon. This placement, however, would muddy even further the ceramic and structure characteristics that distinguish Overstreet's Emergent and Developmental Oneota sites.

Overstreet's 1995 Classic horizon dates A.D. 1350-1600 and includes over 50 Lake Winnebago phase sites which are clustered in the Middle Fox River Passageway locality. Well known sites include Lasley's Point (47 Wn-8/96) (Peske 1966), Overton Meadow (47 Wn-106) (Dirst 1985b), Karow (47 Wn-57/198) (McKern 1945; Dirst 1985b; Dirst and Kreisa 1982), and Baer I (47 Wn-401) (Overstreet and Richards 1992). The sites are large and extend continuously along the margins of lake chains and wetlands, especially west of Lake Winnebago. Carcajou Point (47 Je-2) in the Lake Koshkonong locality also includes a Classic component. Little information exists about house forms, although one or more large, multifamily buildings may have been present at Lasley's Point (Hall 1962; Overstreet 1978, 1981). The extensive villages include middens, garden beds, and mounded features that may have been refuse heaps (Peske 1966) or house locations (Overstreet 1978, 1981). The refuse heaps appear to resemble moundlike features associated with the Silvermale and Apple River sites to the west. Large cemeteries containing extended burials are well known, although not well described (Kreisa 1986, 1993). The spatial relationship of cemeteries and habitation areas is unclear (Dirst 1985b; Kreisa 1986, 1993).

Classic horizon material remains are distinctive. Lake Winnebago phase ceramics are highly decorated with incised or trailed lines arranged in vertical and horizontal linear patterns with occasional bordering punctates. Rims are sharply everted and may be decorated with punctates and trailed lines. Jars tend to be squat with rounded shoulders. Strap handles replace the earlier loop handle form. In the Lake Koshkonong locality, ceramics are decorated with extremely wide trailed lines called Koshkonong Bold. The ceramics are similar to Oneota materials in western Wisconsin during this same period such as Perrot

Punctate and Blue Earth ceramics, and trade wares are found in both regions. Allamakee Trilled vessels related to Orr phase sites in western Wisconsin and northeast Iowa are also sometimes found at eastern Wisconsin Oneota sites. The lithic assemblage includes an increased frequency of end scrapers, and bifacial knives and disks appear. Other characteristic material items include bison scapula hoes, shell spoons, a variety of bone tools, catlinite pipes and ornaments, and copper tools and ornaments. Subsistence remains include nuts, fruits, corn, beans, fish, deer, and elk. Bison bone only appears as scapula hoes which may have been traded from the west. Even though Lake Winnebago phase sites are located along prime wild rice habitat, wild rice has not been found archeologically.

Classic dates are not discussed by Overstreet (1995) but dated Lake Winnebago phase sites include (Boszhardt et al. 1995): Karow - A.D. 1330, 1390; Lasley's Point - A.D. 1400, 1480; Baer I - A.D. 1500; and Sauer Resort - A.D. 1460, 1640 (a date of A.D. 590 has been attributed to an earlier Woodland occupation of the site [Dirst 1985b]). Given the high density and distinctiveness of Lake Winnebago phase sites, this is a meager radiocarbon record. Nevertheless, it is interesting that the dates tend to be clustered by site, and this may suggest the Lake Winnebago phase villages periodically moved from place to place. As previously discussed, Developmental horizon dates have also been reported for Overton Meadow, Lasley's Point, and Baer I, suggesting Lake Winnebago phase sites may have greater time depth than implied by placing them in the Classic horizon.

It is also curious that only one Lake Winnebago phase date falls in the seventeenth century. Several archeologists have argued that Lake Winnebago phase material does not extend into the Historic period (C. I. Mason 1976; Hall 1993; P. Richards 1993a). There is some suggestion that only Orr phase Oneota material (Allamakee Trilled) originating from southwestern Wisconsin and northeast Iowa is present on contact period sites in eastern Wisconsin. These western Wisconsin ceramics have been attributed to the ancestral Ioway and may also reflect ancestral Winnebago (C. I. Mason 1967; Hall 1993). There does not appear to be any direct linkage between the prehistoric Lake Winnebago phase of eastern Wisconsin and the Historic Winnebago who greeted Nicolet in 1634 somewhere near Green Bay. William Green (1993) has suggested that a gap in the radiocarbon record from the 1500s to early 1600s for eastern Wisconsin and the upper Midwest, may reflect a massive depopulation of the region. He suggests the depopulation may have been related to European diseases introduced during the 1500s into Mexico and the Gulf and East coasts of the U.S. The diseases could have spread rapidly into areas densely settled by village-based farmers in the upper Mississippi valley. Green also notes that climatic changes bringing cooler and moister conditions to the region may have influenced population distributions.

Overstreet's 1995 Historic Oneota horizon dates "post-A.D. 1650." The best documented Historic horizon site (Astor [47 Br-243]) is located in northeast Wisconsin and will be discussed below. In southeast Wisconsin, Overstreet has suggested the MacCauley site (47 Wn-222) (McKern 1945; Overstreet 1993e) should be included in the horizon, but others argue the archeological data do not clearly link historic materials with Oneota diagnostics (C. I. Mason 1976; R. J. Mason 1993). The nearby Doty Island site (47 Wn-30) (R. P. Mason and C. L. Mason 1993) has also produced late seventeenth and eighteenth century European materials in equivocal association with Oneota ceramics. The Historic horizon is particularly important in eastern Wisconsin because it may provide linkages between the Oneota tradition and historically documented Indian groups in the region. The presumption has been

that the Winnebago, who now prefer to be called Ho Chunk, are the descendants of eastern Wisconsin Oneota groups (McKern 1945; Griffin 1960a), but clear archeological evidence is lacking (C. I. Mason 1976; R. J. Mason 1993; Hall 1993). In the Lake Koshkonong locality later eighteenth and nineteenth century Winnebago occupations have been identified at Crabapple Point (47 Je-93) (Spector 1974, 1975), Carcajou Point (47 Je-2) (Hall 1962; Spector 1974), and at several other locations (Musil 1987), but they are not associated with aboriginal ceramics.

This discussion has focused on the radiocarbon record for several reasons. There is considerable interest and controversy in both the beginning and ending dates for Oneota sites in eastern Wisconsin. The early beginning dates precede the Stirling phase Middle Mississippian intrusion into the region at Aztalan, and suggest that Oneota culture was developing locally, independent of direct Middle Mississippian contact. If the dates are to be believed, for example, then eastern Wisconsin shell-tempered jars predate the Lohmann phase, and Oneota incising predates the Stirling phase at Cahokia. At the opposite end, dates bridging the transition from prehistoric to historic are rare, and it is difficult to document archeologically the presence of Oneota descendants who may or may not have been Winnebago (McKern 1945; Griffin 1960a; C.I. Mason 1976; Hall 1993). Tree-ring calibration and a greatly expanded set of dates may help resolve these problems in the future (see Boszhardt et al. 1995).

There is also some controversy about what happens during the middle phases of Oneota in eastern Wisconsin. John Richards (1992) has argued not only that Oneota peoples were present in the Lake Koshkonong region when Middle Mississippians settled at Aztalan (Goldstein and Richards 1991), but also that Oneota peoples appear to have abandoned the area during the Middle Mississippian occupation of Aztalan, resettling only after Aztalan had collapsed (Richards 1992:419-421). Richards suggested that the fortification of Aztalan was a Middle Mississippian military attempt to protect their late Late Woodland allies and trading partners from Oneota hostilities in a contested frontier setting. The uncalibrated radiocarbon record for Aztalan and Lake Koshkonong locality sites supports this scenario, as there are seven dates from Aztalan at the same time there is a gap in radiocarbon dates at Koshkonong Oneota sites. Richards suggested the Oneota gap extends from about A.D. 1020 to A.D. 1140 (1992:420-421).

Overstreet (1995) has further developed the idea of a gap in the Oneota radiocarbon record by expanding the region to eastern Wisconsin, and shifting the time frame to A.D. 1050-1150. Overstreet speculated that during this period, Oneota peoples left eastern Wisconsin for unspecified northern areas, and only returned after Middle Mississippians departed (1995:59). Overstreet presented evidence for Oneota abandonment of the region by using the radiocarbon record of sites in the Middle Fox River Passageway and the Door Peninsula, as well as the Lake Koshkonong locality (1995:43). He did not present the complete radiocarbon record for the Middle Fox River Passageway sites, however, and the dates he omitted fill in the gap. As discussed above, Middle Fox River Passageway sites with dates in the A.D. 1050-1150 range include Pipe, Old Spring, Overton Meadow, and Walker-Hooper. It should be noted that editorial errors in Overstreet's radiocarbon figure (1995:43) also produced inaccuracies in the plot of some dates (Crescent Bay Hunt Club - A.D. 1140, 1150), and in the placement of sample numbers along the x axis. If the complete radiocarbon record is considered, it appears that there may be an A.D. 1020-1140 gap for the Lake Koshkonong and Door Peninsula localities, but east central Wisconsin was occupied throughout this entire period. Considering the entire southeastern Wisconsin record, there is also an apparent

scarcity of dates in the 1300s, 1500s, and 1600s. In this author's opinion, however, there are too few dates from specifiable contexts in any portion of eastern Wisconsin to believe that gaps can be reliably identified.

For all the excavations that have been conducted at southeastern Wisconsin Oneota sites, relatively little is known about community plans and settlement patterns. For example, the Carcajou Point site has been excavated by numerous archeologists over the last 30 years (Hall 1962; Peske n.d. in Overstreet 1995; Brubaker and Goldstein 1991). Excavations have revealed at least four rectangular basin structures, some with wall trenches, several single post structures, and a fence or palisade. Some of the structures are tightly clustered, but no overall site plan exists, and the relationship of one excavation to another is unknown. Burial areas have been reported along the lakeshore, but their age and relationship to residential areas is undetermined. At other sites such as Pipe and Walker-Hooper, oval structures and rows of posts have been revealed through relatively small scale excavations, but the overall site plans have not been exposed.

Only at the Old Spring site (47 Wn-350) (Overstreet 1989, 1995) have large scale excavations produced anything like a community plan. The Oneota community at Old Spring was dispersed along the summit of the site's sand ridge. At least 14 domestic structures and hundreds of storage/refuse pits were exposed. Unfortunately, only a sample was excavated due to the time and funding constraints of the salvage project. The semisubterranean rectangular houses had single wall posts. Some houses had interior hearths and all had burned. Storage/refuse pits were located outside the houses and seldom overlapped each other. Clusters of pit features occurred between houses, and some pits clustered around house structures. Two burials of subadults were found in pits inside the houses. Only one house had been rebuilt and had superimposed floors. The paucity of overlapping features and the burned condition of the houses suggest the occupation was relatively short lived, and the features were probably contemporary rather than sequential. Although Overstreet proposed the McKern phase of the Emergent Oneota horizon based on the initial dates (A.D. 1020, 1040, with an A.D. 1480 date considered anomalous) and ceramics from Old Spring (Overstreet 1989, 1995), subsequent radiocarbon assays indicate Old Spring dates from A.D. 1020 or even A.D. 1140 to A.D. 1250 (Boszhardt et al. 1995). The wide range of radiocarbon dates suggest the site could be interpreted as a series of sequential household occupations along the ridge, rather than a synchronic community.

Given the lack of information on the nature of Oneota settlements in the region, there is little agreement among researchers about the nature of the settlement system and its articulation with the local environment. Some characterize eastern Wisconsin as environmentally diverse (Gibbon 1972), and others consider it homogeneous (Overstreet 1976, 1978). In a careful study of the region Rodell (1983) has found that Oneota sites tend to cluster along flow-through eutrophic lakes in the Fox and Rock River systems. Wetland resources in these settings include wild rice, duck potatoes, cattails, fish, shellfish, and migratory waterfowl. Sites are located on well drained, fertile soils in oak/deciduous forest openings. That these soils were regularly tilled is indicated by the presence of numerous garden beds (Rodell 1983; Moffat 1979).

It appears to this author that there is also a variety of ephemeral Oneota site that has not been thoroughly considered in the literature. A sparse presence of Oneota ceramics has been reported on many Late Woodland sites in the region. The shell-tempered ceramics are often explained as being trade items or representing a later, intrusive occupation. Late Woodland sites with a small amount of Oneota ceramics include Sanders (47 Wp-26/70), Bigelow (47 Pt-29), Weisner III (47 Do-

399), Elmwood Island (47 Do-47), Dietz (47 Da-12), Statz (47 Da-642), and others. The Oneota presence on these sites is ephemeral and does not include the concentrations of pit features, houses, and burials so typical of Oneota habitation sites. A similar site was recently excavated by the State Historical Society of Wisconsin at Silver Lake in Waushara County (Roseanne Meer, personal communication). The Silver Lake site was multicomponent and included a variety of unusual features including possible houses, storage/refuse pits, hearths, earth ovens, and wide, linear trenchlike features. The site appears to have been a Late Woodland habitation or resource processing area, and the excavators believe a substantial Early Woodland occupation was also present. There was also a small amount of shell-tempered Oneota ceramics. Radiocarbon dates for the site range from 3600 B.C. to A.D. 1470.

The trenchlike features at the Silver Lake site were relatively sterile and did not appear to be refuse or processing pits. Rather they appear, to this author, to resemble the depressions between ridged fields or garden beds (see Benchley and De Puydt 1981). I suggest that these garden bed features represent an Oneota use of a substantial Woodland midden as an agricultural field. The small quantity of Oneota ceramics and absence of Oneota storage pits suggest that the site was a seasonal farmstead and not an Oneota village. The use of Woodland middens as agricultural fields by Mississippian peoples has been documented in Illinois (Fowler 1969). It would not be unexpected for Oneota family units to seek out the rich organic soils of previous occupations to grow their crops. The practice of small Oneota groups farming earlier middens would explain the presence of a veneer of shell-tempered ceramics associated with many Late Woodland sites across eastern Wisconsin.

#### Southwest Wisconsin

As elsewhere in Wisconsin, the Oneota occupation of the southwest region occurs in readily identifiable pockets, particularly in the Red Wing and La Crosse areas. There is no Oneota presence in the far southwest portion of the state such as Prairie du Chien, or in the Grant River valley area after the Fred Edwards site was abandoned (Stoltman 1992b). The only documented Oneota in the far southwest is in rockshelters along the Wisconsin River such as Mayland Cave (Storck 1972) and the Gotschall Rockshelter (Salzer 1987, 1993).

The Oneota presence at Gotschall Rockshelter (47 Ia-80) is indicated by shell-tempered ceramics identified as Blue Earth (Salzer 1987, 1993), and by rock art which can be tied to Historic Winnebago (Ho Chunk) and Ioway legends. The Gotschall paintings appear to recount the heroic story of Red Horn and include human figures of Red Horn, two giants, a large bird, a turtle, and other characters. The shelter has produced what appears to be contradictory evidence as to the authors and users of the drawings, however. Pigment spills and sandy lenses, possibly from preparing the shelter's walls for painting, are found in layers which contain Madison ware, Aztalan Collared, and shell-tempered, Oneota-like vessels. Burned earth areas which may represent fires used to illuminate the figures are also associated with late Late Woodland collared ceramics. The Blue Earth Oneota ceramics appear to postdate the paintings. The figures themselves are rendered in several styles. Several figures appear to reflect northern motifs and styles (Salzer 1987). Red Horn and the giants, however, are outline drawings with careful detailing of headdresses, tattoos, clothing and implements. The style resembles iconography from Middle Mississippian sites such as Cahokia and Spiro (Oklahoma) and does not appear to be Late Woodland or Oneota in design. The headdress, tattoos, clothing, and forked eye of the large bird also resemble Middle Mississippian rather than Oneota or Late

Woodland motifs. A carved sandstone human head with facial tattoos was also found in Late Prehistoric deposits at the shelter (Salzer 1996). Even though the rockshelter is undergoing extremely careful excavation, the complexities of archeological site formation processes, and of Late Prehistoric cultural dynamics in the region make it very difficult to assign clear authorship to these remarkable figures.

The earliest Oneota or Upper Mississippian settlements of southwest Wisconsin are the Silvernale phase sites in the Red Wing locality. Wisconsin's Diamond Bluff site (47 Pi-2) has been discussed in the Middle Mississippian section. As previously noted, although the Silvernale phase ceramic assemblage resembles Middle Mississippian in form and motif, it does not represent a Cahokian population. The Silvernale ceramics also resemble the local Blue Earth Oneota, and much of the Silvernale assemblage appears as a hybrid of Middle and Upper Mississippian. The Diamond Bluff site dates A.D. 1040 to A.D. 1195 (excluding an anomalous A.D. 995 date), and is contemporary with the Silvernale phase Bryan site (21 GD-4) in eastern Minnesota (A.D. 1030-1210) (Boszhardt et al. 1995). These dates are also contemporary with much of the Middle Mississippian occupation at Aztalan (Richards 1992). If it were not considered Middle Mississippian, then Silvernale might be classified as Emergent Oneota in a horizon scheme (Hall 1962).

Not far from Diamond Bluff is a site whose ceramics resemble both Silvernale phase and Blue Earth Oneota. The Armstrong site (47 Pe-12) (Hurley 1978) in Pepin County is on edge of terrace just above the confluence of the Chippewa and Mississippi rivers. The habitation area was ringed with low mounds of undetermined age and function. Limited excavations revealed an oval, basined house and several storage/refuse pits. Ceramics include sharply everted to high standing rims with incising on rim interiors, and occasional lip top punctates. Shoulder decorations include nested chevrons, straight, and curvilinear (wavy, circles, scroll) parallel lines with bordering punctates. Hurley likened the ceramics both to the Silvernale phase and to Blue Earth Oneota occupations in eastern Minnesota. The five uncalibrated radiocarbon dates range from A.D. 975 to A.D. 1155 (Boszhardt et al. 1995) and average A.D. 1090. Three of the five dates, however, range from A.D. 1115 to 1155. These dates indicate the site is contemporary with the Blue Earth phase Bartron site (21 GD-2) in eastern Minnesota (A.D. 1060-1135) (Boszhardt et al. 1995) and also with the Silvernale phase sites in the region.

Oneota sites are abundant in the La Crosse area of southwest Wisconsin. In this locality, however, Oneota is relatively late in time and dates to A.D. 1300-1600 (Boszhardt 1990, 1994; Stevenson 1983). It has been suggested that the occupations fit within Emergent, Developmental, and Classic horizons (Boszhardt 1989b; Stevenson and Boszhardt 1993), but the horizons are not strictly comparable with those proposed by Hall (1962) or Overstreet (1995). The detailed local sequence of phases that has been developed by University of Wisconsin-La Crosse seems to be more useful than a horizon scheme (Boszhardt 1994; O'Gorman 1995).

Settlements are clustered on the Mississippi River terraces at La Crosse, Stoddard, and Trempealeau. Oneota sites in the region occur as almost continuous scatters along the sandy terraces, and may not reflect cohesive villages. In the La Crosse area Oneota sites have been identified by the abundant pit features which served as storage and refuse pits. Analysis of the organic remains suggests a mixed economy of hunting, fishing, collecting, and maize horticulture. Floodplain resources including fish, shellfish, beaver, and waterfowl were important, as well as deer. Elk and bison scapulae were used as gardening tools. Deer bone tools are abundant, and stone tools include arrow points and end scrapers. Important plant resources include maize, beans, squash,

sunflower, tobacco, little barley, nuts, (acorn, walnuts, hickory), wild rice, fruits, and berries. The organic remains suggest a warm season occupation of the floodplain. Recently, Oneota longhouses and accompanying burials have been identified in the La Crosse area, and these sites may represent longer term occupations (O'Gorman 1995).

Three phases of Oneota occupation have been proposed for the La Crosse area (Boszhardt and Stevenson 1993, Boszhardt 1994) based on the excavation of numerous habitation and cemetery sites over the past two decades. The phases are identified from ceramic attributes and a radiocarbon record of over 70 dates. More detailed information on individual sites and material remains can be found in a variety of published and unpublished reports (Anderson et al. 1995; Arzigian et al. 1989; Arzigian et al. 1994; Boszhardt et al. 1985; Gibbon 1970; McKern 1945; O'Gorman 1993, 1994, 1995; Penman 1984; Penman and Hamilton 1990; Sasso 1993; Stevenson 1994; Stoltman 1973).

The Brice Prairie phase dates approximately to A.D. 1300-1400. It is the initial Oneota occupation of the locality. Sites are located on high sandy Pleistocene terrace edges along the Mississippi River. Sites and site complexes with substantial Brice Prairie occupations include Shrage-Gillies (47 Tr-44) at Trempealeau (McKern 1945), Olson/North Shore (47 Lc-76), and Jim Braun (47 Lc-59). Additional sites with Brice Prairie components include Midway/Tremaine (47 Lc-19/95), Overhead/Pammel Creek (47 Lc-20/61), Gundersen (47 Lc-394), and others. Sites with Brice Prairie phase occupations have also been identified in rockshelters in La Crosse and Jackson counties. There is little information on houses, community organization, or mortuary practices. Most excavated sites have produced typical Oneota storage/refuse pit features and occasional extended burials. Recently reported data from Gundersen suggest that burial areas may be associated with structures (Arzigian et al. 1994). At Tremaine a series of long houses containing burials was constructed during the Brice Prairie phase and occupied throughout the subsequent Pammel Creek phase (O'Gorman 1995).

Brice Prairie phase material culture includes shell-tempered jars decorated with inner rim notching and loop or narrow strap handles. Jar shoulders are decorated with nested chevrons and panels of incised lines with occasional bordering punctates including the types Perrot Punctate and Brice Prairie Trilled. The ceramics resemble Blue Earth ceramics to the north and west. Lithic raw materials come from outside the locality and have been traced to Grand Meadow, Minnesota and Hixton. Sheet copper items are reported from this phase, but catlinite objects are rare. Bison scapula hoes and deer mandible sickles are present. Subsistence remains include wild rice, maize, beans, squash, tobacco, sunflower, little barley, nuts, fruits and berries, deer, elk, beaver and other small mammals, migratory waterfowl, and other floodplain resources such as fish and mussels (Arzigian et al. 1994).

The Pammel Creek phase dates approximately to A.D. 1400-1500. It is considered transitional between the Brice Prairie and Valley View phases, and has attributes of both phases, as well as intermediate radiocarbon dates. Site locations in some areas shift away from the floodplain edge to the bluff base, perhaps for defense. The Brice Prairie area is no longer occupied during this phase. Sites or site complexes with substantial Pammel Creek occupations include Pammel Creek/Overhead (47 Lc-20/61), Sand Lake (47 Lc-44), and Midway/Tremaine (47 Lc-19/95). Extensive garden beds (ridged fields) have been described at the Sand Lake site (Gallagher et al. 1985) which suggest an intensification of maize cultivation. A community plan consisting of feature clusters and seven long houses with burials has been reported for the Tremaine site (see below) (O'Gorman 1995).

Pammel Creek phase material culture includes shell-tempered jars decorated with boldly impressed lip top notching. Strap handles are present. Shoulders are decorated with zones of punctates and incised lines, and bordering punctates also occur. Ceramic types include Perrot Punctate, Pammel Creek Trilled, Allamakee Trilled, and Koshkonong Bold. The ceramics resemble both Blue Earth and Orr phase ceramics to the west. Lithic raw materials are predominantly local cherts and silicified sandstones. Burlington chert from Iowa and Illinois to the south is also present. Copper beads and sheet copper items are known from this phase, and catlinite fragments have been found. Bison scapula hoes and deer mandible sickles occur. Subsistence remains are similar to earlier phases, but some variability is reported between and within sites.

The Valley View phase dates approximately to A.D. 1500-1600/1650 and is the last occupation of the La Crosse locality. The lack of historic materials suggest the area was abandoned by 1625. Because the material culture is similar to Orr phase materials in Iowa and Minnesota, it is presumed the Valley View peoples moved west, and may have become the Historic Ioway. It has been suggested that the depopulation of the region may have been caused in part by the spread of European diseases or climatic cooling (Green 1993). Site locations include bluff base, tributary valleys, and terraces suggesting defensive concerns may persist. Mortuary practices are variable and may include cemeteries and mounds. Sites or site complexes include Valley View (47 Lc-34), State Road Coulee, and late components at Sand Lake, Midway/Tremaine/Filler, Gundersen, and Pammel Creek. A large portion of the Valley View site was excavated revealing a palisade line and numerous storage/refuse pit features (Stevenson 1994), but no houses or structures were recognized.

Valley View phase material culture includes shell-tempered jars decorated with fine line lip top notching. Strap handles are present. Shoulders are decorated with zones of punctates and incised lines, and bordering punctates disappear. Ceramic types include Valley View Trilled, Allamakee Trilled, and Koshkonong Bold. The ceramics resemble Orr phase ceramics to the west. Lithic raw materials are predominantly local cherts and silicified sandstones. Burlington chert from Iowa and Illinois to the south is also present. Copper use increases and includes coils and beads. Catlinite pipes and manufacturing scraps are found. Rasps made from large mammal ribs appear. Subsistence remains are similar to earlier phases, but some variability is reported between and within sites.

Even though the archeology of the La Crosse locality is relatively well known, there is surprisingly little information on settlement organization and community plans. Most sites have been reported as having large concentrations of pit features with occasional burials, possible cemetery areas which also include midden deposits, and generally continuous occupations of terraces. A remarkable exception to this picture comes from the Tremaine site in the Midway/Tremaine site complex (O'Gorman 1993, 1994, 1995) where careful machine stripping and shovel skimming of large areas revealed a series of postmold patterns and associated features that are unique in Wisconsin.

At the Tremaine site (47 Lc-95) seven long houses were revealed along with associated storage and refuse features and burials. The houses have long parallel sides and rounded ends and are divided into halves by midline longitudinal partitions. Evidence for additional interior partitions and benches was also present. The houses averaged 8 m wide and 50 m long. Most houses had been rebuilt several times, expanding from an original core length of 25 m to over 65 m in one case. Pit features were found both within the structures and in clusters between the houses. The houses were first constructed during the

Brice Prairie phase, and were occupied through Pammel Creek to the beginning of the Valley View phase. The site's residents may have moved east to the Filler site during Valley View times (O'Gorman 1994, 1995).

The Tremaine burials were found within the long houses, usually clustered in the original core area of the house. The graves were perpendicular or parallel to the house walls, and often occurred in short rows. Burials were normally extended in individual graves, but a few graves contained multiple individuals. A total of 86 individuals was found in 79 primary and secondary interments. Infants, subadults, and both male and female adults were represented. Grave goods included small mortuary vessels, or fragments of vessels, and occasional stone, bone, and shell tools. Little evidence for status differences was noted, but additional Tremaine burials may be located in what appears to be a cemetery area on a knoll at the OT site (47 Lc-262) just to the east (O'Gorman 1993). The close relationship of burials and residential structures has not been previously observed in Wisconsin Oneota sites. It seems possible that the many other Wisconsin Oneota sites reported as having burials associated with middens and pit features may also have had unrecognized houses, and what have been called cemeteries may be residential precincts.

#### Northern Wisconsin

Shell-tempered ceramics have been reported at numerous sites in northern Wisconsin and appear to represent either trade or occupation by Oneota groups in the east and central regions. The shell-tempered ceramics of the western region are less clearly Oneota in affiliation, however.

#### Northeast Wisconsin

Northeast Wisconsin has produced evidence for a long term Oneota presence dating from about A.D. 900 to Historic times. Each investigator working in the region appears to have his or her own classification system and phase designations have not been consistently applied. Categories used in the region include Mero complex (R.J. Mason 1966, 1993; C.I. Mason 1970), Green Bay phase (Overstreet 1995; Dirst 1987), Grand River phase, Lake Winnebago phase, and Provisional Dandy phase (Overstreet 1993). Some of the phases may be spatially discrete, with Green Bay phase extending from the City of Green Bay through the lower portion of the Door Peninsula, and the Mero complex occurring along the upper portion of the peninsula and its offshore islands. Recently Overstreet (1995) has suggested that the long regional continuity can be fitted into his 1995 horizon scheme including the Emergent, Developmental, Classic, and Historic horizons.

The Oneota occupation of the northern Door Peninsula was first described by Ronald Mason (1966) at the Mero site (47 Dr-83) located on the northeast shore of Door County. A substantial amount of Oneota ceramics was found representing a relatively long-term occupation of this multicomponent site. Mason characterized the Oneota Mero complex ceramics as being predominantly plain, globular jars with sharply everted rims which are either grit (almost 40% of the Oneota vessels are grit tempered) or shell tempered. Décoration of the lip with scallops or notching is common, but incised and trailed shoulder decorations are rare. Handles are extremely rare and include both loop and strap forms. The stratigraphic distribution of sherds suggested that grit-tempered Oneota ceramics are earlier than shell tempered vessels.

Mason suggested the assemblage was most similar to the Grand River phase. A few Lake Winnebago phase trade vessels were also present, and some sherds resembling Perrot Punctate and Allamakee Trailed (Orr phase) were identified. These exogenous decorated vessels

appear to be associated with a late Oneota use of the site. Because the Oneota occupation could not be separated stratigraphically from the previous Late Woodland occupation at the site, Mason was unable to distinguish other aspects of the Mero complex material culture. Several typical attributes of Oneota sites were conspicuous in their absence, however. No refuse/storage pits, corn, abraders, shell tools, or pipes were found, and end scrapers and copper fragments were sparse. Subsistence remains in the Late Woodland/Oneota zones included fish, large and small mammals, and birds. The site appears to have been a warm season camp (R.J. Mason 1966). Similar Mero complex components have been described near the tip of the peninsula at *Porte des Morts* (C. I. Mason 1970) and *Rock Island II* (47 Dr-128) (R.J. Mason 1990b). At *Rock Island II* Oneota vessels of apparently local and nonlocal (Allamakee Trailed) origin are found into the Historic period where they are associated with French trade goods, and corn, beans, and squash (R.J. Mason 1990b, C.I. Mason 1993).

Recently, Mason has obtained radiocarbon dates from charred food remains adhering to several typed ceramic vessels from Mero complex sites (R. J. Mason 1990b, 1992; Boszhardt et al. 1995). The accelerator dates provide chronological information with indisputable associations. The shell-tempered Mero ceramics produced uncalibrated dates of A.D. 920, 923, and 1013, and the grit-tempered Mero ceramics dated A.D. 1169 and 1376. The dates are the reverse of what the stratigraphic relationship of the temper types would suggest. In addition, the early dates for the shell-tempered ceramics predate the Lohmann phase at the Cahokia site. Furthermore, an accelerator date on a Late Woodland Madison ware vessel was A.D. 916, contemporary with the A.D. 920 shell-tempered Mero material. An Aztalan/Point Sauble sherd dated A.D. 1004, contemporary with the A.D. 1013 shell-tempered Mero vessel. A shell-tempered Perrot Punctate-like vessel dated A.D. 1373, contemporary with an A.D. 1376 grit-tempered Mero Trailed vessel (R.J. Mason 1992). If these dates are correct, then there will need to be some serious reconsideration of the relationship of northeastern Wisconsin Oneota to both Late Woodland and Mississippian groups. The stratigraphic situation at several Door Peninsula sites will also need to be reevaluated. There is always the possibility that there is an error in the dating, however, and this may especially be true since the near surface dolostone bedrock of the Door Peninsula is known to produce unreliable radiocarbon results (Norman Lasca, personal communication).

The Whitefish Bay View site (47 Dr-167) (Dirst 1987), located only six miles south of Mero along the east side of the Peninsula appears to be ceramically and culturally different from the Mero complex sites (R. J. Mason 1990b). At Whitefish Bay View test excavations revealed numerous Oneota features including storage/refuse pits, postmolds and a hearth. Ceramics included shell and/or grit-tempered Oneota vessels. Most jars are comparatively small with outcurving rims. Rims are decorated with lip notching or pinching. Small bowls or cups are present and occasionally decorated. Shoulder decoration is rare and resembles Grand River Trailed, Lake Winnebago Trailed, and narrow trailed varieties which may be Perrot Punctate and Allamakee Trailed (Dirst 1995a:42). Subsistence remains included corn, squash, fruit, berries, hazelnut, and knotweed. Deer, bear, and small mammals remains were relatively abundant. The small amount of bird bone is dominated by migratory waterfowl varieties. Fish remains include sturgeon, whitefish, lake trout and smaller pan fish which could have come from the Lake Michigan bay or the tributary creek. Turtles also were found. A single radiocarbon date from a refuse pit containing corn places the Oneota occupation at A.D. 1390 (R.J. Mason 1990b, 1992; Boszhardt et al 1995).

Along the west shore numerous Oneota sites are found from Little Sturgeon Bay south through the Dyckesville/Red River area (Benchley et al. 1994, 1995, Dirst 1989) to the Point Sauble area near Red Banks (Freeman 1956, Hall 1962, 1993) and into Green Bay (Dirst 1995a). Few of these sites have been thoroughly described, but several seem to represent substantial Oneota sites along lake terraces and creeks. Some have produced pit features and stratified middens (Dirst 1989; Overstreet 1980 and personal communication), and others appear to be short term camps (Dirst 1989; Benchley et al. 1994). Surface collections and limited test excavations at these sites have produced shell-tempered and occasionally grit-tempered Oneota ceramics. The fragmentary nature of recently collected ceramics makes it difficult to classify them. Oneota sites along the west shore of the Door Peninsula include Shanty Bay (47 Dr-11) (Schumacher 1918, Dirst 1995a), Arrowhead Beach (47 Dr-107) (Schumacher 1918, Overstreet 1980, 1995; Benchley et al. 1995), Red River (47 Ke-7 and 47 Ke-9/31) (Overstreet 1980; Dirst 1989; Benchley et al. 1994), Little Red River (47 Br-6) (Overstreet 1980; Dirst 1989; Benchley et al. 1994), and Point Sauble/Beaumier Farm (47 Br 46/101/60) (Freeman 1956; Hall 1962). A small, upland Oneota camp (47 Br-278) has also been reported (Benchley et al. 1994).

The Point Sauble site northeast of Green Bay has been cited often as an important locale for Late Woodland and Oneota occupation (Freeman 1956; C.I. Mason 1956 1993; Hall 1962, 1993). Its location near Red Banks, a legendary homeland of the Winnebago/Ho-Chunk, makes it especially important for investigating the late prehistory and early history of the region. The extensive site, located in a developed residential area, is known from decades of surface collections and limited test excavations before the 1950s. Although the site has been classified as Lake Winnebago phase by some (Freeman 1956), several archeologists argue that two Oneota components are present, an earlier Grand River phase component, and a later "Orr phase" component with Allamakee Trilled ceramics. The later material may represent a protohistoric Winnebago or even Ioway occupation (Hall 1962, 1993, C. I. Mason 1976). Historic materials from the surface of the site include possible seventeenth, eighteenth and nineteenth century items. One grave was reported to include brass bracelets and a complete ceramic pot of undetermined affiliation (Hall 1962; C. I. Mason 1976). Beyond this burial, however, no Historic items have been found in situ, or in a context which even indicates if they represent a Euro-American or Indian occupation.

The Astor site (47 Br-243) in the city of Green Bay has recently been identified as a potential contact period site that has produced both Lake Winnebago Trilled ceramics and seventeenth to eighteenth century French items in pit fill (Overstreet 1989b, 1993; P. Richards 1993a). Grit-tempered ceramics from the pit features also suggest the presence of Fox or Potawatomi at the site, and possibly unnamed Late Woodland groups. Faunal remains from Astor include fragments of deer, dog, muskrat, birds, fish, and turtle (P. e). The site appears to have been a small, seasonally occupied village. Unfortunately, more recent excavations at the site have not been described.

Overstreet proposed that his 1995 horizon scheme could also be applied to northeastern Wisconsin from Green Bay to the tip of the Door Peninsula (1995). Emergent horizon (A.D. 950-1150) sites are found only near the tip of the Peninsula and include Mero, Portes des Morts and Rock Island. The basically plain ceramic vessels decorated only with lip modifications fit his Emergent horizon criteria. Only the Mero and Rock Island II sites have produced radiocarbon dates and within this horizon they range from A.D. 920 to 1013. The Developmental horizon (A.D. 1150-1350) includes both Mero complex and Green Bay

phase sites in the northern and southern portions of the peninsula. Mero complex sites in the north include presumably late components at Mero and Portes des Morts. A single date of A.D. 1169 from Mero places it in this horizon. Developmental horizon sites in the south include Point Sauble, Dr-107, and Suamico. No dates are available from these sites and only the probable Grand River series ceramics from Point Sauble have been described (Freeman 1956; C. I. Mason 1976; Hall 1962, 1993). Overstreet does not discuss what cultural attributes would place most of these sites in his Developmental horizon. Classic horizon (A.D. 1350-1650) sites are rare and include what Overstreet terms a Lake Winnebago phase occupation at Portes des Morts and a Green Bay phase occupation at Whitefish Bay View (Overstreet 1995:34). Radiocarbon dates within the horizon come from Rock Island II (A.D. 1373 and A.D. 1376) and Whitefish Bay View (A.D. 1390). None of these sites appear to have clear Classic horizon ceramic or settlement attributes, however. The Historic horizon (post-A.D. 1650) includes Rock Island II and the Astor site. Overstreet (1993) proposed the Provisional Dandy phase of the Historic horizon to include the Astor and Hanson sites in northeast Wisconsin. R. J. Mason (1993), however, has argued that the Hanson site cannot be included in an Oneota horizon, since no aboriginal ceramics or other artifacts were present to distinguish the burials from nonlocal groups.

The end of the Late Prehistoric period in northeast Wisconsin is just as enigmatic as other parts of the state. Some archeologists have proposed a depopulation of the region after 1500 due to the introduction of European diseases or climatic cooling (Green 1993), and this may account for the paucity of sites in the contact period of the 1600s. A Lake Winnebago phase occupation has been suggested only for the Astor site in Green Bay, and a few seventeenth century Euro-American objects have been found associated with these aboriginal ceramics in refuse pits. The Oneota presence at most other sites in the region, however, has been classified as Green Bay phase or Mero complex, and appears to be contemporary with, but different from, the Grand River and Lake Winnebago phases of southeast Wisconsin. Orr phase ceramics (Allamakee Trilled) from western Wisconsin are found in the late components of many sites and may represent the protohistoric Winnebago.

It is curious that little effort has been made to identify the archeological presence of the Menomini in the region, even though they were identified as living on the west shore of Green Bay at contact, and their territorial claims include most of northeast Wisconsin. This is due in part to the fact that Green Bay's west shore is less well known archeologically than the Door Peninsula. It may also be due to a traditional archeological mind set that as Algonquian speakers, the Menomini were Woodland rather than prairie Indians, and their cultural origins should be Late Woodland (Barrett and Skinner 1932; Dirst 1995b). The radiocarbon record for Late Woodland sites and ceramics, however, ends several centuries before contact. It might be useful to consider the possibility that the Menomini descended from Oneota antecedents in northeast Wisconsin such as Mero or Green Bay phases. Elsewhere in the Midwest, archeologists have proposed that, although many Souian groups can be linked to Oneota, non-Siouan speaking groups such as the Miami and Illini may also have Oneota roots (Faulkner 1972; Herold, O'Brien, and Wenner 1990). Brown (1990), however, points out the many difficulties associated with attempting to link Late Prehistoric sites with particular ethnic and linguistic groups.

There is archeological evidence for two types of Oneota sites on the west side of Green Bay. As in other parts of Wisconsin, there are numerous Late Woodland sites that exhibit a small amount of shell-



tempered pottery. These ceramics have been explained as trade vessels, late intrusions, or indicators of the presence of women from Oneota groups (Fitting 1970; Salzer 1974, 1986; Van Dyke 1987). It has been suggested elsewhere in this chapter that these sites could represent small Oneota farmsteads on Woodland middens.

More visible Oneota sites have also been reported in the region. Buckmaster (1979) located two substantial Oneota sites along the lower reaches of the Menominee River. The sites had locations and catchment zones distinctively different from Late Woodland sites in the watershed. Archeological evidence indicated their inhabitants exploited a wide range of riverine and lacustrine resources. The principal village of the contact period Menomini was reportedly at the mouth of the Menominee River, in a setting similar to these prehistoric Oneota sites.

Oneota sites have also been reported inland along Wisconsin lakes and rivers which drain into Green Bay. The Watasa Lake Swamp site (Barrett and Skinner 1932) on the Menominee reservation was a wetland edge site with garden beds and a midden that produced early and late Late Woodland pottery along with numerous Oneota (and possibly Middle Mississippian) ceramics. The nearby South Branch Chapel site had similar Oneota pottery. The Oneota ceramics included grit and shell-tempered varieties with scalloped rims, trailing, and punctates. Just to the north another Oneota site has recently been reported at Zarling Lake (47 Fr-186) in the Oconto River drainage (Bruhy n.d.; Bruhy et al. 1990). The grit and shell-tempered Oneota ceramics included scalloped and plain everted rims. Scattered postmolds and debris distributions suggested that structures may have been present at the site. Numerous shell-tempered vessels also were found associated with Late Woodland ceramics at Fay Lake in Florence County in the Menominee River watershed (Van Dyke 1987) which suggests a substantial Oneota occupation may have been present in this inland area of northeast Wisconsin as well.

#### North-central Wisconsin

Oneota ceramics in north-central Wisconsin have been considered to represent trade items on Lakes phase Late Woodland sites (Salzer 1974, 1986b). Recent investigations suggest that shell and grit-tempered Oneota ceramics are late additions to these sites, and that Oneota habitation sites may be represented in the region (Bruhy et al. 1990; Moffat et al. 1991, 1992, 1993). The recent recovery of corn from Lakes phase sites with Oneota pottery (Arzigian 1993) suggests that plant cultivation was practiced during Late Prehistoric times. The reported presence of garden beds on several Lakes phase sites (Schumacher and Titus 1913; Moffat et al. 1993) also indicates that corn was probably grown in the region. Perhaps the close association of garden beds, corn, and shell-tempered pottery reflects Oneota gardening on Late Woodland middens in this region as well.

Sites in the region which have produced Oneota ceramics include Butternut Lake (47 Fr-122) (Bruhy et al. 1990), Robinson (47 On-27/Li-01) (Salzer 1969, 1974), Ghost Shirt Island III (47 On-146) (Moffat et al. 1992), Fischer's Island (47 On-51) (Moffat et al. 1993), 47 On-153 (Moffat et al. 1993), 47 On-196 (Moffat et al. 1993), 47 Vi-34 (Moffat et al. 1993), and 47 Vi-193 (Moffat et al. 1993). Corn was recovered from 47 On-51 and 47 Vi-34 (Arzigian 1993). No large scale excavations have been conducted at any of these sites, and little detail is available on the Oneota occupations.

#### Northwest Wisconsin

An Oneota presence per se has not been identified in northwest Wisconsin. Shell and grit-tempered, plain and trailed ceramics have

been reported in a variety of contexts in Dunn, Chippewa, and Eau Claire counties (Barth 1985). They appear to represent connections to both Silvernale, Blue Earth phase and Orr phase Oneota manifestations to the south along the Mississippi River. An unusual Mississippian-like vessel was found in an intrusive pit in a Late Woodland mound at the Wakanda Park site (47 Dn-1) in Dunn County, northwestern Wisconsin. The vessel was a grit-tempered, angular shoulder jar with a "red painted" plain surface and parallel incised lines (Wittry 1959c). The intrusive context of this vessel, whatever its cultural affiliation, indicates that it postdates the Late Woodland occupation of the site.

Shell and/or grit-tempered ceramics called Sandy Lake ware (Cooper and Johnson 1964) have been found on a few Late Prehistoric to protohistoric sites in the northern part of the region. Sandy Lake ware has been identified more commonly at Late Prehistoric sites in Minnesota and Ontario where it is found stratigraphically later than or mixed with Late Woodland ceramics. Sandy Lake ceramics appear to be associated with Central Souian speaking groups, possibly Santee Sioux/Eastern Dakota (Cooper and Johnson 1964; Johnson 1985) or Assiniboine (Anonymous 1988). Sandy Lake vessels are globular with short direct or slightly outcurving rims. Exterior surfaces are cordmarked and rarely decorated with punctates or trailing. Interior lips are occasionally notched. Sandy Lake ceramics have been dated from A.D. 1000 to A.D. 1700 (Anonymous 1988). In Minnesota, Sandy Lake sites appear to be associated with the prairie-forest ecotone (Johnson 1985). Faunal remains indicate that a wide range of woodland and prairie species were exploited along with wetland inhabitants. Remains of bison, deer, elk, bear, beaver, muskrat, dog, other small mammals, fish, shellfish, turtle, and waterfowl have been found. Plant remains from Minnesota sites include wild rice, tubers, berries, seeds, nuts, and tobacco. No corn or other domesticates have been reported, however.

In Wisconsin, Sandy Lake ceramics have been reported at the Fickle site (47 Bt-25) (Cooper and Johnson 1964; Kolb 1988) in Burnett County. The shell-tempered ceramics were mixed with and postdated Clam River Late Woodland ceramics. No subsistence or settlement data are available for the Sandy Lake occupation of this region. The Morty site (47 As-40) (Salzer 1980) in the Apostle Islands off the Bayfield Peninsula in Lake Superior has also produced Sandy Lake pottery. At Morty the shell-tempered ceramics were mixed with and postdated Blackduck Late Woodland ceramics. The Morty site has been interpreted as a Late Prehistoric to early Historic moose hunting station which also exhibited a bipolar quartz industry on beach cobbles. A thermoluminescence sample from Morty dates the Sandy Lake occupation to A.D. 1685 (Salzer 1980; Anonymous 1988; Harrison 1990).

## Minnesota

The Late Prehistoric period begins around 1,100 years ago (ca. 900 A.D.) and continues until the time of initial contact between American Indian people and European explorers. This is termed the Late Prehistoric period following Johnson (1979), Anfinson (1987b) and others.

The archaeological cultures for this period are better known than for the preceding stages of Minnesota prehistory, but numerous questions remain to be answered. In general, our knowledge of these cultures is written with a broad brush, and in only a very few areas of the state have intense local research programs been initiated to develop tight local sequences and models.

In the southern half of Minnesota, Oneota culture emerges perhaps as early as 1,000 years ago. Based principally on maize agriculture,



hunting, and the use of fish and other riverine resources, Oneota appears first in the Red Wing area. In and around Red Wing, Oneota sites provide evidence for intense (if perhaps relatively brief) interaction with the Middle Mississippian groups farther to the south (see Gibbon 1974, 1979; Dobbs 1984a, 1985, 1987b; Dobbs and Breakey 1987; Gibbon and Dobbs n.d.). After about 800 years ago, the impact of Middle Mississippian cultures on Oneota seems to wane, and Oneota undergoes a period of increasing regionalization, apparently spreading west and south and perhaps displacing Cambria by the thirteenth century. In his initial definition of several of these cultures, Wilford (1941, 1945, 1955) suggested that there is a developmental sequence from Silvernale to Blue Earth to Orr. While the details of this evolution appear to be more complex than originally thought, the temporal sequence itself still seems to be a valid concept.

Between roughly 800 and 600 years ago (A.D. 1200-1400), Blue Earth Oneota emerges as the dominant group in southern Minnesota. Blue Earth Oneota is best known from the Center and Willow Creek localities of the Blue Earth River Valley (Wilford 1941, 1945a, 1955; Gibbon 1983; Dobbs and Shane 1982; Dobbs 1984a). Oneota in the prairie region of Minnesota during the thirteenth and fourteenth centuries appears to rely more heavily on bison and less on maize horticulture than had been the case during the preceding several centuries. Oneota is also present on the St. Croix River and along the Mississippi at this time, but is poorly known in both these areas. The extensive moundfields of western Hennepin County also appear to represent, in part, a major Oneota presence. Unfortunately, almost all Oneota sites in this area have been destroyed by modern development.

After the fifteenth century, Oneota is known principally from the Orr focus sites of southeastern Minnesota and northeastern Iowa. Recent work in the La Crosse, WI area is also expanding our knowledge of Oneota in this region. It appears that there are significant differences in Oneota culture in these areas when compared to earlier Oneota manifestations. In part, these differences may be attributable to the increasingly inclement climatic conditions of the period from A.D. 1500 on (Little Ice Age). It is possible that European disease also quickly infiltrated this area after the initial Spanish entrada into the lower Mississippi Valley and wreaked havoc with the local populations.

There is evidence (Shane and Dobbs, unpublished research) of a southerly movement of Oneota traits and ideas beginning in the late fifteenth century. Whether this represents diffusion of material and conceptual culture or the movement of actual peoples southward has yet to be resolved. In any case, the Loway Indians who were encountered by Perrot and other early French explorers have been clearly linked with the prehistoric Orr focus Oneota (Mott 1938; Wedel 1959, 1976).

In southwestern and western Minnesota, significant cultural changes are apparent by A.D. 900 and these are most clearly associated with the Plains Village Tradition. Characteristics of the Plains Village lifeway included semipermanent villages on river valley terraces with adjacent river bottom gardens. Many of the village sites were fortified and contained storage/trash pits and sometimes semisubterranean houses. Globular ceramic jars exhibiting a mixture of Woodland and Mississippian traits are typical.

Great Oasis is the earliest phase in the region, although it is most widespread to the south in Iowa. Cambria is known primarily from one large site and several smaller ones around Mankato, MN at the confluence of the Blue Earth and Minnesota rivers. Both Great Oasis and Cambria are presently classified as phases within the Initial variant of the Middle Missouri Tradition of the Plains Village Pattern. Most western Minnesota sites yielding Plains Village ceramics have been classified as Cambria

but as Anfinson (n.d.) observes, this classification system has proved unsatisfactory because Cambria is based on the material from one site and no other site attributed to the Cambria phase matches the type site in terms of artifact density, area, or diversity of assemblage. Therefore, Anfinson (n.d.) has proposed a third Plains Village phase called the Big Stone phase for western Minnesota. This phase is characterized by small, fortified habitation sites near Big Stone Lake and Lake Traverse in western Minnesota. The phase features a more mixed Woodland-Plains Village way of life than Cambria and sites that are probably associated with the phase are also found on the western side of the lakes in South Dakota.

In central and northern Minnesota, matters are also complex, and much of the development in these regions centers around the intensifying use of wild rice as a major food resource. In central Minnesota, Johnson (Caine-Hohman 1983:65-67; Birk and Johnson 1988) has delineated a series of archaeological phases for the Late Prehistoric. The Vineland and Wahkon phases appear to represent a developmental continuity with earlier cultures in the region. During the Vineland phase, Kathio and Onamia ceramic types are found, along with small side-notched and unnotched triangular projectile points. The construction of conical burial mounds is typical of this period and semisubterranean, rectangular houses have been identified. During the later Wahkon phase, Onamia ceramics disappear and during either the Wahkon or subsequent Shakopee phase, Sandy Lake ceramics replace Kathio series ceramics. This rather abrupt change in the local ceramic sequence is distinctive and one hypothesis to explain this replacement is that local populations are replaced by other groups moving into the area. The Bradbury phase is the final phase in the Mille Lacs sequence and contains both Sandy Lake and Ogechie ceramics. Ogechie ceramics show clear relationships to the Orr focus Oneota of southeastern Minnesota but many other aspects of settlement, subsistence, and material culture are rather different from Oneota materials.

In northern Minnesota, the Blackduck culture appears around 1,200 years ago (ca. 800 A.D.) and appears to represent the first intensive use of wild rice as a food resource. In extreme northern Minnesota, Blackduck seems to persist until the time of European contact. In the Mississippi headwaters and other regions of northern Minnesota, however, Blackduck is replaced by groups producing Sandy Lake ceramics beginning around 800 or 900 years ago (ca. A.D. 1100-1200). In many portions of the state, Sandy Lake ceramics persist until the arrival of Europeans. Blackduck and Sandy Lake ceramics often appear at the same site and the best known sites are very large, seasonal villages with extensive middens and debris around the major lakes and rivers of central and northern Minnesota. Birk (1977) has defined the Wanikan culture as the broader cultural unit that includes Sandy Lake ceramics and is characterized by the intensive utilization of wild rice and is most probably associated with Siouan speakers ancestral to the modern Dakota people.

Although it is tempting to see a rather straightforward prehistoric sequence that encompasses most of northern Minnesota, this is perhaps not really the case. In extreme northern Minnesota, Selkirk ceramics are occasionally found and these may be associated with the ancestors of the Assinboine. In eastern Minnesota, the apparent absence of Sandy Lake or Oneota ceramics in the Snake River Valley (cf. Caine 1974; Birk 1977b) is puzzling. Similarly, Sandy Lake ceramics are now documented from the Red River Valley, as well as a new type Michlovic (1987:62) has termed Red River ware. However, there appears to be a complex interaction in the northwestern portion of Minnesota between cultures of the northeastern Plains and the lake-forest region of northern Minnesota.

Seven major trends are apparent during the Late Prehistoric period. These include the intensification of food production (maize horticulture in the south, wild rice in the north), introduction of new technology for tool use and manufacture, significant population increases and the emergence of well-defined regional complexes, the tentative association of archaeological complexes with known Historic groups of American Indian people, interaction and influence with the highly developed Middle Mississippian cultures of the lower Midwest, and the interrelationship between human adaptations in the state and changing climate.

The intensification of food production during the Late Prehistoric period represents perhaps the most significant innovation in Minnesota prehistory for several thousands of years. Increased food production provided an energy surplus that allowed population to increase significantly. Further, the adoption of maize horticulture and wild rice utilization presumably resulted in major changes in social organization, gender roles, land tenure (at least on a small scale), settlement pattern, and the exploitation of various environmental zones throughout the state.

In southern Minnesota, maize appears first during the Late Woodland and is best known from the Nelson site (21BE24) in the Blue Earth River Valley (Scullin n.d.). Maize does not seem to have played a particularly important role in Late Woodland subsistence, but between 900 and 1,000 years ago (A.D. 1000-1100) maize cultivation literally explodes. This rapid intensification is clearly related to the emergence of Oneota and Plains Village (e.g. Cambria, Great Oasis) cultures in southern Minnesota.

In northern Minnesota, the utilization of wild rice follows a similar pattern and at about the same period of time. Although wild rice has been a topic of interest for a number of years, the literature on prehistoric utilization of wild rice remains relatively sparse (see Jenks 1900; Johnson 1969a & b; Yourd 1988). In a recent paper Lofstrom (1987) has provided a provocative model that relates changes in social organization, population size, and the emergence of wild rice. Although this model remains to be tested, it provides a strong synthetic point of beginning for the evaluation of wild rice in relationship to other major cultural trends.

The time-synchronous emergence of both maize and wild rice is intriguing. No major papers have yet appeared which discuss the causal variables that may be involved in the intensification of these two food resources, but this topic is an important and stimulating area for future investigations.

There are numerous changes in technology during the Late Prehistoric period and most of these are linked to food production. Although use of the bow and arrow may be first identified during the Late Woodland and Transitional Woodland contexts, its widespread use is best documented during the Late Prehistoric. Similarly, there are a variety of changes in ceramic technology. These are most clearly seen in the Oneota and Mississippian-like ceramics of southern Minnesota, where the use of freshwater shell as a tempering agent appears about 1,000 years ago, presumably diffusing up the Mississippi River from the lower Midwest. The adoption of shell-tempering resulted in thinner, larger, more finely made vessels. Osborn (1981) has argued that the adoption of shell-tempering may have enhanced the nutritive value of maize, but this remains to be clearly demonstrated.

Other technological innovations relate directly to the increased production and storage of maize and wild rice. Unlike the products of a hunting and gathering lifeway, grains must be processed and stored in a particular fashion or they become inedible. Some of these

innovations are apparent in the archaeological record (e.g. bell-shaped storage pits for corn, ricing jigs for processing rice) while many others must be inferred.

During the preceding Woodland period, a pattern of slowly increasing regional identity and population growth is apparent. This trend is continued and accelerates during the Late Prehistoric period. Population growth, however, does not appear to continue in a straightforward linear fashion. Rather, population growth may ebb and flow in specific regions over time.

The increasing regional identity of archaeological cultures during the Late Prehistoric is a particularly fascinating and complex topic. No synthetic studies of this problem have yet appeared. However, an examination of the relationship between regional identity, perceived movement of populations over time, adaptation to (and utilization of) specific environmental zones, increasing pressure on available food (and other) resources, increasingly structured social organization, and expanding competition for particular territories are all variables that need to be included in such a study.

It is during the Late Prehistoric that it becomes possible to link, in at least a tenuous fashion, archaeological cultures with Historic groups of American Indian people. Such linkages, in most cases, remain tentative hypotheses. However, further work may strengthen this particular type of study.

Wedel (Mott 1938; Wedel 1959, 1976; see also Griffin 1937) has linked the Orr focus materials of southeastern Minnesota with the Historic Ioway tribe. Following this association, Dobbs (1984a:218-229) has tentatively suggested that the Oneota cultures in the Blue Earth River Valley may represent ancestral Oto. Likewise Dobbs (unpublished research) very tentatively suggests that the Oneota and/or Silverdale phase cultures of the Red Wing locality may represent ancestral Ioway. It has also been suggested (Cooper and Johnson 1964) that Sandy Lake may represent ancestral Assiniboine or Eastern Dakota and Johnson has linked the Bradbury phase at Mille Lacs to the Historic Mdewakaton Dakota.

Between about 1,000 and 700 years ago, the complex cultures of the Middle Mississippi Valley appear to have had a strong influence on groups in Minnesota. The most obvious expression of this Middle Mississippi influence is near the junction of the Cannon and Mississippi Rivers near modern Red Wing, MN. However, Cambria, in the southern and western portions of the state, also shows clear evidence of contact with Middle Mississippi ideas. Mill Creek, in northwestern Iowa, presents an analogous situation. Direct evidence for Middle Mississippian contact/influence is absent in central and northern Minnesota. However, despite three decades of discussion and hypothesizing, the precise nature of this influence (and interaction?) remains largely unknown. Griffin (1961), Gibbon (1974), Dobbs (1984a), Johnson (1986), Anderson (1987), and Gibbon and Dobbs (n.d.) have discussed this problem, but none of these models have yet been carefully tested and answers remain elusive.

Another theme is the appearance of fortifications associated with habitation sites after about A.D. 1200 in many parts of Minnesota. The Bryan site in the Red Wing locality was surrounded by a large stockade and one of the characteristics of the western Big Stone phase is the presence of fortified villages. Several earthen 'forts' associated with later Oneota cultures are also known from the Root and Cannon River drainages of southeastern Minnesota.

A final theme for this period is the interrelationship between human groups and changing environmental conditions. Griffin (1961) suggested that the expansion of Mississippian-like cultures into the Upper Mississippi Valley was the result of a shift to climatic conditions

more conducive to corn horticulture some 1,100 years ago. The subsequent (perceived) disappearance of these cultures in the Upper Valley was attributed to a subsequent deterioration of climate which made corn horticulture untenable. Baerreis and Bryson (1965) refined Griffin's hypothesis and provided more substantive climatic data as a framework. Although the interrelationship between climate and the rise and decline of Mill Creek culture in northwestern Iowa has been the subject of some study (Baerreis and Bryson 1968), a major interdisciplinary effort to evaluate this topic in Minnesota has yet to be undertaken. Baerreis, Bryson and Kutzbach (1976) provide a review of studies of climate and culture in the western Great Lakes region.

### The Silvernale Phase and the Red Wing Locality

At the end of the first millennium after Christ, a sweeping series of economic, technological, and social changes transformed aboriginal society throughout much of eastern North America. These changes resulted in the Mississippian Tradition, which represents the second great 'climax' in eastern North American prehistory (Hall 1980). In the Midwestern United States, the most complex manifestations of Mississippian culture are found in the central Mississippi Valley and the lower reaches of its tributary streams in Illinois, Indiana, Kentucky, and Missouri. Although there are hundreds of Mississippian sites scattered through this region, the premier Mississippian center is the site of Cahokia and the series of sites related to it in the American Bottom of southwestern Illinois. Cahokia is the largest prehistoric site in North America north of the Valley of Mexico and, during its most expansive period, appears to have functioned as an intense 'cultural reactor' that profoundly touched and influenced aboriginal groups throughout the central United States (cf. Baerreis and Porter, eds. 1984).

The history of Cahokia and Mississippian cultures in the American Bottom is complex and spans more than 400 years (Hall 1991). Of particular interest is the period during the twelfth century A.D. when the northern and western frontiers of the Mississippian world expanded to include much of the Upper Mississippi and Missouri river drainages. During this period, evidence of Mississippian influence appears throughout this region and several focal points for Mississippian interaction appear to develop in the area including the Red Wing locality of southeastern Minnesota and the Mill Creek sites of northwestern Iowa (Anderson 1987).

Located some 500 miles upriver from Cahokia and the American Bottom, the Red Wing locality is situated at the confluence of the Cannon and Trimbelle Rivers with the Mississippi (Dobbs 1985; Dobbs 1986; Dobbs and Breakey 1987; Gibbon and Dobbs 1991; Dobbs, in press) in Goodhue County, MN and Pierce County, WI. The locality encompasses an area of some 58 square miles and contains more than 2,000 mounds and earthworks, eight major village sites, and dozens of smaller secondary sites. The locality is the most northern center of Mississippian interaction in eastern North America and is (arguably) the largest cluster of Mississippian-related sites in the northern Mississippi Valley.

The most distinctive archaeological culture at the locality during the period A.D. 1050-1300 is the Silvernale phase, which has been defined on the basis of its Middle Mississippian-like ceramic forms and modes (e.g. vessel forms, rolled rims, surface treatment, design, etc.). These forms are unlike any Minnesota ceramics that precede them and document the expansion of Middle Mississippian forms into the region.

The Silvernale focus was defined by Wilford (Wilford 1955:139-140) on the basis of his excavations at Bryan and Silvernale. Wilford's analysis of the Silvernale ceramics identified a complex of distinctive attributes including rolled rims, sharp shoulders, and a series of distinctive

Mississippian-like (e.g. like Cahokia) design motifs. Based on this analysis, Wilford suggested that there was a relationship between the Silvernale focus and the Middle Mississippi cultures of southern Wisconsin and Illinois and that Silvernale focus ceramics were "clearly related to Aztalan, to Apple River, and to the Monks Mound aspect" (Wilford 1955:140). A variety of other artifacts and forms which are distinctively Middle Mississippian have been found at sites throughout the locality, including a flat-topped pyramidal mound, copper ornaments and figures, a Long Nosed God mask, 'chunkey' stones, and Cahokia Tri-Notched projectile points (Williams and Goggin 1956; Hall 1962; Gibbon 1974; Gibbon and Dobbs 1988).

Wilford observed that Oneota material was also present in the Red Wing region (1945, 1955:140-141). He recognized that Oneota was part of a broader Mississippian pattern and suggested that Blue Earth Oneota, which he felt was present both in the prairie region of southern Minnesota and in Red Wing (Wilford 1945), had developed from Silvernale (Wilford 1955:141).

During the early 1970s, Gibbon (1974, 1979) reanalyzed the data from Wilford's excavations and suggested that the Red Wing region had served as a northerly node in a widespread magico-religious network. Following the practice of the time, the Silvernale focus was transformed into the Silvernale phase.

Within the locality, there are four sites that are predominantly associated with the Silvernale phase. One of these (Mero -Diamond Bluff [47PI02]) is in Wisconsin and situated on a high glacial outwash terrace overlooking the delta of the Trimbelle River at its confluence with the Mississippi. The other three Silvernale sites are along the south side of the Cannon River in Minnesota. The Silvernale site (21GD3) is situated on a low terrace near the mouth of the Cannon and overlooks its delta. The Energy Park site (21GD158) is roughly a mile upriver from Silvernale and is situated on a high glacial outwash terrace overlooking the Cannon. The Bryan site (21GD4) is roughly three-quarters of a mile beyond Energy Park and is situated on the same terrace, again overlooking the Cannon River.

There are at least four other major villages within the locality. Two of these sites (Bartron, Adams) are not dominated by a Silvernale phase occupation but rather are associated with Oneota materials most closely related to the Blue Earth phase (see Dobbs 1984a). The precise cultural affiliation of the other two (Mero 2, Belle Creek) is unknown.

All of these habitation sites are surrounded by an extensive group of earthen mounds. However, the physical setting, composition of the mound groups, and character of the village sites is different. At both Mero-Diamond Bluff and Silvernale, the mound group is exceptionally large (more than 300 mounds in each case) and both sites contain a variety of mound forms. The village at these sites is roughly 15 acres in extent. Bryan is surrounded by a group of at least 173 earthworks and the village site may be as large as 20 acres (Yourd 1983:43). The village itself was surrounded by a palisade. At Adams, Bartron, and Energy Park, the number of mounds is considerably lower and the village sites are smaller.

The Adams site appears to represent a single component Oneota site, although some Mississippian-like artifacts (chunkey stones and copper) have been recovered. Controlled surface collections at Adams had suggested a rather different internal settlement plan than at many of the other large sites in the Red Wing locality, and the excavation supported this interpretation. Unlike Bryan, Silvernale, Energy Park, and Mero (Diamond Bluff), no deep pit features were discovered. Rather, a series of what appear to be extensive surface middens

containing freshwater clams, fish and animal bone, and other village refuse were discovered (Dobbs 1986).

Excavation at Energy Park in 1987, 1988, and 1990 (Dobbs and Breakey 1987; unpublished data) revealed a series of pit features and posts similar to types found at the Bryan site. In addition to the standard array of Silvernale artifacts, nonlocal artifacts including galena and a Cahokia Tri-notched point have been recovered. These excavations tended to verify the model of the internal site plan developed from controlled surface studies at the site.

Much of the original habitation area at Bryan, covering perhaps as much as 20 acres, has now been destroyed (see Yourd 1985:11-17). However, in 1983 and 1984, the Minnesota Department of Transportation funded excavation of site remnants in the northwestern portion of the site as part of a bridge replacement project (see Dobbs 1984b, 1987b). The western, northern, and probable location of the southern edges of a palisade surrounding the site had been identified. Two well defined structures and several possible structures had been located. A total of 558 pit features were examined and more than 300 of these were excavated (Dobbs (1984b, 1987b, 1989b).

In 1990, the Archaeological Conservancy acquired the western quarter of the Mero (Diamond Bluff) complex containing site 47PI02. This site has often been interpreted as the earliest Mississippian site in the locality because of the occurrence of Late Woodland and Silvernale phase materials at the site. In 1991 and 1992, excavations at the site revealed more than 70 pit features and the remnants of two semisubterranean structures. In 1992, the northeastern quarter of one of these structures was excavated, and it appears that there are two or three episodes of rebuilding within this structure and that the earliest structure (surrounded by posts) extends to a depth of 90 cm below ground surface. A significant collection of Silvernale and Oneota ceramics was recovered from carefully controlled contexts within both the house and adjacent pit features. These ceramics, although similar to those from other sites in the region, are somewhat different and may represent the earliest Mississippian and Oneota materials yet recovered.

Variation in the ceramic assemblage both within the locality and specifically at the Bryan site has been an ongoing research problem. Earlier studies have identified different ceramic types (e.g. Wilford 1945:34-38; Gibbon 1978; Wilford 1985:24,29-31; Stortroen 1985:43-44).

During the last several years, a comparative study of the larger ceramic rimsherds from Bryan has been underway in cooperation with Dr. George Holley, a specialist in the ceramics of the Cahokia site (e.g. Holley 1988). The objective of this study is to refine the ceramic typology for the Red Wing locality and to identify both differences and similarities between these ceramics and those from Cahokia. The results of this study (Dobbs and Holley 1995) indicate that there are four distinct ceramic forms present within the Silvernale phase. These include the following:

1. The first group is the numerically predominant shell-tempered ceramics that display Cahokia-inspired features: incised jars with Ramey-like designs and angular to subangular shoulders and modified rims. The rims were either rolled or everted (uncommon). None of the jars were slipped and a small proportion may be smudged (unslipped) and polished. Confusion with later dating Oneota style ceramics is evident. Such treatments were not typical of Cahokian styles.

2. The second group comprises grit-tempered examples of Group 1, yet number less than 10% of the collection. Surfaces are uniformly plain and it appears that the majority are incised. These vessels share an affinity with those from the Cambria area to the west.

3. The third group is diverse and comprises grit-tempered, stubby-neck plain or cord-impressed jars with notched rims that are affiliated with western sources from the Cambria area and Iowa. These vessels represent under 1% of the sample.

4. Shell-tempered bowls and anomalous red-slipped sherds.

High-neck incised jars with clear Oneota affiliations are presumed to date after the Silvernale phase and are uncommon at the Bryan site.

Jar morphology within the Silvernale phase is predominated by the Cahokia style: modified rim with inslanted upper body and pronounced shoulder. Also present are unmodified or direct-rim jars and jars with short, angled necks that are typical of Cahokia examples and intermediate with Oneota styles.

The modified rims include everted and rolled treatments. Rolled treatments are clearly predominant in both shell and grit tempering and are diverse in rendition. The uncommon everted-rim jars resemble a portion of the vessels recovered from the Aztalan site and, of all the incised jars from the Bryan site, they bear the closest affinity to the Ramey Incised type, in that they are well-made and may not have the reverse-intaglio effect.

The short neck category also displays variation. One variety resembles the angled rims common to the Cahokia site during the late Stirling subphase and, more typically, the Moorehead phase. This category is distinguished by well-defined and sharply angled necks and rounded shoulders. The other variety is of intermediate size between the angled-rim jar and the high-neck jar. Surfaces are unslipped and the shoulders are rounded. Rim tabs appear to be diagnostic of both varieties, a feature also common with late dating vessels in the Cahokia area and Oneota vessels.

In spite of morphological similarities of rim treatment (everted, rolled, and angled), neck configuration (inslanted), and shoulder angle, as well as stylistic commonalities; there are significant modal differences separating Bryan ceramics from the Cahokia site that concern routines of production. Most of the jars are incised broadly and deeply. As with many Oneota styles, the incising tool was pressed with sufficient pressure onto the surface to leave an impression on the interior. This technique is not typical of examples encountered in the Cahokia area. Silvernale jars at the Bryan site are also never slipped and only occasionally smudged. In addition, the ubiquity of rolled rims and incising is atypical for the Cahokia site Mississippian sequence. Few of the Bryan Silvernale phase jars are not decorated. Lastly, jar handles are common and are of the loop and small strap varieties for the Silvernale phase.

The Red Wing sites appear to have been occupied principally between ca. A.D. 1050 and 1300. Although the actual period of occupation was probably much shorter, at most sites the available radiocarbon evidence is not precise enough to delineate the true length of occupation (Dobbs 1982). However, recent research at the Bryan site using high-precision radiocarbon dating suggests that the principal Silvernale phase occupation at Bryan was relatively short and occurred between roughly A.D. 1180 and 1220.

Because Bryan was a complex entity and has been largely destroyed, discussion of the period of occupation of the site is somewhat speculative. However, the palisade surrounding the site provides a spatial boundary for one maximum period of occupation, and it seems reasonable to believe that it is this period of occupation that we have dated in this study and it occurred between A.D. 1190 and 1223. One hypothesis is that Bryan functioned as a central place for trade and interaction between more westerly groups in the Plains and Cahokia. We suspect that Bryan was first occupied during the last quarter of the twelfth century, grew rapidly to its maximum extent between A.D. 1190-

1223, and quickly declined thereafter. In this model, the occupation and use of the Bryan site encompassed no more than one or two generations.

Hall's revised chronology for Cahokia phases (Hall 1991:10) places the Stirling phase between A.D. 1100 and 1200. This fits well with the model presented here. We suspect that the rapid growth of Bryan was intimately associated with the expansive nature of the Stirling phase and other sociopolitical developments at Cahokia and within the American Bottom.

### Oneota: Blue Earth

Blue Earth has been used in a variety of rather confusing ways in the archaeological literature. At one level, it has been applied to any Oneota site where ceramics with high rims and designs made of chevrons, plats of lines, and 'sun symbols' have been recovered. At another, it has been used to refer specifically to the materials found in the Blue Earth Valley of southern Minnesota.

One useful way to resolve this problem is to differentiate between a Blue Earth horizon, which subsumes many sites scattered over a large geographic area that are obviously related in some fashion, and the Blue Earth phase, which is found principally in the Blue Earth Valley.

Sites and complexes that would fit well into the Blue Earth horizon include the Sheffield site in the St. Croix Valley, the Bartron site at Red Wing, the Adams phase materials at Red Wing, and several sites in Wisconsin including Shrake-Gillies and Olsen. The Correctionville Oneota complex of northwestern Iowa is also probably related to Blue Earth but is not, as some have proposed, the same entity.

The Blue Earth phase consists of sites at the Center and Willow Creek localities in southern Minnesota along the Blue Earth River. A. E. Jenks (University of Minnesota) was evidently the first professional to visit the Blue Earth Oneota sites in an undocumented collecting trip in the early 1930s. Charles Reuben Keyes of Iowa visited the sites around Winnebago, MN in June of 1935 and at the Indianapolis Conference in that same year discussed Blue Earth Oneota. The Blue Earth focus as an archaeological unit was initially defined by Lloyd Wilford (University of Minnesota) in 1941 based on his work at the Humphrey site (21FA1) near Winnebago (see Wilford 1941, 1945a, 1945d). Wilford returned to Winnebago in 1947 to excavate at the Vosburg site (21FA2) and made several other visits to Faribault County in the early 1950s (Wilford 1952d, 1955). No further (documented) archaeological work took place until 1979 when Guy Gibbon (University of Minnesota) and Orrin C. Shane III (Science Museum of Minnesota) conducted an archaeological field school at the Vosburg site (see Dobbs 1984:62-67). Between 1979 and 1984, Shane and Clark A. Dobbs conducted extensive archaeological surveys at the Willow Creek and Center Creek localities respectively (Dobbs and Shane 1982; Dobbs 1984). Several sites at the Center Creek locality were damaged by highway construction in 1985, but some information was obtained after the destruction took place (Anfinson 1987a).

Blue Earth Oneota as an archaeological entity is complex. The principal village sites may have been occupied on different occasions over a period of one hundred years or more, and it appears that there were changes in ceramic styles and subsistence patterns during this time.

In general, Blue Earth Oneota represents a mixed adaptation of farming and bison hunting along the edge of the western prairies. The principal village sites all appear to have been involved in corn horticulture. However, it seems that after about A.D. 1300, these groups

shifted to a heavier reliance on bison with a significant lower emphasis on maize horticulture in their subsistence patterns.

The origins of Blue Earth Oneota remain obscure. This complex seems to appear in the Blue Earth River valley rather abruptly sometime after A.D. 1100 or 1150. Whether this complex represents a movement west from the Mississippi River, or an in situ development remains to be demonstrated. The end of Blue Earth is equally problematic. No European trade goods or evidence of interaction between Europeans and Blue Earth Oneota people have yet been located. Although several radiocarbon dates suggest that the Vosburg site may have been occupied in the sixteenth or seventeenth centuries, this is probably not the case. Dobbs (1984:218-229) has suggested that Blue Earth may represent people who were the ancestors of the Oto tribe. Although intriguing, this proposition has yet to be fully tested.

The Blue Earth artifact assemblage is fairly typical of Oneota in the Prairie Peninsula. Bison scapula hoes, sandstone abraders, triangular projectile points, endscrapers, and pottery are ubiquitous. An interesting aspect of the endscrapers from the Center and Willow Creek localities is that they are largely made of Rapid Member chert. Prehistoric quarries for this material are located in Mower County, more than 90 miles to the east. Catlinite pipes, fragments, gaming sticks, and other objects made of this material have been recovered from several sites at both the Center and Willow Creek localities.

Classic Blue Earth ceramics are distinctively different from other Oneota ceramic complexes and are distinguished by the presence of tool impressions and/or trailed designs on the interior and/or exterior of the rim and the complex design patterns on the shoulder of the vessel. Wilford (1945a:34-35) and Dobbs (1984:104-105) have described this decoration as occurring in panels around the vessel. Shane (unpublished research) argues that evaluating the design program on the vessel may be of more utility.

Perhaps the most distinctive aspect of Blue Earth Oneota is their settlement pattern. The antecedent Late Woodland sites are found along the margins of the prairie lakes and in stream valleys. These sites are widely distributed across the landscape. Oneota sites, however, are found on the west side of the Blue Earth River and are tightly clustered in two localities. These have been termed the Center Creek and Willow Creek locality (Dobbs and Shane 1982; Dobbs 1984:136-190) following Willey and Phillips use of the term locality (1958:18-19).

The reasons for this distinctive settlement pattern are not completely clear. However, proximity to arable land for farming, protection from prairie fire and inclement weather (e.g. blizzards, tornadoes), and an orientation to the more westerly bison hunting country of southwestern Minnesota have all been proposed as possible determinants of this settlement pattern (Dobbs and Shane 1982:67-68; Dobbs 1984:191-217).

The social and temporal relationships between the Center and Willow Creek localities remain obscure, although Shane's work at the Willow Creek locality may shed light on this problem.

The temporal placement of Blue Earth Oneota remains problematic. Only a few radiocarbon dates are available and radiocarbon dating does not, at present, provide sufficient resolution to carefully delineate Oneota chronology within the Blue Earth valley. Ten radiocarbon dates are available (Dobbs and Shane 1982:65; Anfinson 1987a:35-36) from sites at the Center Creek locality. When evaluated at a 95% level of confidence, they bracket the period from A.D. 800 to A.D. 2000 (Dobbs 1984:95-96). This is clearly of little help. Our best guess, at present, is that there may be an initial Oneota occupation sometime between A.D. 1100 and 1200, with extended utilization of the region by Oneota groups continuing

until perhaps A.D. 1400. The densest occupation of the Center Creek locality may have occurred between roughly A.D. 1200 and 1300.

Dobbs (1984:167-190) has proposed an initial set of settlement types for the Center Creek locality. Shane (Dobbs and Shane 1982:65-67) is developing a similar set of property types for the Willow Creek locality. Since these types are based on surface collections, they must be viewed as provisional and subject to additional research and interpretation.

Type 1: Small, special activity sites located on soils of the Truman silty loam series. Located either on bluffs overlooking the river where the floodplain is of normal size or in the uplands. Many stone tools in relationship to total number of waste flakes, but few utilized flakes. Mixture of stone raw materials fairly heterogeneous, but oolitic chert most common. Little manufacture of stone tools, but resharpening appears to be common. Briefly occupied, hide processing stations?

Type 2: Village or habitation sites where the processing of animal hides was of particular importance. Situated on bluffs overlooking a floodplain or in the uplands. Ratio of formal tools to waste flakes average, ratio of utilized flakes to waste flakes very low. There appears to be a very heavy use of formal tool types at these sites. Mixture of stone raw materials fairly heterogeneous, but oolitic chert is most common.

Type 3: Situated either in the uplands or on bluffs overlooking a wide floodplain of the river. The ratio of both formal tools and utilized flakes to waste flakes is very low. It appears that few formal tools or utilized flakes were employed at these sites. Scrapers are relatively uncommon, projectile points are more common. The most characteristic trait of these sites is the large number of cores present in relationship to the total number of waste flakes. The very high percentage of oolitic chert in relationship to other raw materials is also noteworthy. Function is unknown, but perhaps represent habitation areas where tool manufacture/lithic workshop activity was important.

Type 4: These sites are found on Guckeen silty clay loam soils on bluffs overlooking creeks, a normal sized floodplain of the Blue Earth River, or in upland areas. Interpretation of these sites is difficult, since they appear in the field to be diffuse scatters of cultural material over relatively large areas. They are similar in some respects to Type 1 sites.

Type 5: These sites are found on Guckeen silty clay loam soils on bluffs overlooking creeks. These sites tend to be small and of low density with limited amounts of pottery. Cores and cortex flakes are extremely common and the lithic raw materials present are predominantly oolitic chert.

Type 6: These sites are located on Dickinson loamy fine sand soils in small knolls of glacial outwash in the floodplain of the Blue Earth River. These sites are quite dense and contain a wide variety of artifacts. In general, these appear to be seasonal horticultural villages where a wide variety of activities took place (e.g. 21FA2). Human interment in trash pits is not uncommon, and isolated portions of human bone is sometimes found in refuse pits.

In addition, Dobbs (unpublished research) has identified a settlement type that is uncommonly found on small rises in the floodplain of the Blue Earth River and its tributary streams. This settlement type is characterized by low to moderate artifact density, few flakes, moderate number of ceramics, and common occurrence of ground stone tools, particularly manos (grinding stones for corn).

Mounds do not appear to be a part of the property types associated with Blue Earth phase Oneota. Rather, there is some limited evidence that cemeteries with extended primary burials (?) were one dominant burial mode (cf. Dobbs 1984:81-83).

## Oneota: Orr Focus

In 1914, Ellison Orr described ceramics from Upper Iowa River Valley in northeastern Minnesota (Orr 1914). These ceramics were the first Oneota materials to be identified and also were later subsumed under the Orr focus. The Orr focus was initially defined by Keyes (1934) and Wedel (1959) provides a comprehensive study of the Orr materials in the Upper Iowa River Valley. Wilford (1947a, 1947b, 1952e, 1955; Wilford and Brink 1974) has described Orr materials in Minnesota.

The precise origins of the Orr focus remain unclear. However, Wedel (Mott 1938; Wedel 1959, 1976) has clearly demonstrated that at least some of the Orr focus sites in northeastern Iowa and southeastern Minnesota represent villages and/or burials occupied by the Historic Ioway tribe and it is apparent that there is some developmental relationship between materials of the Blue Earth horizon and Orr.

Although Henning (1970) and others have expanded the concept of Orr into a geographically disparate phase, the term "focus" is used here as the more appropriate referent to the Oneota materials in southeastern Minnesota. As Wedel (1976:10) has observed:

If several sites with very similar Historic components are involved, it must be determined whether the components have the measure of similarity in material content and site features to be the cultural remains of a single tribe or other ethnic group recognized in documents, a subjective evaluation, to be sure, that must be justified explicitly. This criterion is the reason for my using the term "Orr Focus" in this presentation to refer to the Oneota manifestation on the Upper Iowa and upper Little Sioux rivers and Riceford Creek which has been identified with the Ioway tribe and not that of the more comprehensive category label "Orr phase." If certain parts of a single large site show time or cultural differences, this should be made clear so that one knows the exact archaeological material which is being linked with the Historic period and/or a certain Native American people.

The material culture of Orr is broadly similar to other Oneota complexes. Distinctive elements of Orr include numerous items of catlinite, particularly disk pipes (a form different than those found in the Blue Earth River valley) and engraved and incised catlinite tablets. Orr ceramics are also distinctively different from other Oneota complexes and are broadly subsumed under the type Allamakee Trilled (cf. Henning 1961). Orr focus ceramics (excluding burial vessels) tend to be rather larger than Blue Earth vessels and have higher rims. Decoration is also somewhat different and rims are not commonly decorated as are those within Blue Earth. The use of punctates to surround trailed-line designs on the shoulder of ceramic vessels is a distinctive Orr trait. Orr vessels are normally tempered with freshwater mussel shell and the paste of Orr vessels appears, in general, to be more porous and of poorer quality than Blue Earth or Silvernale ceramics.

The Orr focus presents a number of exciting challenges to the archaeologist that have yet to be realized. Orr appears to have been present in Minnesota during the beginning and full extent of the Little Ice Age. The concentration of Orr materials in the protected valleys of southeastern Minnesota leads one to suspect that there is a strong relationship, at least in this instance, between climactic change, horticulture, and settlement pattern. Similarly, the Orr focus is one of the few archaeological complexes where a firm identification with a known Historic tribe of Indians can be made. Wedel (1976, 1981) has provided a wealth of ethnohistoric information on the Ioway and their culture. This type of data is rarely available to archaeologists, but has



not yet been integrated with either the existing Orr materials or an aggressive program of research in southeastern Minnesota.

The chronology of the Orr focus in southeastern Minnesota remains problematic. The association of European trade goods and Orr focus ceramic vessels clearly indicates that the end of the Orr occupation in this region dates to the seventeenth century, sometime prior to A.D. 1700 (see Wedel 1981). However, the absence of radiocarbon dates for the (presumably) earlier Orr village sites in the Root River valley makes dating the beginnings of Orr impossible. Radiocarbon determinations from the Valley View site and others near La Crosse, Wisconsin, suggest that Orr may appear in the fifteenth century. Whether this chronology may be extended into southeastern Minnesota remains a matter of conjecture.

Distribution of Orr focus and related materials in Minnesota is not fully known. It appears that the distribution of this particular Oneota unit is limited to southeastern Minnesota, particularly the Root River region. However, given the limited amount of archaeological reconnaissance that has been conducted in southeastern Minnesota outside of the Root River Valley, it would be premature to conclude that the precise distribution of Orr materials is known.

Extensive Orr phase materials are known from the La Crosse, Wisconsin region and the work of the Mississippi Valley Archaeology Center there has provided a great deal of information on Orr phase manifestations. These may not, however, be completely contemporary with Orr materials in southeastern Minnesota.

## Great Oasis

Great Oasis is one of the earliest and most widespread Plains Village phases (Henning 1971). It was first defined in 1945 by Lloyd Wilford following excavations at the type site (21MU2). Great Oasis was J. N. Nicollet's name for a large wooded area in the southwestern Minnesota prairie that was protected from fires by several large adjoining lakes; the type site is on a peninsula in this area. Wilford also excavated a Great Oasis campsite, the Big Slough site (21MU1), located on an island in a shallow lake 20 miles southeast of the type site (Wilford 1954; Anfinson 1977).

Great Oasis ceramics have been divided into two wares, High Rim and Wedge Lip (Henning and Henning 1978). Both feature well-made globular vessels that are grit-tempered with smooth rims and smooth or cordmarked-smoother exterior bodies. High Rim vessels have straight, outflaring rims 2-5 cm in height with flat lips and sharp rim-shoulder junctions. Most rim exteriors are decorated with fine trailing in bands of horizontal and oblique parallel lines (Johnson 1969). Wedge Lip vessels have low outcurving rims with broad, flat outwardly beveled lips; the rims thicken toward the lip resembling a wedge. The rim-neck junction is also thickened giving this area of the vessel more strength than the High Rim ware. Wedge Lip vessels are occasionally decorated on the lip, rim, and shoulder with trailed line crosshatching and/or tool impressions.

The High Rim ware is closely related to Chamberlain Ware found at Mill Creek sites and the Anderson High Rim type from Over phase sites. Great Oasis High Rim may be ancestral to other Initial Middle Missouri high rim types. Great Oasis Wedge Lip closely resembles Mill Creek Sanford Ware and some Over phase Anderson Ware types. The Wedge Lip type is rare in Minnesota.

Great Oasis projectile points are usually small side-notched and unnotched triangular varieties. Ground stone tools are celts, arrowshaft abraders, and hammerstones; a few manos and metates have been recovered. Bone tools include awls, chisels, quill flatteners, shaft

wrenches, and antler tine flaking tools; bison scapula hoes are rare. A deer jaw sickle was recovered at the type site (Wilford 1960). Shell objects include dippers, clam shell crosses, and beads.

Great Oasis subsistence patterns closely resemble local Woodland patterns utilizing a wide range of upland and aquatic species. Bison usage increases moving west. Maize kernels have been found at most Great Oasis sites, as well as some sunflowers and squash. There is no direct evidence for horticultural activities at Minnesota Great Oasis sites, however.

Southwestern Minnesota Great Oasis sites occupy traditional Woodland locations on the islands, peninsulas, and isthmuses of the larger shallow lakes. Typical site locations outside of the Prairie Lake Region are on first terraces above stream or river floodplains. Only a few large sites such as Broken Kettle West in northwestern Iowa appear to have house structures; house were rectangular in shape, 6.5-12 m long by 5-7.5 m wide, and semisubterranean with entryways (Johnson 1973).

At least three Great Oasis burial sites are known, but none have been found in Minnesota. The Gypsum Quarry site (13WB1) featured two mounds on a low terrace above the Des Moines River (Flanders and Hansman 1961). Two High Rim vessels were recovered from one mound, but only fragmentary human remains were noted. At the West Des Moines site (13PK1) at least 18 individuals were unearthed in single flexed and multiple burials associated with two High Rim vessels, eight shell crosses, and *Anculosa* sp. beads (Knauth 1960). At the Ryan site (25DK211) in northeastern Nebraska, Great Oasis and Woodland burial were found together; the Great Oasis burials appeared to be secondary bundles (Ludwickson et al. 1981).

## Cambria

Cambria is an archaeological complex that is known from one major and numerous smaller sites. Cambria ceramics are distinctive and are generally smooth-surfaced and grit-tempered. Although decorations made with cordwrapped stick are common, the most typical decorative technique is the use of trailed lines. Cambria ceramics are very similar to the Middle Missouri tradition. However, there are elements of the ceramic assemblage found only at the Cambria site itself that strongly resemble Silvernale phase ceramics. Thus, although Cambria is principally affiliated with Middle Missouri, there is a Middle Mississippian cast to a portion of the Cambria assemblage. The most recent review and reanalysis of Cambria is by Johnson (1986) who argues that:

The Cambria phase is thus a prairie-lake and river valley complex with a series of differing site types, subsistence patterns, and settlement locations. I suggest that populations in this larger region were interacting in a system of exchange dominated by populations at the Cambria site and that their system was tied to a larger Cahokia-based trade network. Within the Cambria phase this system involved upland groups hunting and processing bison in a tall grass and wet prairie environment . . . The larger Minnesota Valley sites were both horticultural and hunting, utilizing locally produced maize, and perhaps other cultigens; bison, deer, elk, and numerous small mammals from river bottom habitats; and fish and shellfish. Dried bison meat from the upland interacting groups was funneled down the major river tributaries to Gillingham and Cambria, probably in exchange for dried maize, and possibly tobacco and other cultigens. The Cambria site seems to be dominant in this system and appears to be a major trade network node in the larger



Cahokia-based system. That larger system as seen in the Upper Mississippi Valley has been presented in the form of a model by Gibbon (1984) where he describes the system in this northern zone as extractive (1984:9). The analysis of Cambria presented here suggests that the Cambria phase was one subset of that extractive network, Mill Creek another, and Silvernale the third in this northern Cahokia-based system." (Johnson 1986:10-11).

The Cambria phase is the poorest known initial Middle Missouri phase, with almost all of the published information dealing with a single site, the type site. The Cambria site (21BE2) is on a triangular terrace 20 m above the Minnesota River about 25 km northwest of Mankato. The river bluff and a steep ravine provide natural defenses on two sides. W. B. Nickerson excavated at the site in 1913 and 1916 (Nickerson 1989), the University of Minnesota excavated at the Cambria site in 1938 and 1941 (Wilford 1945), and Guy Gibbon and Orrin Shane undertook limited testing at the site in 1974 to obtain material for radiocarbon dating (Shane 1981).

Cambria ceramics are grit-tempered, globular jars with constricted necks, pronounced shoulders, and smooth surfaces. Lloyd Wilford (1945) divided Cambria ceramics into three types based on rim form. Type A features everted rims with trailed line decoration primarily on the shoulder. Type B has S-shaped rims with trailed line or single twisted cord decoration on the rim. Type C features rolled rims with broad trailing on the shoulder.

Ruth Ann Knudson (1967) divided the ceramics into five types based on rim form and decoration. The types were then divided into varieties based on decoration. Ramey Broad Trailed and Powell Plain both feature rolled rims. Linden Everted Rim features low to medium height rims that are outflared. Mankato Incised features medium to high outflaring rims with decorations on rim interiors, rim exteriors, and shoulders. Knudson's S-rim type, Judson Composite, has small lug or loop handles with trailed line and/or single twisted cord decoration on some rims and shoulders. The Cambria site and the nearby Price site (21BE36) are ceramically differentiated from other Cambria habitation sites by the presence of rolled rim sherds.

Cambria projectile points are of two basic types: triangular/unnotched and side-notched (Watrall 1968a). Scrapers make up over half the chipped stone assemblage at the type site. Other stone tools include grooved stone mauls, celts, hammerstones, grinding stones, and sandstone abraders. No catlinite objects have been recovered at the Cambria or Price sites, while a western Minnesota Plains Village site that is attributed to Cambria, Gillingham, yielded a catlinite pipe and plaque. The Cambria and Gillingham sites each produced a copper awl. The Cambria site yielded a large quantity of bone tools including scapula hoes. Worked shell is relatively scarce at Cambria sites.

Mammalian remains from the Cambria site are dominated by deer, followed by bison, *Canis* sp., beaver, and raccoon (Watrall 1968a). Many of the bison remains tend to be scapula hoes and other tools. Nonmammalian remains include fish, turtle, and bird. Eleven species of freshwater mussel were recovered. Overall, Cambria subsistence features a varied assemblage of upland and wetland fauna. Nickerson collected charred maize from the Cambria site that has been identified as Eastern 8 Row or Northern Flint. The Price site has yielded maize, cucurbits, and sunflower (Scullin 1979).

All major Cambria habitation sites are on lower or intermediate terraces of the Minnesota River. No house features have been documented, although trash/storage pits are common at the major sites. Cambria-like ceramics are typically found in small numbers in the upper

levels at many of the major lacustrine habitation sites in eastern South Dakota and southwestern Minnesota. None of these sites has yielded rolled rim ceramics or bison scapula hoes.

Cambria burials tend to be extended primaries in mounds and are often accompanied by specialized ceramics such as miniature vessels. Mounds identified as Cambria on Big Stone Lake may have closer affiliations with other Plains Village complexes.

It has been suggested that Cambria was linked to a Cahokia-based trade network with the Cambria type site a dominant center in the northern extension of this network (Johnson 1986). Cambria may have been involved in the exchange of bison meat, hides, and perhaps finished clothing for cultigens and exotic materials (e.g., marine shells). Cambria exhibits a blend of Woodland, Plains Village, Middle Mississippian, and Oneota influences.

One problem with the current Plains Village classification for western Minnesota is that Cambria as a phase has not been clearly defined. What most investigators think of as Cambria is based on the material from one site, the type site. No other site attributed to the Cambria phase matches the type site with regard to artifact density, site size, or artifact diversity, although a few sites in the immediate vicinity of the type site are clearly related (e.g., Price). Yet small habitation sites distant from the type site that yield thin, grit-tempered, smooth-surfaced, trailed-line decorated ceramics are assigned to Cambria. Thus all non-Great Oasis Plains Village manifestations in Minnesota are considered Cambria sites even though they have little demonstrated resemblance to the type site in subsistence orientation, material culture, or chronological placement.

The Cambria site and the nearby Price site are ceramically differentiated from other Cambria habitation sites by the presence of rolled rim sherds. Price also has most of the other types defined at Cambria site. Other sites ascribed to Cambria have varying percentages of the nonrolled rim types. The Gillingham site ceramics were 80% Woodland; the 20% Plains Village ceramics consisted of 26 sherds of the everted type rims and 15 sherds of the S-type rims. The Owen Jones site contained only everted rim ceramics.

Although ceramics resembling Cambria everted rim types are typically found in small numbers in the upper levels at many of the major Woodland habitation sites on lakes in eastern South Dakota and southwestern Minnesota, most of these sherds are too small to assign to a particular Cambria type or variety. The fact that none of these sites have yielded rolled rim ceramics and most show little variety in general in the Plains Village ceramic assemblage suggests that the ceramic resemblances to the Cambria and Price sites are limited. There are also other artifactual differences. Lithic raw materials at the western sites are dominated by Knife River Flint, not oolitic cherts. There is no catlinite at Cambria or Price, but the Gillingham site yielded a catlinite pipe and plaque.

Most of the sites ascribed to Cambria also evidence a subsistence-settlement pattern different from the type site. Maize horticulture is obviously important at the type site, but even the major habitations in western Minnesota have no maize remains or bison scapula hoes. The western sites also yield significant amounts of bison bone, while the Cambria and Price sites have little bison bone except in the form of scapula hoes. The artifact densities are relatively low within most of these sites and most site sizes are relatively small. Most of the major western Minnesota Plains Village sites are on lakes instead of rivers. The Gillingham site and a number of sites in the Big Stone-Traverse area had clear evidence for fortification ditches, while no such features

are evident at the type site or the sites near it. Mounds are more commonly directly associated with the western habitation sites.

In order to account for some of the Plains Village diversity in the northern Prairie Lake Region and to fill the gap in the prehistoric cultural sequence, it is suggested that sites containing non-Great Oasis Plains Village ceramics in western Minnesota not be automatically assigned to the Cambria phase. The Big Stone phase is suggested as an alternative in the Big Stone-Traverse area. The only sites that should be definitely assigned to Cambria for now are sites near the type site that yield rolled rim ceramics or at least several of the other types defined by Knudson (1967). Using this definition all of the assigned sites would be in south-central Minnesota and would include the type site, Price, Owen Jones, and Lewis. The Gillingham site may be a Cambria outlier dating near the end of the phase. Other sites formerly assigned to Cambria could be assigned to just the Plains Village Tradition for the time being.

## Big Stone

While Great Oasis and Cambria were waning in southwestern Minnesota, other Plains Village complexes were expanding in the northern Northeastern Plains. Evidences for these complexes include numerous small fortified habitation sites (Michlovic 1992; Michlovic and Schneider 1993). A number of these sites are known in the vicinity of Big Stone Lake and Lake Traverse at the northwestern end of the Prairie Lake Region (Winchell 1911:407; Johnson 1991).

James Haug (1983) proposed a Big Stone phase based on excavations at the Hartford Beach site (39RO5) on the west side of Big Stone Lake. The phase features a more mixed Woodland-Plains Village way of life than Cambria as evidenced by the ceramics, the lithics, and the subsistence-settlement pattern. Haug dated the Big Stone phase to ca. A.D. 1100. Anfinson (in press) has recently refined and expanded the definition of the Big Stone phase.

The principal habitation sites associated with the Big Stone phase in Minnesota are the Browns Valley (21TR5) and the Shady Dell (21TR6) sites. The Browns Valley site is located on an elevated terrace between Big Stone Lake and Lake Traverse. It was excavated by the University of Minnesota in the 1930s, but the excavations were so focused on recovering Paleoindian materials that little attention was paid to the extensive Plains Village component. The well-defined enclosure at Browns Valley was mapped by Theodore Lewis in 1883 (Winchell 1911:309). The Lewis map shows a 15 m diameter circular fortification only 45 m northwest of the Paleoindian burial. Just northwest of the fortification there was a flat-topped mound 17 m in diameter and 1.2 m high. About three-quarters of the fortification has been destroyed by a gravel pit.

The 1936 excavations at Browns Valley encountered numerous features apparently associated with the Plains Village occupation of the site, although no excavations were undertaken within the fortified area. Features included at least 14 fire hearths and four caches. Animal bones were present in abundance (Jenks 1937:11). The University of Minnesota collection from the Browns Valley site (excepting the Paleoindian materials) contains over 400 sherds, 10 chipped stone tools, about 100 pieces of debitage, four ground stone tools, seven bone tools, several large mussel shell fragments, and a handful of animal bone fragments. No doubt many artifacts, especially faunal remains, were not saved.

The Shady Dell site (21TR6) was mapped by Theodore Lewis in 1885. The map shows an enclosure with a large mound to the south and a small mound to the west (Winchell 1911:302-303). The enclosure was described by Lewis as an elevated area enclosed by a circular ditch. The ditch was 6 m across and .7 m deep. The site is on a point of a high

bluff overlooking Lake Traverse. The site is 38 m above the lake with a wide terrace between the bluff bottom and the lake.

Lloyd Wilford of the University of Minnesota tested the Shady Dell site in 1952 (Wilford 1958). He estimated the interior dimensions of the enclosure to be 30 x 18 m. No postmolds were noted in a trench excavated in the ditch. Several fragments of bison bone, a few shell fragments, and a few sherds were recovered from the trench. A rectangular excavation unit within the enclosure also encountered no postmolds, but a circular pit was found. The pit was 85 cm across and 55 cm deep and contained some potsherds and bone, mainly fish bone. The artifact yield of the excavation was relatively small with only 371 sherds, 7 chipped stone tools, a ground stone disk, and some animal bone and shell fragments.

The Plains Village ceramics from Big Stone phase sites are from grit-tempered, globular vessels with cordmarked or smoothed surfaces. The Browns Valley vessels average about 6 mm in thickness. The cordmarking on the body sherds is nonoriented, suggesting indistinct fabric or cordwrapped paddle impressions. Most appear to be from globular vessels. Cordmarked rims have tool impressed lips as the only decoration. Smoothed rims can be plain or decorated with narrow trailed lines or single twisted cord impressions. Smoothed body sherds often exhibit broad trailed decoration with both curvilinear and linear designs. Handles are present only in some mortuary vessels. S-rims, collared rims, and rolled rims are lacking, as are simple stamping and check stamping.

The ceramics resemble Anderson High Rim of the Initial Middle Missouri variant (Lehmer 1954) or Lisbon Tool Impressed associated with the vaguely defined Stutsman focus of southeastern North Dakota (Wheeler 1963:201). Johnson (1961:71) classified the ceramics from the Schoen Mound #1 (21BS2) and the Miller Mound (21BS4) as Cambria Type A. Overall, the ceramics associated with the Big Stone phase show much closer Woodland affiliations than Cambria ceramics, although there is considerable variety. There appears to be a fairly high percentage of Knife River Flint. The ground stone tools recovered from the Browns Valley site are a large grooved maul, a large sandstone hoe, a large sandstone chopper, and a small nutting stone.

The Hartford Beach site yielded four bone tools: a bison scapula hoe, a metapodial flesher, and two bone awls. Extensive bone artifacts have been found at the Hartford Beach and Browns Valley sites including awls, fleshers, bison scapula hoes, spatulas, and polished antler tips. Shell artifacts are rare.

Subsistence information is somewhat scarce for the Big Stone phase. The Hartford Beach and Shady Dell sites yielded few animal remains. Hartford Beach contained some small fragments of bison and medium-sized mammal (dog or badger) bone. Fish bone was present in two of the pit features, and Over noted a clam shell refuse heap in the ditch bottom in the southeast quarter. Shady Dell also yielded fragmentary bison bone, clam shells, and fish bone. Few of the subsistence remains were saved from the 1936 excavations at the Browns Valley site, although they were reported to have been "present in abundance" (Jenks 1937:11). The handful of bone in the University of Minnesota's collection is largely shattered large mammal (bison?) bone with a few turtle carapace fragments. Mussel shells were also present.

A few carbonized maize kernels have been recovered at the Hartford Beach site. These along with the scapula hoe suggest that maize was both eaten and grown at the site. A bison scapula hoe was also present at Browns Valley.

The fortified village sites of the Big Stone phase tend to occupy promontories on high bluffs overlooking Big Stone and Traverse lakes.

The Browns Valley site is not only the largest fortified site in the area, but is also somewhat of an exception with regard to its location; a high terrace between the two lakes. The position of the Browns Valley site between two major continental drainage systems and in the narrow gap between the two large lakes is of great importance. This location guards the narrow upland funnel between Minnesota and the Dakotas, between the headwaters of the Minnesota and Red rivers, sitting astride what must have been a major transportation route.

Most of the fortified habitation sites are relatively small, except for the Browns Valley site. The Browns Valley enclosure was 150 m in diameter enclosing an area of almost 2 ha. The Hartford Beach enclosure has an area of .4 ha and Shady Dell has an area of only .05 ha. Artifact density appears to be directly related to enclosure size. House forms have not been determined.

Plains Village ceramics were recovered from Schoen Mound #1, Miller Mound, and Lindholm Mound. Flexed primary burials were found in these mounds, as well as in other vicinity mounds including the Schoen Mound #2 (21BS2), Hartford Beach Mound (39RO4), and Hiawatha Beach Mound (39RO6). Limited grave goods were included with the burials in Lindholm Mound #1, Miller Mound, Hartford Beach Mound, and Hiawatha Beach Mound. The grave goods included mortuary vessels, shell ornaments, and projectile points.

Flexed, primary burials seem to be typical of Big Stone phase burials, while Cambria phase burials feature extended primaries. Limited grave goods often accompany burials of both phases with specialized mortuary vessels of particular interest. Johnson (1961) noted that numerous low, flat-topped burial mounds were present in southwestern Minnesota concentrated along the upper Minnesota River, around lakes Big Stone and Traverse, and along the upper Des Moines River. This distribution suggests an association with Plains Village complexes.

## Blackduck

Blackduck is a distinctive series of ceramics found in northern Minnesota and Ontario, and the term applied to the archaeological culture associated with these ceramics.

Blackduck was initially defined by Lloyd Wilford on the basis of his work at the Shocker habitation site (21BL1) and the Osufsen burial mound (21IC2) (Wilford 1941). Subsequent work by MacNeish (1958), McPherron (1967), Evans (1961a, 1961b, 1961c) and Lugenbeal (1976, 1978) have refined and expanded the definition of Blackduck.

Blackduck ceramics are complex and there appears to be considerable variation in this series through time and space. In general, Blackduck pottery is globular in form and tempered with grit. The surface of Blackduck vessels is commonly cordmarked, although fabric impressions are also found, especially in the Rainy River region. There are a variety of decorative techniques that are used on Blackduck vessels, and these include punctations, application of cordwrapped stick impressions, and bosses (Peters 1988).

Several different typological schemes for Blackduck ceramics have been proposed, but none of these has yet been proven to be useful and Blackduck typology needs reevaluation (Lugenbeal 1976:275-316; see also Lugenbeal 1978, 1979:28). Based on analysis of Blackduck materials from the Smith site (21KC3) Lugenbeal has separated Blackduck ceramics at that site into early and late phases.

Early phase Blackduck vessels are predominately cordmarked and paddled and interior rim decoration consisting of a row of long oblique cordwrapped stick impressions were common, as were other decorations. One distinctive group of vessels in the early phase was bossed, and characteristically had a tendency toward long rims and necks

and flatly angled shoulders. Late phase vessels were usually not cordmarked or paddled but instead had body surfaces that were marked with fabric impressions. Less than 20% of these vessels had interior rim decoration, but other characteristics of the rim and lip decoration were distinctive (Lugenbeal 1979:28).

Lugenbeal (1979:24) has summarized other aspects of Blackduck culture as follows:

Evidence indicates a hunting and gathering subsistence base with marked seasonality involving intensive exploitation of fish during the warmer periods of the year. Evidence for wild rice utilization has been found at the Scott site and Nett Lake sites, but its association with the Blackduck as opposed to Sandy Lake occupations of these sites is not conclusive. Blackduck sites often contain burial mounds, although the circular mounds are modest in size compared to many of the Middle Woodland Laurel mounds. Blackduck burials are usually found in these mounds and occur (1) in pits excavated below the floor of the mounds, (2) on the floor of the mounds, and (3) in the fill of the mounds. The majority of the mound burials are interpreted as primary, partially flexed, burials in the sitting or semi-sitting position. Blackduck burials have been found unassociated with burial mounds at the Shocker site, perhaps occurring in a very slight natural elevation, and frequently occur as intrusions into Laurel mounds in the Rainy River region. Burial goods occur with a portion of the burials (e.g. 12 of 45 burials at the Osufsen burial mound). When burial goods occur, they consist most frequently of small mortuary pots, but harpoons, beads, knives, and other artifacts have on occasion been found. Skeletons are sometimes placed on birch bark mats or wrapped in birch bark. The artifacts associated with Blackduck pottery in northern Minnesota sites have been described by Evans (1961a). However, the sites described by Evans are multicomponent sites and the relationship of the nonceramic artifacts to the Blackduck component is never beyond question. Evans lists the following artifact types:

Projectile points, small triangular and small triangular side-notched; Oval and lunate knives; Side scrapers; Trapezoidal end scrapers; Oval end scrapers or thumbnail scrapers; Tubular-shaped drills; Steatite and clay pipes; Bone awls or needles; Unilaterally barbed harpoons made of mammal bone; Flakers; Bone spatulas; Cut beaver incisors; Bear canine ornaments; Native copper fishhooks, gorges, and beads.

Only the Smith site contains sufficiently well-defined natural stratigraphy to allow relatively unambiguous assignment of nonceramic artifacts to the Blackduck component. The most diagnostic nonceramic artifacts in Blackduck occupations are the small triangular and side-notched projectile points and the unilaterally barbed harpoons.

Blackduck ceramics are the most common prehistoric complex found in the Rainy River region and the Headwaters of the Mississippi River, and more than 3,000 Blackduck vessels are known in extant collections (Lugenbeal 1979:26). However, many of the details of Blackduck subsistence, settlement patterning, and development remain poorly known. The regional variation in Blackduck suggests that there may be significant differences in the development of this archaeological culture in various regions of Minnesota. This state of affairs is due, in part, to the multicomponent and mixed nature of many Blackduck sites. Discovery and excavation of single component Blackduck sites, or sites with stratigraphically separate Blackduck components is essential.

Likewise, rigorous analysis and model-building for Blackduck is a task that needs to be more broadly attempted.

Based on existing radiocarbon dates, Blackduck appears to exist between roughly A.D. 800 and A.D. 1400. However, in the Mississippi Headwaters area, it appears that Blackduck occurs only during the first half of this temporal range. In northern Minnesota, particularly along the Rainy River, Blackduck persists much later in time. In this region, it appears that Blackduck is, at least in part, contemporary with Sandy Lake (Wanikan culture?). Lugenbeal (1979:23) comments that Historic materials have been found associated with Blackduck ceramics in parts of Ontario north and northwest of Lake Superior, but that no Historic contact materials have yet been definitely associated with Blackduck ceramics in Minnesota.

Blackduck is widely distributed across the lake-forest biome and extends from northwestern Michigan and the Upper Peninsula westward to east-central Saskatchewan. In Minnesota, Blackduck is widely distributed across the state, with a particularly heavy concentration of sites in the Rainy River region, and numerous sites throughout the Mississippi Headwaters area.

### Kathio

The Kathio phase is best known from east-central Minnesota where it probably dates between A.D. 900 and 1300. The ceramics are grit-tempered, cord marked globular vessels with expanding rims. There are no handles or lugs. Decoration is limited to the constricted neck and lip surface, the decorative mode is cordwrapped dowel, and the motifs are horizontal bands encircling the vessel and/or oblique impressions on the lip surface. Kathio ceramics are related to the Madison cordmarked, Clam River, Blackduck, and Lake Benton ceramic series. All of these appear to be contemporary units and have a distribution from south-central Wisconsin west and northwest to southern Manitoba.

The associated artifactual assemblage includes Eastern triangular points, snub-nosed endscrapers, deer ulna awls, rectangular semisubterranean houses (at Petaga Point). The faunal and floral assemblages suggest a forest/prairie adaptation and an intensifying use of wild rice.

Lloyd Wilford first defined Kathio as a focus in his Mille Lacs aspect and saw Kathio as terminal Woodland and as the Late Prehistoric complex associated with the Eastern Dakota. Wilford and W. C. McKern, who defined his Clam River focus at the same time, made the Dakota association on the basis of the overlap of the early Historic period distribution of the Eastern Dakota and the geographic position of Kathio and Clam River, and the secondary bundle burial mode discovered in mounds in that same geographic zone. The burial mound Kathio/Clam River attribution was based on reasoning that the Historic Dakota exposed platform burial mode extended back into the Late Prehistoric period and in that period, the remains of those exposed burials were subsequently collected and buried in mounds as disarticulated secondary burials. The absence of grave goods in the mound fill supported their view as it was assumed that grave goods were placed only with the exposed burial.

Kathio dates ca. 1100-650 B.P. (900-1300 A.D.). Kathio is best known from Mille Lacs where it appears in the sequence following St. Croix stamped ceramics and precedes Sandy Lake ceramics. At Mille Lacs it is present at the Aquipaguéin Island, Vineland Bay, Petaga Point, Cooper, Malmo, and Garrison sites and probably also found elsewhere in central Minnesota (Helmen 1964; Dickinson 1968; Bleed 1969; Wilford 1970;

Johnson 1971a & b, 1973; Caine, C.A.H. 1974; Ready 1974; Gibbon 1975, 1976; Gibbon and Caine 1976, 1980; Hudak 1976).

### Sandy Lake (Wanikan Culture)

Sandy Lake is a pottery type that is widely distributed throughout northern Minnesota. Sandy Lake was initially defined by Cooper and Johnson (1964) on the basis of materials recovered from northwestern Wisconsin and northern Minnesota.

Sandy Lake ceramics are globular in form and rather squat. Rims of vessels are generally straight, incurved, or outflaring. The internal capacity of the vessels cluster in the 7.0 to 10.0 liter range, with some vessels falling between 14.0 to 15.0 liters. Mortuary vessels have, as might be expected, a considerably smaller capacity (Birk 1979:176; see also Birk 1977b:12; Lothson 1972:II). Surface treatment of vessels includes vertical cordmarking and plain or smoothed-over cordmarking. Birk (1979 :176) describes two distinct types: Sandy Lake Corded and Sandy Lake Smooth. Birk (1979:176-177) notes that there is a limited sample of ceramics that have simple and check stamping on the exterior that appear to fall within the range of Sandy Lake. Other decoration is comparatively rare and, when present, generally consists of lip notching, interior punctates, or interior lip notching. Notching ranges from a sawtooth-like treatment to a range of clustered or evenly spaced impressions created by use of a variety of tools (cf. Birk 1979:176).

Temper of Sandy Lake vessels may be either shell, grit, or smooth. All Sandy Lake materials from Ontario are grit-tempered, and shell-tempered materials are found in the southern range of Sandy Lake distribution.

Birk (1977b) has argued that Sandy Lake is the ceramic type associated with what he terms the Wanikan culture. According to Birk (1977b:30-31):

Though the total range and distribution of cultural expressions associated with 'Sandy Lake' have yet to be defined, it would seem that with a 700-year old ceramic tradition and a growing list of known cultural characteristics that 'Sandy Lake' could easily be elevated to the level of a full fledged culture. Using currently accepted jargon, a 'culture' is interpreted as a maximizing unit of abstract description that reflects a major segment of culture-history and may be composed of a number of spatially or temporally inferior phases (Willey and Phillips 1958:47-48). It has been suggested, and I agree, that any redefinition of 'Sandy Lake' into cultural terms should be done using names that do not conflict, or cannot be confused with the ware classification (Elden Johnson, personal communication). With this in mind, I propose the formulation of the Wanikan culture to denote the collective phenomena observed as Sandy Lake potteries and their associated cultural expressions . . . The regional and temporal extent of this suggested culture would tentatively match the known geographical and temporal distribution of the previously defined Sandy Lake Ware. Characteristics of the Wanikan culture (based on Cooper and Johnson 1964; Gibbon 1976:25, and others) include but are not confined to: Sandy Lake ceramic wares; intrusive mound burials; exclusive circular conical mounds with shallow burial pits; primary flexed interments with associated mortuary vessels; small triangular projectile points (predominantly quartz?); formally prepared ricing jigs or threshing pits; fire hearths and pits; middens; small, seasonally occupied sites in recognizable lakes area patterns; and the inferred use of wild rice as a staple crop. While our knowledge

of variation within the proposed Wanikan culture is presently too limited to provide the clear cut phase designations already prescribed for Laurel (Stoltman 1973:3), that day may not be far off. This effort—a shift from pottery definition to cultural definition—however, is largely hampered by the lack of stratified sites containing Sandy Lake wares. Since no one has, or currently seems able to demonstrate significant style changes within this ceramic class through time, it may be that phase criteria can only be developed on the basis of its other changing cultural associations.

There are a variety of other ceramic types that are similar to Sandy Lake, although their relationship to the Wanikan culture remains unclear. These types include Red River Ware (Michlovic 1987:53-55), Ash Rapid Corded (Reid and Rajnovich 1980:79), Selkirk (Rajnovich and Reid 1978:46), and several types that remain unnamed but have been described in the literature (e.g. Syms 1979; Schneider 1982; Michlovic 1983; see Michlovic 1987:53-55 for discussion).

There is general agreement that the Wanikan culture represents Siouan speaking peoples. However, whether they may have been proto-Assiniboine or proto-Eastern Dakota is still a matter of debate (Birk 1977b:31, 1979; Arthurs 1978:62; Lugenbeal 1978:50-51).

Sandy Lake poses a number of intriguing problems for the researcher. The internal development of Sandy Lake is surely complex. The globular form of the vessels and the presence of shell tempering in the southern part of Sandy Lake's distribution suggests some level of interaction with Oneota groups to the south. This is interesting in light of the possibility of diffusion of food processing and storage technologies from the maize farmers of southern Minnesota to the wild rice producers of northern Minnesota.

Similarly, the recent discovery of Sandy Lake ceramics in the prairie area of the Red River Valley (e.g. Michlovic 1982, 1986, 1987) hints that there may be increased interaction between people of the plains and lake-forest regions. Conversely, this may signal a shift in the utilization of these two biomes and increased movement across the prairie-forest ecotone during the Late Prehistoric.

The temporal range of Sandy Lake remains poorly known. In general, Sandy Lake appears to fall between ca. A.D. 1000 and 1750 (Birk 1979:175). However, there is considerable variation in the timing of Sandy Lake in different areas of its distribution. In the Headwaters of the Mississippi, Sandy Lake seems to replace Blackduck between A.D. 1100 and 1200. In the Mille Lacs region, Sandy Lake appears to replace Kathio, but its relationship to the later Ogechie ceramic series remains unclear. In extreme northern Minnesota and Ontario, Sandy Lake appears to be contemporary, at least in part, with Blackduck. In the prairie area of northwestern Minnesota and eastern North Dakota, Sandy Lake seems to be, at least in part, contemporary with Plains Village cultures of the eastern plains.

The distribution of Sandy Lake remains somewhat unclear, in part because of the diffuse nature of the ceramic description. It appears that Sandy Lake is found from central Minnesota and the Mille Lacs region north through the Mississippi Headwaters and into Ontario. Sandy Lake is known from northwestern Wisconsin and extends westward into the Red River Valley and eastern North Dakota. It is of interest that Sandy Lake does not appear to be present in the Snake River Valley of east-central Minnesota. This pattern of differential distribution of Sandy Lake, particularly when coupled with the temporal differences in the time of appearance of Sandy Lake in different regions, is especially provocative.

## 8 Historic Period, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

The Historic period begins around 1630 with advent of European contact in the Northern Woodlands. After this time the unwritten history, or prehistory, of the resident American Indian populations becomes transformed into written history and is intertwined with the history of European and eventually American colonists. Native American Indian populations present in the region at European contact included Algonquian (Menomini), Chiwere Siouan (Winnebago, Ioway, Oto), and Eastern Siouan (Santee, Eastern Dakota, Assiniboine, Teton, Yankton) speakers. These groups probably have direct ties to the prehistoric archeological record, but in many cases it is difficult to make conclusive links due to the complications of protohistoric depopulation and subsequent population movements. There are undoubtedly many prehistoric cultures which did not survive the transition to the Historic period. Following contact many American Indian groups moved into the region from the east including a variety of Algonquian (Ojibwa, Ottawa, Illinois, Sauk, Fox, Potawatomi, Kickapoo, and others) and Iroquoian (Huron, Oneida) speakers. The archeological record of all these groups is hard to discern.

European exploration and settlement of the region began with the French who engaged in fur trading and establishing Indian missions. The French were followed by the British who also focused on the fur trade and military control of the area. Although the territory west of the Mississippi river was Spanish for 40 years, there was no significant Spanish settlement in the region. It was not until after the War of 1812 that the area came under American control and after the 1830s that the region was opened to American settlement. Relatively limited archeological investigations have been undertaken at a few Indian and Euro-American sites including camps, trading posts, homesteads, logging camps, mills, mines, brickworks, and urban and industrial sites. The limited archeological research that has been conducted has revealed a wealth of information about American Indian and Euro-American lifeways that enhances the rich historic record.

### Iowa

This period covers the time from the first European incursions into the North American midcontinent in the seventeenth century up to the present day. This has been a period of great turbulence and change. Numerous groups of native people have been forcibly removed from their homelands, and some groups have been driven to extinction by government policies of extermination and acculturation. Still others have managed to maintain their traditional languages and cultures in the face of overwhelming odds. The United States has grown from a small group of agrarian colonies to a world superpower, while many Native Americans have been confined to reservations, and abandoned to despair and poverty through policies of neglect. Little heed has been taken of their wisdom of the ways of the world and of this continent, nor of the lessons that they could teach non-Native Americans.

### Adventure and Exploitation (1600-1820)

Throughout the French colonial period (1682-1762), traders and *coureurs de bois* ascended the Mississippi, Missouri, and Des Moines rivers and their tributaries, but it appears that no permanent posts were

established in Iowa. In 1714 and 1717, Étienne de Bourgmont explored the Missouri River, describing its course and the Native American groups living along it (Blaine 1979). Over the next several decades, the French abandoned and reoccupied the western outposts several times in response to problems with the British and Native American groups. By the 1750s, however, Prairie du Chien was a thriving fur trading center (Vogel 1988). Sometime prior to 1763, Jean Marie Cardinal established a permanent trading post at Prairie du Chien, and is reported to have occasionally explored the area west of the Mississippi (Federal Writers' Project 1938).

To avoid giving up Louisiana to the British before the end of the Seven Years' War (French and Indian War), Louisiana was transferred to Spanish control in 1762, and in 1764 San Luis (St. Louis) was founded. In 1768, the province was divided into several districts, and San Luis was named the administrative center for the new district of Ylinneses, or Spanish Illinois, of which Iowa was a part (Blaine 1979). By this time, British traders had begun moving up the Des Moines River as well, much to the annoyance of the French and Spanish.

In 1800, Napoleon forced Spain to cede Louisiana back to France, and President Jefferson purchased the territory in 1803. The Americans divided the Territory into two districts, Orleans and Louisiana which included the future state of Iowa. In 1804, Meriwether Lewis and William Clark began their famous voyage up the Missouri River to search for a route to the Pacific, scout good locations for forts, and report upon the inhabitants of the region. Of note to Iowa history is the fact that Sgt. Floyd, the only member of the expedition to die, died and was buried on Iowa soil. Lewis and Clark named the Floyd River in western Iowa in his honor, Floyd County in northeast Iowa was named in his honor, and a town along the Missouri is known as Sergeant Bluff (Sage 1974).

In 1805, the Pike expedition reached the Des Moines Rapids. As Blaine (1979:86-87) states:

Although the original journal, maps, and descriptions offer no direct evidence that Pike inspected the Des Moines River to any great distance, the completed, redrawn map by Anthony Nau indicated extensive features of that river, including eighteen subsidiary streams along a distance of approximately 240 miles to the Redwood Post used by Faribault just prior to this time. Scattered along the river were Crawford, Fort St. Louis, Fort Crawford, Fort Gelaspy, and another Fort Crawford. These trading posts, called forts, had been established by Lewis (Louis) Crawford, Redford, and Crawford and Gillespie of the North West Trading Company of Mackinac. They indicate how intensive was the use of the river and Ioway lands by English traders in the years prior to this time.

### Early Contact (1600-1820)

M. Wedel (Mott 1938a, 1938b, Wedel 1976, 1981, 1986), through the use of ethnohistoric sources, has been able to determine that the protohistoric Oneota sites in the Upper Iowa River Valley and those along Riceford Creek in southeast Minnesota represent villages of the Ioway, for whom the state is named. It is her conclusion that the Ioway people shared the "Little Prairie" hunting area of southeast Minnesota with their close linguistic relatives, the Oto, who lived in northwestern



Iowa at the time of the initial European presence in the area. Both groups spoke a dialect of the Chiwere Sioux language, very similar to that of the Winnebago of Wisconsin. It seems likely that all these groups were at one time a single people, and it is possible that the Winnebago sometimes joined their Ioway relatives on communal bison hunts in the Little Prairie. The region along the Missouri River in western Iowa was home to the Omaha and Ponca peoples, also Siouan speakers (the Dhegiha group). Oral tradition has the Iowa, Omaha, and Quapaw travelling together to the regions that they inhabited when they first encountered European influences (Fletcher and LaFlesche 1970). It is also likely that groups of Santee and Yankton speakers of Dakota Siouan ventured into northwest Iowa on hunting excursions from their Minnesota and South Dakota homelands (E. Henning 1985). It appears that the Ioway and Oto were also on generally friendly terms with these people as well until the time of the French fur trade (M. Wedel 1981, 1986).

Meanwhile, southeastern Iowa appears to have been, at least sporadically, utilized by various groups of the Algonkian-speaking so-called "Illinois Confederacy." Franquelin's 1684 map, based on La Salle's reports from Illinois between 1680 and 1683, shows the Moingwena on a river south of that occupied by the Peoria and Tapouaro, and this river possibly represents the river that bears their name, the Des Moines. However, Vogel (1988) believes that this is also the Iowa River. Nearer the mouth of this river is shown a village of the Coiracoentanon (M. Wedel 1986:Figure 4). A river to the north of that shown with the Tapouaro and Peoria villages is labelled as "Rivière des Ai8n8é" (River of the Ioways), and shows an Ioway village far upstream. It is impossible to be sure of the rivers being depicted on this map with any degree of certainty, although Callender (1978a) locates the Coiracoentanon and Moingwena villages on the Des Moines River, and the Peoria village on the Iowa-Cedar River. Bauxar (1978) shows Illinois groups occupying nearly all of southeast and central Iowa.

With the growing British and French colonial presence in the east, and the turmoil created by their competition for Native American allies in the fur trade, more easterly Algonkian groups were being pushed steadily westward. Soon, eastern Iowa fell within the ranges of several of these groups. Goddard (1978), for instance, shows all of eastern Iowa within the range of the Mascouten from 1655 to 1735. Callandar (1978b) shows the Mesquakie as well as the Sauk in eastern Iowa as early as 1733 (Callandar 1978c).

As early as 1785, Julien Dubuque had arrived in the lead mining region of northwest Illinois, southwest Wisconsin, and northeast Iowa. In 1788, he received permission from the Mesquakies to mine lead in what was to become Iowa, and became the first European to permanently live in the future state. In 1796, he obtained a land grant from the Spanish government for what he believed to be thousands of acres of land and established the Mines of Spain (see Abbott 1982, 1983, 1988). For many years he prospered, but later fell on hard times. In 1810, he died in bankruptcy and the Mesquakies reclaimed the operation of his mines (Sage 1974; Federal Writers' Project 1938).

Two other Spanish land grants were made. Louis Honore Tesson (Federal Writers' Project 1938; Sage 1974; Artz 1991), or Louis Tesson Honore (Vogel 1988), or L. Taisont Honoré (Blair 1979) established an apple orchard and trading post at the Des Moines Rapids, near present day Montrose in 1796 (Artz 1991) or 1799 (Federal Writers' Project 1938). Artz 1991) points out, however, that it did not last very long, for "in 1803, the property was seized and sold at auction to his chief creditor (Artz 1991:33)." Basil Giard occupied a third grant from the Spanish government for a large area of land across from Prairie du Chien in

Clayton County for a number of years at the turn of the century, and the Giard Tract is still recognized on maps of the region.

In 1800, the British trader Jean Baptiste Faribault established a post called Redwood 200 miles up the Des Moines River, where he traded with the Ioway, Dakota, Sauk and Mesquakies for four years (Blaine 1979). In 1801-1802, both the British trader Thomas Anderson, and the French trader Julien established temporary posts farther downstream on the Des Moines (Blaine 1979).

With the acquisition of Louisiana by the United States, the American Fur Company was quick to move into the region. Soon posts were being established at traditional Native American rendezvous locations. Many cities in Iowa, including Council Bluffs, Sioux City, Eddyville, Muscatine, and Keokuk, had their beginnings as posts of the American Fur Company (Federal Writers' Project 1938).

### The Ioway

The people known to modern Americans as the Ioway, were generally known to other Native American groups by some form of two different names; Páxoché, the name by which they called themselves was used by all Chiwere-Winnebago and Dhegiha Siouan speakers, as well as the Algonkian-speaking Illinois, and the Caddoan-speaking Pawnee, while Ayúxba was the name used by the Dakota Siouan speakers, and adopted by Algonkian speakers other than the Illinois. Since the French in the region were most familiar with Algonkian speakers, some form of Ayúxba was usually applied to the Ioway, although variants of both forms are found on early maps of the region (M. Wedel 1978). While the exact meaning, if any, of Páxoché remains in doubt, it has been variously interpreted as meaning dusty (or gray) head or noses, or gray snow (M. Wedel 1978).

According to M. Wedel (1986) the earliest possible account of the Ioway comes from Nicolas Perrot in his *Memoir on the Manners, Customs, and Religion of the Indians of North America*, written in the mid-eighteenth century. In it he recounts the story of Ottawa and Hurons fleeing from Iroquois attacks reaching the Mississippi River and ascending a river named for the Ioways. Following it to its source, they encountered an unnamed people. Seeing no timber, and nothing but prairie in the region, they returned by the route by which they had come, and continued up the Mississippi. M. Wedel (1986) places the date of this journey as either 1656 or 1657. During the Joliet and Marquette expedition down the Mississippi River in 1673, they referred to the Ioway by the term Pah8tet, the Chiwere term.

The first account of the Ioway actually meeting a European occurred on April 20, 1676 at De Père Mission south of Green Bay, Wisconsin, along the northern Fox River. Here, at a nearby Winnebago village, Father Louis André spoke with some Ioways who were visiting their close linguistic relatives. André considered the Ioway to be poor since their main wealth seemed to be bison hides and red calumet pipes. He did not understand that to native people these commodities signified great wealth, especially in light of their easier access to these resources than their more easterly Winnebago friends, the bison herds near Green Bay having been greatly diminished by refugee Huron and Algonquian peoples who had fled from the Iroquois. While it has been reported that the Ioway were in control of the pipestone quarries near Pipestone National Monument in southwestern Minnesota, it seems more likely that, as reported by Catlin in 1844, the quarry site was considered sacred and neutral ground among the various peoples of the region (M. Wedel 1986). However, the abundance of catlinite in all forms imaginable on western Iowa Oneota sites attests to the easy access they had to this important resource. Accault reported that he had visited the Ioways,

Otos, and Kickapoos and had collected a large quantity of bison hides. M. Wedel (1986) believes that these visits took place in 1678 and 1679.

At the time of the Lewis and Clark expedition in 1804, they were reported to have been recently living in a village within the present day City Limits of Council Bluffs (M. Wedel 1988). From here they are reported as moving into Missouri, perhaps joining their relatives there, and later, were said to have been living in the central Des Moines River Valley (Sage 1974). However, Blakeslee et al. (1981) have the Ioway moving from the Big Sioux location to one on the Vermillion River in South Dakota, thence to the Council Bluffs village, until 1765, when they moved to the country of the Des Moines. Gussow (1974a), however, notes that they began moving eastward as early as 1755-56, and established themselves along the Mississippi, not the Des Moines. He further reports that by 1777, the bulk of the Ioway had settled along the Des Moines River, near the present-day town of Selma. This is likely the historic village located at Iowaville, described by Gourley (1990). During this time, some Ioway remained along the Mississippi for at least part of the year. In 1805, Zebulon Pike traveling up the Mississippi stated that the Ioway had one village on the Des Moines River and one on the Iowa River (Mott 1938a, 1938b; Gussow 1974a).

While the Ioways were living along the Des Moines, both the French and the British established small trading posts near their villages (Blaine 1979). By 1811, at least some Ioway appear to have returned to the Upper Iowa River, as they were reported as trading at Prairie du Chien, while others were reported to be in the four lakes region of the Rock River (Gussow 1974a). However, the main village seems to have remained along the Des Moines River near Selma. A split seems to have occurred among the Ioway around 1817. With one group moved to the Grand River, another moved upstream along the Des Moines, and a third joined the Oto in Nebraska as they disapproved of some of the Ioway having sided with the British during the War of 1812 (Mott 1938a; 1938b). In 1823, the Des Moines River village was abandoned, and the entire tribe moved to the Grand River area (Blaine 1979).

#### Mesquakie and Sauk

Although the Illinois, and later the Mascoutens had ranged across eastern Iowa in the late seventeenth century, it seems unlikely that they established permanent villages there, especially once the French had established trading posts in the Illinois River Valley. It is the Mesquakies (called by Euro-Americans "Fox") and Sauk who eventually made Iowa their home. Although these two groups have always remained separate tribes, a close alliance developed between them after 1733. As a result, the United States government has persisted in lumping them into a single group called the Sac-and-Fox, causing a great deal of confusion and resentment.

According to Callander (1978b, 1978c), in pre-contact times the Mesquakie, Sauk, Potawatomi, Mascoutins, and Kickapoo likely made their homes in the Lower Peninsula of Michigan and northwest Ohio. In the wake of pressure from westward-pushing Iroquois, they were driven into Wisconsin sometime prior to European contact. The first historic mention of the Mesquakies appears to be Allouez' meeting with them at his Chequamegon mission on Lake Superior between 1665 and 1667 (Callander 1978b). With the establishment of the French post at Green Bay, the Mesquakies established a village on the Wolf River and around 1680 they moved to the Fox River where it exits Lake Winnebago (Gussow 1974a). For the next 20 years, a state of warfare existed between the French and the Mesquakies. These were the so-called "Fox Wars." During this time the Sauks remained friendly toward the French, while often secretly aiding the Mesquakies (Gussow 1974b; Callander 1978b).

Following the Mesquakies movements in Iowa during the eighteenth century is complicated. In 1727, a village of Kickapoos and Mascoutens had joined the Mesquakies and were living in a village along the Skunk River in southeast Iowa (Gibson 1963; Goddard 1978). There is evidence that the Mesquakies were living in several different regions at this time. Apparently, some Mesquakies and Sauks settled near the mouth of the Rock River. They traded with both the British at Green Bay and with the Spanish at St. Louis (Gussow 1974b). The relationship with the British appears to have been an especially good one, and it is reported that the Sauks and Mesquakies sided with the British during the American Revolution. This close relationship continued following the revolution, with the Sauk and Mesquakies making trips to Canada to trade with the British, much to the consternation of the new United States (Hagan 1958). During the latter half of the eighteenth century, the Sauk and Mesquakie seem to have lived along the Rock and Wisconsin rivers, with smaller settlements located on the Turkey, Iowa, and Des Moines rivers in Iowa. During this time, it appears that they were hunting as far west as the Missouri River and beyond.

By 1797 the Sauk and Mesquakies were apparently living on the Iowa River, although their main village may have been on the Des Moines at this time. As early as 1781, they were reported to be living near the mouth of the Des Moines river, probably near Montrose (Gussow 1974b). However, the major portion of the Sauks and Mesquakies seem to have kept their permanent villages along the Mississippi, while extending their hunting territories to the west and south due to continued westward pressure and the depletion of game animals in more northerly regions. In fact, the more northerly groups turned to lead mining rather than fur trapping for their trading needs. Indeed, some became nearly slaves to Julien Dubuque in the Mines of Spain area near Dubuque (see Abbott 1982, 1983, 1988).

#### Frontier Safety (1820-1851)

E. Henning (1985:58) defines the Frontier Safety Study Unit as follows:

This unit is concerned with the process of dispossession. Initially, military concern with much of Iowa revolved around its usefulness as a place where more eastern Indian groups might be confined and controlled. Intergroup warfare was troublesome during the early part of the dispossession period, and constantly shifting alliances were troublesome throughout. By 1820, it was clear that Iowa would soon be engulfed in the westward movement, but the rapidity of that movement was not anticipated. All of the state was Indian territory in 1820; in 1851 the last cession was made. Properties relating to this period were initially of strategic importance. Additionally, many of them formed the foundation of the earliest permanent settlements in the various portions of the state, and marked the earliest routes between settlements.

In 1820, the southern two-thirds of Iowa served as hunting grounds for both the Ioways and the Sauks and Mesquakies with the Ioways gradually being pushed to the south and west where they came into conflict with the Osages, while the Sauks and Mesquakies used the eastern part of the state more intensely. The north and northwest portions of the state were used by the Santee and Yankton Dakota who came into conflict with the Sauks, Mesquakies, and Ioway (Hagan 1958; Blaine 1979; Gussow 1974a, 1974b). Relations between the Ioway and the Sauks and Mesquakies were not always good during this time either, and hostilities and alliances were constantly shifting (Blaine 1979). In that year, Stephen Watts Kearny led an expedition from Cantonment

Missouri (Ft. Atkinson, Nebraska) to Camp Coldwater (Ft. Snelling, Minnesota) and also made contact with the Santee chief Wabasha near Winona, Minnesota, and was reportedly the first non-Native American to explore a good portion of this route (Sage 1974; Federal Writers' Project 1938). During this time, the Ioways at various times maintained villages near Ft. Armstrong on the Mississippi, near Ft. Edwards in Illinois, along the Des Moines River near Iowaville, on the Missouri River near the mouths of the Chariton, Grand, Little Platte, and Nodaway rivers, and near Council Bluffs (Blaine 1979). Meanwhile, the Sauks and Mesquakies were concentrated along the Mississippi River, with a large concentration of Sauks in the Rock River locality (Gussow 1974a, 1974b).

To add to the problems of intertribal hostility, with the admission of Missouri into the Union in 1821, the remainder of the former Missouri Territory including Iowa was left in limbo without a government until 1834 when it was incorporated into the Michigan Territory (Sage 1974; Federal Writers' Project 1938; Vogel 1988). In 1822, under pressure from the American Fur Company, Congress abolished the government factory system, and the fur trade was left in the hands of private traders (Blaine 1979; Fay 1986c; Vogel 1989). However, the Sauk and Mesquakies made frequent visits to British posts in Canada and maintained close relations with the British (Hagan 1958).

In the Treaty of 1824, nearly all of the State of Missouri north of the Missouri River was ceded to the United States (see Gussow 1974a, 1974b). Included in the cession was a tract of land lying between the Mississippi and Des Moines rivers bounded on the north by an extension of the Missouri State Line in modern day Lee County. This was the first land in the future Iowa to be acquired from native peoples by the United States. Known as the "Half-Breed Tract," the area was set aside for former fur company employees who had married Native American women, and their families (Sage 1974; Federal Writers' Project 1938; Vogel 1988). This region contained the Sauk village of Puckeshetuk, within present day Keokuk, where the American Fur Company had a post, and it is the region where legal non-Native American settlement of the state began (Sage 1974; Federal Writers' Project 1979; Gussow 1974a; Artz 1991). However, there is ample evidence of illegal squatting west of the Mississippi during this time (Sage 1974; Artz 1991).

In the Treaty of 1825, the Ioway relinquished habitation in eastern Iowa to the Sauks and Mesquakies, while retaining a joint interest in the region (Blaine 1979). In July of 1830, a treaty council was held in Prairie du Chien. Using threats of armed force and the removal of traders, the government negotiators obtained a treaty whereby:

The Ioways, the Sacs, and the Foxes of the Missouri would cede their land in western Iowa and Missouri; and the Sioux, the Sacs, and the Foxes of the Mississippi would relinquish two twenty-mile-wide strips in north and central Iowa. These would serve as buffers and neutral hunting grounds. The treaty was not to affect the claims of the Ioways or other tribes to other of their lands south of the Sioux, Ioway, Sac, and Fox line as determined by the 1825 treaty. [Blaine 1979:160]

The 40 mile wide strip soon became known as the Neutral Ground and would play an important part in the early American settlement of the state (Sage 1974).

By the peace treaty of September 21, 1832, ending the Black Hawk War, the Sauk and Mesquakies were forced to give up a strip of land 50 miles wide on the west side of the Mississippi, and vacate the region by the following June, never to return. This land has become known as the Black Hawk purchase. To reward Keokuk's band's neutrality during the war, they were allowed to keep a narrow strip of land known as Keokuk's Reserve along the Iowa River in Johnson and Louisa counties

where he had his village. Also at this time, the Americans declared Keokuk a civil chief of both tribes, an hereditary rank that they had no right to give (Hagan 1958; Sage 1974).

Gourley (1990) notes that in 1832 the Sauks and Mesquakies occupied at least three villages. Keokuk's village was located about 12 miles from the Mississippi along the Iowa River in Louisa County. A Mesquakie village under the leadership of Wapello was located along Muscatine Slough, possibly on Muscatine Island in Muscatine County, and another Mesquakie village under Poweshiek was located on the Cedar River 10 miles above its confluence with the Iowa, also in Muscatine County. It appears that, following the Black Hawk purchase, Wapello moved his village to the Iowa River, about 9 miles upstream from Keokuk's village, while Poweshiek's village, outside of Keokuk's reserve appears to have been occupied at least through 1833 (Gourley 1990). Subsequently, Poweshiek and two subchiefs maintained villages along the Iowa River in Johnson County (Fugle 1954; Gourley 1990).

By 1834, at least two other villages had been formed, those of the Winnebago Prophet and Appanoose. The Prophet's village composed of both Mesquakies and Winnebagos was located on the Mississippi in Louisa County. Appanoose was the son of Taimah whose village had been in the Flint Hills region near present-day Burlington. In 1834, Appanoose moved his village to a new location along the Des Moines River. The village was called Ah-taum-way-e-nauk, and the modern city of Ottumwa at the location of this village carries on the name (Gourley 1990). In the Treaty of 1832, the interpreter Antoine LeClaire was granted a section of land on the west bank of the Mississippi within the present day city of Davenport in Scott County (Sage 1974; Gourley 1990). In 1834, General Kearny set out to establish a fort near the mouth of the Des Moines River. This fort, which was known as Fort Des Moines (now usually referred to as Fort Des Moines #1), was established near Tesson's orchard, near Montrose (Gourley 1990; Artz 1991). This site is listed as 13LE11 in the Iowa site files, but has not been relocated archeologically (see McKusick 1975a). Also in 1834, the remainder of the former Territory of Missouri including the District of Iowa was attached to Michigan Territory. However, as Michigan Statehood approached, a new Territory of Wisconsin was created for those portions of Michigan Territory west of the State of Michigan (Sage 1974).

The years following the Treaty of 1832 were difficult ones for the Sauks and Mesquakies. Frictions arose between the tribes and between factions within tribes, often over Keokuk's leadership practices. Keokuk had convinced the United States to pay all the annuities for the tribes to him so that he could disburse them to the individuals. Unfortunately, he used this power to reward his friends and to punish his enemies. Numerous trading houses sprang up (see Gourley 1990), and unscrupulous traders preyed upon the tribes with liquor and kept them in a constant state of debt. Game had become severely depleted, and warfare with the Sioux continued. Meanwhile, squatters began moving into the region, and conflicts were inevitable (Hagan 1958).

In 1838, Iowa Territory was formed, and Robert Lucas was appointed its first governor (Sage 1974). White settlement continued to grow and soon squatters began appearing on Sauk and Mesquakie lands, while sentiments favoring total removal of the Sauks and Mesquakies grew among the Americans. Also in 1838, the Sauk and Mesquakie agency was moved westward to a location near present day Agency by Agent Street. The agency house site has been designated 13WP125, and the cemetery where Joseph Street and Chief Wapello are buried is site 13WP124 and is listed on the National Register of Historic Places (Gourley 1990).

At this time, the Sauks and Mesquakies seem to have been concentrated in villages along the Des Moines River near Ottumwa. Keokuk moved from his village near Lowaville (13VB24) to the Ottumwa vicinity soon after the treaty signing. However, Black Hawk who had lived in this village did not move, died, and was buried in the village locality in 1838. His grave was robbed soon after his death (Gourley 1990). Oral tradition in southeast Iowa says that his bones were on display for some years in Burlington until finally, mercifully, the building was destroyed by fire (Hagan 1958). In 1841, following the death of Wapello, a portion of his village led by Kishkekosh established a village on the Skunk River in Mahaska County (Gourley 1990). This village site has been designated site 13MK132, and an associated burial ground has been designated 13MK97-99 (Till and Nansel 1983; Schermer 1981a, 1981b; Gourley 1990; Merry 1992). Wishecomaque (Hard Fish) moved his village to the Eddyville vicinity in 1840 following a dispute over the allocation of annuities (Gourley 1990). In 1841, Keokuk moved his village upstream to near White Breast Creek in Marion County. Poweshiek maintained a village on the Iowa River in Johnson County, while two other villages were located nearby (Fugle 1954; Gourley 1990). Several trading posts were also in existence in this area. In 1839, Poweshiek moved 16 miles upriver, and in 1840 moved upstream to near where Wapashashiek had a village near the Amana Colonies in Iowa County (Gourley 1990).

As settlers continued to push westward, pressure on the Sauks and Mesquakies continued to increase and in 1842 a treaty was signed in which they ceded all their remaining lands in Iowa to the United States (Sage 1974; Hagan 1958). They were to remove from the area east of the Red Rock Line, a point on the Des Moines River near White Breast Creek, by the next spring and to vacate the western half of the state by the fall of 1845 (Gradwohl 1974; Benn and Rogers 1985; Gourley 1990). At this time, Fort Des Moines #2 was established within present-day Des Moines, near the confluence of the Des Moines and Raccoon rivers. The government Agency was also moved from Agency to a location nearby, and most of the Sauks and Mesquakies settled in villages along the Des Moines in the general vicinity (Gourley 1990). However, Poweshiek maintained his village on the Skunk River in Jasper County. The location of Fort Des Moines #2 has been assigned site number 13PK61, and has been investigated archeologically. During excavations, a hearth containing coins, pipe fragments, buttons, iron, and glass was uncovered in one of the officer's quarters (D. Henning et al. 1982; Brice, Petrides and Associates 1985; Gourley 1990). The fort was abandoned and sold in 1846 after many of the Sauks and Mesquakies had been forced to relocate to Kansas where they suffered great miseries (Gourley 1990). However, many Mesquakies remained in Iowa and in the early 1850s those in Kansas began negotiations to return to Iowa and as early as 1852 many Mesquakies returned to Iowa and purchased 80 acres of land in Tama County (Hagan 1958; McTaggart 1976). In 1856 with the assistance of the governor, they obtained an act from the Iowa legislature allowing them to remain in Iowa. Although the federal government attempted to force them to return to Kansas by cutting off their annuity payments, with the intercession of the State of Iowa on their behalf, their annuities were renewed in 1867, and an Indian Agent was appointed (Callander 1978b; Purcell 1978). Today, the settlement covers over 3,000 acres and numbers around 500 people. They have managed to maintain an amazing portion of their traditional culture, and represent an active and vibrant community (see McTaggart 1976; Waseskuk 1978).

Meanwhile, in 1833 the Potawatomes had ceded their lands in Michigan, Indiana, Illinois, and Wisconsin to the United States in exchange for lands along the east side of the Missouri River in what is

now Iowa and northwestern Missouri (Edmunds 1978). In 1835, one group of Potawatomes wintered along the Skunk River, while the rest continued on to the Platte river country (Edmunds 1978). Over the next several years, problems between the Potawatomes and white settlers continued to increase in the Platte country. In 1837, the annexation of the region by Missouri was imminent, and the federal government established a new Potawatomi agency in Kansas and one at Council Bluffs and began pushing for the removal of the Potawatomes from the Platte country. In July of that year, around 1450 Potawatomes relocated to the Council Bluffs vicinity (Edmunds 1978). Over the next 10 years their ranks were swelled from other groups being removed from the east. During this time they quickly adapted to equestrian bison hunting (Clifton 1978). In 1846, the Potawatomes ceded their Iowa lands to the United States, and the Council Bluffs agency was abolished. The Iowa Potawatomes, now called the Council Bluffs band, were joined with another large group of Potawatomes in Kansas the following year (Sage 1974; Clifton 1978; Edmunds 1978). Although as late as 1848 bands of Potawatomes who had returned to Wisconsin were forcibly removed to Iowa, their major occupation of the state was over (Clifton 1978).

Although they apparently never maintained permanent villages in Iowa, both the Santee and Yankton Sioux included northern and northwest Iowa within their hunting ranges (Hickerson 1974; Sage 1974; Benn 1986). As white settlement increased in the region, and Iowa was admitted to statehood, sentiments toward Indian removal were growing among the white residents of the state. Under pressure from the federal government, the Santee and Yankton Sioux gave up their claims to land in Iowa in 1851 (Hickerson 1974; Sage 1974; Benn 1986). Although they continued to frequent the region for a number of years following this time, sometimes with disastrous results (see Lee 1967; Gardner-Sharp 1885; McKusick 1975b), the last Native American claim on the land had been extinguished, and the way was cleared for full scale Euro-American settlement in the region.

### Initial Occupation (1820-1838)

The earliest widespread Euro-American presence in the state began in the Halfbreed Tract, an area set aside for employees of the American Fur Company and their descendants. The United States retained title to the lands (Artz 1991). According to Artz, the early occupants of the region maintained a colorful blend of Euro-American and Native American lifestyles. At the request of the residents, the area was surveyed in 1831, and, in 1834, the government gave up title to the land to the residents. Although some land speculation began during this time, throughout most of this period, population levels remained quite low. In 1835 the town of Fort Madison was laid out, and in 1837 Montrose.

It was also during this time that steamboat transportation became a major factor in the upper Midwest. In 1819, Stephen Long ascended the Missouri River to the Council Bluff in the *Western Engineer*, and the next year, the same boat reached the Des Moines Rapids on the Mississippi (Bowers, Muessig, and Soike 1990). In 1823, the *Virginia* navigated the Des Moines Rapids and made it upstream to Fort Snelling. In 1831, the American Fur Company's boat, the *Yellowstone*, became the first steamboat to ascend the upper Missouri River, and steamboating became a major form of transportation in the fur trade. In 1837, a steamboat reached the confluence of the Raccoon and Des Moines rivers, and steamboating rapidly became a major form of transportation on that stream. However, steamboating on these shallow streams was not without its hazards, and Bowers et al. (1990) list seven shipwrecks

including the *Warrior* of Black Hawk War fame possibly remaining along the Mississippi adjacent to Iowa.

Even before the Treaty of 1832, American settlers had been hungrily eyeing the lands west of the Mississippi in what would become Iowa. This land hunger was especially strong in the lead mining region, and in 1830 a group of miners under the leadership of Lucius Langworthy crossed the Mississippi and took the Mines of Spain from the Sauks and Mesquakies by force and had to be removed by Stephen Kearny and his troops who were on their way to Fort Crawford at the time (Sage 1974). Due to the lack of local government, Langworthy and a committee of five miners had drawn up a "miner's compact" to help settle disputes and protect claims. Although it did not authorize white settlement, the signing of the Treaty of 1832 opened the way for settlement by whites and the staking of claims. Although this squatting was technically illegal, enforcement was lax, and under later legislation claims established through this method were recognized as legal (Vogel 1988; 1989). By 1836, 10,531 people were recorded in a sheriff's census of what would become Iowa (Sage 1974). Several Iowa cities including Dubuque, Bellevue, Muscatine, Burlington, Fort Madison, and Keokuk can all date their establishment to 1833, with Fairfield, Mount Pleasant, and Keosauqua close behind. Jacobs and Merry (1986:250), describe this early settlement:

White population growth in Iowa became phenomenal. It is estimated that 2,000 came in the summer of 1833; according to the first census in 1836, 10,564 were present, and by 1938, the population reached 23, 242. . . Demographic studies indicate a large majority of Iowa settlers came from the Ohio Valley and the northeast, were American-born, averaged 42 years of age, and had children when they arrived. . . Interestingly, none of these folks owned the land they squatted on. Until 1841, federal law dictated no person could settle land until it was surveyed and offered for sale by the government, which could legally remove anyone settling Indian owned or ceded lands. The illegality of the trespassers, however, was effectively ignored by the U.S. marshalls, Indian agents, and military officers. . . The Black Hawk Purchase public land surveys were initiated by the General Land Office in 1836, and lands began to be listed for sale in 1838.

The illegal occupants of the region, lacking territorial government and government land offices, took the law into their own hands and formed "squatters' associations" to establish and protect their claims. Often they engaged in wild land speculation and exacted tribute from latecomers into the area (Sage 1974). To remedy the situation, the Territory of Michigan was extended westward to include the lands that would become Iowa and parts of Minnesota and North and South Dakota (Federal Writers' Project 1938; Sage 1974). At that time, the Black Hawk Purchase was divided into two counties, Du Buque to the north and De Moine to the south. In 1835, Stephen Watts Kearny led an expedition up the Des Moines River from Fort Des Moines #1 to investigate locations for a fort near the confluence of the Des Moines and Raccoon rivers. Kearny's second in command, Lieutenant Albert M. Lea, published a small booklet the following year, describing the lands of the Black Hawk Purchase. This small book has the honor of being the first to apply the name Iowa to the district, and the name became fixed upon the land (Federal Writers' Project 1938; Sage 1974).

Close upon the heels of the early farmers squatting on the landscape came the millers (Federal Writers' Project 1938). As the major rivers of the region provided a vital means of transportation, it was important to keep them navigable. Therefore, most mills were located on tributary

streams. Wheat was the major crop grown by these earliest farmers, and flour for domestic use and for sale was a necessary commodity (Jacobs and Merry 1986). Nearly all early roads during this time period led to mill sites. Although many mill sites dating to this period no doubt exist, none have been subjected to archeological investigation.

Other tradesmen soon followed. In 1836, William Welch established possibly the first pottery in the state near Bonaparte in Van Buren County, and others soon followed (Reynolds 1970; Page 1983). After five years at Bonaparte, Welch moved his pottery to Fairfield and in 1844 or 1845 moved to the Pella vicinity in Marion County, finally settling and establishing the town of Coalport in northwest Marion County after 1846 (Reynolds 1970). Also in 1836, with the impending statehood for Michigan, the remainder of Michigan Territory was renamed Wisconsin Territory, and a location for a new capital was sought. The first capital selected was a newly created village called Belmont, near Platteville, Wisconsin, but conditions there proved so primitive that lawmakers sought a more civilized location. Several cities, including Dubuque, competed for being chosen as the new seat of government. Ultimately, the City of the Four Lakes (Madison) was chosen, but a group of Burlingtonians succeeded (some have hinted in exchange for votes for Madison) in having the second session of the Territorial legislature meet in Burlington. Although a temporary Capitol was built, it burned to the ground, and the legislature was forced to meet in commercial buildings. During this session, De Moine County was subdivided into seven smaller counties (Sage 1974).

As the population of the Iowa District continued to grow, and following the selection of Madison for the territorial capital of Wisconsin, sentiments began to grow for the establishment of a separate Iowa Territory west of the Mississippi River. In 1838, Congress obliged, and a new Iowa Territory was formed, including portions of Minnesota and North and South Dakota, with Burlington serving as its temporary capital (Sage 1974). Robert Lucas, former governor of Ohio, was appointed by President Van Buren as the first territorial governor. Also in 1838, the first government land offices were opened in Burlington and Dubuque, and legal land sales could finally begin (Sage 1974).

### Early Settlement (1838-1850)

E. Henning (1985:64) confines the Early Settlement Study Unit to the "southeast half of Iowa with a northward extension up the Des Moines River valley and a cluster in Pottawattamie County." She defines the study unit as follows:

The pattern of early settlement in Iowa was strongly influenced by watercourses. This was intensified during the early settlement period by the presence of the steamboat. Commercial ventures, e.g., saw and flour mills, were established to serve the local population.

Usually, the early settlers were previous residents of other frontier areas; most were American-born. New Englanders of British descent and British and German-Americans from the Middle Atlantic States of New York and Pennsylvania were in the majority. Birthplaces of family children suggest a pattern of stopovers in other frontier areas, with Ohio, Indiana, and Illinois predominating. There was also a fairly large minority group of settlers from the Upper South (Kentucky, Tennessee), many of whom had stopped in Indiana and Illinois on their way to Iowa. Foreign-born settlers were in the minority during the early settlement period; they were primarily Irish and German,

settling in enclaves and tending to isolate themselves socially from their American contemporaries.

The eastern American immigrants soon established many commercial ventures and were in the forefront of townsite platting. They were anxious to establish schools, and several institutions typical of the academy movement popular in the East were established in Iowa. They also provided the majority of politicians, sheriffs and judges for developing county governments, founded newspapers and were always in the heat of battles concerned with county seat location. Those who won the battle and obtained county seat designation ensured the survival of their town; the towns which lost often are represented only archeologically, or by graveyards, churches and a few houses. [E. Henning 1985:64]

During the first meeting of the legislature in Burlington in 1838-39, an effort was made to designate a permanent territorial capital. Since none of the cities competing was able to muster enough votes for its own designation, it was determined to locate a new capital in the Iowa River valley to be known as Iowa City, and in 1841 the seat of government was officially moved to its new location (Sage 1974). Although archeological investigations have been carried out at Plum Grove, the house and farm built by Governor Lucas in Iowa City, little evidence from this time period was encountered (Charlton et al. 1988).

In 1839, a boundary dispute developed with the State of Missouri over a interpretation of the "rapids of the River Des Moines (Sage 1974:65)." Militias were called up on both sides, and when Missourians cut down four bee trees the dispute became known as the Honey War. No shots were fired, however, and the decision was left to the United States government, which selected a compromise solution (Sage 1974). During this period, settlers continued producing wheat, along with some livestock, primarily for domestic use, supplemented by hunting and trapping (Jacobs and Merry 1986; Roper 1986). Log cabins were the typical structures erected, and split rail fences were used to control livestock, until the 1840s when Osage Orange hedgerows became common, especially in sparsely timbered areas (Roper 1986). It appears that timbered areas were preferred by the early settlers because of the need for building materials and fuel, and because most of them were more familiar with the forested areas of the east. Also, forest soils are more easily tilled than the hard to break prairie sod (Roper 1986).

In 1842, new land offices were set up in Fairfield and Marion, and an additional land office was established at Iowa City in 1843. Also in 1843, Fort Des Moines #2 was established on the Des Moines River within the modern city of Des Moines (Sage 1974). Steamboating continued to be a major means of transportation, and Bowers, Muessig, and Soike (1990) list four sunken vessels possibly remaining from this time. Most roads during this time period led to the all-important mill sites. As Jacobs and Merry (1986:251) describe it:

Canoes, pirogues, flatboats, keelboats, even a few paddle wheel steamboats provided substantial Iowa River traffic in the nineteenth century. It was recognized that milldams and bridges needed to be built, but the major rivers were avoided for these purposes to allow navigation to flourish. Thus mills were founded on the Iowa River tributaries, and village settlements were often sited close to mill locations. One example is the Yatton Mill and the town of Yatton, originally sited on the English River 1.6 km south of the present city of Riverside, Iowa Township, Washington County. First called the Haskell Mill for the brothers who constructed it as a sawmill between 1839 and 1842, it was converted to a grist mill the following year and the

Yatton Mill became an economic necessity for area farmers. . . . 'Like most of the early grist mills, this mill in its early days of active operation played an important part in the development of the area. A trip to the mill to have their grain processed into flour, grits, corn meal, or whatever the farmers desired was an important project,' stated the granddaughter of one of the Yatton Mill operators. . . . Often considerable waiting was necessary as the miller could not operate during very low or very high water; when the dam washed out during floods, new stone had to be quarried to repair the dam. When conditions were ideal, the mill ran day and night.

An interesting chapter in Iowa history occurred during the late 1840s and early 1850s. Having fled northwest Missouri, Joseph Smith and his Mormon followers were persuaded by Isaac Galland, a southeast Iowa land speculator who had also founded Iowa's first school in 1830, to buy thousands of acres of land in Lee County, and across the river in Illinois. The settlement on the Illinois side was known as Nauvoo, while the Iowa settlement was known as Zarahemla (Sage 1974; Artz 1991). Joseph Smith's decision to live on the Illinois side allowed Nauvoo to grow and prosper, while Zarahemla slowly faded away. Following Smith's murder in 1844, the new leader Brigham Young determined to move his followers westward out of Nauvoo, and in 1846 they moved across the river to a camp near the town of Montrose (Sage 1974). On their trek westward, they established a series of temporary camps along the route to accommodate those to follow. These were located near Farmington in Van Buren County, Centerville in Appanoose County, Garden Grove in Decatur County, Talmage in Union County, and finally at the ferry operated by Peter Sarpy, an American Fur Company trader, across the Missouri from Bellevue, Nebraska. This encampment eventually spread northward to a place where they established their own ferry, near where the present-day Mormon Bridge is now located. This area was generally referred to as the Bluffs, then Miller's Hollow, then Kanesville, and finally, Council Bluffs City (Sage 1974). A permanent camp called Winter Quarters was established on the west side of the Missouri near the site of their ferry. Later, two other alternate routes were established.

Those who trekked in the third and fourth groups were the most pitiful of all because of their suffering in Nauvoo at the hands of their gentle enemies. In September 1846, the anti-Mormons came in as an organized militia and expelled the few remaining Saints with a cruelty known only to religious fanaticism. Most of those who managed to survive the horrors of the trip arrived in Kanesville in a pitiful condition and it was impossible for even so dominant and resourceful a leader as Brigham Young to prepare his followers for an immediate continuation of the exodus to the West. Most of the Saints spent the fall and winter in camp at Winter Quarters; a few stayed on the Kanesville side of the river.

The removal of the Sauks and Mesquakies from land west of the Red Rock Line in 1845 opened the western two-thirds of the territory, including the Des Moines and Skunk River valleys, to full-scale white settlement, although fur trading posts and squatters had occupied portions of the area for some time. Much of the early settlement of this region followed the patterns established in eastern portions of the territory. In fact, many of the early settlers of this region came from the eastern part of the state as the frontier moved westward. William Welch, the potter mentioned earlier, is a good example of this. He moved from Bonaparte to Fairfield, to Marion County, and to Coalport by 1846 (Reynolds 1970). This was a time of rapid population growth, and an increasing fervor for statehood status. After Iowa was technically



admitted into the Union in 1845 only to have the Congressional restrictions on admission related to proposed state boundaries rejected by the territorial legislature. Representative Stephen Douglas of Illinois proposed a compromise boundary that was accepted by both Congress and the territorial legislature. It forms the current boundary of the State of Iowa. On December 28, 1846, President Polk signed the bill that admitted Iowa as the twenty-ninth state (Sage 1974).

Following the farmers into the region were all the attendant industries, and soon small villages and towns sprang up. Gradwohl (1974) has noted the intimate interrelationship between coal mining and ceramic production in the Des Moines River valley. Not only does the coal provide a useful source of fuel, but the coal measures in this region also contain deposits of high-quality 'fire clay,' suitable for making stoneware (Reynolds 1970). A number of Gradwohl's students have prepared papers and Master's theses on pioneer kilns in the Des Moines River valley (Reynolds 1967, 1969, 1970; Schroeder 1974; Schulte 1974). Only one of these, however, the Coalport Kiln (13MA103) dates to this time period. This pottery works was established sometime after 1846 by the same William Welch who had set up the first pottery in the territory in 1836, and who established the community of Coalport (Reynolds 1970). Investigations at this site revealed the remains of a portion of the kiln floor, understructure, and superstructure, as well as vast quantities of broken ceramics and kiln furniture. It is of note that in contrast to later potteries farther upstream in Boone County all the ceramics recovered here appeared to be wheel made rather than molded and jollied as were the later ceramics. Also, Albany Slip and salt glaze seem to have been the only surface materials used at Coalport in contrast to the Bristol Glaze and Cobalt Blue underglazing used at the Boone County sites (Reynolds 1970).

Ballard (1984) has prepared a history of grain and sawmill locations in Story County that is representative of the development of the milling industry during this time period. To gain a glimpse into the early pioneers' world views and belief systems, Nutty (1984) has carried out an analysis of gravestone symbolism in Story County, noting cultural changes in the concept of death and mortuary practices over time.

### Settlement Boom (1850-1860)

E. Henning (1985:67) defines the Settlement Boom Study Unit as follows:

This period is defined by intensification of the patterns of the preceding early settlement period. Changes appear, however, in the degree of urbanization, settlement agglomeration and industrialization, as well as a more complete integration of the settled portions of Iowa into the national economic and political sphere.

River towns predominated as urban and industrial centers, and they became the focus of much migration from other urban areas. Davenport was for a time known informally as 'New Cincinnati' because of the large number of migrants from that city.

Ethnic Settlement remained very localized, and the first significant foreign migration direct to the rural areas of Iowa took place during this decade. There was heavy Norwegian immigration to southeastern Minnesota and neighboring areas in northeastern Iowa. Large numbers of Germans, Austrians, and Swiss formed clustered settlements in Iowa during the fifties. Irish immigration to the northeastern part of the state was also pronounced, and many townships were strongly Irish.

To accommodate the vast numbers of settlers pouring into Iowa during this decade, new land offices were set up in Chariton, Fort Des Moines, and Council Bluffs in 1852, in Fort Dodge, Sioux City, and Decorah in 1855, and in Osage in 1856 (Sage 1974). Iowa's most northerly fort, Fort Dodge, was constructed after the treaty of 1851 with the Sioux. Within two years, however, the fort was abandoned, and a budding city was left behind (Federal Writers' Project 1938). The cities along the Mississippi River grew and prospered, primarily because of the lumber industry. The great influx of settlers provided a huge demand for softwood lumber, which Iowa's forests could not provide. Instead, timber was clearcut in Wisconsin and Minnesota, floated down the Mississippi, and processed in the Iowa river towns. At one time, Clinton claimed to be the largest processor of timber products in the world. People like Frederick Weyerhaeuser made fortunes from the deforestation of the north country, and at one time there were seventeen millionaires in Clinton alone, made wealthy by the lumber industry. However, as the northern forests were used up, the industry gradually moved to the southeast and the Pacific Northwest, disappearing from the Upper Mississippi Valley by the early 1900s (Sage 1974).

Steamboating remained a major form of transportation, and Bowers et al. (1990) list eleven wrecks as possibly remaining from this time. Also during this period, a project was begun to make the Des Moines River more navigable by building a series of locks and dams, but due to mismanagement and the arrival of the railroad the project was abandoned (Bowers, et al. 1990). While early settlement tended to follow the river valleys, flooding, increased settlement, and the development of roads and stagelines tended to shift patterns to following the land survey boundaries (Benn and Rogers 1985). This trend was accelerated by the arrival of the railroads.

Iowa's first railroad, the Mississippi and Missouri Rail Road, was organized by the Chicago & Rock Island Railroad in 1852 to run from Davenport to Council Bluffs (Sage 1974). Construction was begun on the first line from Davenport to Iowa City in 1853, but the first engine did not reach Iowa City until December 31, 1855. In 1856, Congress provided the state with land grants for the establishment of four rail lines across Iowa, which accelerated the pace of construction. Still, however, the rails did not reach Des Moines until 1867 and Council Bluffs until 1869. The first rail line to complete the link from the Mississippi to the Missouri was the line to become known as the Chicago & Northwestern. Although undergoing several bankruptcies and changes of name, also beginning in 1853, this route completed a line from Clinton to Council Bluffs in 1867. A third line, the Burlington and Missouri organized in 1852 by the Chicago, Burlington, and Quincy Railroad began construction at Burlington in 1855, and by 1859 had reached Ottumwa. However, it took another 10 years for it to reach the Missouri opposite Plattsmouth, Nebraska, and a year later in 1870 a spur was run north from Pacific Junction to Council Bluffs. The fourth road was what was to become the Illinois Central Railroad. This line began construction at Dubuque in 1855, but a bankruptcy intervened, and the rails had only reached Cedar Falls by 1861 and did not reach Sioux City and eventually Council Bluffs until well after the Civil War (Sage 1974). So, railroads had a major impact on only the eastern third of the state during the 1850s. Even so this impact would be dramatic and lasting. The arrival of the rail lines forever changed the face of settlement patterns in Iowa, and in the rest of the nation. Wherever the rail lines went, new communities sprang up. Cities located along the rail lines grew and prospered, while those bypassed often withered and died.

As noted earlier, the earliest farmers generally raised a few head of livestock, and concentrated on the production of corn, wheat, oats, and other small grains. However, the transportation of large amounts of grain to distant markets proved extremely difficult, and the costs prohibitive. During this time, it became apparent that more money could be made by raising corn and feeding it to larger numbers of hogs and cattle which could be driven to markets. This increasing specialization in corn and livestock caused a need for good fencing and the proliferation of Osage Orange hedgerows across the landscape prior to the introduction of barbed wire (Jacobs and Merry 1986). This pattern of corn and livestock production would continue to dominate Iowa agriculture for the next century and beyond. With the increasing westward movement of settlement and the establishment of permanent state boundaries by statehood, it was determined that a more westerly location for the capital would be more convenient for more people of the state. In 1855, a law was passed moving the capital to Des Moines. This was put into the new constitution in 1857, as well as permanently locating the State University of Iowa in Iowa City. Late in that year the capital was moved to Des Moines (Sage 1974). In 1858, the Iowa State Agricultural College and Model Farm (later Iowa State University) was founded at Ames.

Meanwhile, as a result of missionary efforts in the East and in Europe, Mormon converts continued to trek westward across southern Iowa. One interesting sidelight to this migration is the establishment of the community of Preparation in Monona County. As Nansel (1989:15) describes it:

In 1854, a splinter group of Mormons under the leadership of Charles Thompson settled in the vicinity of Preparation Canyon State Park. Thompson did not believe in polygamy and established his own branch of the church. He saw himself as the reincarnation of the prophet Ephraim, and was given revelations by the spirit Baneemy. The Mormons established the town of Preparation, Monona County's first County Seat. They reportedly selected the Preparation Canyon area because it has a year-round, warm-water spring. Many people lived in dugouts along the valley of Spring Creek. The Mormons were very active in the organization of the county, and Thompson was the first county judge. At the height of their presence, the Mormons controlled up to 1200 ha (3000 acres) of timberland in the Preparation vicinity. Thompson was deposed in 1858 after a swindling attempt on his followers failed, and the colony gradually faded away until it had largely disappeared by 1900. One of Thompson's followers was C. C. Perrin, whose house stood in Preparation Canyon State Park until 1975 when it was sold by the Iowa Conservation Commission to be torn down. The stockyards, the last remnant of Preparation, closed in 1948.

With the arrival of the railhead in Iowa City in 1855, thousands of Mormon converts began to arrive and they camped near Coralville. Others came up the Mississippi by steamer and camped outside Keokuk. In 1856, the first of a series of handcart expeditions headed west from these locations toward Salt Lake City. During these expeditions, people piled the barest of necessities in handcarts that they pulled across the rough terrain of Iowa and beyond. This method was continued from 1857 through 1860 (Sage 1974).

### Northwest Settlement (1850-1860)

E. Henning (1985:69) defines the Northwest Settlement Study Unit as follows:

This unit examines the same processes described for the Early Settlement unit—processes revolving around locational choices made for farmsteads and townsites. The pattern of settlement in townships settled by 1860 indicates that there was still a strong orientation toward riverine settlement, since few completely upland townships and counties showed settlement by 1860. Many of the early settlers in the northwest were from the more eastern parts of Iowa, following a pattern of movement from one frontier area to another. There was, however, a stronger foreign element in immigration to northwest Iowa than there had been in the east, incorporating the German (Prussian), Norwegian and Irish elements observed in eastern Iowa during the same time period.

Unlike the early settlement period in the southeast, the northwest portion of the state remained predominately rural and agricultural with little initial urban development.

Geographically, the unit includes the "Northwestern half of the state, except Des Moines and Missouri River valleys (E. Henning 1985:69)." As Elizabeth Henning has pointed out above, Euro-American settlement of the northwestern portion of the state came later and more slowly than to areas of the state along major river corridors. This is natural since population pressure was coming from the south and east and the major rivers of the state flow from northwest to southeast. Throughout this time period, river travel remained a primary means of transportation. Also, the prairie soils of this part of the state were difficult to break and having been recently glaciated, much of this region (the Des Moines Lobe) was swampy and poorly drained, making farming nearly impossible until the widespread adoption of drainage tile (E. Henning 1985). Furthermore, the northwestern frontier could be dangerous. Although the Sioux had ceded all their lands in Iowa to the United States in 1851, many still continued to roam through their old hunting grounds often coming into conflict with settlers moving into the region. The most famous of these conflicts has become known as the Spirit Lake Massacre.

During the spring and summer of 1856, two families under the leadership of Rowland Gardner headed west from Clear Lake to the Iowa Great Lakes region and settled on the south side of Lake West Okoboji. Other families soon followed, and by November of that year nearly 40 people were living scattered around the shores of the lakes (Gardner-Sharp 1885). The winter of 1856-57 was a difficult one. Many cabins were unfinished and having arrived too late in the year to plant crops, the squatters were forced to travel to Fort Dodge nearly 80 miles distant for provisions. Furthermore, the winter was one of deep snow, bitter cold, and storms. The winter was equally hard for a band of renegade Sioux under the leadership of Inkpaduta (Sage 1974). This band had traveled down the Little Sioux in the fall of 1856 to the vicinity of Smithland in Woodbury County. Soon, however, they came into conflict with the white settlers of the region and were forcibly disarmed. This action led to a spree of depredations upon the scattered settlers of northwest Iowa, as the band made its way back up the Little Sioux River (Gardner-Sharp 1885). On the morning of March 8, 1857, they appeared at the Gardner cabin, demanding food. This was provided them, and they began demanding other provisions. Finally they left, moving on to another cabin where the killings began. Later that afternoon they returned to the Gardner Cabin, again demanding more goods. This time, however, the results were fatal. All members present in the cabin were killed with the exception of young Abbie, a girl of 15, who was taken captive. They then made their way around the lakes, killing the men and children and taking three other women captive. Of the lake dwellers, only two, Abbie Gardner and a Mrs. Marble, survived and were

ransomed (Gardner-Sharp 1885). Inkpaduta's band was pursued across much of southern Minnesota but although his son Roaring Cloud was killed, Inkpaduta was never captured.

Hostilities such as the Spirit Lake murders would continue between the Sioux and encroaching white settlers until erupting in a major uprising in 1862, in which hundreds of settlers in southern Minnesota were killed, leading to government military action (Sage 1974). The massacre had the effect of slowing settlement in this region and, indeed, many settlers left the region. The beginning of the Civil War and financial panics also contributed to a slowing of settlement (E. Henning 1985; Benn and Rogers 1985).

## The Civil War Years (1861-1865)

Although Iowa provided 47 infantry regiments, four artillery companies, and nine cavalry regiments, as well as many replacement troops (Sage 1974), the Civil War had little direct impact on the state aside from removing many men from their families (Benn and Rogers 1985). Iowa's southern counties were, however, full of strife, and many Confederate sympathizers helped Missouri rebels and intimidated local officials. In 1862, martial law was declared, and a Southern Border Brigade of 10 companies and 2,000 men was formed (McKusick 1975b). Of more direct concern to most Iowans, especially in the northern and western portions of the state, were the growing hostilities between white settlers and recently displaced Native American groups. McKusick (1975b:1-2) describes the time:

The western frontier along the Missouri River had settlements at Sioux City and Council Bluffs but elsewhere was very thinly populated, and protection from the Indians had been a matter of concern for a decade. The main defense against small groups of mounted Indians was volunteer companies of militia. These companies, with such names as the Frontier Rangers and Mills County Mounted Men, formed and disbanded and reappeared under new names over the years. As part-time soldiers they were generally ineffective. Although commissioned by the state and supplied with some weapons, they lacked training and discipline and seem to have been primarily social groups or clubs rather than military organizations. . . .

The political dissensions, transportation difficulties and economic weaknesses of the state were magnified on the frontiers. The Iowa Northwest 19 counties, was one-fifth of the state and totaled over 11,000 square miles. Its population in 1860 was only 5,500 people, mainly engaged in subsistence agriculture. This density of population was about one person for each two square miles, a deceptive average, for about half lived in Fort Dodge, Sioux City, and the small communities in between. Most of the Iowa counties along the Minnesota border were virtually uninhabited. The Sioux vacated title to northwest Iowa and southwestern Minnesota by a treaty ratified by the U.S. Senate in 1853. In subsequent years small parties of Indians occasionally returned to forage, steal horses or beg for provisions at outlying farms.

Following the Spirit Lake Massacre, a small fort garrisoned by men from the Fort Dodge Frontier Guards was erected. Increasing horse stealing activities and the often comical ineffectiveness of the volunteer militia units led in the fall of 1861 to the creation of the Sioux City Cavalry, a detached unit of the U.S. Army, to patrol the Northern Border region. During the first year and a half they were deployed in various settlements between Estherville and Sioux City (McKusick 1975b). In the late summer of 1862, as a result of corrupt reservation practices, a full-scale

Sioux uprising developed in southern Minnesota. The city of New Ulm was destroyed, and countless settlers were massacred. As this news travelled, panic spread across southern Minnesota, Northern Iowa, South Dakota, Nebraska, and even into Wisconsin and Kansas. Settlers abandoned the area in large numbers, seeking safety in the larger towns, and many left the region permanently. Inflated accounts of the magnitude of the slaughter, and the number of Native Americans involved increased the panic, and there is some indication that certain speculators encouraged the panic in order to reap a profit by drawing U.S. military expenditures to the frontier (McKusick 1975b). Nearly all of southern Minnesota, eastern South Dakota, northern Nebraska, and northern Iowa was abandoned by white settlers, many leaving everything they owned behind. This led to widespread plundering of the region, some by Native Americans, but much by civilian whites and the various military and paramilitary groups operating in the region (McKusick 1975b). Along the northern border, only Estherville and Spirit Lake remained occupied.

The four U.S. Army posts in southern Minnesota and Dakota Territory, Forts Abercrombie, Randall, Ridgely, and Ripley, had been depleted of experienced officers and soldiers by the need for troops in the Civil War. To aid the outnumbered federal troops, Minnesota's governor commissioned Henry Sibley to muster volunteer regiments to suppress the uprising. After several skirmishes, ending with what Sibley called the Battle of Wood Lake in late September, the insurgents began to break up and head for Dakota Territory, while those who remained sued for peace, and the fighting in Minnesota came to an end, although campaigns were carried out against the Sioux in Dakota Territory in 1863 and 1864 (McKusick 1975b).

In Iowa, as news of the uprising reached Des Moines, Governor Kirkwood commissioned Schuyler Ingham to organize military forces along the northern border. Ingham enlisted 40 local men, and divided them between stations at Estherville and Iowa Lake, from which they could patrol both forks of the Des Moines River. Meanwhile, the state legislature, meeting in special session to discuss Civil War matters, authorized the governor to recruit 500 men to be stationed along the northern border, although only 250 were actually enlisted. This group became known as the Iowa Northern Border Brigade, and was divided between posts at Iowa Lake, Estherville, Ocheydan, Peterson, Cherokee, Ida Grove, Sac City, Correctionville, West Fork, Little Sioux, and Melbourn, while the Sioux City Cavalry manned posts at Spirit Lake and Sioux City. Triangular forts were erected at Correctionville, Cherokee, and Peterson, while large square forts of logs and sod were built at Iowa Lake and Estherville. A replica of the Iowa Lake fort has been erected at Fort Dodge, and a replica of the Correctionville fort has been built by that town in a local park, not at the original site of the fort. These forts were part of a network of over 70 stations making up the federal defenses of the northwestern frontier at this time, and patrols between the various locations assured communications at all times.

As the frontier grew quiet, three of the Brigade companies were disbanded in September of 1863, and the entire Brigade was disbanded on January 1, 1864. They were replaced at their posts by the Sioux City Cavalry, and over the following year the forts were gradually abandoned. McKusick (1975b) conducted excavations at the site of the Cherokee fort in 1967, revealing much of the site plan, and locating the fort's well. Unfortunately, little material dating to the time of the fort was encountered. Nansel (1989) conducted a minimal site visitation at the site of the Correctionville fort (13WD71), and while local residents reported locating a well and an 1860s coin, no materials dating to the time of the fort were observed.

## Rural, Urban, and Mineral Development (1865-ca. 1900)

Riverboating remained important in the postwar years, and Bowers et al. (1990) list 46 wrecks possibly remaining, mostly along the Missouri River. One such steamboat wreck that attracted a great deal of attention is that of the *Bertrand* (Petsche 1974; Switzer 1974). While technically located in Nebraska, the wreck is on land on the east side of the modern Missouri River channel, and an interpretive center has been built in Iowa within De Soto National Wildlife Area which contains the cargo, which is listed separately from the wreck itself on the National Register of Historic Places (Bowers, Muessig, and Soike 1990). The *Bertrand* sank on April 1, 1865 while on its way to Montana carrying mining supplies, dry goods, and provisions. A large quantity of mercury for use in mining operations was supposedly on board. In 1968, treasure hunters from Omaha, anxious to get their hands on the valuable mercury, succeeded in locating the wreck, and it was eventually excavated in 1969 with the assistance of National Park Service archeologists. Little mercury was found, however, and it appears that the contemporary salvors succeeded in removing as much as one half of the cargo. The remaining cargo, much in a remarkable state of preservation, provides a unique "time-capsule" glimpse into the material culture of the mid-1860s.

During this period, the railroad supplanted river travel in the area. The location of railroad lines continued to influence patterns of settlement, and the efficient transportation they offered accelerated urban growth, spurred on the coal mining industry, and provided Iowa farmers with easier access for their products to distant markets. In addition, the railroads served to more closely link the economy of the developing state with that of the nation as a whole (Benn and Rogers 1985). During this time, a fifth major railroad company, the Chicago, Milwaukee, St. Paul and Pacific, or Milwaukee Road, built two rail lines across Iowa, one from McGregor to Sioux City and one from Sabula to Council Bluffs. This line also bought and built many feeder lines across the state, and at one time ranked third in track mileage in Iowa (Sage 1974). The other lines also continued building spurs and connecting lines, and many other small companies sprang up within various areas of the state. Soon, Iowa's communities were interconnected in an efficient network of railroads. As stated earlier, the railroads accelerated the urbanization of Iowa's industries. As E. Henning (1985:71) states:

Even after the era of the steamboats was over, Iowa's river towns continued to prosper. The lumber industry was still Iowa's most important nonagricultural industry, and its location was in the Mississippi River towns. River town survival was also a product of railroad routes, and by the latter portion of this period the river towns which had failed to obtain major rail routes diminished in size and importance. . . . Mill consolidation began during this period for flour milling as well as sawmilling operations. Processing of farm products, both animal and grain crops, became more and more an urban function, with major packing plants confined to river towns. The head start the river towns had achieved before and during the Civil War continued to maintain them, especially when rail routes coincided with needs for shipment to market. . . . Urban areas received more foreign immigration than ever before during this period. Most were still from northern Europe, and while some moved on west to agricultural areas, many had come from cities and were skilled laborers attracted to Iowa's developing urban areas.

Not all milling operations became so urbanized, however. Many local mills remained in operations throughout this period. See Merry

(1989) for a study of one such mill, the Kendallville Mill (13WH228) in Winneshiek County.

E. Henning's (1985) Mineral Development Study Unit concerns the production of coal and ceramics, mentioned earlier, and gypsum mining and processing in the Fort Dodge vicinity. Although these industries had been developed on a small scale in the first half of the nineteenth century, the coming of the railroads at once increased the demand for coal and provided a means for its transportation in quantity (Benn and Rogers 1985). Coal was widely mined in southeast Iowa, and up the Des Moines River valley. Many temporary company towns appeared, prospered, and disappeared as mining operations were moved to new locations. Although slightly postdating this time period and being slightly atypical because of its permanence of construction, the Buxton township (13MO10) in Monroe County provides a fascinating glimpse into the everyday lives of coal miners and their families in the mining towns of this period (Gradwohl and Osborn 1984). Elizabeth Henning (1985: 77) states that:

The development of these extractive industries had important effects on the development of towns and cities in the mining areas. Miners in some cases were from specific ethnic groups. This led to the formation of ethnic enclaves in towns during the boom period, which sometimes continued in other cities after the mining period had past, as with the people of Buxton.

A Buxton, Iowa Club, Inc. in Des Moines, remains very active to this day (Gradwohl and Osborn 1984). While Buxton had a large black population, numerous whites lived there as well, and adjacent to Buxton was an area known as Swede Town, an enclave of Swedish immigrants. Unfortunately, Iowa's coal deposits are low-quality, high-sulphur bituminous coal, and as the demand for coal dropped over the years and high-quality western anthracite coals became readily available, Iowa's coal industry dwindled in the middle of the twentieth century. Recently there have been several attempts to bring it back, and some washing plants have been built. However, few mines continue in operation.

Coal mining was intimately related to ceramic production in the Des Moines River Valley. Although railroad transportation made imported fine china more readily available, most utilitarian wares and field drainage tile were still manufactured locally. Several studies have been conducted on kiln sites from this time period, including the Moingona and Flint Stone potteries (13BN120 and 13BN132; Schroeder 1974), the Noah Creek Kiln (13BN111; Schulte 1974), the Dahlonga potters (13WP107; Tandarich 1977), and the Parker and Hanback Pottery in Bonaparte (13VB200; Till 1983). All show evidence of much more mechanization and mass production techniques than the earlier Coalport Kiln investigated by Reynolds (1969, 1970). At Coalport nearly all vessels were wheel thrown while at the later potteries most vessels were mold made and finished by jiggering and jollying, that is, by using an arm-mounted template attached to a wheel. However, as the century progressed, ceramic production largely shifted to large industrial plants such as the Fort Dodge Stoneware Company and to the production of bricks and drainage tile. By the end of the nineteenth century, stoneware vessels were being largely replaced by vessels of glass, tin, and other metal containers (Schulte 1974). However, as late as 1938 Mason City could claim to be the brick and tile capital of the world (Federal Writers' Project 1938).

Another important mining industry developed during this time period for gypsum in the Fort Dodge area. The first quarries were established in 1869, and the first plant for processing of the gypsum into plaster was built in 1872. Since that time, underground mines have been developed, and Iowa has remained one of the top two or three

states in the Union in the production of gypsum (Federal Writers' Project 1938; W. Anderson 1983). In an interesting sidelight to Iowa's gypsum deposits, the Cardiff Giant of P.T. Barnum fame was carved from a slab of Fort Dodge gypsum in 1868, shipped to New York State, and "discovered" a year later in a well excavation. It attracted a great deal of attention and scholarly debate until it was finally revealed as a hoax (W. Anderson 1983).

Changes also occurred in the practice of agriculture in Iowa during this time. As Roper (1986:376) describes the transition:

Whatever the varieties of commodities farmers were producing in the early general farming era, a trend toward increasing both the quantity and quality of that production was operating from the earliest times as prairie farming became more than a subsistence activity. Several conditions had to be met before this trend could come to full fruition. First and foremost, the first generation of Iowa settlers had to sufficiently tame the prairies and develop effective means to control their domesticated plants and animals before such techniques as selective breeding and propagating, soil conservation and fertilizing, and feedlot meat production would be feasible. Second, the motivation for applying these techniques had to come from the marketplace; the farmer had to perceive an increased return for his improved farm production. Third, knowledge of the means of achieving this greater and better production had to reach the farmer in his rural isolation. Fourth, animals and plants of a better quality and higher productivity had to become available. Fifth, labor-saving machines had to be developed so that the farmer could cultivate more acreage more effectively. Finally, a means of transporting the farmer's enlarged and improved production had to be developed. . . . All of these conditions for specialization were being brought about during the general farming era, with the result that by the 1880s, cash crop specialization was possible, common, and already forming the foundation of the agribusiness of the mid-twentieth century.

The introduction and widespread use of drainage tile and the subsequent destruction of wetlands in northern Iowa made millions of acres of fertile farmland available for the first time during this time period. Euro-American settlement in this region had been slowed by the Civil War and by the Sioux uprising of 1862, but in the postwar years settlement boomed. Improved varieties of animals and plants also enhanced both the quantity and quality of production, and the new Iowa State Agricultural College and Model Farm helped to encourage more scientific farming techniques throughout the state (E. Henning 1985).

## Post-1890

E. Henning (1985) has divided the post-1890 period into four study units: Economic Change, from 1890-1914; War and Aftermath, from 1914-1930; The Great Depression, from 1930-1940; and Post-1940. She notes that Iowa, by this time is totally integrated into the economy and social structure of the nation as a whole, and cannot be fully examined without constant reference to happenings on the national scene. She also notes that events do not always have equal or similar impacts in all regions, and divides the state into four regional variants, based on river basins; the West, the Des Moines-Skunk Basin, the Iowa Basin, and the Northeast.

## Economic Change

During the time prior to World War I, trends begun in the previous time period continued, with continued immigration, mainly to urban areas. Migrants from eastern and southern Europe began moving into the state as did blacks from the rural South. Agriculture continued to become more specialized, moving from diversified farming to an emphasis on corn and cattle and hog finishing. Coal mining and the railroads remained major industries as did brick and tile production (E. Henning 1985; Benn and Rogers 1985). As E. Henning (1985:81) states, "there was still, however, a distinctly parochial flavor to much of the state, and there were great sociocultural differences between urban and rural areas."

## War and Aftermath

High commodity prices caused by the demand created by the war accelerated the trend toward agricultural specialization of single cropping and livestock finishing. This resulted in the need for large packing plants in the cities. The high prices also resulted in a great deal of land speculation and inflated land prices, resulting in a great many losses as prices collapsed at the end of the war. This led to a slight trend back toward diversification, and new crops, such as sugar beets and soybeans were tried (E. Henning 1985). Coal mining reached its peak during this time, and the trend toward urbanization continued. Rural population began to decline for the first time. The war had the effect of fostering the persecution and forced acculturation of Iowa's multiple ethnic groups, particularly Iowa's large population of those of German descent. Despite strong criticism at home and in Washington that he was going against the very freedom we were fighting for, Iowa's governor Harding

issued an edict requiring [all groups not using English] to use English in public and private schools as the medium of instruction; in conversation on trains, all public places, and over the telephones; in public addresses; and in church services, saying that those who could not speak or understand English should worship in their homes [Sage 1974:252].

This resulted in the loss of much of German-American culture in the state. Improved transportation and communication, with the widespread availability of automobiles, telephones, and radios, as well as the migration of young people to the cities, greatly reduced rural isolation during this time period, and the state became much less parochial. Farmers and labor groups became increasingly organized as political forces, and rural-urban conflicts developed in state government over economic decision making that continues to this day (E. Henning 1985).

## The Great Depression

During the Great Depression, many Iowa farms and businesses fell to bankruptcy and the rural exodus to the cities increased, intensifying urban problems as well. Land prices plummeted, as did prices for farm products. Much land was sold for taxes, and the loss of farms to banks led to the process of consolidating small farms into much larger units. This pattern led to consolidation of schools and other social units, and continues to this day. Farmer's organizations continued to gain political power in the state, and, because of the increasing role of the federal government in state and local affairs, state government was greatly reorganized (E. Henning 1985; Benn and Rogers 1985). The WPA and CCC carried out many construction projects in Iowa, and much

archeological research was conducted by Keyes and Orr with federal funding.

#### Post-1940

The advent of World War II revived the nation's and Iowa's sluggish economy of the 1930s. It also increased the rural exodus as young men joined the services and the rest of the work force including many women were moving to the cities to earn the lucrative wages being paid in defense plants. These trends continued after the war, and the educational opportunities offered by the GI Bill drew many veterans away from their rural homes. After the war, larger, more powerful machinery, chemical fertilizers, pesticides, and herbicides revolutionized agriculture and intensified the trends toward consolidation of farmland begun during the Great Depression. Production shifted almost entirely to corn and soybeans, and huge surpluses were produced, causing falling prices and the need for government price supports, as well as damaging soil fertility and increasing soil erosion. Minimum tillage and no-till farming methods were experimented with, but while they decreased soil erosion, they required greater herbicide use which threatened groundwater supplies. The cities continued to increase in population, and the growth of the suburbs during the 1950s and 1960s resulted in the decay of the inner cities and the urban renewal movement of the 1960s and 1970s (E. Henning 1985). The development of the Interstate highway system spelled the end for the railroads' dominance of the transportation industry, and, once again changed settlement patterns and influenced which cities would continue to prosper, and which would decline in importance.

## Wisconsin

The purpose of this chapter is to summarize information on a series of historic contexts that have been outlined by Wisconsin archeologists, rather than to recount the history of the region *per se*. Although some historical archeology has been conducted under traditional research conditions (R. J. Mason 1986b), most investigations in the last two decades have been in conjunction with cultural resource management projects. Much of the work has been performed by prehistorians who inadvertently have been faced with historic resources. Consequently the research often has been descriptive, and meaningful problem orientations have not yet been developed for most eras or regions of the state.

### American Indian

The archeology of the Historic American Indian era in the Upper Great Lakes has been subdivided into three time periods: Early Historic (A.D. 1610-1670), Middle Historic (A.D. 1670-1760), and Late Historic (A.D. 1760-1820) (Quimby 1966). Recently, the Late Historic period has been expanded and further subdivided to include Late Historic I (A.D. 1760-1848), Late Historic II (A.D. 1849-1899) and Late Historic III (A.D. 1900-present) (Wyatt 1986). These subdivisions reflect a concern for the American Indian presence and interactions with Euro-Americans in the state (C. I. Mason 1988), rather than a concern with European or American history *per se*.

At the time of European contact, only three American Indian groups appear to have been native to Wisconsin: Winnebago (Ho Chunk), Menomini, and Santee Sioux. The perturbations of the fur trade, European diseases, and European and Indian warfare to the east, however, resulted in the movement of Indian groups, and remnants of

Indian groups, westward into Wisconsin and beyond. The Potawatomi, Ottawa, Huron, Sauk, Fox, Chippewa (Ojibwa), Oneida, Brotherton, and others moved into Wisconsin in historic times. The fur trade and contact with the European economy produced substantial changes in Indian subsistence, settlement, material culture, economy, and social organization.

### Early Historic (1630-1670)

The Early Historic period in Wisconsin marks the time of French exploration and dominance in the Upper Great Lakes region. Beginning with Champlain's founding of New France in 1615, French colonization focused on the fur trade and establishing missions and fortified outposts to protect trade. At first information on Wisconsin Indians came to the French only indirectly through other Indian groups. Until 1650 the Huron of Ontario were middlemen between the French and more interior bands and tribes. This was probably not a prehistoric pattern, rather it was stimulated by the French desire for furs, and the increasing native demand for European goods (C.I. Mason 1988). The middleman position was lucrative in terms of goods and power, and the Huron did their best to keep the French from trading directly with interior groups.

The Winnebago, a Siouan speaking group, were first mentioned to Champlain in 1629 as "the people of the sea" or "Puans", the Stinkards. Champlain sent Jean Nicolet west to contact them and explore the region in 1634. Nicolet's journals were lost, so information on his trip is recorded only second hand in the Jesuit Relations of 1640 (Thwaites 18:231-233). Nicolet contacted the Menomini and Winnebago in the vicinity of Green Bay, and their neighbors were reported to include the Santee Sioux, Illinois, Mascouten, and Potawatomi, among others. Recent critical analyses of the historic documents, however, suggest that the "neighborhood" alluded to in the Jesuit Relations may have encompassed the entire western Great Lakes (R. J. Mason 1986b).

The Winnebago were reportedly living in settled agricultural villages at the foot of Green Bay at a location traditionally called Red Banks. Wild rice and fish are also mentioned as an important part of Winnebago subsistence. The early historic records portray the Winnebago as populous, powerful, and warlike. A few recent analyses, however, have suggested that they may only have been part of a large population at some time in prehistory (C. I. Mason 1976, Hall 1993, P. Bruhy 1981, P. Richards 1993a). The precise location of the Red Banks of Nicolet's landing and Winnebago settlement is also open to debate (C.L. Mason 1994, Hall 1993).

Before the advent of radiocarbon dating, several scenarios for the origins of the Winnebago had been proposed. Paul Radin, for example, argued that the Winnebago descended from the people who constructed effigy mounds (Radin 1916). Subsequent archeological research, however, suggested that effigy mounds could not be directly linked to the Winnebago (Rowe 1956, McKern 1945). Other archeologists argued that the Winnebago were direct descendants of Lake Winnebago phase Oneota and were closely related to the Ioway who could be linked to Orr phase Oneota in Iowa and Wisconsin (McKern 1945, Mott 1938a, 1938b; Wedel 1959). More recent analyses which include radiocarbon evidence, however, have cast serious doubts on our ability to link the Winnebago to eastern Wisconsin prehistoric cultures (C.I. Mason 1976, Hall 1993, R. P. Mason and C. L. Mason 1993, C.L. Mason 1994, P. Richards 1993a). The exact location, size, and nature of Winnebago settlements at contact is unclear in the historic record, and there is no solid archeological evidence of them for this period.

The location and nature of the Menomini is also unclear at initial contact. They were Algonquian speakers and "neighbors" of the



Winnebago, according to the earliest historic accounts. They may have been settled along the lower reaches of the Menominee River, which is where their Grand Village was situated in the eighteenth century. The latest prehistoric sites reported along the lower Menominee River are Oneota, but they have not been radiocarbon dated (Buckmaster 1979). The Menomini expanded south into the Fox River drainage after 1720 (Wyatt 1986). Menomini territorial claims include much of northeast Wisconsin, and they moved into the area of their present reservation in Menominee County in the nineteenth century. The Menomini appear to have had a mixed economy adapted to their ecological setting which included cultivating maize, squash and beans, hunting, fishing, and collecting nuts and wild rice (Bruhy and Goldstein 1983).

There is no archeological evidence for the Menomini during the Early Historic period. This is probably the case because we do not know what the prehistoric material culture of the Menomini might be. As suggested in an earlier chapter, it is possible that the late Oneota occupations evident in northeast Wisconsin may represent Menomini sites. Some archeologists have suggested that the prehistoric Menomini were descended directly from late Late Woodland groups (Barrett and Skinner 1932, Quimby 1966, Dirst 1995b), but the archeological record does not include any Late Woodland sites with late prehistoric or protohistoric dates.

The Santee Sioux (also called Eastern Dakota, Santee Dakota, or Nadieseu) were also described as "neighbors" of the Winnebago in the mid-seventeenth century. Nicolet may have met some who were visiting Green Bay, but they probably were living along the upper Mississippi River at this time. The Santee Sioux may be descended from northwest Wisconsin Late Prehistoric groups that manufactured Sandy Lake pottery, or they may be related to more Oneota-like groups to the south. No definitive archeological evidence for the Santee Sioux has been recorded during the Early Historic period in Wisconsin.

For 20 years after Nicolet's landing there was no direct contact between Europeans and Wisconsin Indians, since the Huron served as an effective bottleneck. In these 20 years, the Winnebago, reportedly the most settled and populous Wisconsin group, appear to have lost substantial population, possibly due to the introduction of European disease, and increasing hostilities from immigrant eastern groups.

By 1650 the Iroquois, armed by the Dutch and effectively organized for warfare, had decimated the Huron and were raiding as far west as Wisconsin and Illinois. The surviving Huron and their allies (Petun and Neutral) fled westward through the Great Lakes, with some moving as far as the Mississippi River. After Huron control of the trade was broken, French traders were also able to travel into Michigan and Wisconsin. The chaotic and hostile social environment of the Upper Great Lakes prompted many Indian groups to move west and align themselves with related and sometimes totally unrelated remnants of other groups. The French withdrew their missionaries during the Iroquois onslaught, and written accounts from the period are scarce.

Groups who began to move into Wisconsin around this time include the Potawatomi, Huron, Petun, and Ottawa, who probably entered from the north (R. J. Mason 1986b). Probably entering around the south end of Lake Michigan from lower Michigan, Ohio, and Indiana were the Sauk, Fox, Kickapoo, Mascouten, Illinois and Miami (C. I. Mason 1988, Tanner 1987).

French traders continued to explore Wisconsin after 1650. The best known were Radisson and Groseilliers, who travelled with the Huron and Ottawa in the late 1650s from Green Bay to the Chequamegon Bay area along the south shore of Lake Superior in Wisconsin. Soon other Europeans followed including missionaries, military, political

agents, and more traders. The missionaries followed their converts and established Wisconsin missions at Chequamegon Bay and Green Bay. Allouez reported Huron, Petun, Ottawa, Potawatomi, Sauk and Fox, and Illinois in the Chequamegon Bay area by 1667 (Quimby 1966, Birmingham 1992). Early historic immigrants in the Green Bay area according to Perrot, Allouez, and others included the Sauk and Potawatomi who had a single village at the lower end of Green Bay, the Fox who initially settled on the Wolf and subsequently along the Fox River, and the Mascouten/Miami and Kickapoo/Illinois who were located up the Fox-Wisconsin River (C. I. Mason 1988, Rusch 1985, Wittry 1963). The Winnebago living in the Green Bay region were reported to have been substantially reduced in number due to warfare with the Indian groups intruding from the east, internal conflicts, and disease (P. Richards 1993a). The Menomini appear to have occupied regions that were not affected by population intrusions, warfare, and disease. The Early Historic period ended around 1670 when the Huron and Ottawa left the Lake Superior region under pressure from the Santee Sioux, and formed a multiethnic community at Michilimackinac.

Early Historic Potawatomi and Huron-Petun-Ottawa occupations have been identified at the Rock Island II site (47 Dr-128) off the tip of the Door Peninsula. This stratified, multicomponent site located in a south facing cove, produced evidence for a series of prehistoric and historic occupations that have been carefully excavated and thoroughly reported (R. J. Mason 1986b, 1990b, 1991, 1992). The earliest Historic component produced grit tempered ceramics identified as Potawatomi (Bell site Type II [Wittry 1963]), lithic tools and debris, and French trade goods including gun parts and personal items such as glass beads, brass tinkling cones, a brass wire bracelet, and a mirror fragment. This first Potawatomi encampment has been dated from archival sources to between A.D. 1641 and 1650/51 (R. J. Mason 1986b:212).

A second Early Historic component at Rock Island II has been identified as Huron-Petun-Ottawa and dates A.D. 1650/51 to 1653 (R. J. Mason 1986b:213). The component is marked by the construction of a palisade which was pentagonal in shape and enclosed about an acre (R. J. Mason 1986b:71-72). It seems likely the fortification was erected by the inhabitants as protection against potential Iroquois raids. Several storage/refuse pits produced fish and mammal bones and charred corn, squash, beans, hazelnuts, cordage, and wood and bark artifacts. Material remains with this component included Huron-like pottery vessels, Bell site type II ceramics, notched filleted ceramics which resemble Illinois types but probably derive from Ontario (R. J. Mason 1986b:215-217), Iroquoian style pipes, stone tools, and carved wood and bone tools including a perforated bear mandible. French trade articles included glass beads, cut kettle brass, iron knives, lead shot, and Dutch and native-made gunflints. The presence of several Oneota and Late Woodland vessels suggested to Mason the possibility that these ceramic types may have persisted into the historic era (R. J. Mason 1986b:213-214).

Early Historic Huron and Petun material also has been reported from the Winston-Cadotte site at La Pointe on Madeline Island, which is part of the Apostle Islands group off the Bayfield Peninsula at the head of Chequamegon Bay. The site, which was excavated in the 1960s by Leland Cooper, has not been thoroughly described (Quimby 1966). A recent inspection of the site materials suggests its earliest occupation may represent the multiethnic Huron-Petun-Ottawa settlement mentioned in the historic records at Chequamegon Bay (Birmingham 1992).

A possible Mascouten occupation has been suggested for the Springview site (47 Gl-132) near the (Upper) Fox River in east central Wisconsin (Rusch 1985). The presence of cordmarked, shell-tempered

sherds and blue trade beads suggested the presence of an early historic nonlocal Indian occupation. More recent investigations at the site, however, indicate that it is unlikely to be the major settlement suggested by the historic accounts for the Mascouten (C.L. Mason 1994a, 1994b).

### Middle Historic Period (1670-1760)

During the Middle Historic period French dominance continued across the Upper Great Lakes and spread throughout the entire Mississippi River Valley. Explorers, missionaries, and traders in the Upper Mississippi basin during the period included Marquette (1669-79), La Salle (1679-82), Hennepin (1679-80), Duluth (1678-87), and Perrot (1665-1695). European trade routes and settlements concentrated along the northwest shore of Lake Michigan, from Green Bay north across the Door Peninsula and chain of islands to the Upper Peninsula. From Green Bay south, trade and settlements extended from Lake Winnebago along the Fox River, to the Wisconsin River and Portage, and westward to the Mississippi River. Major trading centers were present at Chequamegon Bay, Green Bay, and Prairie du Chien. Smaller outposts were constructed by traders and missionaries throughout the French sphere along the Upper Mississippi River and its tributaries, and the Great Lakes shorelines in Wisconsin. French military presence was established in the region to both protect and control the fur trade. Forts were established at Prairie du Chien, Trempealeau, and Lake Pepin along the Mississippi, and at Chequamegon and Green Bay. The most powerful French settlement in the upper Great Lakes region, however, was at Fort Michilimackinac in Michigan.

In northern Wisconsin the multiethnic settlement at Chequamegon Bay on the south shore of Lake Superior was a node for fur trade interests along the upper Mississippi and interior of northern Wisconsin. American Indian groups at Chequamegon during this period included the Ojibwa and Sioux. By the mid-1730s, however, the Ojibwa and Santee Sioux had become competitors for territory and resources in the fur trade (Hickerson 1970). The Ojibwa began to exploit and occupy the interior areas of northern Wisconsin, and the Sioux began to move west into Minnesota. Multiethnic communities were also present in the Green Bay region and included the Winnebago, Menomini, Sauk, Fox, Potawatomi, and others.

This is the period when European trade items become abundant in the archeological record (Quimby 1966, C. I. Mason 1986). French trade goods include copper/brass kettles, iron clasp knives, iron axes and hoes, glass seed and larger multicolored beads, glass bottles, catlinite pipes and pendants, bale seals, gun parts and gun flints, fire steels, Jews harps, Jesuit rings, and religious medals. While native pottery vessels were probably not produced long after the beginning of the period, some stone and bone tools are still found archeologically (C. I. Mason 1986).

The period ended with the defeat of the French by the British at the end of the French and Indian War. The French withdrew, at least politically, from the region in 1763. French Canadian traders remained in many areas, however, and the French influence is still evident around Green Bay, Prairie du Chien, and along the Mississippi River drainage.

The Rock Island II site (47 Dr-128) in northeast Wisconsin produced Potawatomi and French materials from the Middle Historic period (R. J. Mason 1986b). There is substantial archeological evidence for this second Potawatomi occupation of the site between 1670 and 1730 following the Huron-Petun encampment. The second Potawatomi occupation included reuse and rebuilding of the southwest portion of the earlier Huron-Petun-Ottawa palisade, and the erection of two wooden French buildings and an external masonry fireplace. Mason suggests, given the abundance of French trade goods, that the buildings

were used by French traders ensconced in a Potawatomi settlement. The features appear to correspond to a French trading location established by La Salle's voyageurs and visited by him in 1679 (Mason 1986b:17). The ill fated Griffon probably sailed from this spot loaded with furs just before it was lost in a storm.

Ceramics in the second Potawatomi component were dominated by Bell site Type II vessels, which have definitively been assigned a Potawatomi authorship as a result of the Rock Island II investigations. Other material remains included an abundance of bone and antler tools such as points and harpoons along with carved catlinite artifacts such as pipes, pendants, and beads. Bone and catlinite items may have been produced in quantity due to the availability of iron knives. Bear mandible tools were relatively abundant. Stone and kaolin clay smoking pipes were present along with stone net sinkers. Stone arrowheads began to be replaced by metal in this period. French trade goods included glass beads and bottles, Jesuit rings, Dutch gunflints, iron knives, and lead bale seals.

The Bell site (47 Wn-9) along the Upper Fox River in east central Wisconsin has been identified as the grand village of the Fox (Mesquakie, Outagami) from about A.D. 1680 to 1730. Excavations were initially conducted at the site in the 1950s by amateur archeologists and the State Historical Society of Wisconsin while the site was being quarried for gravel (Wittry 1963). Recently the University of Wisconsin-Oshkosh has conducted extensive investigations of the site remnants and reanalysis of several extant collections to clarify the nature and extent of the site (Behm 1992, 1993). Information on the Bell site is also present in the historical record.

Historic accounts indicate the Fox were present in northeast Wisconsin by the late 1660s and settled along the Wolf River west of Green Bay (Wittry 1963, Behm 1993). By 1670 they had moved to the Upper Fox River west of Lake Winnebago. From this location, the Fox were able to control access to the Fox-Wisconsin-Mississippi River trade and travel route, and they established themselves as middle-men in the fur trade with the French. The French made several attempts to dislodge the Fox using the French military and Indian allies. The first French attack in 1716 involved using cannons to lay siege to the fortified Fox village. A second French attack in 1728 caused the Fox to flee their several villages which the French then burned. A series of engagements in 1730 led to the Fox abandoning the area and fleeing to central Illinois where they were defeated by the French and other Indian groups. The Bell site is situated in the mapped location of the Grand Village of the Fox along the Upper Fox River in 1730 (Behm 1993).

Archeological remains at the Bell site include a palisade, several types of structures, refuse pits, and a midden. The palisade appears to have encompassed the 15 acre residential precinct of the site. Limited excavations suggest the palisade was triangular in form with several lobes (Behm 1993:263). The wall had been remodeled during the several reconstructions of the village. Only the western portions of the palisade had been burned, suggesting that the village expanded to the east during its several rebuildings (Behm 1993:260). Houses included rectangular wall trench and single post structures interpreted as summer houses (Wittry 1963). Oval, single post structures interpreted as wigwams, possibly winter residences, were also present (Wittry 1963). Burials were found within the stockade, and in possible cemetery areas away from the village (Behm 1993). Refuse pits were both basin and bell shaped, and a midden deposit filled the gully which bisected the site. Outside the palisade, a light debris scatter suggests the site covered a total of 45 acres. The eighteenth century French maps suggest the outlying zone may have included agricultural fields.

The Bell site material remains were diverse and consistent with a late seventeenth to early eighteenth century date. The ceramics were dominated by Bell site Type I, a distinctive grit tempered everted rim jar which was plain or decorated, with occasional strap handles (Wittry 1963). Decorated vessels had lip punctations and incised filled triangles from the neck to the base (Behm 1993). Bell site Type I ceramics are linked to the Fox based on the Bell site excavations. A minority ceramic type, Bell site Type II, was a grit tempered, cordmarked everted rim jar, with occasional lip crimping (Wittry 1963). Bell site Type II ceramics are linked to the Potawatomi based on the Rock Island II site excavations (R. J. Mason 1986b).

Bell site lithics included small triangular points and Indian and French gunflints, but few scrapers or stone knives were present (Wittry 1963). French trade items included clasp knives, kettle fragments, gun parts, axes, Jesuit rings, and a variety of glass beads. Items probably manufactured by the Fox from trade goods included tinkling cones, shell beads and catlinite pendants. Cast iron grenade fragments from the 1716 French siege were also found across the site. Faunal remains from the site included deer, beaver, turtle, otter, wolf, owl, fish. Plant remains included corn, birch bark, and cattail matting.

An Ojibwa (Chippewa, Saulteur) occupation on Madeline Island has been described at the Marina site (47 As-24) (Birmingham 1992, Birmingham and Salzer 1984). The habitation and cemetery site was apparently situated near the location of the second French trading post established at La Pointe in 1718. The Ojibwa occupation of the Marina site continued until shortly after the French left the region in 1760. Both rectangular and circular single post structures were revealed in the excavations along with numerous storage/refuse pits. Subsistence remains and historic records indicate a reliance on moose, bear, birds, and small mammals. Fish dominated the faunal remains and included sturgeon, whitefish, pike, perch, and suckers. Beaver and other fur bearing animals were important for trade as well as subsistence. Corn, squash, nuts, and berries contributed to the vegetable diet, but no evidence for wild rice was found. The cemetery area of the site, which probably included hundreds of burials, produced evidence of Ojibwa style, single interment graves along with cremation burials. Few grave goods were present.

Material culture remains at the Marina site included items of both aboriginal and French manufacture. Aboriginal ceramics were sparse and included plain ware and vessels decorated with incising and punctates. None of the ceramics were considered to be culturally diagnostic. Lithic tools included triangular projectile points. Bone tools including awls, matting needles, and harpoons were abundant. French items included glass beads, brass kettle fragments, copper projectile points, gunflints, clasp knives, iron awls, and Jesuit rings. Normally perishable items were also found including wool blankets, porcupine quillwork, and birchbark.

The P-Flat site (47 As-47) (Richner 1987, 1989, Birmingham and Salzer 1980) is a protohistoric or historic Ojibwa fish camp located not far from the Marina site on the south end of Manitou Island in the Apostle Island chain. The site produced a limited but uniform ceramic assemblage consisting of plain grit tempered globular vessels with rounded lips and occasional punctate decorations. The ceramics appear to be locally made and may be Ojibwa, as they do not resemble any Late Prehistoric ceramics from the region. Radiocarbon and thermoluminescence dates of several sherds provide a potential age range of A.D. 1650-1800. The lithic assemblage was predominantly quartz and included pebble cores, bipolar cores, flakes, and fire cracked rock. Similar lithic assemblages are known for prehistoric sites in the region

at locales where quartz or quartzite cobbles are exposed near fall fish spawning areas (Benchley et al. 1988). Faunal remains were dominated by fall spawning fish (lake trout, whitefish) which were undoubtedly harvested using gill net technology (Cleland 1982).

Middle Historic Winnebago occupations have been identified from the historic records in the Green Bay and Lake Winnebago regions and along the Fox River. The sites appear to be small, seasonally occupied locales which are markedly different from the large, Lake Winnebago phase Oneota agricultural villages proposed by some as ancestral Winnebago (McKern 1945, P. Bruhy 1981, P. Richards 1993a). The change in Winnebago settlement pattern has been related to the effects of the fur trade which created an increased emphasis on the winter hunt, and on controlling major waterways in the forest oak-savanna ecotone (Kay 1977). The sites appear to include summer agricultural settlements along the Fox River and Lake Winnebago. Some groups travelled to the Prairie du Chien area in the fall and dispersed across the Mississippi River to winter hunting areas for fur bearing animals. After 1728 the Winnebago split into two segments, one of which remained at Doty Island on Lake Winnebago and the other moved to the west with the Fox (Mesquakie). This rift persisted into the Late Historic period when one group of Winnebago was reported living along the Rock River and Lake Koshkonong, while the other resided in the Lake Winnebago and Green Bay region (P. Richards 1993a, Goldstein, Bruhy, and Stark 1983).

Test excavations at the Astor site in Green Bay (Overstreet 1993e, P. Richards 1993a) have revealed a few refuse pits which contain Lake Winnebago Trilled and Bell site Type I ceramics along with a glass bead, kettle brass, and iron clasp knife. Overstreet has interpreted Astor as an historic Winnebago site, although he acknowledges that the association of prehistoric ceramics with historic trade items may be fortuitous. The limited French trade goods reported from the site are not temporally diagnostic, but could date to the Middle Historic period.

A multicomponent prehistoric and historic site at Doty Island on Lake Winnebago has been test excavated (R. P. Mason and C. L. Mason 1993). The historic component at Doty Island Village (47 Wn-30) dates to the Middle to Late Historic period (A.D. 1720-1780). The historic records strongly suggest that the site was Winnebago. Aboriginal artifacts include Late Woodland and Oneota varieties along with Huron and Fox ceramics. The shell tempered Oneota ceramics which dominate late contexts may be Winnebago. French trade items include glass beads, brass kettle scrap, points, and tinkling cones, iron knives and gun parts, catlinite, lead shot, French gunflints, and silver adornments.

### Late Historic Period (1760-1850)

The Late Historic period is marked by the total dominance of European material culture in the archeological record of American Indian sites (Quimby 1966). The British controlled the land east of the Mississippi River after 1760 and established a much more military based rule over the fur trade and settlement than had the French (Wyatt 1986). The French missions were withdrawn and no British missions replaced them. The British were inconsistent in how they administered the fur trade, sometimes allowing many independent traders to operate, and sometimes trying to choke out all trade. The Indians, feeling they needed a reliable source of trade goods, were flexible about their trading partners. When the British were not available, Indians traded with the Spanish west of the Mississippi, especially in the St. Louis area, and with the French in New Orleans. After the end of the Revolutionary War in 1776, although the Old Northwest Territory became American, the British did not leave the area. They maintained a trading and military

presence in the Upper Great Lakes, and did not withdraw from the region until after the War of 1812.

American fur traders were active in the Green Bay and Prairie du Chien regions after 1812. Military outposts were established to protect American trade and settlement at Fort Howard (Green Bay), Fort Winnebago (Portage), and Fort Shelby/Crawford (Prairie du Chien) in the early nineteenth century. American settlement of Wisconsin initially focused on the lead mining district in the southwest corner of the state. The Winnebago, in particular, came under pressure to leave the lead district. During the 1830s the American's negotiated the ceding of Indian lands throughout Wisconsin and Illinois. Blackhawk's band of Sauk and Fox, joined by some Rock River Winnebago, resisted removal and engaged in the last armed confrontation with Americans in southwest Wisconsin in 1832. Most Indian groups either moved out of the state to the west, or were placed on reservation lands in the north by the 1850s. Formal reservations were established for the Ojibwa and Menomoni. Some groups without formal reservations, including some Winnebago and Potawatomi, resisted removal and returned to Wisconsin to settle in dispersed communities. Some lands were also set aside for Indian groups from New York including the Oneida, Stockbridge-Munsee and Brotherton.

Archeologically, this period is marked by the absence of native made products. Native pottery, stone tools such as projectile points and scrapers, and even bone tools are no longer found. British and British Canadian products become common including kaolin pipes, English China, glassware, and particularly Canadian silver. The uniform material culture allows sites to be dated, but there is no way to identify native ethnic differences without historic accounts describing particular sites.

A final historic Indian occupation at Rock Island II is attributed to the Ottawa from 1760 to 1770 and appears to predate any British influence in the region (R. J. Mason 1986b:218-219). Located east of the earlier Potawatomi and French settlement, the Ottawa occupation area included two buildings, a cemetery, and a rich midden. The cemetery reused limestone slabs from the earlier French buildings. By this time aboriginal ceramics were no longer being manufactured, although stone tools such as scrapers, wedges, and gunflints were present. Arrowheads were predominantly brass and iron, but stone points were still being made. The manufacture of bone and antler tools and catlinite artifacts continued to be important. French trade items included beads, bottles, brass kettles, Jesuit rings, iron knives and tools, and both Dutch and French gunflints.

The Winston-Cadotte site on Madeline Island has produced evidence of both Ojibwa and Euro-American occupations during this time period (Birmingham 1992). Both the British and Americans had trading posts nearby. Materials at the site include British gunflints, pipes and ceramics, glass beads, iron tools, birchbark, and Canadian trade silver. A cemetery associated with the Ojibwa occupation has been looted over the year and has produced lavish grave goods.

Burial sites dating to the Late Historic period are recognizable when silver items are present. It is often difficult to assign tribal affiliation, however. Possible Menomoni burials have been identified along the Lower Fox River and elsewhere in east-central Wisconsin (C.I. Mason 1983). Early to middle nineteenth century burials were found at the Bigelow site (47 Pt-29) along the Wisconsin River (Lange 1969). The burials, of unknown tribal affiliation, were intrusive into two Late Woodland mounds. Grave goods included iron knives, fork, and strike-a-light, kaolin pipes, and silver brooches, gunflints, and birchbark. The scanty evidence for historic Indian habitation of the site suggest the

occupation was ephemeral, as might be expected during and after the period of removal of tribes to the west (Lange 1969).

Limited excavations were conducted at the Crabapple Point site (47 Je-93) on Lake Koshkonong as part of a study to identify historic Winnebago sites in southeast Wisconsin (Spector 1974). Features at the site included refuse pits, hearth-like features which may have been lead smelting pits, and pits filled with charred corn and seeds which were probably used for smoking hides. Numerous post holes were found, but no structure patterns could be discerned. Dutch spall type gunflints, a small amount of trade silver, and several bead types date the site to early in the late Historic period (1760-early 1800s). Evidence that the Winnebago may have been manufacturing lead shot (or other lead objects) included lead shot, ore, lead strips and sheets, lead residue, and possible smelting pits. Historic accounts suggest the lead may have been mined nearby. Charred floral remains included corn, chenopodium, amaranth, hawthorn, wild rice, tubers, berries, and fruits. Extensive garden beds were reported at the site around the turn of the century (Spector 1974:239). Faunal remains were dominated by deer and fish. Elk, beaver, dog, raccoon, and turkey were also present. The plant and animal remains suggest the site was occupied during the summer and fall. No pottery or lithic artifacts were associated with the historic component at the site. The historic assemblage did not include copper kettles, iron knives, gun parts, or other items which would be expected at a long term habitation site. This suggests the site may have been a special activity camp, possibly for processing lead (Spector 1974).

The Carcajou Point site (47 Je-2) on Lake Koshkonong also had a historic component (Hall 1962a; Spector 1974). The historic Winnebago occupation has been suggested to be White Crow's village of 1828. However, bead types from site suggest an earlier occupation, possibly dating to the Middle Historic period. Gunflints similar to the Crabapple Point assemblage suggest an early Late Historic date. The presence of silver at Carcajou indicates a Late Historic occupation. Spector (1974) concluded that the Carcajou Point site may have been occupied by the Winnebago in both Middle Historic and early Late Historic times.

The Potawatomi dominated southeast Wisconsin east of the Rock River during this period, and many sites have been identified as Potawatomi in the historic record. No Potawatomi archeological sites, however, have been excavated in this region (Goldstein et al. 1983).

The Marina site on Madeline Island (47 As-2) (Birmingham 1992) contains evidence of an 1830-1850 occupation related to Baraga's Catholic mission. During this period the fur trade was no longer an important economic factor in the region, and the Ojibwa turned to fishing and labor to generate cash. The material remains in the late component reflect the mixed Euro-American and Indian inhabitants of the site. Ceramic kitchen and serving wares were of British manufacture. Iron tools included fish hooks, trade axes and hoes. Smoking pipes were made of British kaolin clay and Indian pipestone. Religious items were abundant as would be expected at a mission. Subsistence focused on local resources such as fish, garden products, mammals, birds, berries and maple sugar. Shortly after this time reservations were established for the Ojibwa on the mainland at Bad River and Red Cliffs, and the Indian occupation of the island ended.

A few late nineteenth and early twentieth century American Indian sites have been investigated in Wisconsin. These include the Potawatomi Indian Farms site (47 Ta-16) in Taylor Co. (Oerichbauer n.d.) which consists of a residential area, dance ring, and cemetery. The Dogtown site (47 Bt-101) (Birmingham 1984) is an early twentieth century Ojibwa site located in Burnett County, northwest Wisconsin. Dogtown includes houses, middens, and possible burials. Several Ojibwa sites investigated

near the Lac du Flambeau reservation in Vilas and Oneida counties have been used to formulate the John Badger phase (Salzer 1969, 1974). Sites such as Badger (47 On-20) and Strawberry Island (47 Vi-25) produced items of predominantly Euro-American manufacture, although local metal working of tin, brass, and iron was evident.

Increasing contact with Euro-American colonists and their market economy had a devastating, albeit variable, effect on native Wisconsin groups. The fur trade focus on harvesting fur bearing animals appears to have produced a new emphasis on a wide-ranging winter hunt. For some groups such as the Ojibwa and Menominee, this may have altered the location and duration of the seasonal round and the social group organization (Hickerson 1970). For other groups such as the Winnebago and Sioux, the fur trade focus was manifest in the summer hunt for buffalo. The Euro-American market also included a demand for sugar, and this may have created a new emphasis on the production of maple sugar in the early Spring for many woodland Indian groups (C. I. Mason 1990).

## Euro-American

### French Fur Trade

French exploration and the fur trade began in Wisconsin with Nicolet's landing near Green Bay in 1634. Missionaries and military outposts accompanied the expanding trade. French settlement focused on Chequamegon Bay on Lake Superior and Green Bay on Lake Michigan. Trade routes to the interior, and especially to the Mississippi River extended from Chequamegon Bay and Duluth inland to the Brule River and the St. Croix River which flows into the Mississippi at River Falls. From Green Bay, important trade routes extended south along the Fox River to Lake Winnebago and west along the Upper Fox to Portage and the Wisconsin River, which flows into the Mississippi at Prairie du Chien.

Although European accounts and maps suggest the potential locations of numerous French forts, missions, and settlements in Wisconsin, none have been documented archeologically (Wyatt 1986). A recent survey of the Lake Pepin area in western Wisconsin (Birk 1994), for example, demonstrated that suspected early French forts established by Perrot were either natural features, unrelated historic sites, or possible forts dating to a later period. Structures related to French traders have been identified archeologically at Rock Island II (R. J. Mason 1986b). Although the official French occupation of the region ended in 1760, many traders and trappers remained in the region. The French presence in Wisconsin has left a strong record in place names, architecture, land ownership patterns, and people who are descendants of French Canadian traders, trappers, and lumbermen.

### British Fur Trade

The British regime in Wisconsin began in 1763 after the French relinquished their North American territories at the end of the French and Indian Wars (Wyatt 1986). The Spanish acquired French lands to the west of the Mississippi at the same time. In Wisconsin the British established trading centers, sometimes with military garrisons, at La Pointe (Chequamegon Bay), Green Bay, and Prairie du Chien. The British trade was hampered by Indians who remained loyal to French traders or preferred to deal with the Spanish in St. Louis. In an attempt to regulate trade, the British did not allow colonists to enter the region. The American Revolution (1775-1783) had little impact on Wisconsin, although a British military expedition was organized at Prairie du Chien against the Spanish, French and Americans in St. Louis in 1779.

After the Revolution Wisconsin, as part of the Northwest Territories, remained under British control, even though it was now American territory. The British Northwest Fur Company monopolized the fur trade across the state and established trading posts at La Pointe, Superior, Prairie du Chien, Milwaukee, and elsewhere. The XY Company formed in 1798 to compete with Northwest Fur. By 1806 the two had merged and in 1821 Northwest joined with the Hudson's Bay Company (Wyatt 1986).

Archeological excavations and reconstruction have been undertaken at a site which was a wintering post of both the Northwest and XY fur companies (47 Bt-26) from 1802-1804 on the Yellow River, a tributary of the St. Croix in Burnett County (Oerichbauer 1982). Archival documents indicate the companies were trading with the Ojibwa in territory that was subject to Sioux raiding (Ewen 1986, Hickerson 1970). The site, which had burned after abandonment, consisted of two contemporary and very short term occupations (Oerichbauer 1982, 1988). The Northwest Company compound included three cabin structures within a palisade wall which had bastions at two corners. An XY Company cabin was located approximately 30 m to the south. Structural remains including posts, floor planking, and clay and rock fireplaces were found with each cabin. Construction techniques included a hybrid of post on sill and post in ground techniques reflecting the French-Canadian background of the traders.

A variety of material remains related to the occupation and trading activities were preserved at the wintering site. Besides wood identified as white pine, structural elements included wrought iron nails and tacks, staples, and window glass. Tools included axes, knives, files, awls, gunparts, gunflints, and scissors. Smaller tools included needles, pins, thimbles, and fishhooks. Clothing items included beads, buttons, buckles, and cufflinks. Silver objects included crosses, rings, brooches, and earrings. Copper or brass kettle fragments, bells, tinkling cones, and rings were also found. The small amount of ceramics included annular and polychrome floral hand painted pearlware, salt glazed stoneware, and kaolin pipes. Remains of a few glass bottles and tumblers were recovered, as were mirror fragments. Floral remains included abundant charred wild rice, along with some corn and berries, which all may have been provided by the Ojibwa. Faunal remains were dominated by deer and beaver, which were also probably provided by the Ojibwa (Ewen 1986). A spatial analysis of the faunal remains revealed that the Northwest traders consumed a greater quality and quantity of meat than the XY traders. Within the Northwest compound the distribution of faunal remains and high status material remains (ceramics, container and window glass, keg spigot) suggested that the chief trader of the Northwest Company and his family lived in Cabin 2, while the chief clerk and voyageurs lived in other structures (Ewen 1986).

### American Fur Trade

The American occupation of the Northwest Territories and Wisconsin began only after the close of the War of 1812 (Wyatt 1986). The American Fur Company established trading posts in many of the same locations used by the earlier British and Canadian traders. Prairie du Chien and La Pointe (Chequamegon Bay) became especially important during the American Fur Trade, and Green Bay and the Fox/Wisconsin River waterway continued as important links to the Mississippi River markets. American forts were established at several locations to protect the traders and other entrepreneurs at Fort Howard (Green Bay), Fort Winnebago (Portage), and Fort Shelby/Crawford (Prairie du Chien) in the early nineteenth century. American settlement of Wisconsin initially focused on the lead mining district in the southwest

corner of the state in the 1820s and 1830s. Numerous militia outposts were established across the lead mining district, many in response to perceived Indian threats in the region. As the fur trade drew to a close in the mid-nineteenth century, Americans began to extract other resources from the region including fish in the Great Lakes, timber in the northwoods, and lead in southwest Wisconsin. Wisconsin became a territory in 1836 and a state in 1848.

Although there is rich documentary evidence for American fur trade sites in Wisconsin, there is little archeological data relating to such sites. A recent archeological survey of the Fox River corridor produced practically no evidence for fur trade era sites (C.L. Mason 1994b). Likewise, archeological surveys and test excavations to locate early American forts have been attempted, but the results have been negative or are unpublished (Wyatt 1986). Considerable archeological research has been undertaken in the Prairie du Chien area by the State Historical Society of Wisconsin and others, but unfortunately little of it has been published or widely distributed.

Limited archeological investigations have been conducted at a few sites associated with American fur traders. The DuBay site (47 Pt-122) in Portage County is a homestead site associated with John duBay, a prominent American fur trader (of French Canadian and Menominee parentage) and entrepreneur in north-central Wisconsin. The DuBay site was excavated in the 1940s by Philleo Nash and Winslow Walker, who believed the site was duBay's trading post. More recent analyses of the material remains, however, indicate that the site was the mid-nineteenth century (1839-1886) homestead of the duBay family (Abler 1964, Wackman 1991). The locations of other trading posts are known, but professional archeological investigations have not been undertaken (C.I. Mason 1983, C.L. Mason 1994b).

Archeological research has been employed in a sometimes futile effort to locate early nineteenth century forts and militia outposts (Wyatt 1986). One militia fortification associated with the Blackhawk War (1832), Fort Bluemounds in Dane County, is currently undergoing archeological investigations (R. Birmingham, personal communication). Archeological investigations have also been conducted at a reported battle site associated with Blackhawk's defeat (Boszhardt 1992).

## Lead Mining

The lead mining region of Wisconsin is located in the unglaciated or "driftless" southwestern corner of the State and centers on Iowa, Grant, and Lafayette counties (Wyatt 1986). The lead, and later zinc, resources of the region were easily identified and relatively easily mined from the exposed limestone bedrock of the region. The lead resources had been exploited prehistorically in Archaic, Middle Woodland, and Mississippian times probably for use as pigment (Walthall 1980). French fur traders and historic Indian groups also mined lead for ammunition, ornaments, and trade.

The lead district was commercially exploited initially in the 1820s and 1830s by American miners. Place names such as Mineral Point, Lead Mine, New Diggings, Hard Scrabble, and Galena (in northwest Illinois) reflect the local industry. In the nineteenth century lead was important not only for bullets, but also for the manufacture of paint, weights, pipes, and pewter. The region was one of the most densely settled at the time of Wisconsin statehood in 1848. American miners came from the lead mine district in Missouri and across the mid-South. British Isles settlers were also important in the region, particularly Cornish miners. The growth of mining communities spurred the establishment of mills and overland transportation routes. Farming also became important in the region by the time it was officially opened to

settlement in the 1830s. The importance of lead mining declined by 1850, but after the Civil War deeper zinc deposits in the region were exploited. Zinc ore was transported via railroads to smelters outside the region until a smelter was built at Mineral Point in 1882. Zinc was used in the production of paint, brass, and architectural details such as molded ceilings and walls. The zinc industry declined in the region after 1920.

The intensive historic lead mining produced a cultural landscape of clustered settlements, mining pits and holes (called diggings), and smelting furnaces that provides an interesting context for archeological investigations (Brazeau and Lusk 1992). To date, however, no archeological investigations of intact lead mining resources have been reported in Wisconsin.

## Settlement

Following the fur trade and early lead mining eras in Wisconsin, the territory was opened to general settlement and new commercial enterprises in the 1830s (Wyatt 1986). Families from the Northeast and Mid-South, along with immigrants from the British Isles and Canada moved to the region to establish farms and businesses. In some areas enclaves of other immigrants were established, such as Germans and Norwegians in southern Wisconsin, and free African Americans in southwestern Wisconsin. Lands in the southern part of the state were cleared for farming, saw and grist mills were constructed, and local service centers developed. The increasing demand for lumber to build houses and ships spurred the beginning of the logging industry along the Wisconsin River. Local extractive operations were established including lime and limestone for construction of buildings, and clays for brick and pottery production. Commercial fishing along the Lake Michigan and Lake Superior shores supplied local markets. Water transportation of people and goods through muscle, wind, and steam power was of great importance especially on the two Great Lakes and the Mississippi River. Until the construction of railroads in the 1850s, rugged overland roads provided the only transportation routes inland. Unfortunately, no archeological investigations pertaining to the initial Euro-American settlement of Wisconsin have been reported.

## Rural, Urban, and Industrial Development

Following the mid-nineteenth century and especially after the Civil War, settlement and industry increased rapidly across Wisconsin (Wyatt 1986). Immigrant groups included British Isles (particularly English and Irish), Germans, Norwegian and other Scandinavian groups, Swiss, Dutch, Belgians, Polish, Eastern European. Many of these immigrant groups settled in rural parts of the state and established family farms. Rural ethnic enclaves in various parts of the state included German (E), English/Irish (S), Swiss (SW), Norwegian (SE and NW), Belgian (NE), and Czech (NE). Other Scandinavian groups such as Swedish and Finnish settled in northwestern Wisconsin during the harvest of the forests and attempted to transform the cutover lands into farms. These ethnic enclaves provide an intriguing context for archeological research into nineteenth century settlement, but little has been attempted in Wisconsin.

Rural settlement was an important part of Wisconsin's nineteenth century history. In the southern part of the state farming initially focused on wheat but soon diversified to include multiple crops, vegetables, and a variety of livestock. By the end of the nineteenth century Wisconsin farmers began to emphasize dairying and the commercial production of milk, butter, and cheese (Wyatt 1986). Important rural enterprises



included blacksmith shops, mills, breweries, cheese factories, brick works, lime kilns, inns and taverns, stores, post offices, churches, and schools.

Although numerous farmsteads and homesteads have been identified as archeological sites during the last two decades of compliance archeological surveys in Wisconsin, practically none have been investigated beyond identification, limited archival research, and occasional test excavations (Salkin 1994a, Rusch and Penman 1982, Cassell and Holtz 1995, Cassell and Broihahn 1996). Large scale excavation has been conducted only at the Warren House site (47 Da-910) in Dane County (Porubcan and Benchley 1995). The site marks the remains of a house and cistern which archival and archeological data suggest were built and used between 1852 and 1866. The house was a second residence on the prosperous Hawes family farm. The main house served for a time as an early Traveler's Home located on the outskirts of Verona, a small town between Madison and Mineral Point. The second house was built by Warren, one of the Hawes sons, who subsequently took over the farm and moved into the main house by 1856. Archeological data revealed a family with young children were the first occupants of the site. A second, brief occupation appears to have been by a small group of adult males and females, possibly tenants or laborers. The house was abandoned and dismantled before 1873. Material remains indicate the site inhabitants participated in the mid-nineteenth century farm and market economy, although local resources including berries, waterfowl, small mammals, and fish were also collected. The short term use of the site provided a rare context for the analysis and interpretation of mid-nineteenth century material culture and lifeways in southeast Wisconsin.

Excavations at the Jackson House (47 Kn-118) (Wackman 1990) revealed structural and material remains related to a mid-nineteenth century inn in rural southeast Wisconsin. Although the archeological report describes mid-nineteenth century material from the site, the building apparently was in use through the 1930s and was still standing in 1988. Most of the archeological contexts at the site were disturbed and mixed with later twentieth century materials. Remnants of what may be a nineteenth century midden produced a faunal assemblage which suggests beef was the preferred meat source, although pig and sheep were also present along with a variety of locally obtained small mammals, birds, and fish.

Recent archeological investigations have identified a series of nineteenth century rural sites in the Door Peninsula including farmsteads, mills, mill towns, brickworks, and cheese factories which may be investigated prior to planned highway construction (Benchley et al. 1994, Benchley, Weston and Koster 1995, Weston, Benchley and Koster 1996, Benchley 1995, 1996a). An 1871 fire across the region catastrophically destroyed several homesteads and towns. These sites have high potential for intact archeological remains and may provide important information on nineteenth century industry and ethnicity in the region.

Archeological investigations of nineteenth and twentieth century rural sites in northern Wisconsin have also been conducted at a limestone quarry (Dirst 1994), mill (Patrick Martin, personal communication), industrial brickyard (Hamilton 1988), and several shipwrecks (David Cooper, personal communication) in the Green Bay region. Test excavations were also conducted at a late nineteenth century fish camp in the Apostle Islands in lake Superior (Richner 1991).

In the mid-nineteenth century commercial centers developed along Lake Michigan and Mississippi River ports, particularly at Milwaukee, Green Bay, and Prairie du Chien. The construction of canals, railroads,

and overland roads spurred the growth of new land-based centers, and strengthened the position of some towns at water and land transportation nodes. Growing urban nodes connected Wisconsin farms to the economy by providing markets, slaughter houses, tanneries, a variety of mills and mill products, building materials, shipping outlets, and other goods and services. The urban and industrial areas of southeastern Wisconsin were particularly attractive to ethnic groups such as Germans, Irish, Polish, Russian, and Italian (Wyatt 1986).

There have been relatively few nineteenth century urban or industrial archeological investigations reported in Wisconsin. Limited archeological survey and testing have been conducted at the Greenfield Lime Industry District in Milwaukee County (1850-1900) (Benchley 1989b, Benchley and Newell 1990). This lime industry complex included the remains of at least four types of kilns ranging from individual household production pits to large scale industrial kilns, along with large quarry pits. Portions of the district have been reconstructed and incorporated into a county historic site, but little of this reconstruction was based on archeological investigations. The reconstruction and interpretation of one outbuilding was aided by archeological work (Demski 1980). The remains of a small 1850s homestead and the earliest kilns (Benchley 1989b) were destroyed by residential development before archeological research was completed.

Limited archeological investigations have been conducted at a few other historic sites in the Milwaukee area. An archeological and architectural survey of the Milwaukee Road Shops complex, an 1890s railroad industry site in the Menomonee Valley resulted in the documentation of some of the extant structures (Benchley, Birmingham, and Vogel 1983). Survey and limited test excavation projects have been performed on the uplands above the Menomonee Valley at the Milwaukee Veterans Administration Medical Center, a hospital facility established at the end of the Civil War (Van Dyke 1990). Here the foundations of a nineteenth century barracks building were relocated, but no meaningful context for research was identified (Benchley 1992).

There are probably numerous limited distribution reports of archeological investigations in towns and cities of Wisconsin which investigated nineteenth century remains, but only a few have been widely distributed. Excavations have been reported at a mid-nineteenth century site in southwest Wisconsin. The Brower site (47 Cr-437) in the City of Prairie du Chien was the location of a three story wholesale drug and grocery store dating 1857-1875 (Salkin 1990). The business was established just as railroad service was extended to the area from Milwaukee. Mitigation excavations revealed an undisturbed assemblage of structural and abundant material remains relating to this commercial establishment. Spatial distributions of various artifact classes suggest several activities occurred in the basement of the building, including storage of drug supplies and containers, manufacturing, and possible residential use. The material remains reflect strong connections to the East Coast and the importance of railroads in the transportation of goods and people.

A late nineteenth century shoemaker's shop was investigated at Mineral Point in the lead mining district of southwest Wisconsin (Penman 1978). The shop was constructed in 1882 and used through at least 1917. Excavations revealed the foundations of the shop and an earlier house. Following abandonment, the area became a secondary refuse dump and the structure fill deposits were highly disturbed. The limited undisturbed deposits produced artifacts related to the shoemakers trade along with late nineteenth century ceramics and bottles. The ceramics were primarily of American manufacture. Faunal remains suggested the shoemaker (or a resident of the shop) consumed relatively low status

cuts of beef, along with mutton and wild game such as ducks and passenger pigeon.

In northern Wisconsin, the principal industry and catalyst for settlement was the harvest of the pinelands and later hardwoods. Lumber companies bought up vast timberlands, cut the pine, and floated the logs down river to mills at the river mouths or to be rafted to commercial centers. The pine was sawed into lumber for building ships, houses, barrels, and made into other products such as shingles and railroad ties. At about the time the pine was logged out of Wisconsin at the end of the nineteenth century, railroad transportation was adopted by many lumber companies. Railroads were used to haul hardwoods and cedar out of the forest, which resulted in extensive tracts being clear cut of timber. New company facilities grew up in some areas to process the wood into a variety of products including furniture, bowls, charcoal, railroad ties, and chemicals using steam powered engines. The cleared lands provided opportunities for farmers and homesteaders to settle, although much of the land turned out to be marginal for agriculture. The clearcut lands also provided ample dried fuel for forest fires, which burned over many parts of the state through the turn of the century. Much of the cut over land reverted to public ownership and national, state, and county forests were established to manage soil erosion and replant trees. By the mid-twentieth century the focus of logging had shifted to cutting pulpwood from second growth forests for manufacturing paper, and transportation was by truck.

Sites related to the logging industry in northern Wisconsin have been researched by historians (Vogel 1980, 1983) and cultural geographers (Rohe 1972, 1985a, 1985b, 1986) as well as archeologists. While some research has attempted to understand regional or drainage wide patterns (Rohe 1972, 1985a, 1985b, 1986, Birmingham 1985), most archeological investigations have focused on locating and evaluating individual sites for compliance projects for the Nicolet and Chequamegon National Forests (Overstreet 1982, Stiles 1994). For example, over 500 logging related sites have been reported since the 1970s in the Nicolet region including camps, dams, mills, roads, and railroad spurs (Stiles 1994). Over 60 of these have been evaluated through survey, mapping, and limited archival research into their dates and ownership history. Fewer than five sites have been archeologically tested, and none have been excavated (Stiles 1994). Although there is a considerable potential for investigating a variety of archeological research questions relating to ethnicity (Dinsmore 1985), material culture and style (Franzen 1992), foodways (Franzen 1992), settlement organization (Rohe 1985a), gender (Brashler 1991), technology (Vogel 1980, Benchley et al 1993), site location patterns (Rohe 1972, Karamanski 1984, Birmingham 1985, Benchley 1996b), and local history (Karamanski 1989), such studies have not yet been completed by archeologists working at Wisconsin logging era sites.

The mining industry also made attempts to extract mineral resources such as copper and iron, particularly in the northern part of the state. None of the mineral deposits appear to be as rich, concentrated, or accessible as those as neighboring Upper Michigan and Minnesota, however, and few mineral mining operations in Wisconsin had much duration. No archeological investigations have been undertaken at mining related sites.

Although military sites are known from the historic record in Wisconsin, they have received little archeological attention (Wyatt 1986). The locations of most French, British, and American fur trade era military posts have not been confirmed archeologically. One settlement era post, Fort Blue Mound, is currently being examined (R. Birmingham, personal communication). Several Civil War training camps in southeast

Wisconsin are known or suspected from historic records, but no archeological research has been undertaken at them. The Veterans Administration hospital in Milwaukee County, which was established following the Civil War, has identified prehistoric sites on its facility, but has not identified or evaluated most of its historic archeological resources (Van Dyke 1990, Benchley 1992).

A small number of federal military installations in Wisconsin date to the twentieth century. Fort McCoy, Wisconsin's only currently active Army military base, was begun in 1909 and has been used as an artillery training facility for the Army and the National Guard, a supply depot, CCC camp, and World War II prisoner of war camp (Salkin 1994, Spencer 1996). The facility has sponsored numerous archeological investigations for both overall planning and project specific undertakings. Prehistoric sites dating from Late Paleo Indian through Late Woodland or Oneota have been identified, and a few have been test excavated. Most sites have been found to represent ephemeral use of the well drained sandy terrain. Historic non-military sites include numerous nineteenth and twentieth century farmsteads, and several mills, schools, and cemeteries. Military facilities which may include archeological resources include the original encampment area, the pre-World War II Camp McCoy, CCC camps, and the World War II Fort Mc Coy cantonment (Salkin 1994). Recently documentary and archeological data were used to investigate the remains of the World War II prisoner of war camp, which was considered eligible for the National Register based on its historic importance, even though its archeological context has been severely disturbed by demolition and later activities (Spencer 1996).

Archeological and historical research has been conducted on nineteenth and twentieth century shipwrecks in Wisconsin waters in recent years under the auspices of the Corps of Engineers (Berwick 1992) and the State Historical Society of Wisconsin (Cooper 1992). Underwater archeological survey has focused on the shorelines of Lake Superior and Lake Michigan, especially in the region of the Apostle Islands (Carrell 1985, Cooper 1991) and the Door Peninsula (Cooper 1989 and personal communication). Numerous shipwrecks have been located and documented for nomination to the National Register through an innovative research program which incorporates sport divers and students. Research has also been conducted into shipwrecks along the Mississippi River (Jensen 1992), especially in the La Crosse area (Berwick 1992) and in Milwaukee Harbor (Watts 1992).

## Minnesota

A traditional point of view in archeology was that the contact period represents the beginning of the "historic" period and that scholars could learn most of what they needed to know from written records. Archeological investigations of contact period sites were often seen as simple exercises in the validation of the written record or as a prelude to reconstruction of a fort, a camp, or similar site. There is also a deep-rooted and almost subconscious belief that history really begins with the arrival of Europeans in Minnesota. Put more bluntly, the assumption is that history begins when Euro-Americans appear on the scene.

For many prehistoric archeologists (who tend to dominate the field in North America), the contact period is difficult to deal with. For example, in a recent review of Great Lakes archeology, Mason (1981:1-4) refers to the "beheading of prehistory." Mason's point is that: "There is something of a mystery—an inescapable and pervasive quality of uncertainty—variable in intensity from region to region and time to time, regarding the precise nature of the indigenous societies whose careers

were so dramatically redirected, if not terminated, by the coming of European man" (Mason 1981:4).

The difficulty with this perspective arises when the contact period is perceived as a time when prehistory ended and the 'historic period' begins. No longer is the archeologist dealing with 'ceramic cultures' or 'tool assemblages' but groups of human beings who are described in written records and who engage in all the activities that humans are wont to do. No longer are the people who created the archeological record hidden behind the artifacts. During the contact period, they confront us directly and bridging this gap between artifacts and people requires a conceptual leap that is often difficult to make.

Rather than viewing the contact period as a gaping chasm between prehistory and modern times, it may be more useful to consider this time as a bridge and to examine the types of continuity and disjunctions that existed. Certainly for American Indian people, their history does not begin with the arrival of the French, but rather continues back in time to the beginning of the world as they defined it. Similarly, there are intriguing continuities from earlier times in how modern people utilize the landscape they live on and where their towns and cities are located. These continuities are only now beginning to be recognized and explored.

In a similar vein, the concerns of American Indian people and their own perceptions of their history pose a problem for the scholar. Until quite recently, the standard view of the Contact period focused primarily on the machinations of the European powers that were present in Minnesota throughout the period. While useful in some respects, this "Euro-centric" approach ignored the larger portion of the people living in Minnesota. Roger Buffalohead, in his introduction to a recent edition of William Warren's *History of the Ojibway people*, makes this point quite clearly:

Problems of understanding and writing about American Indian history and culture rise like specters from the tragedy of the past to haunt the realm of professional scholarship. These problems will remain until the historical knowledge transmitted by the first people of this land secures genuine equality in the intellectual foundations of contemporary knowledge and scholarship. While much scholarly revision has taken place in recent years, new perspectives continue to shatter old myths and are themselves called into question. Historians, cultural anthropologists, and contemporary tribal members all have viewpoints and questions that must be taken into consideration, striking a proper balance among these concerned and contentious parties may, however, be impossible. In this fluid and challenging context, the reexamination of such classics as Warren's history helps us to understand better the people whose life beckons for truth, both to heal the past and to initiate new beginnings in a relationship spanning the whole of American history. (Warren 1984:xiii).

The fur trade was an important part of the economy and history of the contact period and has often been used as a definitive model of inquiry for the seventeenth through the nineteenth centuries. As Gilman (1974:3) puts it: "The North American fur trade meant many different things in different times and places. It was the first economic link by which Europeans reached out to grasp the wealth of a new continent. It was the first avenue through which native Americans adapted their traditional cultures of Europe. And for more than two centuries, it was the main channel through which these two widely different worlds came into contact." Because of its important and pervasive character, studies

of the fur trade have tended to dominate the public and scholarly perception of early Minnesota history. As Birk (1988b:1-3) has recently observed:

Early Great Lakes history is often treated topically and chronologically as an era of European-Indian transactions known as the 'fur trade'. In Minnesota, where I come from, a long line of scholars with widely different backgrounds and expertise have written papers, dug sites, exhibited materials, and attended conferences - all in the name of the 'fur trade'. To categorize their work and subject matter under this single unified theme may be working to over-simplify the past, mislead the public, stifle creative research, and inhibit the preservation of important archeological sites. There is no doubt that 'fur trade' is a loaded term steeped in imagery. A large segment of the public, content with an uncomplicated vision of the past, see it as a romantic time when carefree voyageurs sang and paddled their way across the continent in search of furs and adventure. Others, less afflicted by the Hollywood drill, view the fur trade as a procession of explorers and company mergers, a series of conflicts and treaties, a web of cultural ecological shifts, of an arena where the Old and New Worlds met to exchange genes, ideas, and merchandise. Most scholars are aware of this 'identity crisis' and accept fur trade studies as a field of research covering a broad range of human and natural subjects. They recognize that the nature of their inquiries is changing and welcome the trend towards new interests and approaches . . . Unfortunately, some in the historical and anthropological professions embrace a more parochial view. They see 'the' fur trade as a trite and requisite part of Great Lakes history that uniformly conditioned inter-cultural encounters and led to inevitable Euro-Canadian or Euro-American domination in the nineteenth century. Some privately argue that fur trade studies have been overdone and seriously question the utility of researching a subject or time that is so completely known! . . . Combining the idea that the fur trade was a romantic era now being studied to death, with the notion that archeology is a trivial pursuit, has done little to excite public support for 'fur trade archeology' in Minnesota. The general lack of enthusiasm has also inspired few efforts to preserve historic sites identified with the fur trade. The generic, one-explanation-fits-all, fur trade concept may even lead to prophetic scholarship in the sense that it can seriously affect how early historic records and materials are gathered and used. To consider the rich and diverse European interactions as just so many facets of a single, uniform economic experience maybe limited our capacity to know and explain many broader issues. For these reasons, when studying French fort sites in the Minnesota-area I prefer not to think of them simply as fur trading posts, but rather as places associated with European global expansion and cultural exchanges that went far beyond the mere act of swapping furs and kettles. Minnesota's French forts are material expressions of past human thought and enterprise; frozen time capsules that reflect the ability and resolve of French colonials in dealing with austere and often uncertain conditions on the western edge of their known world.

It is a truism that people — collectively and individually — tend to see the past through the mirror of their own culture and experience. Thus, many Minnesotans today perceive early Minnesota as filled with French explorers, British traders, enterprising Americans, and so on. In reality, the number of Frenchmen in Minnesota at any given moment in the seventeenth century probably would have been less than 100 and

the number of Euro-Americans in the state did not exceed the number of American Indian people until sometime after 1850. Similarly, it is common to see reference to 'the virgin wilderness' which Euro-American explorers 'discovered'. In fact, the Minnesota landscape had been used and modified for thousands of years by human beings and had been 'discovered' by American Indians by the end of the last glacial age.

To develop units of study for the contact period requires an approach that takes into account both the point of view of Euro-American explorers and traders, and the American Indian groups with whom they interacted. Although the relationships between Euro-Americans and American Indians were inextricably intertwined, the perceptions of each group and the types of preservation issues that arise are distinctly different.

Therefore, we have divided the discussion of the contact period here into both Euro-American and Native American units. Following existing practice, three Euro-American units are examined. These are the French, British, and Initial United States Presence. The justification for this is presented by Birk (1988a:3) who says:

Because pre-1849 (pre-territorial) source materials in Minnesota often reflect inter-relationships between Indian and non-Indian peoples, most treatments of the early historic past relate something of either group regardless of perspective. Indeed, the affairs of these groups were so interwoven that they form the warp and woof of early history in the western Great Lakes (Kellogg 1925:x). To explain European presence in Minnesota before the era of modern settlement, historians usually divide the historic past into the French, British, and American regimes (Nute 1941:5-10; 1960). Though ethno-centric in name and perspective, these regimes define eras when foreign national groups claimed or exercised economic, military, and political control of Indian peoples or territories in the Northwest. The regimes also marked periods of shifting inter-cultural relations. It was through 'regimes' of commerce, that Indian and non-Indian groups met to exchange news, ideas, technologies, genes, and materials (Kellogg 1935:ix). The notion of intercultural 'regimes' is most valid in viewing earlier periods when Indian groups played a decisive role in shaping historical events in Minnesota. After the Civil and Indian wars of the 1860's, the 'frontier' qualities of the American regime quickly evolved into the period of 'modern' statehood (an evolution that occurred earlier in southern Minnesota than in the north).

Five Native American contexts are also defined here. These are the Chiwere Siouan language group (which includes Ioway and Oto, but could also include Winnebago and Missouri), Eastern Dakota; Teton/Yankton; Ojibway; and Assiniboin. Several other approaches to delineating these units have been discussed, and the difficulties this approach presents are freely acknowledged. However, for our purposes here this delineation seems most useful.

There is a vast literature on the history of the Euro-American and Native American topics, and there are numerous archival sources of importance. In the presentation that follows, the principal emphasis is on archeological concerns. Only the principal references have been listed, since extensive discussions of the historic literature are available elsewhere.

### Chiwere Siouan Language Group (Ioway, Oto)

In 1938 Mildred Mott Wedel (Mott 1938a, 1938b) suggested that archeological sites associated with the Orr focus in southeastern Minnesota and northeastern Iowa were, in fact, villages that had been

occupied by the Ioway group of American Indians. Since that initial publication, Wedel (1959, 1976, 1981, 1986) has strengthened and refined her discussion of the Ioway. In a recent publication Wedel (1986) presented a comprehensive picture of the European interaction with the Ioway and a model of Ioway life in the seventeenth century.

The Ioway and Oto are included in the Chiwere Siouan language group. As a whole, Siouan is divided into the Eastern, Central and Western divisions. Dakota, Dhegiha, and Chiwere-Winnebago are the principal groups within Central Siouan. The Chiwere group includes the Ioway, Oto, and Missouri groups. Winnebago is closely related and is sometimes included within Chiwere. Chiwere-Winnebago is most closely related to Dhegiha (Quapaw, Kansa, Osage, Omaha-Ponca) and less closely related to the Dakota language group (Assiniboine, Stoney, Teton-Yankton-Santee), although there has been considerable borrowing of words from the Dakota group. Springer and Witkowski (1982) have presented a comprehensive historical-linguistic study of Central Siouan languages and argue that Chiwere, and to a lesser extent Dhegiha, can be linked to the Oneota archeological complex.

The Ioway, Oto, and Missouri were closely related and shared ties of language, belief, culture, and kinship. Oral histories of the Oto indicate that at one time these three groups were one and that they subsequently split apart (cf. Whitman 1937:xi). In any case, it is reasonable to assume that all three shared a common ancestry.

In the seventeenth century, the Ioway were living along the Mississippi River in southeastern Minnesota, but the exact location of the Oto and Missouri groups remains unclear. There is some tentative evidence that the Oto may have lived somewhat west of the Ioway.

During the contact period, the Ioway are the best known of these three groups and were probably larger than the Missouri. The population size of the Oto is essentially unknown. Although the French had heard of the Ioway as early as the mid-1650s, the first face-to-face contact with Ioway people was at a Winnebago village near Green Bay in 1676. Pere Louis Andre described this meeting as follows:

We have seen this year at the home of the puants [Winnebago] 7 or 8 families from a nation neutral between our Indians [Algonquians] and the nadoessi [the Ottawa word for Siouan speakers] who are at war. They are called aiaouaor mascouteins nadoessi. Their village which is 200 leagues from here is very large but poor, since their greatest wealth is in buffalo hides and red stone calumet pipes. They speak the language of the puants.<sup>1</sup> (Translated by M.M. Wedel in Wedel 1986:15)

Father Andre's characterization of the Ioway as poor is misleading, since it represents a European's judgment uninformed by clear knowledge of the local situation. The pipestone calumets which he refers to were of inestimable value and the bison hides, to which the Ioway had easier access than did the Winnebago, were also of tremendous importance (cf. Wedel 1986:16).

Michel Accault visited the Ioways in the years 1678 and 1679 to obtain bison hides in trade. The Ioways would have received a variety of European trade goods in exchange for these hides (e.g. knives, needles, kettles, blankets, etc.). Subsequently, Nicholas Perrot visited the Ioway in 1685 to trade for furs. By this time, the focus of the fur trade had shifted from bison to beaver and individual Frenchmen were reaching out to the western tribes, rather than relying on Indian middlemen to handle the trade. Perrot convinced the Ioway to go on a beaver hunt to the west of the Mississippi in the winter of 1685-1686 and Perrot provided them equipment for this project. When they returned from this hunt, which presumably took place in the lake region of southwestern Minnesota and northwestern Iowa, they evidently took

Perrot to their village or villages on the upper Iowa where they adopted him as a chief of their tribe through a performance of the Calumet Ceremony (Wedel 1986:47)

The shift in French policy had disastrous results for the Ioway. Wedel (1986:46-48) summarizes the events of this period as follows:

The Ioways close friends in this period [1650-1700] are revealed to have been the Oto Indians whose Chiwere Sioux dialect reflected their age-long kinship, and the Winnebagos who were also Siouan-speakers. Otos often hunted with the Ioways, and it is implied that the Winnebago Indians may also have joined them at times on hunting expeditions. The Ioways must surely have traveled west to the Oto and Omaha villages although this author has no record of such visits until they sought refuge with the Omahas around 1699 . . . Although it is said that at times in the past some of the Illinois bands had made trouble for the Ioways, the Dakota Sioux to the northeast of them were reported to be generally friendly in the early decades of the latter half of the seventeenth century. So were the Algonquians who had recently moved into the Wisconsin area. It would be a reasonable guess that the Ioway village hunts in the Little-prairie region up until the 1680s were carried on under relatively peaceful conditions. But when the Frenchmen came into the area west of Lake Michigan—both explorers and traders who sought to acquire bison hides and later beaver furs in exchange for metal trade items, glass beads, guns, and ammunition—intensive rivalry and hostility developed among the Indian peoples occupying the Mississippi River basin . . . Algonquian-speakers, particularly the western Mascoutens, were antagonized by this development. They did not want trade items carried to Indians, such as the Ioways, who lived west of their villages. Especially, they were concerned that firearms taken to more westerly people would enable the latter to protect themselves from the gunbearing Eastern tribes who at the moment were able to dominate them . . . It was in the late 1680s (M.M. Wedel 1976:29) that the Ioway tribe came to the decision that it must move its semi-sedentary settlement(s) farther west near Spirit Lake [in northwestern Iowa], nearer to the Otos, in the hope of being able to live there in greater safety. However, it seems that even in the next decade the western Mascoutens may have pursued the Ioways all the way to their new home. Having dared to defy the French and to openly declare war against the Ioways whom the Frenchmen considered to be allies, the western Mascoutens made their way to the Iowa large (*grande*) village where, it is said, they cut to pieces all the inhabitants (B. de La Potherie 1722,2:291; Blair 1912:88) . . . Le Sueur was informed in 1700 by traders he sent to the Ioway village near Spirit Lake (M.M. Wedel 1981:4) that it was then deserted and evidently had been for the past year (AM,2JJ56-9:55). Its inhabitants had joined their friends, the Omahas (M.M. Wedel 1981:4), who were living perhaps on the Big Sioux River, near the mouth of Blood Run Creek, where the Blood Run archeological site lies. From there, at Le Sueurs invitation, the Ioways evidently moved east to live for a time in 1701-1702 near Fort liHuillier on the Blue Earth River. The French post was abandoned in 1702. The Ioways must then have returned to the Spirit Lake region.

The tenure of the Ioway and Oto in Minnesota during the contact period was brief. Because of changes in French policy and increasing warfare, the Ioway and Oto were forced westward out of their ancestral homes at a very early period. However, this does not negate the

importance of these groups. There is clear evidence that the Orr focus archeological materials are the product of Ioway people (cf. Mott 1938a, 1938b; Wedel 1959, 1976) and it is hypothesized that at least some of the Blue Earth Oneota materials may represent the Oto (cf. Dobbs 1984:218-229). It is conceivably possible (Dobbs, unpublished research) that the extensive Oneota materials around Red Wing may also represent ancestral Chiwere Siouan peoples. If this is indeed the case, then Chiwere Siouan-speaking groups dominated most of south-central and southeastern Minnesota for at least 700 years.

## The Eastern Dakota

The Eastern Dakota were perhaps the largest and most widespread of the American Indian groups living in Minnesota at the beginning of the Contact period. The traditions of Dakota people and archeological evidence indicate that Minnesota had been their ancestral home for many years prior to the arrival of Euro-Americans.

Gary Anderson, using admittedly shaky evidence, has estimated that there were 38,000 Eastern Dakota people in A.D. 1650 (Anderson 1984: 18-19). There are four major groups within the Santee or Eastern Dakota. These are the Mdwekanton, the Wahpateon, Wakpekute, and Sisseton. These groups are linguistically and culturally related to the more westerly Yankton and Yanktonai (Dakota), Teton (Lakota) and the Assinboin.

Although the best known of the Eastern Dakota villages in the seventeenth century are those at Mille Lacs Lake (Izatsy), there were probably villages at Sandy, Red, Cass, Leech, and Winnebigoshish lakes as well. Certainly there were villages at these locales in the early eighteenth century.

The available evidence indicates that Dakota people occupied most of the Lake-forest biome of central and northern Minnesota. Wild rice, game, bison obtained from the prairies to the west, and a variety of other resources formed the basis for their economy in this region. Johnson (1985: 162-163) has argued that the term forest fringe dwellers may be most accurate in describing the subsistence economy of the Dakota in the seventeenth century.

The French had heard of the Dakota for at least twenty years before they actually met them and used numerous variations of the Algonquian term =‘Nadouessiw’ (meaning snakes or adders, and by extension enemy) to refer to these people. The French subsequently shortened this name to Scioux and later Sioux (Meyer 1967:5).

The first recorded contact between Dakota people and the French took place in the spring of 1660 at a rendezvous in what is now northwestern Wisconsin or perhaps eastern Minnesota. The French explorers Pierre Esprit Radisson and Medard Chouart, Sieur des Groseilliers had arrived the previous autumn at Chequamegon Bay on Lake Superior and had spent the winter at an Indian village in the interior, perhaps on Lac Court Oreille (Meyer 1967: 1). In the spring, eight ambassadors from the Dakota brought food (including corn and wild rice) to the French, who had nearly starved during the winter. Subsequently, eighteen nations came together for a Feast of the Dead, a particularly spectacular affair. At subsequent councils, the Dakota offered presents to the French, placed themselves under their protection, asked the French to visit them at their homes to the west, and requested firearms from the French (Meyer 1967:2-3). Radisson subsequently made two trips to the west. One of these was a peacemaking mission to the Cree, where he was accompanied by about 50 Dakota, and the second was to the prairie Sioux or nation of the beefe (Meyer 1967:3).

The first Europeans to visit the Dakota at their principal center near Mille Lacs Lake were Daniel Greysolon, Sœur du Luth, and Father Louis

Hennepin, a Recollect missionary. Du Luth planted the French flag at the village of Izatys on July 2, 1679 and left only a brief statement about his achievement. Hennepin had been captured by the Dakota in April of 1680 and was held captive at their village for about 3 months until his release was obtained by Du Luth. Hennepin's account of this captivity, although written in terms of his own culture and often exceptionally self-serving, provides an intriguing written account of Dakota life at the end of the seventeenth century. Other French documents including works by Perrot, Charlevoix, and Le Sueur (cf. Blair 1911) are extant and describe the Dakota at the end of the seventeenth century.

Other French documents including works by Perrot, Charlevoix and Le Sueur (cf. Blair 1911) are extant and describe the Dakota at the end of the seventeenth century. French records contain only limited information on the Dakota during the first half of the eighteenth century, but during the second half of this century somewhat more information is available from French and British documents. Jonathan Carver's narrative (cf. Parker 1976) provides detailed information on the lifeways of Dakota people, although like Hennepin's narrative, it must be taken *cum grano*. Documents by other British explorers, traders, military personnel and travelers also provided glimpses of Dakota life. The reminiscences of Samuel and Gideon Pond are valuable documents for the early to mid-nineteenth century (cf. Pond 1986).

Five themes can be discerned that seem to run through the experience of the Eastern Dakota during the contact period.

The first of these is the continuing shift in settlement and subsistence, particularly as it relates to use of the prairie. The movement of the Dakota from the lake-forest region into the prairies and forests to the west and south has historically been linked to the migration of the Ojibway into this region. The Dakota were displaced, so the story goes, because the Ojibway had guns and they did not. The adoption of a prairie lifeway was, therefore, a recent occurrence and the result of European trade. There is archeological evidence that suggests that the dual use of the prairie and forest fringes was a long-standing pattern among Dakota people. Further, there is some reason to believe that the westward movement onto the prairie began at least 100 years or more prior to the arrival of the Europeans and may have been linked to deteriorating environmental conditions during the Little Ice Age. Certainly there is evidence that Oneota groups farther to the south began to rely more heavily on bison hunting perhaps as early as the fifteenth century.

The second theme involves the shifts in traditional Dakota culture because of their interaction with Europeans and the introduction of European goods. The impact of firearms and other European trade goods on the lifeway of Dakota people was profound. However, it appears that at least initially only certain kinds of trade goods were particularly desired. Even in the eighteenth century, it has not been clearly demonstrated what balance was maintained between the use of European trade goods in everyday life and the use of more traditional material items.

Likewise, there were significant changes in many aspects of Dakota culture. However, as Gilman (1974:13-14) points out:

There is even less reason to assume that Indian societies were doomed to internal collapse from contact with Western civilization. By the end of the eighteenth century native Americans in the upper Mississippi Valley and Great Lakes region had reached in material terms what has been called a pan-Indian culture. Nearly all the tools and implements used in their daily lives were manufactured in Europe, and the goods from which they made their clothes were also largely European . . . But in

spite of this pan-Indian material sameness, other aspects of Native American culture remained little changed. A Winnebago was still different from a Chippewa—just as the use of mass-produced goods failed to make a Norwegian and an Italian into identical Europeans. Probably the best evidence for the inherent vitality of Indian societies is the extent to which some still retain their identities even under the pressures of the mid-twentieth century.

The third theme is the ongoing and often intense intertribal warfare between the Dakota and the Cree, Ojibway, and other eastern groups attempting to move into Dakota territory. A review of seventeenth and eighteenth century history makes it eminently clear that continuing and harsh intertribal warfare was a dominant activity from even before the arrival of Europeans in Minnesota until the first quarter of the nineteenth century. This warfare, in large measure, seems to have been caused by the dual factories of increasing climatic stress caused by the Little Ice Age and the westward displacement of other Indian groups by both Europeans and the Iroquois Confederacy.

Although warfare was undoubtedly a part of Dakota life prior to the contact period, it is unlikely that it was as dominant or ongoing a practice as it appears to have been during the contact period. In the seventeenth century, the Dakota fought with tribes migrating westward into their territory. Perrot recounts the hostilities that developed between the Dakota and a group of Hurons and Ottawas who settled about 1656 on what is presumed to be Prairie Island near Red Wing. Similarly, Perrot presents information on the disastrous fate of a Huron war party that attempted to penetrate into the heart of Dakota territory (Meyer 1967:9). During the first third of the eighteenth century, the Dakota were in a continual state of conflict with the Cree to the northwest, and during the remainder of this century were at war with the Ojibway over the use and control of the lake-forest region of Minnesota.

The fourth theme is the displacement of the Eastern Dakota from their traditional homelands in the Lake-forest region of Minnesota. Between roughly 1744 and 1780, there was almost continual warfare between the Dakota and the Ojibway in the lake-forest region of Minnesota, culminating in the movement of the Dakota to the south and west. The Battle of Kathio, an event that supposedly lasted three days in which the Ojibway defeated the Dakota living around Mille Lacs and destroyed their villages, was perhaps one of the most important events in this extended warfare.

The standard interpretation of Dakota-Ojibway hostilities has been that the Ojibway had firearms and the Dakota did not and, therefore, the Ojibway were able to defeat the Dakota. Current research suggests that this interpretation of the events is too simple. Rather, it appears that the Dakota may have been pushed by the Ojibway from their traditional homelands, which were also becoming less desirable because of the effects of the Little Ice Age. At the same time, the Dakota may have been pulled by the bison herds on the prairie, a more amenable environmental setting in southern Minnesota, and the increasing number of traders at the confluence of the Minnesota and Mississippi rivers.

The fifth theme is the interaction of the Dakota with the French, British, and American presence in Minnesota, particularly in relation to Euro-American politics, economics, and warfare. Although trade with the Dakota was of particular importance for the French, British, and Americans, the Dakota were also often viewed and sometimes used as tools in the broader machinations of European imperial politics and strategy. As early as 1701, D'Iberville, governor of Louisiana, was plotting the use of the Dakota. According to Meyer (1967: 12):



He [D'Iberville] saw the Sioux as essentially useless to the French if they stayed in their own country, and proposed resettling them on the Missouri River, where they would be more accessible from the lower Mississippi and less accessible to the traders of the Hudson's Bay Company. He opposed giving presents to the Indians. Instead, he said "When they come to us, it will be necessary to bring them in subjection, make them no presents, and compel them to do what we wish, as if they were Frenchmen."

Although D'Iberville's scheme of resettling the Sioux was not carried out during the French period, doubtless the kind of cold-blooded calculation it manifested was present in the policies that were actually followed by the French.

The manipulation of the Dakota by European powers was continued under the British and American regimes. For example, the British recruited Chief Wabasha as an ally during the American Revolution and described the Dakota as "A warlike people undebauched, under the authority of a chief named Wabasha of very singular & uncommon abilities, who can raise 200 men with ease, accustomed to all the attention and obedience required by discipline" (in Meyer 1967: 19). Under British orders, an expedition was organized at Prairie du Chien for an attack upon St. Louis, the principal center for the fur trade in the lower Mississippi Valley and a chief competitor with the center at Prairie du Chien. This expedition was led by Wabasha and an Ojibway chief named Matchekewis. This expedition ultimately failed and the Spanish at St. Louis sent troops in reprisal against Prairie du Chien (Gilman 1974: 10). At the end of the contact period, the Eastern Dakota were established at a series of villages along the Minnesota and Mississippi rivers, while more westerly groups occupied areas near the border of Minnesota and North and South Dakota.

Unfortunately, this period of relative calm and stability would not last, and the events of the later nineteenth century would culminate in the system that is still present in Minnesota today.

## The Teton and Yanktonai

The Teton and Yankton are Siouan speaking people who are linguistically and culturally related to the Eastern Dakota. These groups had moved westward from the lake-forest region into the prairie area of western Minnesota and the eastern Dakotas at some time during or prior to the Contact period. The western groups had split from the Santee some years before and were oriented principally toward the prairie and intensive utilization of bison. During his stay at Mille Lacs in 1680, Hennepin noted that: "While we were staying with the Issati or Nadouessioux, we saw Indians who had come on an embassy from about five hundred leagues to the west. They informed us that the Assiniboins were at the time only seven or eight days journey to the northeast. All the other known tribes to the west and northwest live on prairies and immense plains where buffaloes are numerous and large quantities of furs are to be had. Sometimes those people are obliged to make fires with buffalo dung for lack of wood." (Cross 1938:113). In the autumn of 1700, Pierre-Charles Le Sueur (Thwaites 1902:180-181) observed that: "The Scioux of the West have, according to the response of those of the East, more than a thousand cabins. They do not use canoes, cultivate the earth, or gather wild oats [e.g. wild rice]; they generally keep to the prairies between the Upper Mississippi and the River of the Missouri, and live solely by hunting." Michlovic (1985: 138) points out that: "The notion of early widespread movement and land use on the prairie is corroborated in the John K. Bear Winter count." While it does not refer

directly to the Teton, this document may show a comparable pattern of activity. The Yanktonai, subject of the Winter count, are depicted traveling between south-central Minnesota and the Missouri River region. In 1683 the Yanktonai camped near Canton, South Dakota; in 1699 they traded with Le Sueur on the Blue Earth River; in 1694 they fought the Arikara; in 1715 they held council with the Mandan; in 1718 they camped near Redwood Falls, Minnesota. As late as 1811, in fact, the Yanktonai still camped at Redwood Falls, a region they were using in the seventeenth century (Howard 1976:20, 22, 24, 27, 28). Thus, throughout most of the Contact period, Teton and Yanktonai peoples were living and utilizing the prairie area throughout western Minnesota. It is only in the nineteenth century when these people were permanently displaced westward into the Dakotas.

The standard interpretation of the westward migration of the Dakota people is that they were pushed westward very quickly by the Ojibway, who had firearms, and subsequently abandoned their woodland way of life and rapidly became plains people. This hypothesis has engendered a great deal of debate about the nature of cultural change, the transition from woodland to plains lifestyles, and has been used in support of various anthropological discussions of cultural ecology and cultural evolution. A fairly typical statement of this point of view is presented by Howard (1976:4): "Shortly after the period of first European contact, or in other words the late seventeenth and early eighteenth centuries, the Teton, Yankton and Yanktonai bands began a westward movement. The Teton band, already known to the French as the gens de Prairies or prairie people, apparently led the way." Michlovic (1985) has critiqued the standard interpretation of the Teton migration and argued that: "many anthropologists and historians accept a recent Dakota presence on the Great Plains, and their view has been more or less incorporated into discussions of Siouan ecology and social organization."

A re-reading of the ethnohistoric accounts indicates that the western Dakota were using the prairie when the Europeans contacted them. By definition, historical records cannot determine whether this land use pattern existed in prehistoric times. Though ethnological studies of Plains tribes are based on the assumption of recent Teton migration to the Plains, archeological findings on the Northeast Plains point to prehistoric utilization by peoples who were probably Siouan. I contend that these artifacts (found in the Northeastern Plains) constitute strong evidence that people manufacturing ceramics similar to hypothesized proto-Dakota pottery in Minnesota, and Oneota and Middle Missouri affiliated pottery to the south and west of the Red River, were living on the Northeast Plains in prehistoric times. The people who participated in this set of ceramic traditions were probably distinct from populations engaged in the Blackduck and related traditions centered around the western Great Lakes.

I follow others (Johnson, Syms) in proposing that this artifact distinction may be a product of a Siouan presence in the northern prairies in late prehistory. Although the relationships between particular archeological cultures and sites and specific historic groups has been demonstrated for the Ioway (see Chiwere Siouan context) and the Eastern Dakota at Mille Lacs (see Eastern Dakota context), such connections have not yet been explored for the Teton and Yankton. Further, it now appears that the standard interpretation of the westward movement of Dakota people in the seventeenth and eighteenth centuries is inadequate. Development of a clearer understanding of the lifeways and development of the prairie people mentioned by Hennepin and others is overdue and has the potential to be a particularly exciting program of study.

## The Ojibway

The Ojibway or Chippewa people were, and remain today, among the most populous and widely distributed of all Native American groups. The first mention of the Ojibway in historical documents dates to 1640 in a listing of bands in the Upper Great Lakes, based on information obtained by Jean Nicollet on his 1634 voyage to the Winnebago (Ritzenthaler 1978:743). Later descriptions of the Ojibway during the Contact period are found in a variety of French and British documents and journals (cf. Henry 1901, 1969; Blair 1911; Kinietz 1965, among others).

The Ojibway are an Algonquian-speaking group and are most closely related to the Cree to the north and the Ottawa and Potawatomi to the south. Because of their more easterly position and early contact with the French, the Ojibway were deeply involved in the fur trade from a very early time. Relations between the French and Ojibway were generally very cordial, and the Ojibway supplied warriors to the French during the French attempt to maintain their forts along the northern frontier at Quebec, Montreal, DuQuesne, Niagara, and Detroit (Ritzenthaler 1978:744). Relations between the Ojibway and British after the defeat of the French in Canada were not as amicable.

There may have been Ojibway fishing stations along the south shore of Lake Superior during the mid-seventeenth century. After concluding a truce with the Dakota in 1679, the Ojibway established villages at Chequamegon and Keweenaw bays on Lake Superior and began their gradual expansion westward.

During the eighteenth century, there was a major geographical expansion of the Chippewa. Hickerson (1962:2-3) has suggested that there is a four-part division that emerged in the nineteenth century as a result of the expansion. Ritzenthaler (1978:744-745) describes this division as follows:

The Northern Ojibwa, or Saulteaux, occupied the forests of the Laurentian uplands north of the Great Lakes. They were characterized by small, discrete, scattered bands with a hunting-fishing-gathering economy, which made little or no use of wild rice or maple sugar . . . Second are the Plains Ojibwa, or Bungee, of southern Saskatchewan and Manitoba. They exhibited the most radical change in adopting certain political and ceremonial traits, as well as a bison-hunting economy, from the northern Plains tribes with whom they come in contact. Third, the southeastern Ojibwa, who began occupying the lower peninsula of Michigan and adjoining areas in Ontario by the eighteenth century, were hunters, fishermen, gardeners, and gatherers of maple sugar and in some instances wild rice . . . Fourth, the Southwestern Chippewa moved in to Wisconsin's northern rim and the northern half of Minnesota extending up to the Lake of the Woods on the Ontario-Manitoba border. There they found a rich supply of wild rice, which became an important part of their economy. They also collected maple sugar and did some gardening in addition to their important mainstays of hunting, trapping, and fishing.

The rich resources of northern Minnesota were particularly important to Chippewa people. The available records and histories indicate that there was a marked seasonal round of activity, beginning in the early spring with maple sugar gathering, continuing through the summer with a variety of activities, wild rice gathering in the fall, and hunting and trapping during the winter. Moreover, involvement in the fur trade was probably very important for Chippewa people during this period of time. Since most histories of the fur trade have been written from the European perspective, an understanding of the importance,

and impact of the fur trade on the Chippewa people in Minnesota from their point of view is of particular importance.

It is often thought that the Chippewa and Dakota were always enemies and at war. This is not the case. During the late seventeenth and early eighteenth centuries, these two groups enjoyed a period of peace and relatively harmonious relations. However, by 1736, the Chippewa were again moving west into Minnesota and the conflict between the two groups erupted again.

The Chippewa-Dakota wars, which lasted from the 1730s until 1854, represent one of the dominant themes in Minnesota history during this period. The Chippewa invaded the Mille Lacs region in the 1740s and permanently displaced the Dakota from Mille Lacs. This was followed, during the next 40 years, by almost continual Chippewa victories and by the 1780s, the Mississippi Headwaters and most of the lake-forest region of Minnesota was occupied and controlled by Chippewa people. During the 1780s, a smallpox epidemic decimated some of the northern Chippewa groups, much as smallpox would kill many of the Assiniboin people later in the nineteenth century. However, the Dakota-Chippewa warfare continued and during the first half of the nineteenth century was particularly bloody. The conflict during this period seems to have stemmed in large measure from a struggle for control over hunting and trapping territory and the use of wild-rice beds. Although the principal participants (and victims) were Dakota and Chippewa people, the intense warfare affected everyone living in Minnesota and was a particular source of concern for the traders, military personnel, and missionaries who were active in the state.

A comprehensive history of this period from the Chippewa point of view was written during the first half of the nineteenth century by William Warren and subsequently published in the 1885 (Warren 1984). Warren was the son of a white man and Ojibway woman, who spoke the Chippewa language fluently, was at home both in Chippewa and white society, and was well educated by the standards of the times. In compiling his history, Warren collected firsthand descriptions and stories from his relatives, tribal leaders, and acquaintances and developed methods for evaluating his sources.

In his introduction to a recent edition of Warren's classic work, Roger Buffalohead (Warren 1984:xii-xiii) points out that:

The History of the Ojibways was greeted on its original publication in 1885 as a rare book . . . valuable because it is written by one who understood all their history. It is exceedingly interesting as a narrative, surprises one with the ease and clearness of its style. The assessment is still valid. Warren's book has much to offer modern readers. On the clan system, principal bands and divisions, patterns of governance and leadership, and other aspects of political organization, the text provides information valuable to any historical or cultural study of the Ojibway. His biographical data on political leaders, fur traders, and members of his Indian family are in many cases the only such information available. Of course the detailed descriptions of intertribal wars carry an Ojibway bias (as Warren recognized) and suffer distortion from perceptions of Indian warfare held by whites in the nineteenth century. But they contain much useful information about the principal groups involved . . .

Although the history and settlement/subsistence patterns of the Ojibway in the eighteenth and nineteenth centuries in Minnesota are somewhat well known (see Ritzenthaler 1978; Warren 1984 among others), the material and archeological record of the Ojibway for this time period is most sketchy. Although there are components at several sites that may be associated with the Ojibway, no eighteenth or early

nineteenth century sites that can be positively associated with the Ojibway have been identified and studied. Given the tremendous changes taking place during this time, this gap in our knowledge is regrettable.

## The Assiniboine

The Assiniboine are a group of Siouan speaking people who are linguistically and culturally related to the Dakota. The Assiniboine split from the Dakota at some time prior to the seventeenth century and lived primarily north of the Eastern Dakota people. The Assiniboine have also been called the Stonies, since the name Assinboin derives from the Ojibwa term meaning "One who cooks with stones."

The ethnography and history of the Assiniboine are best known from the nineteenth century when they were living on the plains of Canada and the United States. However, during most of the Contact period, the Assiniboine appear to have occupied portions of northern Minnesota and southern Ontario and Manitoba.

One of the earliest references to the Assiniboine is in Hennepin's narrative of his travels in the Upper Mississippi Valley. According to Hennepin (Cross 1938:113):

While we were staying with the Issati or Nadouessioux, we saw Indians who had come on an embassy from about five hundred leagues to the west. They informed us that the Assiniboins were at the time only seven or eight days journey to the northeast. All the other known tribes to the west and northwest live on prairies and immense plains where buffaloes are numerous and large quantities of furs are to be had.

Hennepin's comments would seem to place the Assiniboine, at least in 1680, in the vicinity of modern-day Duluth, MN. However, as pressure from the Ojibway moving west and French and British traders increased, the Assiniboine were forced westward. During the first half of the eighteenth century, there was almost continual hostility and warfare between the Dakota to their south and the Assiniboine and their allies. According to Birk (1982:118):

In the opening decades of the 1700s, the Dakota showed their strength by gaining control of the Rainy Lake-Lake of the Woods area and raiding as far northeast as Kaministikwia. The targets of their raids were the allied tribes of Cree, Monsoni, and Assiniboine who had steady access to French and Hudson's Bay Company firearms (Ray 1974:14). When La Verendrye arrived on the scene in 1731 he upset Dakota control by trading among the northern tribes on contested grounds. In 1736, a Dakota war party retaliated by killing and beheading 21 Frenchmen en route from Fort St. Charles [on Lake of the Woods] to Michilimackinac . . . . As a direct result of this incursion, Fort Beauharnois, at Lake Pepin deep in Dakota territory, was immediately abandoned. Coincidentally, the Lake Superior Ojibway, fearing for their middleman trade position, broke relations with the Dakota and realigned with the northerly Cree and Assiniboine. In the following decades, the Ojibway gained enough strength to displace the Dakota from northern Minnesota and Wisconsin, probably with the assistance of French guns (Warren 1885).

During the last half of the eighteenth century and the early part of the nineteenth, the Assiniboine continued to move westward and occupied the great prairies of Montana, North Dakota, and Canada. This movement into the territory of other groups involved them in continued conflict, primarily with the Blackfoot. Smallpox epidemics during the

1820s and 1830s decimated the Assiniboine and they signed their first treaty with the United States government in 1851.

No archeological sites have yet been positively associated with the Assiniboine and the historic records for the late seventeenth and early eighteenth century regarding these people are particularly sketchy. Although some archeologists have argued that the Selkirk ceramic complex of Ontario and Manitoba, or the Sandy Lake ceramic series are associated with the Assiniboine, this has yet to be firmly demonstrated. The difficulties of associating archeological sites and properties with specific American Indian tribes and particularly the problem with identifying historic native groups has been eloquently discussed by Syms (1985:75:77):

When the various groups who have lived on the Northeastern Plains are identified, it is apparent that there were a large number, as can be seen in the Western Sioux alone. It is also important to realize that we are dealing with a complicated set of interrelationships. The static non-overlapping maps found in early ethnological research and more recent synthesis are simplistic and, I believe, have produced a systematic distortion in interpretive efforts among archeologists. These small non-overlapping distribution maps have tended to encourage archeologists to remain narrowly focused in their research interests and expertise rather than having a broad, comparative perspective. One of the systematic errors has been to continuously under-represent the number of independent groups that existed. The Assiniboine, for example, have been frequently identified as a single group to which the synonymous term, Stony, was applied. Jenness (1938), for example, presented a widely held view of early decades that the Assiniboine represented a family or small group that broke away from the Yanktonai in the late 16th or early 17 century. On the other hand, recent linguistic research indicates that the Stony and Assiniboine represent 11 different groups within two different divisions, with each division having two distinct dialects. Since these two divisions have been separated sufficiently that they have developed mutually unintelligible or almost mutually unintelligible languages, one could infer that they had been separated as distinct ethnic groups for some time. Ray (1974), relying primarily on other observers such as Alexander Henry of the early 1800s, identified several bands distributed across the entire Northern Plains and adjacent Aspen Parkland. Various groups would have had considerably different sets of activities as they developed interpersonal relationships with different groups and utilized different environments during certain seasons. Alexander Henry's work of the early 1800s indicates that the Assinboin consisted of a large number of autonomous bands. Rodnick's (1937) work of the 1930s demonstrated that the identity of certain bands lasted over 100 years, that in the 1800s each band had its own chief and advisory group, that rarely did more than two or three nearby bands come together throughout the year, and that two or three Sun Dances would be held during the same year because there were no pan-tribal gatherings . . . . The recognition that a single historic tribe, in fact, consisted of numerous autonomous bands which developed different inter-tribal relationships, adapted to different environments during certain seasons, and evolved dialect differences at least two different levels of comprehension, has major implications for attempting to identify prehistoric and proto-historic sites and artifacts.

## The French Regime

The French Regime in the Minnesota area began with the French explorations in the 1600s and ended with the British conquest of Canada in 1763. During this dynamic period, the French began to infiltrate the west and cause or influence the movement, alienation, or alliance of numerous Indian groups. French colonials introduced new language, religions, technologies, diseases, modes of warfare, and a paternalistic Indian policy (Eccles 1974a; Elliot 1975:xi). In turn, they borrowed from native cultures and adapted to a diverse range of natural and human conditions encountered in the west.

The French regime accounts for about one-third of recorded historic time in the Minnesota area, yet remains poorly known. To promote a better understanding of this formative period, a system has been proposed for dividing it into lesser temporal units or phases (Birk 1982:118). These phases broadly reflect shifting colonial interests and the concomitant rhythms of French presence in the Northwest. For archeologists, this scheme offers an alternative to the Quimby historic dating system which is only marginally useful in regions west of the Great Lakes (Quimby 1966:7).

The Initial or French Contact phase (ca. 1640-1702) was marked by western geographical discovery and the opening of cross-cultural relations with contacted native groups. During this formative period the French entered the upper Mississippi Valley, met the powerful Siouan-speaking nations, and encountered the vast treeless plains of the west. Regional historians have characterized the French Contact phase as an era of pristine discovery and an era of hope and achievement (Kellogg 1908: 150; compare with Turner 1977:29-38; Blegen 1963:53-62).

From 1702 to 1713, France was embroiled in Queen Anne's War and the French largely withdrew from the western Great Lakes to promote their advantage elsewhere. This disruptive period is a watershed between seventeenth and eighteenth century French activities.

The Late or French Expansion phase (ca. 1713-1763) saw a renewed demand for western furs, a reopening of French interests through the Great Lakes, and the reestablishment of direct trade with the Dakota. An increased French presence led to the construction of a number of licensed posts in the Northwest, including the transshipment center of Fort Michilimackinac. The French Expansion phase has been defined as an age of exploration (Kellogg 1908: 150).

French-period forts in the Minnesota-area were situated with regard to resources, transportation lanes, and exchange opportunities. Actual site selection might be made through invitation or direction of Indian groups (Turner 1977:38). Remote, contested, or poorly populated areas were usually bypassed. The vast, Dakota-dominated grasslands of western Minnesota formed a physical and psychological barrier to the French movement and were avoided for siting forts. Although early recognized as a Dakota settlement, Mille Lacs Lake was apparently too confined, underpopulated, and unstable to attract a permanent French post (Birk and Johnson 1988).

The most prominent French forts in the Minnesota-area were tribal or multiband exchange centers built on major waterways in game-rich locales near the prairie-forest edge. Some of the largest facilities were at lucrative and accessible points on the Minnesota, St. Croix, and Mississippi rivers in southeastern and east central Minnesota. Others, such as Fort St. Charles and Fort St. Pierre, were on northern waterways along the present international border with Canada.

These forts were pockets of French influence and points of distribution for European goods. In theory, each was part of a broad

security and logistical network that promoted French interests in the western Great Lakes. In reality, Minnesota-area forts were temporally and spatially dispersed and, because of native loyalties and the jealousies or cross-motives of their builders, were often in conflict.

The establishment and use of the Minnesota-area posts was reliant on external forces such as political and economic affairs in Europe and the Americas, or the whim of the French colonial governors. Equally important were conditions along the western frontier itself. Use of the French posts in the Lake Pepin region, for example, hinged on the real or perceived disposition of such groups as the Dakota, Fox, Sauk, and Illinois. French interests at Chequamegon, on the south side of Lake Superior, in the greater Mississippi Headwaters, and the northern border lakes region were more closely linked to Assiniboine Cree-Ojibway-Dakota relations and, at times, dealings with fugitive eastern tribes like the Ottawa.

Because evidence for French presence results from interactions with different native groups in diverse locations, Minnesota's French regime also lends itself to spatial division. The difficulty is in trying to find areal names relevant to a century of discontinuous French occupation. Much of the problem stems from the evolution of geographical knowledge, shifting political boundaries, and the inconsistent use of names to define western territories or locales (e.g., Innis 1973:100, 413-414). French forts along the present International Border, between Lake Superior and Lake-of-the-Woods, were part of what became known as the *Mer de l'Ouest* (or the Posts of the Western Sea). This French interaction sphere, with roots in late seventeenth century exploration, eventually extended beyond Lake Winnipeg to the foothills of the Rocky Mountains (Eccles 1974a:145). The *Mer de l'Ouest* involved exchanges with northern Indian groups (including the Cree and Assiniboine), use of the Voyageurs Highway, competition with the Hudson's Bay Company, and an unrequited effort to find a passage to the Pacific Ocean (WHC 18:187-188). The French entered this area by water routes through Kaministikwia and Grand Portage, or the St. Louis (Fond du Lac) River that empties into Lake Superior at present day Duluth (Morse 1969:80; Thompson 1969:5-11).

The boundaries of the *Mer de l'Ouest* were elastic and changed in response to waxing and waning French interests and intertribal wars (Burpee 1968:7; Birk 1982:117-118). In the region northeast of Grand Portage, on the north side of Lake Superior, were the French *Postes du Nord* that included facilities at Michipicoten and Nipigon (Morton 1973:168; WHC 18:191). In broader terms, all French forts within the area of Lake Superior and its dependencies were sometimes considered as northern posts (Guillet 1966:9).

The Sioux Country, composed of the western hinterlands of the Green Bay and Chequamegon trade districts, extended from near Prairie du Chien northward in an arc through the Minnesota, Mississippi, and St. Croix river basins to the head of Lake Superior. This interaction sphere was separated from the *Mer de l'Ouest* by the boglands and closed forests of northern Minnesota. In the southeast it cornered on the Illinois Country. French posts in the Sioux Country were accessed from Lake Superior through the St. Louis and Brule rivers, from Green Bay via the Fox-Wisconsin route, or from the south by way of the Mississippi (WHC 17:57).

Modern use of the Sioux Country as a geopolitical or logistical concept is not completely satisfying. Several forts in the area attracted Indian groups other than Dakota and some posts in the Mississippi-St. Croix headwaters regions after 1745 may have catered exclusively to non-Dakota groups like the Cree and Ojibway.

Almost from the time France's North American empire collapsed in 1760, people have been trying to learn where French colonials built their forts. Early maps and records have been mined for clues while armies of speculators have scoured the countryside searching for artifacts. Some sites have been looted, while others have probably been lost to erosion or to developments including farms, railroads, highways, towns, marinas, houses, factories, and reservoirs. Today the archeology of the French presence in the upper Midwest is still largely known only in caricature or through a dynamic folklore. Contemporary studies often lead to new questions and debates, but little concrete knowledge.

The pioneering efforts of Robert Wheeler in underwater archeology at canoe accident sites and portages in northern Minnesota led to the identification of a French component offshore at Fort Charlotte at the west end of the Grand Portage Trail (Birk and Wheeler). More recently, archeologist Douglas Birk has pursued an extensive series of investigations designed to locate and document both the French Contact and French Expansion phases in the Minnesota-area of Mer de l'Ouest and the Sioux Country.

Historical records suggest French colonials established at least seven forts in the Lake Pepin-Trempeleau region (e.g., Kellogg in Quaire 1916:117-123; Wedel 1974:160-161; Birk and Poseley 1977:19-20, 23-31; White 1991; Le Blanc 1993). The least reliable aspect of any such review of Pepin area history is in suggesting where the forts were actually built and, as with past researchers (e.g., Draper 1909:321; Clark 1911:91), no claim can be made to the precision of the data presented here. Some records are so vague regarding site placement they can be used to support a range of opposing theories (Wedel 1974: 157-158; Birk and Johnson 1992:213). Students of French presence, for example, have placed Paul Marin's 1750s Fort La Jonquiere at such disparate points as Prairie Island and the east and west sides of Lake Pepin (e.g., Nute 1951:229; Brisbois 1909:286; Kellogg 1925:380; Scanlan 1937:37).

Ironically, the fort locations most clearly defined in the Lake Pepin-Trempeleau region are those from the French Contact phase (Birk 1982:118). The best data, as reviewed by ethnohistorian Mildred Mott Wedel, seems to place Nicolas Perrot's 1685 wintering quarters at Trempeleau, his premier fort (Fort St. Antoine or Fort Perrot) at Pepin Prairie, his second fort (Port Bon Secours or Fort Perrot II) on the west bank somewhere opposite Chippewa Delta, and Pierre-Charles Le Sueur's Fort Le Sueur at Prairie Island (Wedel 1974:160). It was at Fort St. Antoine on May 8, 1689 that Perrot issued his notorious *Prise de Possession* laying claim in his Majesty's name to the territories and rivers between Green Bay and the Mississippi and including the lands of the Dakota and the basins of the St. Croix and Minnesota rivers (Birk and Poseley 1977:104-105).

Of the forts established in the Lake Pepin-Trempeleau region during the French Expansion phase, the most widely known and debated is probably that of Fort Beauharnois, the *Poste des Scioux* (Sioux Post) built by Rene Boucher de la Perriere in 1727. An observer attached to la Perriere's party said that, upon reaching Lake Pepin, the expedition settled on the shore about the middle of the north side, on a low point where the soil is excellent. Other versions of his report explicitly state the expedition established on the north coast of the lake (Birk and Poseley 1977:32-39). Such varied passages hint that Fort Beauharnois could have been built at any number of low points, terraces, or deltas in the lake basin. To date there is hardly agreement among historians as to whether the fort was built on the Minnesota or the Wisconsin side. Nonetheless, descriptions of Fort Beauharnois offer valued clues about the type and arrangement of features that might be expected within a

well-appointed French post occupied at Lake Pepin during the second quarter of the eighteenth century.

The fort itself was said to occupy a plat of ground a hundred feet square although a supposed plan view shows a slightly larger compound (just over 108 feet square) with no less than nine structures inside. The buildings were described as large, detached and not crowded; and each was built to the dimensions: 16 x 25, 16 x 30, or 16 x 38 (Birk and Poseley 1977:34). According to the plan view the buildings included a guardhouse (*Le Corps de Guard*), storehouse (*Magazin*), trading houses (*Maisons de Traitte*), Commandants house (*Maison du Comendant*), Chaplains house (*Maison de Laumouler*), and church (*Eglise*). Other features were a powder magazine (*Poudriere*), parade (*Place Darnes*), rampart (*Rempart*), and four single and five double fireplaces (Birk and Poseley 1977:87-88).

Western French forts were typically built of wood (Heldman 1991:209; Birk 1991:246) and it is certain that construction of most French outposts in the Lake Pepin-Trempeleau region involved little use of rock. The 1727 Fort Beauharnois was surrounded by stakes twelve feet high with two good bastions. Lintot's post, commissioned in 1731, called for a fort of stakes, properly strengthened, 120 feet square with four bastions (Birk and Poseley 1977:27). Saint-Pierre's *Poste des Scioux* burned in 1737 suggesting that it too was made of wood (Birk and Poseley 1977:30). Only Paul Marin, with a garrison of French soldiers, was directed to select a site that may appear to him most suitable for the erection of a stone fort (Birk and Poseley 1977:31).

These data help illustrate the apparent evolution in western French fort construction after 1683. While descriptions of Contact phase posts in the upper Mississippi Valley are not readily available, various writers have described them as being small, or as simple log cabins surrounded by a few pickets (e.g., Neill 1882:xiv). With design innovations introduced by military engineer Sebastien le Prestre de Vauban, and the growing prosperity of New France after 1713, Expansion phase forts in the same area assumed a grander scale with more standardized geometric forms and defenses (Heldman 1991:205-209; Gallup and Shaffer 1992: 183-187). The change is seen in the Vaubian-inspired 1727 plan of Fort Beauharnois, the rather grandiose size and defenses noted for Lintot's 1731 Sioux Post, and the renovations completed at Fort Michilimackinac, at the straits of Lake Michigan, in the early 1730s. By 1750, when Paul Marin headed west to build his Fort La Jonquiere, France was again at war and the call for choosing a site suited for a stone fort may have reflected that condition. In any case, the suspicion arises that Marin's Fort La Jonquiere was built in a place where workable rock was plentiful and accessible.

The Institute for Minnesota Archeology (IMA) recently conducted an archeological study to identify and evaluate possible French fort sites at Lake Pepin. The study included literature review, field reconnaissance, subsurface probing and excavation, oral interviews, and mapping. The Mellen site, a supposed fort site first noted by an Army officer in the 1830s and later mapped by archeologist Theodore Lewis in 1889, was relocated and explored by IMA and found to be a natural dune formation. Subsurface testing at the Mellen site recovered ancient Native American lithic and ceramic artifacts which may, in part, predate the period of dune formation.

Evidence of early French presence was found at 47PE22 near the rocky plateau of Bogus Bluff. Some historians have speculated that 47PE22 is the remains of old Fort St. Antoine and the site is so characterized on a nearby wayside marker. Other evidence suggests the site could be the remains of Fort La Jonquiere. Investigations at 47PE22 recovered an assemblage of French-period artifacts in association

with fired clay (bousillage), wood charcoal, rocks, and other evidence of old buildings. The artifacts include a range of stone, metal, glass, and bone objects, some of which also show signs of burning. While age determination of the French-period deposits is hampered somewhat by the paucity of dateable materials, preliminary analysis of the assemblage of artifacts suggests it is most consistent with a mid-eighteenth century occupation.

Earlier Native American and later European-settlement components are also present. The French period deposits at 47PE22 have been adversely affected by recreational digging, cultivation, and other land use and development activities since the site was first discovered and homesteaded in the last century. Sufficient potentials survive, however, to recommend that further archeological investigations be pursued.

The remains at 47PE22, no matter what their condition, are important to reconstructing the history of French presence in the Lake Pepin area. Broader excavation of the site will contribute to our understanding of the complex cultural, political, and ecological interrelationships of French colonials and native peoples in the upper Mississippi Valley and can help to define the nature and impact of European colonization in the Americas from a regional archeological perspective.

In central Minnesota, IMA excavations at site 21M020 have provided important information on the character of mid-eighteenth century French wintering activities in a region where the prairie-forest transition intersects the Mississippi Valley. Similarly, a review of French Contact sites in the Mille Lacs region have more clearly defined both the French presence and interaction with Dakota people in this area (Birk and Johnson 1992).

## The British Regime

The British regime in Minnesota begins with the triumph of the British over the French in the French and Indian War in 1760 and ends with the purchase of the Louisiana Territory by the United States in 1803. It is a particularly odd period of time for, although the British effectively controlled the fur trade in Minnesota, the territory that is now Minnesota was the possession of Spain.

In 1762, France ceded Louisiana west of the Mississippi River to Spain and in 1763 transferred virtually all of its remaining possessions in North America to Great Britain. On October 1, 1800, Napoleon induced King Charles IV of Spain to cede Louisiana back to France. Thus, for 37 years Minnesota was at least nominally a possession of Spain and for three years (1800-1803) was once again a French possession. British policy toward the fur trade fluctuated during the years between Queen Anne's War and the American Revolution but according to Gilman (1974:8-9): "In the Upper Mississippi Valley none of these developments had any great impact."

After the French forts were closed, a number of coureurs de bois, later joined by independent British traders, continued to winter in the country returning east or south each summer to exchange their furs for new supplies. Green Bay developed into a permanent and influential French settlement, but under the British the depot for trade and the center for administration were at Mackinac. In 1764, Frenchmen founded St. Louis and it quickly became a magnet for traders in the Upper Mississippi and Ohio valleys who objected to living under the British. French and Spanish traders also began a settlement at Prairie du Chien which quickly became an alternative center of trade. For independent traders with the capital and courage to venture into the western country, fortunes could and were made in the 1770s.

The events of the American Revolution created turbulent times for traders and people living within what is now Minnesota. The Treaty of Paris in 1783 drew the boundary of British territory through the Great Lakes and the upper Mississippi region was effectively divided down the middle—American on one side of the river and Spanish on the other. The formation of the North West Company in 1783 made it increasingly difficult for the independent traders to operate and by the late 1780s the country west of Lake Superior was under the control of this monopoly. The more enterprising traders turned toward the unexploited reaches of Louisiana between the Mississippi and upper Missouri rivers and Prairie du Chien became a logical jumping off point for this trade (Gilman 1974: 10-11). Jay's Treaty of 1796 reasserted the American ownership of the Great Lakes and upper Mississippi region and also gave reciprocal trading privileges to Americans and Canadians on both sides of the Canadian border. At this time, Prairie du Chien remained a major center of the upper Mississippi Valley fur trade, while Grand Portage was the center for trade north and west of Lake Superior and British trade from the Mississippi Valley and beyond went through Mackinac.

A secondary center of trade emerged at the fond or head of Lake Superior. According to Birk (1984:51):

This fortified complex, built under the administrative hand of trader John Sayer, was variably known as Fort St. Louis, Fort Fond du Lac and Sayers Fort. It was located on the south side of the Duluth-Superior harbor in what is now a heavily industrialized section of Superior, Wisconsin. From the time of its construction until sometime after the War of 1812, Fort St. Louis served as an administrative and transshipment center for some or all of the dozen or so NWC [North West Company] houses scattered about the contiguous Fond du Lac district. The district, in turn, was divided into subareas or departments that clustered around the west end of Lake Superior like spokes on a wheel. These included the Fond du Lac Department in the Mississippi Headwaters and the Folle Avoine, Lac Court Oreilles, and Lac du Flambeau departments on the south side of Lake Superior.

The character of the fur trade and exchange with Native American people in Minnesota had significantly changed by the second half of the eighteenth century. As Gilman (1974:8) puts it:

The era had long since passed when great seasonal expeditions to the east met the needs of the Indian people living west of the Great Lakes. Not only were they economically dependent upon manufactured goods; they were also dependent upon a steady and relatively accessible supply. No longer could vast quantities of furs be obtained quickly through trade with tribes farther west; hunting took time and steady effort, and the need to make a thousand-mile expedition to trade for goods was a real hardship. They were also increasingly dependent upon the credit extended by resident traders during the hunting season.

This shift in the character of exchange relationships between American Indian people and the European traders undoubtedly reflected other profound changes in the culture and lifeways of Indians in Minnesota. It also suggests that the character of the archeological record for both Euro-American and American Indian sites in the state may be significantly different than sites of the French regime.

Although there were no British military posts or garrisons in Minnesota, they actively recruited American Indian groups as allies during the American Revolution. For example, the British recruited the



Dakota chief Wabasha and described the Dakota as: "A warlike people undebauched, under the authority of a chief named Wabasha of very singular & uncommon abilities, who can raise 200 men with ease, accustomed to all the attention and obedience required by discipline" (in Meyer 1967: 19).

Under British orders, an expedition was organized at Prairie du Chien for an attack upon St. Louis, the principal center for the fur trade in the lower Mississippi Valley and a chief competitor with the center at Prairie du Chien. This expedition was led by Wabasha and a Ojibway chief named Matchekewis. The expedition ultimately failed and the Spanish at St. Louis sent troops in reprisal against Prairie du Chien (Gilman 1974: 10). Other military activities of American Indians as allies of the British may have occurred but are poorly documented.

## The Initial United States Presence

At the end of Queen Anne's War, the French ceded their western territories to the Spanish and from 1763 until 1800, when the French regained ownership of the vast western region, Minnesota was legally under the control of Spain. In reality, Minnesota was effectively controlled by the British and numerous British traders, both independents and those with the North West Company and the Hudson's Bay Company, traded with impunity throughout Minnesota. Presumably there were independent traders from the United States in the region as well. This de facto control of the rich Upper Mississippi region had long been a source of annoyance to the Spanish and would continue as a bone of contention during the opening years of the United States presence in Minnesota.

The history of the initial United States presence is a tangled web of politics, cut-throat business competition in the fur trade, conflict with Indian people, military expeditions, and ultimately the loss of American Indian lands to the invading United States settlers. Five distinct but inextricably interwoven themes run through this turbulent period of time. They are: initial exploration and mapping of the region by the United States government, United States military presence and consolidation of control of the territory, fur trade, increased effects of the fur trade economy and hunting pressure on Minnesota wildlife, and interaction with American Indians leading to the cession of Indian lands to the United States.

The initial exploration and mapping of the region was conducted by members of the United States military establishment. The first expedition to Minnesota was led by Zebulon Pike in 1804 and was a sister expedition to that of Lewis and Clark to the west. In October of 1805, Pike was forced to winter at the mouth of the Swan River near Little Falls and this fort (21M021) is the first military post in Minnesota. During the winter of 1805-06, Pike traveled northward to Leech Lake to reinforce the United States presence in the territory and impress upon British traders in the region that this was now territory of the United States. In September of 1805, Pike met in council with the Dakota chiefs Red Wing and Little Crow. At this Council, Pike requested land for a United States fort and also requested that hostilities between the Dakota and Chippewa cease. At this time, Pike claims that the Dakota granted 100,000 acres of land to the United States which included the site that would become Fort Snelling. Subsequently, Dakota leaders disputed the extent of Pike's land claims.

A second series of expeditions exploring Minnesota were led by Stephen Long in 1817 and 1823. It was during the first of these expeditions that Long, based on Pike's earlier description of the site, recommended the confluence of the Minnesota and Mississippi rivers as a location for a major military post in Minnesota.

In 1836-37 and again in 1838-39, Joseph N. Nicollet conducted a series of scientific explorations to the Mississippi Headwaters and other areas of Minnesota. A similar scientific geological expedition that should be mentioned is that of George W. Featherstonhaugh in 1835 and 1837 to the headwaters of the Minnesota River, which represents the first expedition in this region since those of Stephen Long in 1823.

The United States military presence in some respects begins with the initial exploration of the territory, since these expeditions were conducted by U.S. Army personnel. The War of 1812 had some impact on Minnesota but no military actions were fought within the territory. However, Prairie du Chien, a center for the fur trade, was fortified by the Americans and subsequently captured by the British.

After the War of 1812, the United States government moved aggressively to gain control of the fur trade on the south side of the international boundary. A series of land cessions by the Indians began the initial opening of Minnesota to frontier expansion and replacement of the fur trade system with an annuity system corrupted by the traders.

The first permanent military presence in Minnesota began with the founding of Fort Snelling in 1819. The site for the fort had been purchased from the Dakota by Pike in 1805 and construction of the fort recommended by Long in 1817. The U.S. War Department had asked Long's opinion about "What posts are necessary on the Mississippi to afford protection to the frontier, check unauthorized intercourse, and preserve friendly relations with the Indians" (Kane, Holmquist, and Gilman 1978:333). Long replied that "The establishment of respectable and commanding posts at these positions, especially at the mouth of the St. Peters [Minnesota River], I consider absolutely essential to the attainment of the objects Specified in the question and am convinced that the success of our Military operations upon the Mississippi in the prosecution of the objects of Government depends in a great degree on the adoption of this measure" (Kane, Holmquist, and Gilman 1978:342).

The site purchased by Pike and recommended by Long was occupied in August 1819 when Col. Henry Leavenworth arrived with a portion of the Fifth Regiment of Infantry. Construction of the fort was subsequently initiated and completed by Col. Josiah Snelling. From this time, Fort Snelling served as the center of United States military and government operations in Minnesota.

The fur trade, as well as trade in other items, was of major importance during the first four decades of the United States presence in Minnesota, and was a major factor in the ultimate loss of American Indian lands. In a comprehensive review of the fur trade and its impact on American Indian people, Gilman (1974:13-18) discusses the closing years of the fur trade and observes that:

What the Americans had won was the privilege of presiding over the closing years and final destruction of the Indian fur trade in this region. The seeds of that destruction were engulfing wave of white settlement. There is little solid evidence that the fur trade as a way of life for Indian people could not have continued, with some modifications, if it had been possible to guarantee them possession of the lands and its resources . . . After the War of 1812, Americans moved rapidly to consolidate control of the fur trade on their side of the border. In 1816 a law was passed excluding foreigners from trading with Indians in United States territory (exceptions were later allowed), and government-operated factories in conjunction with military forts were authorized for Green Bay and Prairie du Chien in Wisconsin . . . More important, Astor revived the American Fur Company, bought out his Canadian partners in the South West Company,

and embarked on a twenty-year struggle to monopolize the business of the Upper Great Lakes and Mississippi . . . Along the international border from Lake Superior at Grand Portage to the Red River at Pembina, the early 1820s had seen a trade war so fierce that it occasionally led to violence. There old partners from the North West Company often found themselves on opposite sides, for many had remained with the Hudson's Bay Company after the merger of the two organizations, while the Northern Department of American Fur was also staffed largely by former Canadians . . . Between 1820 and 1826 the elder Morrison established a line of posts along the border from Grand Portage to Lake of the Woods. Although furs from both sides of the line were sought, the border area itself did not by that time yield great amounts, and the real purpose of Morrison's posts was to prevent British penetration of the rich Mississippi headwaters, a region known as the Fond du Lac Department . . . By 1830 white settlement was pushing into the [Mississippi] valley from the south and blossoming legally and otherwise . . . Already the Potawatomi Nation had signed away most of its land in Illinois, and within another year or two the Fox and Sauk under Black Hawk would be engaged in their final despairing struggle against white aggression. The rest of the Indian population, long decimated by epidemic diseases, was still shrinking. Some kinds of game, like elk and buffalo, had been permanently depleted, and beaver was practically extinct in the area. The highly valued 'fine' furs like marten, fisher, and otter were no longer shipped in large quantities, though their smaller cousin, the mink, remained plentiful. So did the lowly muskrat. In the 1830s it accounted for 95 per cent of the furs shipped from the upper Mississippi Valley, with deer skins second. Those Indian people who depended for their whole living on selling furs faced poverty and even actual starvation. They were caught in a vicious circle of vanishing resources and therefore even greater dependence on expensive trade goods - often including food to get them through the winter . . . There were few bands by this time that did not have their resident trader, and as debts mounted, the relationship became far more like employment at piece work than independent barter. It was a losing business but one that neither the trader nor his customers could afford to quit. Most of the losses appeared on the trader's books as unpaid Indian debts, which mounted from year to year . . . It was these accumulated losses masquerading as bad debts for which the larger operations claimed reimbursement when the tribes of the upper Mississippi Valley were at last forced to give up their land to the United States Government. The politics of treaty-making were delicate and involved, but Dousman and Sibley were equal to them, and both men collected handsomely. As Dousman told Sibley after traders had pocketed a subsidy of \$310,000 under the 1837 Sioux, Chippewa, and Winnebago treaties "otherwise we were gone coons." Fur was only a marginal part of the business in the few years that remained before all Indian people of the upper Mississippi Valley were confined to reservations. Instead of the rendezvous there was the annuity payment, and there the treaty story was continued: traders profited immensely and eventually collected most of the government money, either for payment of debts or new purchases.

## Minnesota's Territorial Period

By 1812, the first European settlers entered northwestern Minnesota led by Thomas Douglas, Earl of Selkirk. They started an agricultural colony at the confluence of the Pembina and Red rivers and despite many hardships, the area became a seasonal settlement of the Selkirk colonists and a locus of fur trading activities on the lower Red River. By 1823, explorer Stephen Long noted that most of the residents of the village at Pembina were metis or a mixture of Native American and European descent. In the 1840s, the American presence at Pembina was intensified by the establishment of posts by N. W. Kittson and Company. Between 1820 and 1870 a series of trails connecting St. Paul, the Red River settlements, and trading centers in Manitoba such as Winnipeg were constructed and designed to be traversed by Red River oxcars. The trails provided the foundation for a transportation network that was eventually replaced by railroads (1870).

The Territory of Minnesota was established in 1849 with Alexander Ramsey as presiding Governor. At that time, concentrated Euro-American settlement of Minnesota was largely relegated to the triangle formed by the Minnesota, St. Croix, and Mississippi rivers. Regular land cessions by Minnesota Native Americans between 1837 and 1867, the expansion of military, staging, and other roads between 1850 and 1875. The expansion of the railroad after the Civil War changed the Minnesota landscape drastically during the last half of the nineteenth century. St. Paul emerged early on as a settlement and head of navigation.

In the mid-nineteenth century the placement of roads was critical in the development of interior Minnesota. While the major rivers were marginally viable transportation routes for two-thirds of the year, for fully one-third of every year they were frozen and difficult to navigate. Thus, the patterns of road building in interior Minnesota defined the cultural landscape until the coming of the railroads.

Early roadways and trails influenced the placement of the rail lines. The Minnesota Road Act, effective in 1850, resulted in state and federal appropriations for the construction of four roads and a survey of a fifth. The roads connected the mouth of the St. Croix to the falls of the St. Louis River near Lake Superior, the village of Point Douglas and Fort Ripley, the mouth of the Swan River and the Winnebago agency at Long Prairie, Mendota and Wabasha, and the survey of a road from Mendota to the mouth of the Big Sioux River on the Missouri River. Later, roads connecting St. Paul and Ft. Ridgely and the Red River were proposed.

The Minnesota Road program suffered from administrative dissension and lack of funding. Few of the roads were built as part of that program and those portions completed lacked regular maintenance. Private staging companies, acting in their own best interests, began improving existing trails and crude roadways in Minnesota by 1853. Local residents in the interior of Minnesota encouraging mail delivery in anticipation of increasing population conducted privately sponsored road improvement projects. By 1870, the railroad had arrived in Minnesota and supplanted the military and other roads which became "mere feeder lines, carrying local traffic to the nearest railroad" (Hess 1989). Many of the staging entrepreneurs "defected" to the railroads in the 1860s and 1870s.

Prior to the arrival of Europeans in the region, more than two-thirds of Minnesota was covered by forests: to the west of the Mississippi and the south a hardwood forest extended to the edge of the prairie, while to the east a vast pine forest extended to Canada (Swanholm 1978:8). The purchase of the area between the Mississippi and St. Croix rivers in 1837 was the first step in opening the region to lumbermen. The first commercial mill was established on the St. Croix at Marine in 1839 (Folwell 1956:356). Stillwater soon arose as the center of milling activity

during the next decade: by 1854 six mills were operating and over 1,000 lumbermen were at work in the forest (Swanholm 1978:9). While a saw mill had been constructed at the Falls of St. Anthony by the U.S. military by 1823 (Kane 1987:9), a commercial mill was not erected to take advantage of the Falls until 1848 (Folwell 1956:356). By 1856 there were eight mills at the Falls, along with a growing number of related businesses, fed by lumber cut in the Upper Mississippi drainage basin (Swanholm 1978: 10). A third lumber center arose on the Mississippi at Winona to provide lumber to support expanding agricultural settlement. As settlement moved west, however, this center was surpassed by those, such as St. Anthony, that were better served by railroads (Swanholm 1978:10).

Ft. Ridgely on the Minnesota River and Ft. Abercrombie on the Red were established between 1857 and 1863 to "hold the Sioux in order, and Fort Ripley [near Little Falls] would protect the missionaries and traders among the peaceable Chippewa" (Folwell 1956: 503). Much of the land held by Ft. Snelling was sold in 1857 as garrisons moved to the outposts and activities at the Fort were predominately supply and distribution oriented.

Lands in Minnesota became legally open for settlement in 1853. However, the law stated that only surveyed lands could be settled. The law was ignored by many settlers and it is estimated that there were 20,000 people in the region of the lower Minnesota River by 1852. An act of 1854 extended preemption privileges to settlers on unsurveyed lands. An estimated 40,000 people were in the Territory in 1855 and by 1857 a census revealed that the population had grown to 150,037.

Most of the new Minnesotans moved out into southern Minnesota, settled into communities, and began farming. The Minnesota Territorial Agricultural Society organized in 1854 was promptly deluged with applications for membership. The years 1855 to 1857 witnessed an explosion in land speculation and it is estimated that approximately 700 townsites were platted, but few built, during that period. The Panic of 1857 stripped the Territory of cash and credit and land speculators left the area.

## Statehood, Agriculture, and the Establishment of the Railroads

In 1857, an act of Congress granted land for the proposed routes of railroads in northwestern, southwestern and southeastern Minnesota and in 1858 Minnesota became a state.

Conflict between the Euro-American settlers, the U.S. Government, and the Dakota population resulted in the Dakota War in 1862 and, ultimately, the removal of the Dakota people from the state and, in most cases, on to reservations.

During the immediate post-Civil War period, rapid railroad expansion and large scale wheat production dominated the agricultural industry of the state. For a twenty year period between 1870 and 1895 Minnesota farmers capitalized the on availability of land, the presence of the railroads, and other factors to focus on the cultivation of wheat which was a lucrative cash crop, easily grown and shipped to the mills (Ohlhausen 1995: 3-25). By 1885, increasing sophistication of wheat milling technology combined with the creative divesting of excess railroad lands had created the Bonanza Farm land craze and the Great Dakota Boom in the Lake Agassiz Plain (Robinson 1966: 134).

Rural sites associated with agricultural development and rural society and economy have yet to be recognized as a serious focus of archeological research in Minnesota. Historic/cultural contexts focusing on rural agriculture have, however, been developed for several parts of

the state, but these studies have largely been used in the evaluation of architectural resources (e.g. Arnott et al. 1996). An approach focused on economic forces, evolving market relationships, and changes in the organization of farm labor has been offered as a regional framework for the archeological study of rural sites (McCarthy and Ward 1995; McCarthy 1996).

Archeological investigations of rural sites have been few in number. Gnabasiak (1994) undertook an evaluation of 21 rural sites, including 15 farmsteads, at Camp Ripley in Morrison County. She focused primarily on the relationship of these sites to their physical environments. Excavation of a ca. 1849-54 semisubterranean pioneer dugout at the Gibbs Farm in Ramsey County focused on the location and appearance of this homestead structure (Blair and Forsberg 1996). Few artifacts that could be clearly associated with the use of this structure as a dwelling were recovered. The ceramics that were recovered suggest common mid-cost wares (Blair and Forsberg 1996:46).

## Industrialization, Commerce, and Urbanization

The Falls of St. Anthony represented a major source of cheap power and the area surrounding the Falls became the industrial center of Minnesota almost as soon as it was opened for settlement in 1853. The eight sawmills operating at the Falls by 1856 were soon joined by others and many closely related businesses were established as well, including sash, door, box, and furniture makers (Swanholm 1978:10). Other businesses, such as iron foundries, arose as well to support the mills (Crown Iron Works 1978). The growth of industry led to the growth of cities.

Towns, first St. Anthony on the east bank of the Falls in 1849 and then Minneapolis on west bank in 1856, soon grew up near the mills (Kane 1987: 19,42). St. Paul thrived as a commercial and administrative center, serving as the seat of state government following statehood in 1857 (Folwell 1969:8-10). The cities of St. Anthony and Minneapolis were formally consolidated in 1872 (Folwell 1969:480).

As St. Paul and Minneapolis grew into a metropolitan area with population increasing by over 250,000 between 1880 and 1890, the demand for lumber to support this growth alone totaled nearly 300 million feet of lumber annually (Swanholm 1978:13). During this period, Duluth too arose as an important lumbering center (Swanholm 1978: 14).

The success of agriculture in the southern regions of the state, and later in the Red River Valley to the west, led to the establishment of flour mills as well in Minneapolis. The 1870s saw that industry expand dramatically, supplanting lumber as the chief industry of the city (Kane 1987:99). While water power made possible the initial rise of flour milling, its success was sustained by the railroads which brought wheat to the mills from the agricultural hinterlands and then took the finished flour to national markets at rates favorable to the city's millers (Kane 1987:99-100).

Statewide, the production of lumber continued to grow through the final decades of the nineteenth century, but as the first growth forests were depleted, the industry's days were clearly numbered. The industry persisted into the first decades of the twentieth century before its eventual demise (Swanholm 1978:14-15). The turn of the twentieth century brought about the emergence of a number of new nonextractive industries in the major urban centers based on advanced technologies which did not rely on the processing of raw material from the rural hinterlands. These appear to have been critical to the continuing development of urban areas into the mid-twentieth century (MN SHPO 1990).

In addition to the Twin Cities and Duluth, which arose as cities in a national context of industry, commerce, and government, other towns such as Rochester, Mankato, and Red Wing arose as well as regional centers having some or all of the functions of larger communities. Some of these were clearly urbanized, having sufficient population and functional diversity to have supported streetcar mass transit systems, while others never outgrew their small town character (MN SHPO 1990).

Archeological investigations in urban areas of Minnesota, while limited in extent, have produced some important results addressing aspects of industrialization and urban social development. Anfinson (1989) provided a detailed overview of the history and archeological potentials of Minneapolis' central riverfront. He also reported the results of field investigations in this area associated with the development of the West River Parkway through the central part of the city (1990). A wide range of features associated with the industrial development of Minneapolis were demonstrated to have survived along the riverfront, often beneath extensive fill deposits.

More recently, investigations at the sites of the North Star Iron Works and the Pacific Saw Mill (McCarthy et al. 1996a) focused on: (1) the correspondence of historic and archeological records, (2) the nature of industrial construction techniques, (3) the relationship of academic knowledge to the practical application of technology, (4) the material culture of working life, and (5) the physical evolution of the Minneapolis riverfront. These sites were revealed to have been dynamic enterprises where change and improvement were ongoing processes. They employed "cutting-edge" technologies improved on the "shop floor" in a competitive market environment. Large-scale changes were made to the riverfront, first to accommodate these industrial facilities and second as a result of their presence. Extensive fills of sawdust waste, well over 3 m in depth, were documented that considerably changed the configuration of the riverfront.

Investigations of residential and commercial areas of Minneapolis have focused primarily on sanitation issues and expressions of sociocultural identities such as ethnicity and class, including the experiences of working class children. Investigations of a series of privy features at the Bridgehead site revealed a working class world where Victorian values of gentility, respectability, cleanliness (hygiene), and separation of work and home did not apply, or applied only to the extent that the sensibilities and tastes of middle class customers of these establishments were accommodated (McCarthy and Ward 1996). For example, teawares, extensive food remains, and toys were recovered from deposits that included large amounts of leather-working wastes. Work might stop at any time for a meal or to attend to the needs of a child. Children, in fact, may have been workers in these craft establishments, learning trades from more experienced workers.

Other results include an unusually wide range of fish represented among the food remains, including ocean as well as native fresh water species, many of which may have been caught in the nearby Mississippi. Sanitation and hygiene standards appear to have been lax. Privies were filled to overflowing with wastes, and while evidence of roundworm was not as extensive as at other sites from this period, the first archeological evidence for tapeworm found in North America was recovered. In addition, the fragmentary remains of a 6 month old fetus and a child's tooth broken-off at the root reflect the violence present in this environment.

These results are in marked contrast to those from a working-class residential site only a few blocks away at the intersection of 4th Street North and 4th Avenue in downtown Minneapolis (McCarthy et al. 1996b). The Irish immigrant and Irish American residents of this site were skilled

workers who apparently exhibited an array of middle class values and behaviors, if not white-collar, middle class occupations. They resided in single-family homes removed from places of work (admittedly rental properties with some boarders), maintained unusually high standards of sanitation and hygiene (as reflected by patterns of waste disposal and the absence of evidence of parasite infestation), enjoyed an apparently healthy diet of moderately-priced market-purchased foodstuffs, purchased at least some costly ceramics and engaged in their ritual use and display (while using the cheapest wares available for everyday family use), and purchased toys for both male and female children, recognizing childhood as a distinct stage of life. These results suggest that young "frontier" cities such as Minneapolis were more socially open and offered greater opportunities for those with marketable skills than did eastern cities at the same time. Ethnic background appears to have been no real barrier to steady employment and social advancement relative to the more restrictive social and economic environments found elsewhere.

## 9 Bioarcheology of Iowa, Wisconsin, and Minnesota, by Susan M. Thurston Myster and Barbara O'Connell

In this chapter, the bioarcheological data of Iowa, Minnesota, and Wisconsin will be discussed sequentially utilizing period designations and by environmental zone within each period. The Iowa, Minnesota, and Wisconsin study area represents the northeastern edge of the Central and Northern Plains region. As a result of their relatively recent glaciation, these three states have environments that are significantly different from the rest of the region. Benchley (this volume) divided this subregion into four broad environmental zones, each characterized by distinct plant and animal resources: Eastern Woodland, Northern Forest, Prairie Lake, and Prairie. The Eastern Woodland zone covers southern Wisconsin, southeastern Minnesota, and eastern Iowa and includes the Mississippi River trench. The Northern Forest zone covers northern Wisconsin and the northeast portion of Minnesota. The Prairie Lake zone covers southwest Minnesota and north-central Iowa and includes the area surrounding the Minnesota and Des Moines rivers. The Prairie zone extends across western Iowa and the southwest corner of Minnesota and includes the Missouri River trench. The environmental setting, glaciation history, and available resources for each zone is discussed in Chapter 2.

### Iowa

#### History of Iowa Bioarcheology

The history of Iowa archeology has been well documented in a number of sources (Anderson 1975; McKusick 1975, 1979; Green 1992a) and is summarized in the Iowa Archeology section in Chapter 2. The history of bioarcheological research presented here relies heavily on these earlier summaries. Bioarcheology in Iowa began in the mid-nineteenth century, as it did in much of the midwest United States, with an antiquarian interest in explaining the nature and origins of mounds and earthworks in the context of the Mound Builder myth. The earliest recorded reference to mounds in Iowa occurs in John Newhall's (1841) *Sketches of Iowa*, or the *Emigrant's Guide* (McKusick 1975; Green 1993). Newhall described the Toolesboro Mounds and an enclosure at the nearby McKinney Oneota Village site. Mounds were reported at the Dubuque town site as early as 1830, and the looting of mounds was a common pastime. McKusick (1975:19) quotes an 1859 periodical, *Ballou's Pictorial Magazine*, as reporting that, "The good people of Keokuk are deeply engaged in digging for Indian skeletons. They have already found about forty." Excavations at the Cook Farm Mounds in 1874 by Reverend Jacob Gass of the Davenport Academy of Science led to the discovery of various artifacts, including inscribed slate tablets, with symbols that seemed to support the lost race theory for construction of the mounds. The tablets were later discovered to be a hoax perpetrated by resentful members of the Academy (McKusick 1970, 1991).

Cyrus Thomas' (1894) landmark report, *Report on the Mound Explorations of the Bureau of Ethnology*, ended speculation about lost races of mound builders. Thomas did little survey or fieldwork himself relying instead on the fieldwork of a series of regular field assistants. In Iowa, fieldwork was conducted by Colonel P. W. Norris who recorded mounds along the Mississippi River, primarily in Allamakee County. Norris conducted excavations on the Hartley Terrace and at Fish Farm Mounds in Allamakee County. He also mapped mounds and earthworks in Clayton, Dubuque, Wapello, Van Buren and Lee counties (Smith 1985 edition of Thomas 1894:99-112).

More extensive mapping of Iowa mound sites was done by Theodore Lewis as part of the Northwestern Archaeological Survey (1880-1895) which recorded and surveyed over 2,000 mound and village sites containing more than 17,000 mounds in 18 Midwestern states. Lewis recorded 81 sites and 771 mounds in Iowa, primarily in the northeastern counties of Allamakee, Cherokee and Clayton but also in northwestern Lyon County (Dobbs 1991).

Frederick Starr was the first professionally trained anthropologist to work in Iowa. He taught anthropology at Coe College in Cedar Rapids (McKusick 1975; Anderson 1975) before leaving to start the anthropology department at the University of Chicago and become a founding member of the American Anthropological Association. He conducted brief excavations near the Blood Run site in Lyon County and described a shell heap near Cedar Rapids. He produced a bibliography (1892) and summary (1895) of all available archeological data in the state, which was published by the Davenport Academy of Science in 1897 (Starr 1897). Descriptions of mounds and burials dominate his summary. Descriptions of mounds in Scott County even included a section on "Physical Anthropology" wherein cranial fragments from the Cook Farm Mounds are described and measurements are presented (Starr 1895:116).

Another early attempt at producing physical anthropological data/interpretations regarding mounds in Iowa was made by Duren Ward, Universalist Minister of All Souls Church, who was trained in philosophy and anthropology at Harvard. Ward organized the Iowa Anthropological Association in 1903 under the auspices of the State Historical Society with the stated mission of "carrying out a systematic and scientific anthropological survey of the state" (McKusick 1975:36). His first publication "Historico-Anthropological Possibilities in Iowa" provided a sequence where "little Eskimoid" man was followed by the "famous mound builders" and finally by the Indian tribes known in historic times. He excavated a mound at Lake Okoboji and described intrusive historic burials in the mound. His report included appendices with descriptions of skull morphology and teeth (Ward 1905).

The Boone Mound, the largest mound in Iowa, was excavated in 1907 by Thomas Van Hyning under the direction of Charles Aldrich, Director of the State Historical Museum in Des Moines. Due to disagreements between Van Hyning and Aldrich's successor, a final report of these excavations was never produced.

Charles R. Keyes and Ellison Orr dominated Iowa archeology between 1920 and 1950. Neither was a professionally trained archeologist and both developed their avocation late in life. Charles R. Keyes was a professor of German literature at Cornell College, Iowa and began conducting archeological surveys throughout the state of Iowa in the 1920s and 1930s. In 1934, when Works Progress Administration funds became available, he became director of the Iowa Archaeological Survey. Ellison Orr, a retired telephone company surveyor and avocational archeologist who had documented sites extensively in Allamakee County, directed the fieldwork. In 1934, Keyes and Orr conducted excavations at Oneota and Woodland sites in Allamakee County (McKusick 1979; Green 1992). Over the next five years, Keyes and Orr continued excavations in northeast Iowa, in north-central Iowa, at the Glenwood locality of southeast Iowa, and on Mill Creek sites in northwest Iowa. Excavation of mound and habitation sites recovered a large amount of archeological data, including human remains. The lack of funding for analysis and write-up hindered

the study and reporting of this massive collection. Orr prepared 10 volumes of archeological reports which were compiled by McKusick (1963) in a microcard edition of the *Archives of Archaeology* (Orr 1963). However, Keyes never completed his planned comprehensive report on the survey or any detailed reports before his death in 1951.

Disputes between Orr and Keyes on this issue led to Orr willing his collection and manuscripts to the Effigy Mounds National Monument rather than to the Iowa State Historical Society, where the rest of the collection resides as the Keyes collection. Logan (1959, 1976) published a summary of the Woodland component from Keyes' and Orr's work in northeast Iowa. M. Wedel (Mott 1938; M. Wedel 1959) published a summary of the Oneota component. Although both report extensively on burials, neither presents osteological/bioarcheological data except for comments on type of interment, associated grave goods, and general attribution of age, e.g., adult or child. M. Wedel (1959:31) reports one case of trauma, a "sternum ... pierced through by a stone projectile point" from the Burke site (13AM67), which she identifies as the only skeletal material saved from the Keyes/Orr excavations (Wedel 1959:46). However, Glenn (1974) reports cranial measurements for some of the sites in her thesis on the physical affiliation of Oneota populations. The human skeletal material that comprised the Orr collection at the Effigy Mounds National Monument has been analyzed in a primarily descriptive contract report (Fisher and Schermer 1987). The human skeletal material that comprised the Keyes collection is at the Iowa State Historical Society and is currently being analyzed related to Native American Graves Protection and Repatriation Act (NAGPRA) compliance (Schermer, personal communication).

In 1955, human remains were uncovered by gravel operations at the Turin site in western Iowa from an area 6 m (20 ft.) below the surface in a "silty loess" deposit overlying glacial till (Frankforter 1955). The site was originally thought to be of Late Wisconsinan age and "Turin Man" received national publicity as the result of a feature in *Life* magazine (1955) entitled "Bones Found in Iowa Sandpit May Be Oldest American Skeleton." Subsequent study of the geological context and radiocarbon dating identified the site as Middle Archaic ( $2770 \pm 250$  B.C.), but a detailed bioarcheological report on this site was not produced until 1985 (Fisher, Frankforter et al. 1985).

Bioarcheology in Iowa commenced when Alton K. Fisher, D.D.S. was appointed professor and department head of oral pathology at the University of Iowa School of Dentistry in 1949. His appointment coincided with the beginnings of academic anthropology at the University of Iowa with the hirings of cultural anthropologist David Stout, the same year, and archeologist Reynold Ruppé three years later in 1952.

Information on Alton K. Fisher's life and his contributions to Iowa bioarcheology are based on an unpublished obituary by Green (1991b). Alton K. Fisher was born in Abrams, Wisconsin in 1905. He attended the University of Wisconsin-Madison and began working for the Milwaukee Public Museum as an assistant to Will C. McKern in 1927. As McKern's assistant, he worked on archeological excavations throughout Wisconsin, including excavations in Trempealeau and Vernon counties which defined the formal characteristics of Hopewell and determined Woodland and Oneota temporal relationships. In the laboratory at the Milwaukee Public Museum, Fisher developed an interest in paleopathology and published several landmark reports on osteological and dental characteristics of Wisconsin Indians (Fisher 1931, 1939; Fisher, Kuhm et al. 1931). He also worked closely with McKern on the development of the Midwestern Taxonomic System.

Poor job prospects in anthropology following the Great Depression, led Fisher to a career in oral pathology research after graduation from Marquette University School of Dentistry in 1935. During his tenure at

the University of Iowa School of Dentistry, Fisher maintained his strong interest in archeology and physical anthropology. He was a founding member of the Iowa Archeological Society in 1951. He conducted physical anthropological work from 1957 to 1960 with the Mesquakie Indians of Tama, Iowa. When he retired in 1974, he continued his research in paleopathology in a volunteer capacity as physical anthropologist in the Office of the State Archaeologist at the University of Iowa.

Crisis situations at a number of burial sites in Iowa in the early and mid-1970s led to changes in the Iowa Burial Code (305A.7) which defined the nature of future osteological/bioarcheological research in Iowa. The situations, which initially opposed Indians and archeologists but ultimately led to compromise and collaboration, are detailed in Anderson et al. (1978). In 1971, the disturbance of a cemetery in western Iowa resulted in the immediate reinterment of "white" burials, but the archeological curation of an Indian burial. The differential treatment accorded these burials galvanized Indian opposition in Iowa to cemetery disturbance and osteological study of human remains. This situation, known as the Glenwood Case, later served as the fictional backdrop for a novel set in South Dakota (Doane 1994). In 1972, gravel operations disturbed a burial site in Sioux City, Archeological attempts to recover the disturbed remains were shut down by the American Indian Movement (AIM) and the site (13WD401) was subsequently completely destroyed by quarrying operations. Other situations in 1972 pointed out the need to develop procedures for handling cases of disturbed burials. In 1975, the disturbance of human remains at the Lewis Central School site (13PW5) resulted in collaboration between Indians and archeologists, when careful archeological recovery and identification before reburial was deemed preferable to removal by an undertaker with a bulldozer (Anderson et al. 1978:188).

The resultant changes in the Iowa Code in 1976 prohibited intentional burial site disturbance (714.21, Violating Sepulcher). Other changes, under the Code for Reinterment Ancient Remains (305A.7), required the state archeologist to arrange for the identification of disturbed ancient (more than 150 year old) human remains by a forensic osteologist before reinterment, and further required the filing of a "written report containing both physical and cultural information regarding the remains" with the Iowa Department of Public Health.

In response to these changes, Alton K. Fisher, in his volunteer capacity in the Office of the State Archaeologist, began producing osteological reports of all disturbed human remains. These reports were the basis for the Research Papers series of the Office of the State Archaeologist that began in 1976. Between 1976 and 1989, Fisher published approximately 85 osteological reports in this series. The reports are primarily descriptive but cranial and postcranial measurements are reported as well as pathological conditions. Reflecting Fisher's interests, dental observations (attrition and caries) were also reported. Fisher taught human osteology from 1977 through 1987 as an adjunct professor in the Department of Anthropology at the University of Iowa. However, a graduate program dealing with bioarcheology was never established. Except for Elizabeth Glenn's (1974) study of Oneota crania which was the basis for her Ph.D. thesis under George K. Neumann, Indiana University, there are no Master's theses or Ph.D. dissertations based on the human osteology of the early people of Iowa. According to Green (1991b), Fisher's studies represent "the first and only substantive human osteological work conducted in Iowa until his students and associates began assisting him and eventually assumed the burden of work in the late 1980s." Alton Fisher died October 9, 1991.

The Burial Programs Office of the Office of the State Archaeologist expanded in the 1980s with the addition of Shirley Schermer as Director. Reports in the late 1980s and throughout the 1990s adopted a more explicit



bioarcheological approach and routinely reported the additional categories of enamel hypoplasias and Harris lines. Additional osteological personnel in the Burials Program Office have also produced osteological reports in the Research Papers series, now in Volume 21, 1996. These include Toby Morrow and Marcy Young (1981), Denise Hodges (1989) and since 1990, Robin Lillie. These reports provide detailed descriptive data for comparative research. However, the osteological data are often not placed in a larger synthetic archeological context or in the context of problem-oriented bioarcheological research. Notable exceptions are noted in the following sections that provide an overview of Iowa bioarcheology arranged by cultural periods.

The accomplishments achieved since enactment of Iowa's burial law were recently (May 11, 1996) highlighted in a program, "Protecting Iowa's Indian Heritage," which marked the twentieth anniversary of the law (Schroeter 1996). While mindful of the loss of data that reburial involves, positive outcomes resulting from changes to Iowa's burial code and the establishment of the Burial Programs Office of the Office of the State Archaeologist include protection of burial and cemetery sites, significant analysis of human remains, publication of osteological research, and collaboration between Indians and archeologists.

### Paleoindian Period (9500-7500 B.C.)

Skeletal remains of individuals from the Paleoindian period in North America are exceedingly rare. A review article by Smith (1976) identifies 15 individuals for all of North America. Four of these individuals, including three amino-acid racemization-dated individuals from California, have subsequently been shown to date to a more recent time period. A thesis by Young (1986), on the Horn Shelter Texas Paleoindian remains, identifies a sample of 19 individuals. Steele and Powell (1992) estimate that there are fewer than 50 North American sites containing human remains that are older than 5,000 B.P. and fewer than one-half that many older than 8500 B.P. Table 4 identifies 20 sites, representing 22 individuals, that present the most firmly dated evidence for Paleoindian remains in North America. Sharbauer (Midland), Texas is not included because its 7100 B.P. date places it after the 8000 B.P. cutoff time generally used for Paleoindian remains. Sauk Valley, Minnesota has recently been AMS dated as 4360-4190 ± 70 B.P. and is therefore Archaic.

No Paleoindian human remains have been firmly identified in Iowa. Potentially of interest are the three individuals recovered from a roadcut, 12-18 inches below the surface, in Monona County (13MN3) and reported by Hotopp and Fisher (1981). One burial representing two individuals was uncovered in 1956 during road construction. The second burial, representing one individual, was discovered eroding from the roadcut and excavated in 1980 by the Office of the State Archaeologist. The basal portion of a Paleoindian Yuma point and a large triangular scraper were recovered from the surface approximately 200 yards northeast of the skeletal material. Cracked and broken bison bones were also recovered 200 feet south of the human skeletal material. Association with the burials is not known (Hotopp 1981:3).

Osteological analysis by Fisher (Appendix A in Hotopp and Fisher 1981) identifies an adult individual of undetermined sex, and a juvenile male individual in Burial 1. Burial 2 represents an adult, possibly male individual. According to Fisher, the most noteworthy feature of these individuals is the unusual pattern of advanced dental attrition in the adult individuals. The occlusal plane is sharply angled buccally and the molar occlusal surface contacts are uneven and apparently disharmonious, as though abrasion had not been produced by tooth contact alone. Additionally, excessive abrasion of the first molars, in combination with

Table 4. North American Paleoindian remains.

Site (state)	MNI	Sex	Age (yrs)	Date (B.P.)
Whitewater Draw (AZ) <sup>1</sup>	1	Female	25-35	8200-10,400
Arlington Springs (CA) <sup>2</sup>	1	NA	NA	10,000 ± 310
Mostin (CA) <sup>3</sup>	1	NA	NA	10,000-11,000
Rancho La Brea (CA) <sup>4</sup>	1	Female	~25	9000 ± 80
Gordon Creek (CO) <sup>5</sup>	1	Female	26-30	9700 ± 250
Vero Beach (FL) <sup>6</sup>	1	NA	NA	No Date
Warm Mineral Springs (FL) <sup>7</sup>	1	NA	NA	10,260 ± 190
Buhl (ID) <sup>8</sup>	1	Female	Adult	10,675±95
Browns Valley (MN) <sup>9</sup>	1	Male	35-40	8790-9049 ± 82/110
Pelican Rapids (MN) <sup>10</sup>	1	Female	13-15	7840 ± 70
Anzick (Wilsal) (MT) <sup>11</sup>	2	NA	NA	8620-10,500
Fishbone Cave (NV) <sup>12</sup>	1	NA	NA	10,900-11,200
Horn Shelter (TX) <sup>13</sup>	2	Male	30-40	
		Male	~12	9500-10310 ± 200
Pyramid Lake (TX) <sup>14</sup>	1	Male	Adult	9515±155
Shifting Sands (TX) <sup>15</sup>	1	NA	NA	No Date
Spirit Cave (TX) <sup>16</sup>	1	Male	Adult	9410±60
Wilson-Leonard (TX) <sup>16</sup>	1	NA	NA	9470-9650 ± 170/120
J.C. Putnam (TX) <sup>17</sup>	1	Male	~40	Late Pleistocene
Marmes (WA) <sup>18</sup>	1	Unknown	Adult	10,678 ± 215
Kennewick (WA) <sup>19</sup>	1	Male	~25	~9300

<sup>1</sup>Waters 1986; <sup>2</sup>Orr 1962; <sup>3</sup>Kaufman 1980 and Taylor et al 1985; <sup>4</sup>Berger 1975 and Kroeber 1962; <sup>5</sup>Breternitz et al 1971; <sup>6</sup>Stewart 1946; <sup>7</sup>Clausen et al 1975; <sup>8</sup>Fenton 1997; <sup>9</sup>Jenks 1937; <sup>10</sup>Jenks 1936; <sup>11</sup>Taylor 1969 and Stafford et al 1987; <sup>12</sup>Orr 1956, 1974; <sup>13</sup>Young 1986, 1988; <sup>14</sup>Steele and Powell 1997; <sup>15</sup>Owsley (personal communication) as reported in Steele and Powell 1992; <sup>16</sup>Steele 1989 and Weir 1985; <sup>17</sup>Roberts 1945; <sup>18</sup>Fryxell et al 1968; <sup>19</sup>Gibbons 1996.

observed transverse micro-grooving on the occlusal surface, suggested the use of the first molars for stripping of abrasive substances. According to Fisher (Appendix in Hotopp and Fisher, 1981), the general pattern of attrition was similar to that of Late Archaic peoples of Iowa (Fisher 1978a).

An AMS bone date on these remains would contribute significantly to resolving their archeological/cultural affiliation and chronological context.

### Archaic Period (7500-500 B.C.)

The Archaic is generally defined as representing a shift from specialized nomadic hunting of large game to more broad based utilization of a wide variety of small game and plant food sources eventually resulting in central based collecting with a seasonal round of exploitation. This adaptation has been defined as Primary Forest Efficiency by Caldwell (1958) for the Eastern Woodlands. In the Prairie/Plains region, the presence of large herds of bison allowed occupants to maintain a more specialized, nomadic lifeway and lifeways on the Plains changed little throughout the Archaic. In fact, Anfinson (1987) points out that using the term Archaic on the Plains is misleading because of its implications about increasing sedentism and complexity in the East. For the Prairie Lake region, he proposes the term Late Middle Prehistoric instead of Late Archaic. In Iowa, the eastern part of the state exhibited an Eastern Woodlands adaptation, while the central and western regions generally followed a Plains adaptation. Johnson and Wood (1980) point out that Eastern Plains Archaic sites in river valleys demonstrate a more Eastern Archaic adaptation, with deer hunting, fishing, and nut and seed collecting. Benchley et al. (this volume) suggest that the Missouri River served as a natural pathway from the eastern woodlands to the prairies, carrying eastern influences westward during the Archaic as it did later during Middle Woodland and Late Prehistoric times. The discussion of Archaic bioarcheology will therefore be organized around the adaptive zones from east to west in the state: (1) Eastern Woodlands, (2) Prairie Lake, and (3) Prairie. The Archaic period is also generally subdivided into three time periods: the Early Archaic, 7500 to 5500 B.C., the Middle Archaic, 5500 to 2500 B.C., and the Late Archaic, from 2500 to 500 B.C.

## Archaic Bioarcheology Database

There are 18 Archaic period burial sites with reported human remains in Iowa, 5.8% of the 310 identified burial sites with human remains, representing 109 individuals, 8.0% of the total 1360 identified individuals (Table 5). The Hemphill phase is Middle Archaic. The Red Ocher/Ryan phase is Late Archaic/Early Woodland. Nine of the sites are in the Eastern Woodland adaptive zone, two in the Prairie Lake adaptive zone and seven in the Prairie adaptive zone.

In the Eastern Woodlands the Middle Archaic, Hemphill phase is represented at the Sand Run West site, 13LA38 (Benn, Schermer and Sellars 1992). The Late Archaic is represented at the Fish Farm Mound/Village site, 13AM46 (Morrow 1981e) and at the Red Ocher complex Turkey River Mound Group, 13CT1 (Green and Schermer 1988).

In the Prairie Lake zone, the Late Archaic is represented by the multicomponent Pooler site (13WB215) where Feature 6 of Mound 2 has produced a radiocarbon bone collagen date of 610 B.C., extending mortuary use of the site to the Late Archaic/Early Woodland time period. In the Prairie zone, the Middle Archaic is represented at the Turin site (13MN2) and the Late Archaic is represented at the Lewis Central School site (13PW5). Subperiods and phases are unspecified for the remaining identified Archaic sites.

## Early Archaic (7500-5500 B.C.)

No Early Archaic sites in Iowa have been identified with a mortuary component. The Cherokee Sewer site (13CK405) in western Iowa is a stratified Paleoindian/Archaic site with an Early Archaic component. Horizon II is dated between 5480 and 5370 B.C. and contains the remains of 15 bison along with stone and bone butchering and hide working tools, 22 projectile points, and a grinding stone (Anderson, Shutler and Wendland 1980, Anderson 1980). The presence of fetal bison bone and bison tooth eruption data suggest a late winter kill/butchering site. The presence of human deciduous teeth is interpreted as indicating occupation by family groups rather than male hunting parties. No other human remains have been identified at Early Archaic sites. The bioarcheology of this period is unknown.

## Middle Archaic (5500-2500 B.C.)

The Middle Archaic period corresponds with the arid Mid-Holocene Warm period when occupation was concentrated along wetter river valleys. Middle Archaic sites are often deeply buried and difficult to locate and are therefore poorly represented in Iowa. Two significant Middle Archaic burial sites have produced good bioarcheological information about this otherwise poorly known time period.

The Sand Run West site (13LA38) is a multicomponent site in the Eastern Woodlands region with 10 late Middle Archaic burials and one late Late Woodland burial (Benn et al. 1992). The site is located on the west bank of Sand Run Slough on property administered by the Corps of Engineers, Rock Island District. Fluctuating water levels and the erosion of human burials from the cutbank led to excavation and recovery of human remains from the burial site in 1991. Earlier disturbance of the site resulted in the recovery of cranial fragments that are identified by Fisher (1987b) as representing an adult older than 30 years.

The burial recovery in 1991, carried out by Bear Creek Archaeology, Inc., represents a good model of cooperation between various agencies and constituencies, including the Corps of Engineers, the Office of the State Archaeologist, and the OSA Indian Advisory Committee. The final contract report (Benn et al. 1992) prepared for the Corps of Engineers, Rock Island District is an excellent bioarcheological summary. Although the skeletal remains were in very poor condition, information collected in situ provided significant data. Archaic people were buried at Sand Run West after the domestic site had been abandoned. Burials are primary flexed and bundled in an ossuary pit. The mortuary program is compared to other Midwestern archaic cemetery sites including the Bullseye site (11GE127) in Illinois, the Osceola (47GT24) and Convent Knoll (47WK327) sites in Wisconsin, and the Hatten Mound (23MN275) in Missouri.

The Sand Run West mortuary program is fundamentally similar but significantly different in its lack of grave goods. Grave associations are reportedly conspicuous and copious in the Archaic cemeteries cited above and frequently were made of nonlocal materials. The conglomeration of bones—whole individuals in the flesh, portions of articulated bodies, bundled bones and heads—placed in Archaic cemeteries in seemingly haphazard ways with little internal structure or segregation of burials is discussed in terms of beliefs in corporate vs. individual identity and status using the model of Charles and Buikstra (1983).

The ossuary burials of the Sand Run West site and the Lewis Central School site (13PW5) of western Iowa seem to support their conclusions that these Archaic (Middle and Late) cemeteries reflect beliefs in corporate identity and control/inheritance of territorial resources. Repeated use of cemeteries is seen as a reaffirmation of rights to resources by lineal descent groups. Unlike the blufftop locations of the Elizabeth Mound, the Hatten Mound, Osceola, and Convent cemeteries, however, the Sand Run West site and Lewis Central School sites are habitation sites on the valley floor that became cemeteries. While blufftop cemeteries may be more visible markers of territory, Benn et al. (1992:25) conclude that, "the act of placing a cemetery in an abandoned habitation is presumably just as effective as blufftop burial for reaffirming corporate rights to a territory." Human remains from the Middle Archaic component are generally too poorly preserved to make any osteological measurements or pathological observations. Benn et al. (1992) suggest that the lack of obvious evidence for trauma and violent death among the Sand Run West individuals conforms to the general pattern for Archaic populations. Only the Convent Knoll site in eastern Wisconsin does not fit this pattern and the site may represent a single incident (Overstreet 1980). The demographic profile for the Middle Archaic component includes two infants (16.6%), one adolescent (8.3%), three male adults, two female adults, and four adults

Table 5. Iowa sites with Archaic mortuary components in the Eastern Woodlands (EW), Prairie Lake (PL), and Prairie regions.

Site	Period/Phase	MNI	Region	Type
McKee Terrace (13AM45) <sup>1</sup>	Unknown	1	EW	Unknown
Fish Farm Village (13AM46) <sup>2</sup>	Late/Unknown	5	EW	Ossuary
Elephant Terrace (13AM59) <sup>3</sup>	Multi/Unknown	7	EW	
Harper's Ferry MdGrp (13AM117) <sup>4</sup>	L/Red Ochre-Ryan			
Ryan MdGrp, Md 2		2	EW	Mound
Houlihan Mound		1	EW	Mound
Layton Farm (13CK73) <sup>5</sup>	Unknown	1	P	Isolated
Turkey River MdGrp (13CT1) <sup>6</sup>				
—Md. 38&39	L/Red Ochre-Ryan	14	EW	Mound
Sny-Magill (13CT18) <sup>7</sup>	L/Red Ochre-Ryan	NA	EW	Mound
French Town MdGrp (13CT166) <sup>4</sup>	L/Red Ochre-Ryan	18	EW	Mound
Sand Run West (13LA18) <sup>8</sup>	Middle/Hemphill	12	EW	Ossuary
Turin (13MN02) <sup>9</sup>	Middle/Hemphill	4	P	Burial
Kennebec Township (13MN13) <sup>10</sup>	Unknown	2	P	Unknown
(13MN16) <sup>11</sup>	Unknown	2	P	Unknown
Page Co. Find (13PA39) <sup>12</sup>	Unknown	1	P	Unknown
PK Co. Sheriff (13PK111) <sup>13</sup>	Unknown	1	PL	Unknown
Rubel (13PM413) <sup>14</sup>	Unknown	2	P	Isolated
Lewis Central Sch. (13PW5) <sup>15</sup>	Late/Prairie Plains	25	P	Ossuary
Pooler (13WB215) <sup>16</sup>	Late/Prairie Lake	10	PL	Mound
Quandahl RkShelt (13WH35) <sup>17</sup>	Unknown	1	EW	Isolated

<sup>1</sup>OSA Proj #73 Report; <sup>2</sup>Morrow 1981e; <sup>3</sup>Fisher and Schermer 1987 and CCR 245: 17-29; <sup>4</sup>Logan 1976; <sup>5</sup>Fisher 1979e; <sup>6</sup>Green and Schermer 1988; <sup>7</sup>Beaubien 1953: 52-60; <sup>8</sup>Benn, Schermer, and Sellars 1992; <sup>9</sup>Fisher et al 1985; <sup>10</sup>Morrow 1981a; <sup>11</sup>Young 1981d; <sup>12</sup>Fisher 1984a; <sup>13</sup>Fisher 1981i; <sup>14</sup>Schermer 1983f; <sup>15</sup>Anderson et al. 1977 and Anderson et al. 1978; <sup>16</sup>Abbott and Schermer 1983, Fisher 1981a, Schermer et al. 1994, Young 1981h; <sup>17</sup>Fisher 1978i.

of unknown sex (75%) (Table 6). The single late Late Woodland burial which was headless appeared to have died as a result of violence as indicated by the presence of five projectile points in the chest cavity (see Late Woodland section for further discussion).

The Turin site (13MN2) located on the western border of Iowa in the Prairie region was originally thought to be of late Pleistocene age (Wormington 1957). A radiocarbon date ( $4720 \pm 259$  RCYBP) for Skeleton 3, however, places the site in the Middle Archaic period (Crane and Griffin 1960:113). An extensive bioarcheological report by Fisher et al. (1985) provides information on the burial program and osteological data. The mortuary practices are interpreted as representing four individual burial episodes. In contrast to the pattern at Sand Run West, the individual burials indicate little interaction between individual social groups and show that "integrative cultural mechanisms such as the periodically constructed ossuaries of the Late Archaic period (Lewis Central School) and conical burial mound of the Woodland period were not developed as yet among the band level societies of the Middle Archaic period on the eastern border of the Great Plains" (Fisher et al. 1985:215).

The human remains consist of four individuals, one adult male, two children (6-7 years, 10-11 years) and an infant (4-5 months). Only burial 3, the 10-11 year old child, showed evidence of a burial pit that also contained associated artifacts. Burial 3 was flexed in a shallow pit. The body had been sprinkled with red ocher. Two *Anculosa* shell beads were found near the neck during excavation and an additional 16 were found during laboratory analysis. A side-notched point made from Knife River Flint was found between the individual's feet, near the pelvic region. Extensive cranial, dental, and postcranial measurements are reported where possible. Dental attrition is extensive; no caries is observable. The adult male exhibited enamel hypoplasia on all 22 of the permanent teeth examined with a total of 49 lines. Growth disruption occurred between 1.0 and 1.5 years and then continuously from 2.0 to 7.0 years of age. The 10-11 year old child exhibited enamel hypoplasia on 15 of the 24 permanent teeth examined with a total of 29 lines. Growth disruption occurred between 2.0 and 2.5 years of age, 3.0 and 5.5 years of age, and again at 6.0 to 6.5 years of age. Cranial morphological comparisons to other Archaic populations/individuals in the eastern Plains region, including Lansing (14LV315), Draper Cave (5CR1), Witkin (5AH6), Lewis Central School (13PW5), and Bradford House (5JF52), suggest that these crania represent a single population. Double shoveling of the permanent incisors of skeletons 1-3 suggests a close genetic relationship and the possibility that these individuals represent the same population subgroup.

#### Late Archaic (2500-500 B.C.)

The Late Archaic period in the Upper Midwest is characterized by two burial complexes, Old Copper and Red Ocher. No Old Copper complex burials are identified in Iowa and Old Copper culture sites in northeastern Iowa are rare. Red Ocher complex sites have alternately been classified as Late Archaic or as Early Woodland Ryan focus. Osteological reports generally assign them to the Late Archaic period.

**Eastern Woodlands.** The most significant Red Ocher complex site in the Eastern Woodlands region is the Turkey River Mound Group (13CT1), a multicomponent site consisting of 41 mounds situated on a narrow bluff ridge north of the Turkey River at its confluence with the Mississippi River. Five mounds (Mounds 37-41) have been excavated; three (Mounds 37-39) have produced human remains. Mound 37 is Early Woodland, Prairie phase and will be discussed in the Early Woodland section. Mounds 38 and 39 are Late Archaic (or Early Woodland, Ryan phase) with Mound 39 exhibiting significant Red Ocher mortuary features. Late Woodland components may also be present based on the presence of effigy mounds.

The association of mound building with the Red Ocher complex has been controversial in Midwestern archeology. It does not appear, as suggested for the Sny-Magill site (13CT18), that a Red Ocher cemetery has subsequently been covered by a mound built by later Woodland peoples. The mortuary practices in Mounds 38 and 39 include primary extended and semiflexed burials, secondary burials, cremation, red ocher, and exotic as well as utilitarian burial goods. Mound 38 has 11 burials representing 12 individuals. Five of the eight primary burials (62.5%) in Mound 38 are headless. Two burials represent cremated cranial bones only. Headless burials and skull burials have variously been interpreted as representing "decapitation," and evidence for conflict and the taking of trophy skulls or as representing dismemberment/defleshing as part of the mortuary ritual. Green and Schermer (1988:156) interpret the pattern here as removal and reverence of ancestors' skulls.

Low levels of trauma and violent death are assumed to be the pattern characteristic of Archaic populations in contrast to the higher frequencies of conflict associated with later populations. Two headless skeletons in Mound 38 appear to have died as a result of violence. One individual has a projectile point in the chest cavity. In the second individual a copper "dagger" in the chest region cut through a neck vertebra, split a rib and protruded underneath the right clavicle. Possible cutmarks are evident on the C3 vertebrae of one headless individual and on the clavicle of another. Vertebrae (C1-C4/5) are missing in two other headless individuals. Mound 39 consists of two secondary burials. Burial 1 consisted

Table 6. Iowa Archaic demography.

	0-4		5-9		10-14		15-19		20-29		30-39		40-49		50+		Adult		Total		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	?	M		F	
Eastern Woodland																					
13AM45																		1		1	
13AM46			sub1															1	1	2	5
13CT1- Md. 38 and 39			2			1	(m)1		2	2		2						1	2	1	14
13LA38			2			1												4	3	2	12
13WH35																			1		1
Prairie Lake																					
13PK111																			1		1
13WB215				1			1				2		2	1		2		1			10
Prairie Zone																					
13CK73											1										1
13MN2			1		1				1												4
13MN13									1		1										2
13MN16													1	1							2
13PA39			1																		1
13PM413											1								1		2
13PW5			4	2				2	1		2	2	1		5			2	6		25
Total Ages			9	4	3		2		5	2	7	4	5	2	5	2		6	12	12	088
Frequencies (%)			12.3	5	3.7		2.5		8.6		13.6		8.6		8.6			37			100

of the bundled, poorly preserved remains of one individual. Burial 2 represents the mixed bones of an infant found in a layer of red ocher 1-2 inches thick overlain by a ca. 1 foot thick layer of relatively unconsolidated soil with charcoal and ash.

Osteological data are recorded for the 14 individuals from the two mounds and summarized here together. Five females and five males are identified. The demographic profile which is presented in Table 6 includes one infant (7.1%), one child (7.1%), one adolescent (7.1%), five young adults (35.7%), and six adults (42.8%). Evidence of trauma resulting from conflict is found in two individuals (14.3%); periostitis is observed in five individuals (35.7%); cribra orbitalia is recorded in one individual (7.1%); slight degenerative/lipping arthritic changes are observed in four individuals (28.6%); and spondylolysis is observed in one individual (7.1%) (Green and Schermer 1988).

Additional Late Archaic, Red Ocher complex burial sites were identified during the 1934-1936 excavations by the Iowa Archaeological Survey of mounds in northeastern Iowa (Allamakee and Clayton counties) by Orr and Keyes. Logan (1976:146) provisionally identifies these sites as Early Woodland, Ryan focus. (See Green and Schermer [1988] for a discussion of the Late Archaic vs. Early Woodland classification of Red Ocher sites in Iowa.) The sites include Mound 10 of the French Town Mound Group (13CT166), Mound 43 of Sny-Magill (13CT18), Mound 2 of the Ryan Mound Group, and the Houlihan Mound (13AM117). The number of individuals from these sites is based on burials reported in Logan (1976). Human remains from these sites comprise the Keyes collection of the Iowa State Historical Society. Osteological analysis of this collection is in progress. These sites are therefore not included in Table 6.

Additional Late Archaic sites, phase unspecified, are identified in the Eastern Woodlands and have yielded some descriptive bioarcheological information on small numbers of individuals. The most clearly identified is the Late Archaic ossuary associated with the Fish Farm Mound/Village site, 13AM46 (Morrow 1981e). It represents five individuals, four adults (one male, two females, and one unknown) and one subadult. One adult exhibited an auditory canal torus and another exhibited arthritis of the left elbow joint.

*Prairie Lake.* Only two burial sites with identified human remains are reported for the Archaic period in the Prairie Lake adaptive zone. Fragmentary skeletal remains found near the PK Co Sheriff site (13PK111) represent the incomplete remains of a young adult male (Fisher 1981i). Craniometric and nonmetric data are presented as the basis for the possible Late Archaic or Early Woodland affiliation of this individual. No pathological changes were evident.

The Pooler site (13WB215) is a multicomponent site (Middle Archaic to post-Woodland) located in the Des Moines river valley in north central Iowa. Cultivation and erosion exposed human remains in 1979. Osteological analysis of remains recovered from five surface concentrations is reported by Fisher (1981a). Excavations in 1979 and 1980 by the Office of the State Archaeologist recovered additional bones. Osteological analyses of these remains from three mounds and one feature represent a total of 27-29 individuals (Young 1981h). Archeological and osteological analyses are summarized by Abbott and Schermer (1983).

Five individuals were recovered from a bundle burial in an isolated pit labeled Feature 1. A small, side-notched projectile point and a few shell-tempered sherds suggest a late Late Woodland to post-Woodland, possibly Oneota, burial.

A single flexed burial was recovered from Feature 2, Mound 3. Limited, highly fragmented charred remains represent three subadults. A rim sherd recovered with the primary burial suggests a late Middle Woodland to early Late Woodland interment. Six individuals represented by

fragmented, dispersed remains were recovered from Mound 1. Mound morphology similar to Mound 2 suggested a Middle Woodland date for Mound 1. However, since Mound 2 now appears to be older, the age of Mound 1 is unknown.

At least 10 individuals were recovered from a small ossuary, Feature 6 of Mound 2 at the bottom of a shallow basin. Although both Archaic and Woodland projectile points were found at the site, it was originally believed (Abbott and Schermer 1983) that the site was not used as a cemetery until the Middle Woodland period. Radiocarbon bone collagen dating of Feature 6 extended use of the site as a cemetery to the Late Archaic/Early Woodland (610 B.C.) period.

Artifact material was abundant on the surface and in the fill but interpretation is hampered by the lack of stratigraphic control for most of the material and by the unsystematic collection of the surface material (Abbott and Schermer 1983:147). A large quantity of hematite was recovered primarily from the surface and plowzone. A total of 501 fragments weighing 4794.4 g was collected. The authors suggest that the hematite may be a local manifestation of customs associated with the Red Ocher mounds to the east and may have been added to the surface of the mounds during visits for ceremonial purposes. The nearby Late Woodland Mound 1 at the Gypsum Quarry site (13WB1) also had hematite "generally scattered in the fill with the exception of the occurrence of about a quart of the pebbles in a pile deep in the center of the mound" (Flanders and Hansman 1961:4).

Univariate craniometric and morphological analysis after the physical varietal types of Neumann (1952) by Young (1981h:220) suggested a heterogeneous population in the different features at the Pooler site. Abbott and Schermer (1983:147) interpret this variability as possible evidence for increased cultural interaction through time and an "influx of genes from more eastern groups."

Bioarcheological information obtained from the Late Archaic/Early Woodland component represented by Feature 6, Mound 2 is discussed here. Intermingled ossuary burials represent 10 individuals, eight adults (five males, two females, and one unknown) and two subadults (7-9 years and 15-17 years). Demographic data are presented in Table 6. Osteological analysis by Young (1981h:211-214) identifies advanced attrition on most of the teeth and subsequent exposure of the pulp chamber with secondary periapical alveolar bone resorption in three to four individuals (40-50%). A single carious lesion on a maxillary second molar of a 35-50 year old individual was the only case of dental caries noted in all the dentitions from the Pooler site. Frequency for the population represented by the Late Archaic feature for dental caries per individual is therefore 10%. Young also reports extensive supracortical bone hyperplasia in numerous bones.

Schermer et al. (1994) provide a differential diagnosis of pathology at three western Iowa sites and conclude that this periosteal proliferative pathology at the Pooler site and at two other Woodland sites, Haven (13PW18) and the Council Bluffs Ossuary (13PW1), represents treponematoses. The proliferative pathology is expressed in at least four of the eight adults at Pooler. Although treponemal infection has been identified in Illinois during the Late Archaic in Red Ocher burials at the Morse site, 1500-1000 B.C. (Morse 1978) and at the Klunk site (Cook 1984), there is limited evidence suggestive of treponemal infection during the Archaic on the Northern Plains (Walker 1983), and this represents the first evidence for treponemal infection in this region. Other western Iowa burial sites that have been studied provide no evidence of treponemal disease. These include the Middle Archaic Turin site, the Late Archaic Lewis Central School site, and the Middle Woodland Hanging Valley site. There was also no evidence of treponemal infection in any of the individuals from the later Woodland or Late Prehistoric burials from Pooler.

*Prairie.* The Lewis Central School site (13PW5), dated at  $2815 \pm 80$  B.P., is the only major excavated Prairie Plains Late Archaic site in Iowa (Anderson et al. 1977:36; Anderson et al. 1978) and its analysis was instrumental in the development of Iowa's current burial law. Along with Turin and Pooler, it represents one of the few Archaic populations described in the literature from the eastern Plains border. Primary and bundle burials were placed in an ossuary as part of a single ritual event. Anderson et al. (1978) hypothesize that the site represented a cyclical burial event where scattered bands of hunter-gatherers came together to construct an ossuary, thereby reinforcing group solidarity and identity similar to Red Ocher ossuaries and Woodland mounds to the east. Such an event could have been connected with times of plentiful food resources, such as a communal bison hunt or the harvest of a particular plant food. Osteological analysis includes demography, stature, cranial and postcraniometrics/nonmetrics, and pathology. More extensive paleopathology analysis is presented in a separate article by Fisher (1978a). The sample consisted of a minimum of 25 individuals, including 11 adult males, eight adult females and six subadults (Table 6). The mean age for adult males is 43.4 years and for females 32.5 years, suggesting males were older than females at time of death. Subadults represent approximately 25% of the population. Attrition of the teeth was severe, starting soon after the teeth erupted, and progressing to serious dental complication, including pulpitis and chronic periapical inflammatory lesions, in one-third of the adults over 20 years of age. No unequivocal evidence of dental caries was observed. One tooth, a markedly worn lower molar, in one individual out of 23 exhibited a lesion that might have been produced by caries. Slight to moderate arthritic changes were observed in four of the 18 (22%) adult skeletons. Osteoarthritic involvement was more extensive in the Burial 2 individual who exhibited compression fractures in two cervical vertebrae and a compression fracture and ankylosing exostosis uniting three vertebrae in the lumbar region. Spondylolysis was observed in the fifth lumbar vertebra of one individual (5%). Most populations show a frequency for this trait of 5% to 10% while some Inuit populations show frequencies up to 51% (Stewart 1953, 1956). Only one individual exhibited evidence of infection; a left radius and right ulna exhibit periostitis suggestive of localized chronic inflammation. Craniometric and nonmetric variation is presented and compared to Late Archaic and Early Woodland people from Kansas, Colorado, Kentucky, and Alabama (Anderson et al. 1978:213). Univariate comparisons of cranial measurements suggest greater affinities to Archaic populations to the east.

#### Archaic (Subperiod/Phase Unspecified)

A number of mortuary sites identified as Archaic are multicomponent or lack specific period or phase designation. In the Eastern Woodlands, they include four sites representing 10 individuals. The Elephant Terrace site (13AM59) is a multicomponent site with Archaic, Early Woodland, Late Woodland, and Oneota components present. Fisher and Schermer (1987) report on human remains from this site in the museum collection of the Effigy Mounds National Monument. Seven individuals are identified from fragmentary remains but their temporal/cultural affiliation cannot be determined (and they are not included in Table 6). The McKee Terrace site, 13AM45 (OSA Project #72 Report) represents an adult male, but no additional information has been published on this individual. The Quandahl Rock Shelter, 13WH35 (Fisher 1978i) is a multicomponent site with Archaic and Late Woodland components. The Archaic period remains consist only of the femora and right tibia of a short (stature =  $147.41 \pm 3.55$  cm) adult female.

In the Prairie adaptive zone, five additional sites in four western Iowa counties in the Missouri and Little Sioux River valley regions are identified as Archaic period. Published reports on these five sites representing eight individuals present descriptive information including age, sex, metrics, and pathological conditions.

The Layton Farm site (13CK73) represents a single individual recovered from a gravel pit in 1921 (Fisher 1979e). The human remains consist of a skull, mandible, and the upper five cervical vertebrae. A shell necklace was reported to have been associated with the burial but was no longer available for observation. The individual was a male approximately 30 years old. Marked attrition of the teeth produced an occlusal plane sloped infero-buccally/labially. Periapical lesions are associated with pulp chamber exposure in the first molar region. No dental caries is observed. Archaic period designation is based on the absence of dental caries and the unusually marked attrition of the teeth in a relatively young individual.

Site 13MN13 represents a bundle burial exposed by earthmoving activities on a knoll in the Loess Hills region of Monona County. Osteological analysis is reported by Morrow (1981a). Two males, 22-30 and 35-45 years of age, are identified. Marked attrition with occlusal wear that sloped toward the palate in the maxillae and buccally in the mandible is reported. No caries is evident. Archaic affiliation is based on the cranial morphology identified by Glenn (1974) as characteristic of Archaic peoples in the Upper Midwest.

Site 13MN16 represents human skeletal remains collected from a ridge slope overlooking the confluence of the East Soldier and Soldier rivers. Osteological analysis by Young (1981d) identified a male and a female, both 45-55 years of age. The degree of polish on the occlusal surface of the teeth and the lack of dental caries was interpreted as evidence for a predominantly meat-eating diet.

Site 13PA39 is an isolated burial exposed by erosion on the banks of the Nodaway River in 1984. Osteological analysis by Fisher (1984a) identified a male, 40-50 years of age. All teeth present were extensively abraded. A lesion in the upper left second molar region perforated the maxillary sinus and was identified as a periapical radicular cyst or granuloma. Osteoarthritic lipping of cervical and thoracic vertebral body margins was slight. Cranial measurements/indices identify a low and long skull with conspicuous alveolo-subnasal prognathism. This cranial morphology is compared to Archaic period groups in Iowa and Colorado (Fisher et al. 1984; Anderson et al. 1978; Finnegan 1976, 1978; Swedlund and Goodman 1966) and is the basis for the cultural identification as eastern Great Plains Archaic.

The Rubel site (13PM413) is an isolated burial recovered from a road cut west of Hinton, Iowa in 1968. The burial contained one individual positioned chest-up with legs flexed and oriented to the right side. A report on the excavation and preliminary analysis of the burial notes the presence of an elk mandible and six elk teeth located near the left scapula, a fossil coral gorget on the right side of the skeleton, and fragmented bird bones in the chest area, possibly from a Sand Hill crane, whooping crane, or pelican. The location of the bird bones with a perforation of possible human manufacture led Anderson (1971) to speculate the presence of a breast plate. Osteological analysis by Schermer (1983f) identifies the human remains as a male, 30-40 years of age. Dental attrition is severe, calculus is slight, but no caries is present. Slight osteoarthritic lipping is present on the lumbar vertebrae. Anderson (1971) suggested Great Oasis as a possible cultural association after eliminating Oneota and Mill Creek. Schermer suggests an Archaic/Early Woodland association based on craniometric comparison to regionally available population samples (Glenn 1974; Owsley et al. 1981) and similarities to Neumann's Otamid and Lenid groups. Additional human skeletal material was recovered from

the Rubel site in 1985. Osteological analysis by Fisher (1986e) describes a middle-aged adult male represented by a left arm, leg, hip, and foot bones and a few rib fragments. Also present was a single phalanx (left, first) from a bison. No evidence of bone disease was observed.

A lack of dental caries in combination with a high degree of attrition, in some cases "polished," is noted for these individuals and is inferred to be associated with a nonagricultural, meat-based Plains Indian diet. In some cases, however, the dental pattern is the basis for the culture period identification rather than a characteristic of an archeologically defined culture period.

*Summary of Iowa Archaic Bioarcheology.* The 18 Archaic period burial sites in Iowa representing 109 individuals present a picture of a hunter-gather adaptation in both the Eastern Woodlands and Plains. Sites are concentrated on the eastern and western borders of Iowa with only two sites representing the interior of the state. The demographic profile of these sites is presented in Table 6. Infants and young children are underrepresented with only 10/81 (12.3%) under the age of 5. Males are greatly overrepresented among adult individuals for whom age at death could be specified (22/32 or 68%) but equally represented in the category of adult/age indeterminable (12/24 or 50%).

Bioarcheological information supports a subsistence pattern that produces a low frequency of caries and a high level of attrition. There is little evidence of infectious pathology on the individuals represented in this sample, except for the dramatic evidence for treponemal infection in four of the eight adults at the Pooler site. Degenerative arthritis is reported at a number of sites; spondylolysis was found in two individuals. Trauma from human conflict is reported in two individuals from Mound 38 of the Turkey River Mound Group site (13CT1).

#### Recommendations - Iowa Archaic Bioarcheology

Although significant bioarcheological information is reported for a number of sites in the Eastern Woodlands and the Prairie adaptive zones, little is known of the adaptation of Prairie Lake populations from bioarcheological data for the interior of the state of Iowa. The mortality sample in all regions is biased, with few remains of infants or young children. More specific models need to be developed to understand the relationship of mortuary programs, involving the use of red ocher, cremation, dismemberment, bundle burials, and "mounds" to settlement pattern and ideology. The role of "decapitation" as evidence of mortuary ritual, ancestor veneration, and/or human conflict needs to be defined. Lacking other evidence of trauma related death, "scalping" may be interpreted as part of soft tissue removal. Models for interpreting the behavioral context of culturally modified human bones have recently been developed by Owsley et al. (1994) and Olsen and Shipman (1994). Similar models need to be developed, refined, and applied to the Archaic period in the Eastern Woodlands and Plains. More information on the frequency and form of infectious disease in small, migratory, endogamous populations as opposed to later, larger, sedentary, horticultural populations needs to be documented.

#### Woodland Period (1000 B.C.-A.D. 100)

The Woodland period in North America is traditionally defined by the appearance of pottery, burial mounds, and agriculture (Griffin 1967:156). These innovations likely had their beginnings in the Late Archaic period. Mound construction is associated with the Red Ocher mortuary complex which straddles the Late Archaic/Early Woodland boundary. The cultivation of squash, gourds, and other native cultigens also began during the Archaic (Ford 1985; Smith 1987, 1992).

In general, the Woodland period continues trends begun during the Archaic period. People became increasingly reliant upon cultivated plant foods, sedentism continued to increase, status differentiation became more pronounced, and long distance trade and interaction increased, culminating in the Middle Woodland Hopewell Interaction Sphere (Struever 1964). The Woodland period is characterized by the coevolution of sedentism, native cultigens and ceramic technology (Braun 1987; O'Brien 1987; Smith 1992).

The Woodland time period is generally divided into three subdivisions: Early (1000-200 B.C.), Middle (200 B.C.-A.D. 400), and Late (A.D. 400-1100). Stoltman (1978) suggests that, although the Woodland periods are usually thought of as time units (periods) by archeologists, they are used mainly as content units (cultural stages).

The Woodland period in the upper Mississippi River Valley of northeast Iowa is the most extensively studied. Comparison to the better known classic Havana-Hopewell of the lower Mississippi River Valley and Illinois Valley reveals similarities in mound construction, burial ceremonialism, and grave goods for the Middle Woodland period, but differences in the transitional period to the Late Woodland, with closer parallels to the Effigy Mound tradition of southern Wisconsin (Beaubien 1953; Benn 1979). Benn (1979) attributes the differences between the Illinois-Ohio Hopewell and the Upper Mississippi River Valley Middle Woodland period to a characterization of the latter region as a frontier zone with microenvironments supporting a more sparsely distributed population adopting an increasingly dispersed settlement pattern that resulted in stronger regionalism in the Allamakee phase (A.D. 300 to A.D. 700). The subsequent Late Woodland, Effigy Mound tradition (Keyes phase, A.D. 650 to A.D. 1200) in northeast Iowa is characterized as a system of ideology and social organization for integrating dispersed groups engaged in a seasonally shifting subsistence strategy (Benn 1979; Mallam 1976).

Little is known about the Woodland period in the interior of Iowa, although Perry (1991) reviews Havana-Hopewell sites in the Cedar River valley. In western Iowa the Mid-America Woodland tradition extends into eastern Nebraska. An essentially Archaic lifestyle continues, with ceramics having little impact on the lifeways of people in this region. Benn (1983, 1990) argues that lower population levels resulted in less territorial packing and the ability to maintain a less sedentary, diffuse pattern of hunting and collecting than was possible in the Midwest. Less intensive cultivation, less social complexity, less status differentiation, less mound construction and less mortuary ceremonialism were the concomitant results relative to the pattern in the Midwest. Increased population size during the Middle Woodland period has been interpreted by Benn (1981, 1990) as developing into an aggregate band model of social organization. Tiffany, Schermer et al. (1988), based on excavations at the Hanging Valley site (13HR28), question this model because of the indications of severe nutritional stress and conflict and the lack of evidence for mound building. Alternatively, they propose that the family is the largest unit of social organization during the Middle Woodland time period on the plains. During the late Late Woodland, Loseke Ware ceramics suggest an intensive reliance on the cultivation of hard, starchy seeded plants and maize horticulture (Benn 1990) but the settlement/subsistence pattern of local bands cooperating on communal bison hunts, exchanging produce, sharing territories, and forming trade partnerships continued.

#### Mound Surveys

Woodland period mortuary sites in northeast Iowa are well documented as a result of a series of extensive mound surveys. Petersen (1984) reviews the early Effigy Mound surveys of Richard Taylor (1838),



Locke (1840), and Stephen Taylor (1842) primarily in Wisconsin but also in areas of Iowa. These early surveys were presented in Squier and Davis (1848), *Ancient Monuments of the Mississippi Valley*, in which they concluded the effigies were the work of a vanished race of mound builders. The refutation of Squier and Davis' mound builder myth by Cyrus Thomas (1894) relied primarily on documentation of mounds to the east and south but included descriptions of mounds from Allamakee, Clayton, Dubuque, Lee, Wapello and Van Buren counties in northeastern Iowa including those on the Lane and Fish farms in northern Allamakee County and others in the vicinity of Dubuque (Thomas 1894 [1985 edition:99-112]).

The Northwestern Archaeological Survey conducted by T. H. Lewis and A. J. Hill spent portions of 11 field seasons between 1883 and 1892 in Iowa recording mounds. According to Haury (1993), work in nine counties (Allamakee, Clayton, Dickinson, Dubuque, Emmett, Jackson, Lewis, Lyon, Marion) documented 61 effigy mounds, and 553 other mounds and enclosures. According to Dobbs (1991), Lewis surveyed mounds in nine counties (Allamakee, Cherokee, Clayton, Dickinson, Dubuque, Emmett, Jackson, Lyon, Mills) and recorded 81 sites representing 771 mounds. The exact number of mounds located by this survey is confounded by confusion regarding the number of mounds in the Harpers Ferry "Great Group" (13AM79), located on a broad terrace of the Mississippi River at Harpers Ferry and reported to be the largest grouping of mounds in North America. According to a note written by Lewis on May 4, 1892:

This group consisted of 107 tailless animals, 67 birds, 98 embankments that were probably animals 154 embankments and 240 round mounds the largest of which is now about 6 feet high. Total number of effigies in sight including 4 surveyed 276. Total number of mounds including surveyed 671. Add 229 small round mounds (estimated) that have been destroyed by cultivation makes a total of 900 mounds of all classes. All except about 50 mounds are cultivated. (1892:13-14)

Peterson (1984) has attempted to interpret this entry in the context of Lewis' letter and surveys by other nineteenth century surveyors. He can neither confirm nor reject this figure.

Other early mound surveys were conducted in Iowa by Pratt (1877) and by Starr (1895).

The Iowa Archeological Survey, under the direction of Keyes and field supervision of Orr, surveyed and excavated Woodland mounds in the northeast, northwest, and southwest regions of the state. Keyes (1928) estimated the presence of 10,000 mounds in Iowa. Keyes and Orr died before publishing the results of their work. The Luther College Archaeological Research Center conducted an intensive Effigy Mound survey of northeastern Iowa in 1973. The results of this survey combined with the surveys by Keyes and Orr documented 53 mound complexes containing 1,426 mounds within three counties—Allamakee, Clayton, and Dubuque (Mallam 1976:5).

Not all of these mounds are Woodland time period; the dates range from A.D. 700 to A.D. 1300 and contain both Woodland and later Oneota burials. According to Mallam (1976), they may reflect a Woodland cultural-ecological adaptation over a broad time span. Only a small proportion of these mounds were excavated or produced accidentally disturbed human remains. Bioarcheological data are available for an even smaller proportion.

Keyes' and Orr's 1934-1936 excavations of Woodland mounds in northeastern Iowa are summarized in Logan (1976) (Table 7). The Oneota component of their survey was summarized by M. Wedel (1959). Most of these remains are part of the Keyes Collection at the Iowa State Historical Society (Tiffany et al. 1990, Tiffany 1981). Systematic study of the Keyes

Collection is scheduled in the near future before it is reburied (Schermer, personal communication). Skeletal material recovered from a number of the same mounds, as well as others in Allamakee County that are part of the Effigy Mounds National Monument collections, have been studied as part of a report of material at the monument (Fisher and Schermer 1987) (Table 8). Since the 1934-1936 excavations, some of these mounds/sites have produced additional human remains as a result of subsequent excavation or accidental disturbance. Osteological analyses of these remains have generally been reported in the Iowa Office of the State Archaeologist Research Papers series.

#### Woodland Bioarcheology Database

Published osteological/bioarcheological data representing the Woodland period in Iowa comes from 57 burial sites (18% of the total 310 sites). Eighteen (32%) of these sites are Woodland-unspecified, five are Early Woodland (9%), 21 are Middle Woodland (36%), and 13 are Late Woodland (23%). Most sites are located in the Eastern Woodland adaptive zone (30/57 or 53%), 15 are Prairie zone sites (26%) and 15 are located in the Prairie Lake adaptive zone (26%). The 57 Woodland sites contain 258 individuals or 19% of the total 1,360 individuals reported for Iowa. The Woodland-unspecified period is represented by 55 individuals (21%), the Early Woodland by 18 individuals (7%), the Middle Woodland by 135 individuals (52%), and the Late Woodland by 50 individuals (20%).

#### Early Woodland Period (1000-200 B.C.)

The Early Woodland period in Iowa is poorly understood archeologically and bioarcheologically and is difficult to distinguish from the preceding Late Archaic period in terms of subsistence, settlement pattern, or mortuary practices. The presence or absence of ceramics is the single defining attribute. The Red Ocher mortuary complex appears to straddle the boundary of the Late Archaic/Early Woodland transition. Esarey (1986) has argued convincingly for an association of Red Ocher burials and Marion Thick pottery in Illinois burial mounds; see Green and Schermer (1988:132-133) for a discussion of the Late Archaic vs. Early Woodland designation of these sites in Iowa.

Tiffany's (1986) review of the Early Woodland period in Iowa identifies 18 sites in the Eastern Woodland adaptive zone. All are multicomponent and few have produced human remains in an identifiable Early Woodland context. Table 10 identifies five Early Woodland sites with remains representing 18 individuals. Two sites are from the Eastern Woodlands, Levens (13JK4) and Mound 37 of Turkey River Mound Group (13CT1). No published information is available on the 10 individuals from the Levens site (13JK4).

The Turkey River Mound Group (13CT1) is a transitional Late Archaic/Early Woodland, Ryan focus site. Mound 37 is reported to be of Early Woodland age (ca. 100 B.C. - A.D. 100) Prairie phase based on the presence of two tiny sherds (Early Woodland Prairie ceramic series) beneath the "submound" limestone cap. A ring of limestone slabs surrounds a central extended burial of an adult male (Burial 4) associated with the incomplete remains of an infant (Burial 5) covered with red ocher. The adult male is headless. Shell beads are associated with the burial. Mound fill includes a bone tube possibly made from a human tibia, an elk upper right second molar, projectile points, and a diagnostic Red Ocher bipointed knife made of Wyandotte chert (Green and Schermer 1988:134-135). Three additional sets of remains (Burials 1-3) were identified within the mound at various depths. These badly weathered, incomplete remains represent four adults (two males, one female, and one unknown) and an infant (.5-1.5 years). Little bioarcheological information is obtainable from these fragmentary, poorly preserved remains. Burials 2 and 3 (male and female adults) exhibit

Table 7. Woodland burials/human remains resulting from Keyes/Orr Survey reported in Logan (1976).

Site	# Mounds/ Type	# Mounds Excavated	MNI*	Comments
Allamakee County—Mounds				
Mud Hen Joe Mound Group (13AM116)	4 Conical	3	1	extended burial, headless
Harpers Ferry Mound Group -Valley Mound (13AM157)	NA	1	0	
Harpers Ferry Mound Group 13-Mound 2 (13AM79)	NA	1	1	
Martell Mounds (part of Harpers Ferry Mound Group)	~5	2	0	
Ryan Mounds (13AM117)(part of Harpers Ferry)	7 Conical	4 Conical	5	bundle burials
	1 Oval	1 Oval		red ochre
Houlihan Mound (13AM117) (part of Harpers Ferry)	1 Oval	1	>1	bundle burials
Hill Mound Group (13AM105)	4 Conical	4	15	extended burials, skull burials
Brazell's Mound Group (13AM81)	1 Conical	1 Linear	1	bundle burial in bear effigy
	1 Linear	1 Linear		
	1 Effigy			
Luth Mound Group	5 Conical	3	8	extended burial, bundle burial, skull burials
Paint Rock Mound Group	NA	1	1	extended burial
Waukon Junction Mound Group (13AM87)	5 Conical	1 Conical	1	cremation
	9 Linear			
	1 Bear Effigy			
	1 Bird Effigy			
Lane Farm Mound Group (13AM104)	84 Conical	10 Conical	~44	bundle burials, extended burials, Woodland and Oneota
	6 Linear			
	Enclosure			
New Galena Mound Group (13AM108) (13AM137)	32 Conical	14	~59	bundle burials, extended burials, Woodland and Oneota
Hogback Mound Group (13AM1)	3 Conical	2	13	bundle burials, extended burials, Woodland and Oneota, skull burials
Slide Mound Group (13AM120)	15 Conical	5	5	bundle burials, skull burials
Allamakee County—Habitation/Rockshelter Sites				
Elephant Village Site (13AM120)			5+	Woodland habitation site, Oneota burials
Highway 13 Rockshelter			5	flexed burial, burned crania, infant burials in crevice
Clayton County—Mounds				
Gudovissy Mound Group 2 (13CT44)	12 Conical	3	10	bundle burials
Harvey's Island Mound Group 2 (13CT66)	5 Conical	3	14	bundle burials, extended burials, 1 intrusive post-contact American Indian burial
French Town Mound Group (13CT166)				
	1 Linear			
	10 Conical	4	~18	bundle burials, extended burials, red ochre, cremation
Jackson County Mounds				
Deppe Mound Group (13JK72)	8 Conical	2	11	bundle burials, skull burials, dish cut from human skull
Pleasant Creek Mound Group (13JK17)	5 Conical	2	19-20	bundle burials, skull burials, a stone "altar"

\*MNI is estimated from descriptions in Logan (1976).

moderate to advanced dental attrition. Burial 4 (adult male) has slight osteophytic lipping of the cervical vertebrae and sacral promontory and moderate osteoarthritic lipping on the long bone articular surfaces and the superior margin of the left acetabulum. Burial 4 had a healed fracture of the left fifth metatarsal.

Research in the Prairie Lake region of north-central Iowa indicates that utilization of lacustrine resources increased sharply at the onset of the Early Woodland period. According to Tiffany (1986:168), this emphasis may have resulted from population increase, seasonal movement into the Prairie Lake area by hunting and gathering groups residing in riverine areas, or developing sophistication in resource utilization among hunting and gathering groups. The increased utilization of this region and the population increase is not reflected in the bioarcheological record. Only one site with human remains is documented for the Early Woodland period in the Prairie Lake region. This site, 13PK111, with a single individual is the same incomplete individual discussed in the Archaic section of this review.

Tiffany's (1986) review of the Early Woodland period in Iowa identifies five sites with Early Woodland components from the Prairie adaptive zone, including MAD; 13CH101/102; Rolling Hills Farm (AKA Hanging Valley), 13HR28; Lewis Central School, 13PW5; and the Glenwood locale. Although these sites have produced earlier Archaic or later Middle Woodland burials, none has produced Early Woodland burials. Two sites containing two individuals, not discussed in Tiffany's review, have provisionally been assigned Early Woodland status. A single skull from site 13LO1 is assigned to the Early Woodland period based on craniometric data. This middle age male exhibits extensive dental attrition but no evidence of periodontal

disease or caries (Fisher 1984b). One individual from the Rubel site (13PM413) is given a provisional Archaic/Early Woodland designation (Schermer 1983f).

The Early Woodland period in Iowa is bioarcheologically unknown. A pattern of high abrasive attrition of the dentition is suggested. Burial practices similar to the Archaic continued, including the use of red ochre, cremation, and postmortem skeletal modification including dismemberment and "decapitation." The admixture of Late Archaic and Woodland cultural traits reflects continuity between these stages with the independent acquisition of major cultural features. According to Tiffany (1986:167) and Stoltman (1978:711), pottery had a minor impact on the overall Archaic hunting and gathering way of life.

#### Middle Woodland Period (200 B.C.-A.D. 400)

Hopewell mounds (Havana-Hopewell horizon, McGregor phase) have a long history of research in northeastern Iowa with many attempts to relate the local Hopewell mortuary materials to the broader Hopewell pattern from Illinois and Ohio. Throughout most of the riverine Midwest, Hopewell settlement and economic patterns were directed toward permanent habitation in major valleys and intensive exploitation (and cultivation) of native plants. Only minimal use of upland and interior areas occurred.

The documentation of mounds in Iowa, many of which are presumably Middle Woodland, was discussed above. Sites excavated by Keyes and Orr as part of the Iowa Archaeological Survey and the number of burials recovered are presented in Tables 7, 8 and 9. Most of these sites are multicomponent with Middle Woodland, Late Woodland, and Oneota periods represented. Assignment of burials/individuals to appropriate

archeological period or culture is not reported except for the Oneota component in M. Wedel (1959). Bioarcheological documentation has not been reported for most of this collection. Human remains from these sites are part of the Keyes Collection at the Iowa State Historical Society and were also part of the museum collection at Effigy Mound National Monument. Bioarcheological information has been reported for the human remains from the Effigy Mound National Monument (Fisher and Schermer 1987).

The most complete detail of sites excavated and burials recovered is likely to be found in Orr (1963). Table 7 presents sites and number of burials for Woodland sites extracted from Logan (1976). No osteological data are available for these remains. Table 8 presents sites and numbers of individuals in the Effigy Mounds National Monument Collection. Osteological data are reported by Fisher and Schermer (1987). Table 9 presents sites and extracted number of Oneota burials/individuals presented in M. Wedel (1959).

The Middle Woodland period in Iowa is represented by 21 burial sites with reported remains of a minimum of 135 individuals (Table 11). Ten sites representing 71 individuals are identified for the Eastern Woodland zone. Extensive bioarcheological data exist for two of these sites, the Adams Mound (13DB5) and the Pine Creek Mounds (13MC44).

The Adams Mound contained 14 individuals, eight adults and six subadults. Although the sample size is small, complete metric and nonmetric data are presented for comparative purposes (Lillie 1993h). Dental caries is present in 25% of the adults but at a rate per person of .375. Dental attrition is marked in older adults. Enamel hypoplasia is present in 14% of adults and transverse lines are observed in both adults and subadults at a frequency of 50%. Adult trauma frequencies of 25% are comparable to rates in other Woodland groups. Adult infection rates of 62.5% are high compared to frequencies for other Woodland groups. Trauma includes a partially healed cranial depression fracture and dislocated clavicle and scapula.

The Pine Creek Mounds represent 23-25 individuals, 11-14 adults and 12 subadults (Fisher 1986; Hodges 1989a). Subadults constitute 46-52% of this sample, a mortality rate that is comparable to rates for Middle Woodland sites in Illinois. Metric, nonmetric, and pathological data are detailed and compared to other Middle Woodland populations in the Midwest (Hodges 1989a). Dental caries is rare, occurring in one individual of 16 (6%) at a rate per person of .06. Enamel hypoplasia occurs in three individuals (15%). Various pathological conditions are comparable to rates reported for the Middle Woodland Elizabeth Mounds in Illinois, although the frequency of vertebral arthritis is almost double at the Pine Creek Mounds (40% vs. 22%), and joint arthritis is absent at Pine Creek Mounds with variable rates from 4-24% for various joints at the Elizabeth Mounds. Adult infection rates (28.6%) and adult trauma rates (16-25%) are comparable. Cribra orbitalia is absent at Pine Creek and porotic hyperostosis occurs in only one adult (7.1%). Significant is the identification of a probable case of treponemal infection in an adult male, described in detail in the report for the Pine Creek Mound site (Hodges 1989a).

The other Middle Woodland period Eastern Woodland sites produced less extensive bioarcheological data and are briefly summarized below.

The Keystone site (13JK23) suggests that the slight dental attrition exhibited by one 5-6 year old individual may be indicative of a less coarse diet than that characteristic of Archaic cultures (Fisher 1981f). A similar lack of attrition is reported for two children from the Honey Creek State Park site (13AN43) by Fisher (1976b). This is in contrast to the extreme dental attrition exhibited by individuals from the Late Archaic Lewis Central School site where all occlusal surface enamel on all molars and premolars

Table 8. Museum collections of Effigy Mounds National Monument (Fisher and Schermer 1987).

Site	Period	MNI
Spike Hollow Rockshelter (13AM47, Accession 49, Additional material in Keyes Collection)	Woodland/Oneota	5
Elephant Terrace (13AM59 [formerly 106], Acc. 14, Additional material in Keyes Collection Iowa SHS)	Archaic to Oneota	7
Nazekaw Terrace Mound Group (13AM82, Mound 55, Acc. 1)	Middle Woodland McGregor Focus A.D. 1050±300 (Mound 33)	3
Red House Landing Mound Group (13AM101, Accession 78)	Middle Woodland McGregor Focus A.D. 210±110, 10 B.C.±90	4
(13AM190, Mound 33, Acc. 106)	Middle Woodland McGregor Focus A.D. 200±300	5
Fire Point/Procession Mound Group (13AM190, Mound 36/37, Acc. 16)	A.D. 200±300 (Mound 33)	2-3
(13AM190, Mound 38, Acc. 109)		5
(13AM190, Mound 41, Acc. 111)		1
(13AM207, Mound 18, Acc. 53)		3
Waukon Junction Rockshelter (13AM266, Acc. 48)		9
Sny Magill (13CT18, Mound 7, Accession 5)	550 B.C.±250 - 1520±200	1
Highway 76 Rockshelter (13CT231, Accession 8)	Woodland	14
Quandahl Rockshelter (13WH35, Accession 51)	Archaic to Oneota (mostly Late Woodland)	2
New Albin Rockshelter (Acc. 13)		1
Accession 44 (Unknown Origin)		2
Guttenberg Burial (Acc. 50)		1
Marquette Rockshelter (Acc. 70)	Woodland	10
Accession 8 (Unknown)		2

Table 9. Woodland sites (Oneota component burials) reported by M. Wedel (1959).

Site	Burials	Type
Hogback/Flatiron Terrace (13AM01)	13	Intrusive Woodland Mound
O'Regan Cemetery (13AM21)	34	Cemetery
Elephant Cemetery (13AM59)	20	Cemetery
Woolstrom (13AM61)	4	Cemetery
Burke (13AM67)	13	Cemetery
Lane Mound Group (13AM104)	16	Intrusive Woodland Mound
New Galena Mound Group (13AM108)	4	Intrusive Woodland Mound

Table 10. Iowa sites with an Early Woodland mortuary component in the Eastern Woodlands (EW), Prairie Lake (PL), and Prairie (P) regions.

Site	Phase	MNI	Region	Type
Turkey River Md. Group <sup>1</sup> (13CT01)—Md. 37	Prairie	5	EW	Mound
Levsen (13JK04) <sup>2</sup>	Unknown	10	EW	Unknown
13LO1 <sup>3</sup>	Unknown	1	P	Unknown
PK Co. Sheriff (13PK111) <sup>4</sup>	Unknown	1	PL	Unknown
Rubel (13PM413) <sup>5</sup>	Unknown	1	P	Unknown

<sup>1</sup>Green and Schermer 1988; <sup>2</sup>Cordell and Marcucci 1991; <sup>3</sup>Fisher 1984c; <sup>4</sup>Fisher 1981i; <sup>5</sup>Schermer 1983f.

was removed by attrition shortly after 20 years of age (Fisher 1978). An adult male from the Keystone site (13JK23) exhibits a thickened and bowed tibia shaft suggestive of syphilis or yaws (Fisher 1981f).

The Rooks Collection (13DB9002) comprises nine adults and three subadults from a number of burial sites in the tristate area around Dubuque (Morrow 1981c). This collection presents the highest frequencies of caries, 9/27 (33%), 1.3 per individual for the reported Middle Woodland, Eastern Woodland sites in Iowa.

No information is available regarding the two burials from Mound 10 at 13CT166, but stable carbon isotope ratios of -14.4 and -21.1 are reported by Pratt (1994). These ratios present conflicting evidence regarding the amount of C<sub>4</sub> plant (maize) consumption. The general lack of dental caries in the reported individuals from the Middle Woodland/Eastern Woodlands period is consistent with the more negative value (-21.1).

Excavation of five bundle burials is reported by Ruppé (1960) from the Westwood site (13HN4), a mound on a terrace above the Skunk River. Five individuals are identified, three adults and two juveniles, but no additional osteological information is presented. A Havana Zoned Incised vessel associates the burials with the Middle Woodland period.

Little or no information is available for the three individuals reported from the Nazekaw Terrace Mound (13AM82), the one individual from the Harper's Ferry Mound (13AM160), and the one individual from the Lane Enclosure (13AM200).

The Prairie Lake adaptive zone is represented by six burial sites and 51 individuals for the Middle Woodland period. These sites are found primarily in three adjacent counties (Webster, Boone, and Dallas) running in a north-south line paralleling the Des Moines River. The most extensive bioarcheological information is available for the Pooler Mound (13WB215). Little bioarcheological information is available for the Birdie Mound, 13WB114 (Thompson 1977b; Fisher 1977p), Hartz Brothers' Farm site, 13WI115 (Fisher 1977h), Boone Mound, 13BN29 (Fisher 1986h), the Redfield Assemblage, 13DA7 (Fisher 1986k), or the Gypsum Quarry site, 13WB1 (Flanders and Hansman 1961). These sites will be summarized first, followed by a review of the Pooler site.

The Birdie Mound, 13WB114, presents evidence of a rock vaultlike structure and another configuration of rocks surrounding two human calvaria. A femur, tibia, and fibula were found near these two features. The bones were in anatomic relationship but with epiphyseal and diaphysis spiral fracture breaks that appear to have occurred before interment and before degradation of soft tissue. Polished stones of possible ideological importance were uncovered. Faunal material recovered from the mound fill includes wolverine, whose normal distribution is north of Iowa. A welk conch shell bead suggests that Gulf Coast trade to the south as well as trade to the north (wolverine) was occurring at this site.

The Westwood site (13HN4) presents five bundle burials covered by a pavement of limestone slabs. Pieces of a Havana Zoned Incised vessel were recovered in a similar mound a few hundred yards upstream. This association suggests a relationship with the Illinois River Valley Middle Woodland complex (Ruppé 1960).

The Gypsum Quarry site (13WB1) consists of seven conical mounds located on terraces above the Des Moines River. Partial examination of one mound produced no burials, although pieces of human long bone and an occipital fragment with smooth edges were recovered. This fragment may reflect ceremonialism similar to the occiput removal practices found in burials in the Rainy River aspect of Minnesota (Wilford 1955:133) or at Aztalan (Barrett 1933:358). Significant amounts of hematite are scattered in the fill, in addition to a pile of 459 pebbles of hematite found deep in the center of the mound. While the mound form and material suggest similarities to the Late Woodland, Effigy Mound aspect, the presence of two Great Oasis vessels suggests a possible early Mississippian influence (Flanders and Hansman 1961).

The Hartz Brothers' Farm site (13WI115) is represented by a small collection of human bone and two bird bone fragments gathered from a knoll after the hill top had been removed for borrow. The human remains consisted of an occipital fragment and various long bone fragments from a single male individual between 20-30 years old (Fisher 1977h).

Table 11. Iowa sites with a Middle Woodland mortuary component in the Eastern Woodlands (EW), Prairie Lake (PL), and Prairie (P) regions.

Site	Phase	MNI	Region	Type
Nazekaw Terrace Md. (13AM82) <sup>1</sup>	McGregor	3	EW	Mound
Harper's Ferry Md. Group (13AM160) <sup>2</sup>	Unknown	1	EW	Mound
Lane Enclosure (13AM200) <sup>3</sup>	Unknown	1	EW	Mound
Honey Creek Mds. (13AN43) <sup>4</sup>	KC Hopewell	3	EW	Mound
Boone Md. (13BN29) <sup>5</sup>	KC Hopewell	5	PL	Mound
M.A.D. (13CF101) <sup>6</sup>	Unknown	1	P	Isolated
Frenchtown Md Grp, Md 10 (13CT166) <sup>7</sup>	Unknown	2(18)	EW	Mound
Redfield (13DA7/64) <sup>8</sup>	Unknown	12	PL	Mound
Adams Mounds (13DB5) <sup>9</sup>	Allamakee	14	EW	Mound
Jim Rook's Coll. (13DB9002) <sup>10</sup>	KC Hopewell	12	EW	Unknown
Westwood (13HN4) <sup>11</sup>	Unknown	5	EW	Mound
Hanging Valley (13HR28) <sup>12</sup>	? Phase*	7	P	Isolated
Diggins (13HR401) <sup>13</sup>	Unknown	1	P	Unknown
Hartz Bros. Farm (13WI115) <sup>14</sup>	Unknown	1	PL	Unknown
Keystone (13JK23) <sup>15</sup>	Unknown	7	EW	Shelter
Pine Creek Mds. (13MC44) <sup>16</sup>	Unknown	25	EW	Mound
Tipton Md (13ML193) <sup>17</sup>	Unknown	3	P	Mound
Gypsum Quarry (13WB1) <sup>18</sup>	Allamakee	1	PL	Unknown
Birdie Mound (13WB114) <sup>19</sup>	Unknown	3	PL	Mound
Pooler (13WB215) <sup>20</sup>	Allamakee	29	PL	Mound
Denise Carter (13WD0405) <sup>21</sup>	Unknown	1	P	Isolated

<sup>1</sup>OSA proj. Rpt. #226; <sup>2</sup>Keyes List and Mallam 1976; <sup>3</sup>Young 1981b; <sup>4</sup>Fisher 1976b; <sup>5</sup>Fisher 1986h; <sup>6</sup>Fisher 1981d; <sup>7</sup>Mallam 1976 and Pratt 1994; <sup>8</sup>Fisher 1986k; <sup>9</sup>Lillie 1993h; <sup>10</sup>Morrow 1981; <sup>11</sup>Ruppé 1960; <sup>12</sup>Schermer and Owsley 1987 and Tiffany, Schermer, et al. 1988; <sup>13</sup>Fisher 1977i; <sup>14</sup>Fisher 1977h; <sup>15</sup>Fisher 1981f; <sup>16</sup>Fisher 1986l, Hodges 1989a; <sup>17</sup>Lillie 1995c; <sup>18</sup>Flanders and Hansman 1961; <sup>19</sup>Fisher 1977p; <sup>20</sup>Abbott and Schermer 1983, Fisher 1981a, and Young 1981h; <sup>21</sup>Hodges 1993a.

\*Mid-American Woodland Tradition

The Redfield Assemblage (13DA7) included the fragmentary remains of 12 individuals. The burials were extended and covered with stone slabs but were unmarked by overlying mounds (Fisher 1986k). The human remains represent 10 adults (three males, three females, and four unknown) and two children (5 and 6 years old). Noteworthy was the lack of dental caries and the comparatively low level of dental attrition.

The most extensive bioarcheological information comes from the Pooler site (13WB215), located in an upland area south of the Des Moines River. Interments in the cemetery date from the Middle Woodland through the Late Woodland period. Human remains and cultural material were recovered from three mounds. Osteological and paleopathology data are presented in reports by Fisher (1981a), Young (1981h), and Abbott and Schermer (1983). The burials are primarily bundle burials, with some evidence of cremation. Hematite is abundant and appears to have been scattered over the mounds, perhaps during ceremonial visits to the mounds. This same pattern and quantity of hematite distribution is reported for the nearby Gypsum Quarry site (13WB1) and the earlier Turkey River Mounds in northeastern Iowa. Craniometric and nonmetric data suggest a variation in morphology with relationships to both Eastern Woodland groups and Western Woodland Plains groups. Relevant to dietary reconstruction and general health status, dental caries is infrequent and attrition is moderate to advanced. This pattern is consistent with a moderate amount of grit and low carbohydrate content in the diet.

The Prairie adaptive zone during the Middle Woodland period is represented by five burial sites and 13 individuals. Until recently the Middle Woodland occupation of western Iowa was thought to be transitory and sporadic. Identification of numerous buried cultural horizons and the excavation of the Rainbow site (13PM91), the type site for the Woodland stage in the Loess Hills, has produced a model of occupation represented by small bands with a broad spectrum subsistence base (Benn 1981). According to Benn (1981), under population pressure, these small bands linked periodically or seasonally into aggregate bands to maintain social

relations as a hedge against drought. However, bioarcheological data from the Hanging Valley site (13HR28) has raised questions about the validity of the aggregate band model.

Bioarcheological analysis of the Hanging Valley burials (13HR28) suggests a rather precarious and unsatisfactory adaptation during Middle Woodland occupation (Tiffany, Schermer et al. 1988; Schermer and Owsley 1987). The site is located in the extreme western portion of the Loess Hills on the western border of Iowa at the junction of the Little Sioux and Missouri rivers. Gully erosion did not allow protection in situ so excavation proceeded in 1983 under the provisions of chapter 305A of the Iowa code to recover endangered human skeletal remains after consultation with the Indian Advisory Committee. Seven burials were recovered in isolated pits. The burial practice appears to be a continuation of the Middle Archaic mode of isolated burials as seen at Turin (13MN2) in the adjacent county to the north. The Late Archaic ossuary at the Lewis Central School site (13PW5), in the adjacent county to the south, is thought to foreshadow mound building which became the dominant pattern of burial in Woodland populations to the east and west. Evidence of mound building is lacking for the Loess Hills area of western Iowa. Radiocarbon dates on wood charcoal date the Hanging Valley site to A.D. 190 ± 190, A.D. 310 ± 60, and A.D. 700 ± 90 (Tiffany, Schermer et al. 1988:224).

The seven individuals at the Hanging Valley site represent two adults and five subadults. The adults are a young female (16-19 years old) and an older female (35-40 years old). The five subadults range in age from 1 to 11 years (Table 14). Pathological conditions indicative of biological adaptation include dental disease, bone lesions, and trauma. Marked attrition and lack of caries characterize the dentition of these individuals. The quantity and form of dental attrition varies significantly from the Archaic Turin (13MN2) samples. Dental chipping and extreme wear of the Hanging Valley individuals suggests an abrasive diet. The flatter molar wear in the Archaic remains compares to the type of wear observed in several hunter-gatherer populations, while the oblique wear found in the Woodland group compares to the highly angled occlusal wear found in several agricultural groups. Bone lesions suggestive of nutritional deficiency are indicated by the presence of slight porotic hyperostosis, cribra orbitalia, or both in all individuals from 13HR28.

Cuts consistent with scalping are present on a 35-40 year old female. While cutmarks on the cranial bones of Plains Indian skeletons have been associated with burial practices including defleshing of the bones, the number and location of the cuts in this individual is suggestive of scalping (Tiffany, Schermer et al. (1981:244). The date for the two skeletons makes this possible case of scalping one of the oldest examples yet recorded. It also suggests the need to develop better models for discriminating between the bony expressions of scalping and defleshing and the widely disparate human behaviors (conflict vs. ancestor/relative ceremonial veneration) that may produce them. Other indicators of environmental stress including enamel hypoplasia, transverse lines, and reduced long bone growth corroborate the poor health of this population. Enamel hypoplasia is observed in five of the six individuals (83%) with three individuals averaging 68.7 hypoplastic lines per individual. Transverse lines or Harris lines are observed in all five individuals with femora available with an average of 10.3 lines per individual. While the cultural interpretations regarding adaptation, subsistence, and settlement pattern may represent a large leap from the evidence of seven burials, the report is a model for the development of bioarcheological hypotheses that can be tested with additional data. See Benn (1989) for an alternative model and Tiffany et al. (1989) for a response to Benn.

#### Late Woodland Period (A.D. 400-1100)

The Late Woodland period has received less study than the more "elaborate" preceding Middle Woodland/Hopewell period and the subsequent emerging Late Prehistoric/Mississippian period. A number of recent researchers have attempted to change this deficiency (Braun 1988, Green 1987); they show that the Late Woodland was more than just a transitional "dark age" of prehistory. The characteristics of the immediate post-Hopewell groups in northeastern Iowa (Allamakee phase, ca. A.D. 300-700) include larger populations, reduced interregional interaction, and more use of uplands and interior valleys, including more intensive native plant cultivation. The role of maize in the subsistence economy is poorly understood (Green 1987:20). It is also generally believed that the bow and arrow came into use during the Late Woodland period (Hall 1980). The characteristics of Late Woodland social organization and the nature of social interaction are topics of debate. Braun (1985) argues that networks of reciprocity developed to reduce subsistence risk in smaller collecting territories. Green (1987:382-3) suggests that networks result from the need for information exchange. Benn (1980:208-210) characterizes network development among dispersed Late Woodland populations as a "Late Woodland Interaction Sphere." The subsequent Effigy Mound manifestation, Keyes phase (ca. A.D. 700-1100), represents the best known archeological features (effigy mounds) in northeastern Iowa.

Green and Schermer (1988) propose that the Effigy Mound upland settlement may represent a continuation of the Late Woodland trends in the context of a frontier model of movement of small communities into an unoccupied or little-utilized area. Burial mounds and effigy mounds suggesting clan symbols represent visible evidence of societal integrative mechanisms in northeast Iowa. A number of surveys of this region, including those of Allamakee, Clayton, and Dubuque counties, have identified over 53 Effigy Mound complexes containing over 1,426 mounds (Mallam 1976:5). Allamakee County has also produced the largest number of burial sites/cemeteries with human remains identified in the current database (45/310 or 15%). However, the Late Woodland period is poorly represented. Only three sites from Allamakee County and 10 from the Eastern Woodland zone have produced human remains. Late Woodland groups in the Prairie Lake and Prairie adaptive zones are even less well known. Only one site with one individual is identified for the Prairie Lake region and two sites representing two individuals are identified in the Prairie adaptive zone (Table 12). The biological nature of Late Woodland peoples is poorly understood.

The 10 sites in the Eastern Woodland included 46-47 individuals. Three sites are located on the high bluffs adjacent to the Mississippi River in Allamakee County in northeast Iowa where extensive survey and excavation of Woodland mounds was undertaken by Keyes and Orr between 1934 and 1936. Many of these sites contained intrusive Oneota burials. Late Woodland burials are uncommon or not identified.

The Keller Mound site (13AM69) represents 31 mounds, including two bear effigies, located on a terrace where Spring Brook flows into the Mississippi River. T. H. Lewis platted the mound group in 1885. Orr made a plat of the entire terrace in 1910 and excavated two conical mounds in 1912, recovering only a few fragments of human bone and a small Spring Hollow Plain vessel (Orr 1963). In 1977 David Benn and R. Clark Mallam excavated three conical mounds that had been disturbed by road expansion.

Three mounds (Mounds 4, 23, 29) were excavated and six individuals identified. Mound 4 has two extended burials of an adult male and female, with the dental arch of an 18 month old infant placed on the hip of the

Table 12. Iowa sites with a Late Woodland mortuary component in the Eastern Woodlands (EW), Prairie Lake (PL), and Prairie (P) regions.

Site	Phase	MNI	Region	Type
Keller Mound (13AM69) <sup>1</sup>	Allamakee	6	EW	Mound
Lane Farm Mounds (13AM104) <sup>2</sup>	Keyes	15	EW	Mound
Bluff Top Mound (13AM243) <sup>3</sup>	Allamakee	3	EW	Mound
Little Maquoketa River Md (13DB36) <sup>4</sup>	Unknown	2	EW	Mound
(13JK80) <sup>5</sup>	Unknown	1	EW	R. Shel
Gast Farm Site (13LA12) <sup>6</sup>	Weaver	13	EW	Isolated
Sand Run West (13LA38) <sup>7</sup>	Unknown	1-2	EW	Unknown
Jollyville Hill (13LE12) <sup>8</sup>	Unknown	2	EW	Mound
Harrison Fisch Burial (13OB404) <sup>9</sup>	Unknown	1	P	Isolated
Buchanan (13SR153) <sup>10</sup>	Unknown	1	PL	Isolated
Le Claire (13ST78) <sup>11</sup>	Unknown	1	EW	Isolated
(13WD78) <sup>12</sup>	Unknown	1	P	Isolated
Quandahl Rockshelter (13WH35) <sup>13</sup>	Unknown	2	EW	R. Shel

<sup>1</sup>Benn et al. 1978 and Fisher 1978b; <sup>2</sup>Fisher 1977i, u; <sup>3</sup>Fisher 1978c; <sup>4</sup>Slattery et al. 1977; <sup>5</sup>Schermer 1983g; <sup>6</sup>Lillie 1995e; <sup>7</sup>Fisher 1987b and Benn et al. 1992; <sup>8</sup>Fisher 1984b and Lillie 1990i; <sup>9</sup>Tiffany, Fisher 1976; <sup>10</sup>Schermer 1989b; <sup>11</sup>Schermer 1984a; <sup>12</sup>Lillie 1994d; <sup>13</sup>Mallam 1977 and Fisher 1978i.

female individual. Two additional human skull fragments were also found in separate burial features. No human remains were found in Mound 23. A single human molar was found in Mound 29.

Another blufftop mound (13AM243) was excavated and it contained three crania in elaborate burial context. In addition both Keller and 13AM243 contained fragments of human bone deposited in specific parts of the mound fill. Some of these bones are complete, but the majority are variously shattered, cracked, or gnawed. Benn et al. (1978) suggest "sprinkling of bone fragments in the mounds may represent the symbolic release of the human soul by casting it back into its environment, i.e., the earth." While no osteological data other than age and sex are presented, the report by Benn et al. (1978) presents extensive analysis of the burial practices and hypotheses regarding the ideology of the human groups that produced the reconstructed burial ceremonialism. The significance of fire, red plants/minerals, burned soil, rocks, water, and the sprinkling of bone fragments is discussed in relationship to the ideology of various North American Indian tribes.

The Lane Farm Mound Group (13AM104) is a multicomponent site with Woodland burial mounds, a circular enclosure, and an Oneota village overlying the mounds. Excavation of 10 mounds by the Iowa Archaeological Survey in the 1920s and 1930s reports burials in nine of the mounds (Mounds 1, 2, 3, 10, 11, 12, 13, 16, 17). Seventeen conical mounds were extant at the time of the survey, although an 1882 Bureau of American Ethnology survey reported 90 mounds (84 conical and six linear). No osteological information or report exists for these burials. Osteological data are reported for burials from two other mounds (Mounds 14 and 50) that were recovered during a 1970 excavation of the overlying Grant Oneota Village site (13AM201) (Fisher 1977u). The human remains are fragmentary and generally in a poor state of preservation, limiting the amount of recoverable osteological data. Eight burials were identified in Mound 14 and six in Mound 50. The skeletal remains of 11 adults and three children are identified. The rate of attrition is described as moderate in the few teeth available for examination. The teeth showed no signs of dental caries. No pathology or evidence of disease were observed. Additional human remains were recovered from the surface of an eroding mound during excavations at the Hartley Terrace in 1970 by Marshall McKusick. The remains of a very incomplete young female (20-30 years of age) is identified by Fisher (1977i). Stature is calculated to be 157.09 ± 4.45 cm. No evidence of disease is observed.

The most extensive information about Late Woodland people in the Eastern Woodland region is documented from the Late Woodland Weaver component of the Gast Farm site (13LA12). The site was excavated between 1991 and 1994 by the University of Iowa Department of Anthropology summer field school. Radiocarbon dates and cultural

material from the Weaver component indicate the area was occupied ca. A.D. 300. Osteological analysis by Lillie (1995e) identifies 13 individuals, six subadults, two adolescents, and five adults, two of which could be identified as male. Although the remains are fragmentary and incomplete, bioarcheological information includes the following: both adult and subadult dentition were characterized by slight to moderate calculus buildup, three individuals of eight with observable dentition exhibited enamel hypoplastic defects (37.5%) and three individuals of 10 with observable dentition exhibited carious lesions (30%). Additionally of interest, the dentition of a partial subadult mandible was marked by the presence of an unerupted supernumerary premolar and rotation of the erupted first and second premolars.

The remaining six sites from the Eastern Woodlands are represented by only one or two individuals each, but bioarcheological analysis of even these small samples have contributed important information to Late Woodland culture and population adaptation.

Bioarcheological information from the one Late Woodland burial from the Sand Run West site (13LA38), which also produced Archaic burials, provides evidence of conflict in an adult male with five projectile points in his left torso region. Similar to the burial practice of a number of Archaic burials from this region, this individual was also headless. Benn et al. (1992) reports examples and frequencies of violent death during the Late Prehistoric period in the Midwest are discussed and explained in conjunction with political upheavals related to tribal forms of social organization after the model of Braun and Plog (1982). Evidence for conflict does not appear to precipitously rise during Late Woodland and Late Prehistoric/Mississippian times in Iowa as proposed elsewhere.

The Little Maquoketa Mound Group (13DB36), located in northeast Iowa, was surveyed and tested in 1977 related to a proposed residential development (Slattery et al. 1977). Visual survey identified the presence of 28 conical mounds. Two mounds were subsurface tested to determine the presence of human remains. Mound 1 produced a femoral shaft fragment and a human skull that was left in situ. Mound 3 produced a navicular bone. Both individuals were adult but no additional information was recovered from these fragmentary remains.

A human burial was accidentally uncovered in a rockshelter in east-central Jackson County, 13JK80, in 1982. A single individual in a flexed position resting on the left side and oriented towards the northeast was identified. Osteological analysis was performed by Schermer and the remains were reburied in the rockshelter at the completion of the examination (Schermer 1983g). An adult female, 30-40 years of age, is identified. The cranium was reconstructed, allowing a few measurements to be made for comparative purposes. Stature estimates suggest an individual of 155.78 ± 3.66 cm to 156.08 ± 4.45 cm. The individual exhibited severe dental attrition, tooth loss and a large carious lesion on the distal surface of mandibular molar. The left temporal bone exhibited the unusual condition, atresia, or imperforation/closure of the normal opening of the external auditory meatus. Late Woodland cultural affiliation is based on associated ceramics. A comparison of craniometric characteristics to Neumann's (1952) varietal types and the comparative series described by Glenn (1974) indicate the closest similarity to the Sauk, Iowa Effigy Mounds, and Orr Oneota comparative series.

Human remains from the Jollyville Hill site (13LE12) are described by Fisher (1984b). The site, located in southeast Iowa, contained several partially destroyed mounds. The site is identified as Late Woodland based on associated ceramics. The human remains are very poorly preserved, fragmented, and incomplete. Two individuals, a 7 year old child and an adult, possibly male are represented by teeth, cranial bone flakes, and 75 postcranial bone fragments. The only noteworthy morphological feature was the presence of large (Dahlberg class g) Carabelli's cusps on the first



molars of the child. Additional skeletal material from this site was found in the Repository Collection of the Office of the State Archaeologist and is reported by Lillie (1990i). These remains consist of a small quantity of long bone fragments that probably belong with the previously identified material.

Human remains unearthed during deep plowing of a vacant lot in LeClaire, Iowa in 1983 and designated 13ST78 represent an isolated bundle burial. Osteological analysis by Schermer (1984a) identifies an adult, possibly male, 40-50 years of age. A single tooth exhibits severe attrition. A transverse line was evident in the medullary cavity of the distal portion of the right tibia. The presence of thin, grit-tempered, cord-marked ceramics suggest a late Middle to early Late Woodland affiliation.

The Quandahl Rockshelter (13WH35) was an important multicomponent rockshelter that was destroyed in the 1950s as a result of unauthorized and indiscriminate excavation. A small collection of artifacts obtained by Gavin Sampson, a Decorah resident who carried out limited test excavations in the rockshelter in 1946, indicates the rockshelter was occupied variously from the Archaic period through the Late Prehistoric Oneota period, with the most intensive occupation occurring during the Late Woodland period. Human remains from the rockshelter include a small collection donated to the Office of the State Archaeologist but the details of recovery are unknown.

Fisher (1978i:10-11) identifies only right and left femora and a right tibia representing an adult of undetermined age, possibly female. A reconstructed stature estimate of  $147.41 \pm 3.55$  cm suggests an individual of short stature. Of greater interest is the cut and perforated human mandible recovered by Sampson in the early 1960s and reported by Mallam (1979). The mandible is that of an adult male, 30-40 years of age that has been modified through cutting, grinding, and perforation. The mandible is separated along the symphysis, the ascending ramus has been cut away, and perforations have been chipped and drilled into the ramus and the mental foramina. Mallam suggests the perforations were used for suspension by a cord in order for the mandible to serve as a pendant. According to Parmalee (1959), modification of mammalian skulls and mandibles is found in Archaic, Woodland, and Mississippian peoples in Illinois. Modification of human remains has most commonly been associated with Middle Woodland Hopewell people. A similarly modified human mandible is reported from the Sister Creeks mounds in Illinois (Cole and Duel 1937:156; Plate XXIII). Assignment of this mandible to the Late Woodland period is based solely on the predominance of that occupation period at the site.

The only Prairie Lake region site with human remains from the Late Woodland period is the Buchanan site (13SR153) near Ames, Iowa. The Buchanan site was excavated in 1987 as part of a collaborative field project between Iowa State University and the Institute for the History of Material Culture, Polish Academy of Sciences. A human radius was uncovered in a nonmortuary context and is described by Schermer (1989b). The bone is adult and the small size suggests female. No measurements were possible and no pathology was observed.

Two sites from the Prairie region have produced human remains from the Late Woodland period. The Smith site (13OB404) is located on an alluvial terrace of the Little Sioux River. Human remains were accidentally uncovered during a house excavation in 1976. Fisher identified the fragmentary and incomplete remains of an adult male, 30-40 years of age (Tiffany and Fisher 1976). No pathology or dental caries were observable. Site 13WD78 is a burial site located on the top of a deep, loess bluff east of the Big Sioux River. Erosion resulting from recreational motor bikes exposed human bone in 1990. Osteological analysis by Lillie (1994i) identified the fragmented and incomplete remains of a single adult, probable male. A few of the bone fragments were burned and one was

calcined. Dental attrition was extreme with the pulp chamber exposed on all of the teeth. No other pathology was observable. The Late Woodland date is based on the presence of a Reed or Des Moines point recovered from the surface and the presence of grit-tempered, cord-impressed sherds. The point, however, could not be linked specifically with the burial.

#### Woodland - Unspecified Period/Phase

A number of sites with recovered human remains have been assigned to the Woodland period generally but are not assignable to subperiods or phases. These sites are presented in Table 13. Eighteen sites are identified representing 55 individuals. Many of these sites represent few, fragmentary, incomplete remains in disturbed contexts. Little bioarcheological information is obtainable from these individuals. Therefore only six sites, three from the Prairie Lake region and three from the Prairie region are reviewed here. These regions are particularly underrepresented and the sites represent the largest samples or have produced bioarcheological information of interest. Sites in the Prairie Lake region are Mohler-Miller Mound Group (13MA20), Nelson site (13WR1), and Northridge Subdivision (13SR18/13SR19).

The Mohler-Miller Mound Group (13MA20), located in south-central Iowa, was originally recorded in 1961 by McKusick and Ries and more precisely mapped in 1964 by Gradwohl. Test excavations were conducted by the Iowa State University Archaeological Laboratory as part of the Red Rock Reservoir survey in 1964. Three mounds are oriented in a southwest-northeast direction. Test excavations identified human remains in Mound 1. Excavation of an area adjacent to the test trenches in 1966 uncovered a secondary burial area identified as Feature 2. The human remains were transferred to the Iowa Office of the State Archaeologist in 1991 and 1994 for identification and reburial.

Osteological analysis by Schermer and Perez (1995) identifies a minimum of 10 individuals, six adults and four subadults. The adults include four males and two females. Age determination was possible for one female, 40-60 years of age, and one male, 35-55 years of age. The ages of the four subadults are 3-9 months, 2-3.5 years, 5-6.5 years, 7-8.5 years, and 7-12 years. Bioarcheological characteristics of the adult individuals included slight to moderate calculus on all adult dentitions; enamel hypoplastic defects on all five individuals with dentitions (100%),

Table 13. Iowa sites with a Woodland mortuary component (unspecified period/phase) in the Eastern Woodlands (EW), Prairie Lake (PL) and Prairie (P) regions.

Site	Region	MNI	Type
Upper Village Site (13BH68) <sup>1</sup>	EW	1	Unknown
Rock Run Shelter (13CD10) <sup>2</sup>	EW	4	Unknown
(13CT223) <sup>3</sup>	EW	2	Mound
(13CT254) <sup>4</sup>	EW	1	Isolated
(13CY26) <sup>5</sup>	P	2	Unknown
(13DM31) <sup>6</sup>	EW	2	Isolated
Erickson Farm (13HB101) <sup>7</sup>	PL	5	Unknown
Mohler-Miller Mound Group (13MA20) <sup>8</sup>	PL	10	Mound
Sharp's Site (13ML42) <sup>9</sup>	P	1	Isolated
(13ML428) <sup>10</sup>	P	4	Unknown
(13ML283) <sup>11</sup>	P	6	Mound
(13PK197) <sup>12</sup>	PL	1	Surface Find
(13PK496) <sup>13</sup>	PL	1	Surface Find
Council Bluffs Ossuary (13PW1) <sup>14</sup>	P	10	Mass Burial
Northridge Subdivision (13SR19) <sup>15</sup>	PL	1	Cemetery
(13VB123) <sup>16</sup>	EW	1	Mound
(13WD78) <sup>17</sup>	P	1	Burial
Nelson (13WR1) <sup>18</sup>	PL	2	Unknown

<sup>1</sup>Lillie 1995j; <sup>2</sup>Young 1981f and Lillie 1993a; <sup>3</sup>Fisher 1986d; <sup>4</sup>Lillie 1994c; <sup>5</sup>Lillie 1994f; <sup>6</sup>Lillie 1996a; <sup>7</sup>Fisher 1977w; <sup>8</sup>Schermer & Perez 1995; <sup>9</sup>Lillie 1996i; <sup>10</sup>Lillie 1994h; <sup>11</sup>Lillie 1996d; <sup>12</sup>Lillie 1996p; <sup>13</sup>Myster and Lillie 1994; <sup>14</sup>Schermer 1993; <sup>15</sup>Schermer 1991; <sup>16</sup>Fisher 1977d; <sup>17</sup>Lillie 1994d; <sup>18</sup>Morrow 1981f.

Table 14. Iowa Woodland demography.

Early Woodland (site/region)	0-4			5-9		10-14		15-19			subadult	20-29			30-39		40-49		50+		Adult			NA	Total
	?	M	F	?	M	F	?	M	F	M	F	M	F	M	F	M	F	?	M	F					
13CT1(MD37)/EW	1																			1	2	1		5	
13JK4/EW																							10	10	
13LO1/P																					1			1	
13PK111/PL																					1			1	
13PM413/P													1											1	
Totals/Age	1/6%	0	0	0					0	0			1/6%	0					0		6/33%	10/55%		18	
Middle Woodland																									
13AM82/EW																								3	3
13AM160/EW																							1	1	
13AM200/EW																					1			1	
13AN43/EW													1	1											2
13CT166/EW																								18-20	18-20
13DB5/EW	2	2	2		1	1							1	1	1		1					2			14
13DB9002/EW	2				1								2	1	2	1	2				1				12
13HN4/EW					2																3				5
13JK23/EW	1	1				1																4			7
13MC44/EW	6	3	2		1								2	1	1	1					5-7		1		23-25
13BN29/PL	1						1														1	2			5
13DA7/PL		2																			4	3	3		12
13IW115/PL											1														1
13WB1/PL																					1				1
13WB114/PL						1															1	1			3
13WB215/PL	1	2	1		3	1		5					3	1	1		2				2	3	2	2	29
13CF101/P	1																								1
13HR28/P	1	3	1		1									1											7
13HR401/P						1																			1
13ML193/P	1					1																	1		3
13WD405/P														1											1
Totals/Age	16/ 11%	13/ 9%	7/ 5%		15/ 10%			6/ 4%					14/ 9%		9/ 6%		5/ 3%			0		41-43/ 27%	24-26/ 16%	154	150-
Late Woodland																									
13AM69/EW	1					1																1	1	1	6
13AM104/EW			2			1		1					1									8	1	1	15
13AM243/EW	1	1											1												3
13DB36/EW																						2			2
13JK80/EW																1									1
13LA12/EW	1	3	2		2	1															3	1			13
13LA38/EW																						1		1	1-2
13LE12/EW		1																				1			2
13ST78/EW																									1
13WH35/EW																								1	2
13SR153/PL																								1	1
13OB404/P																									1
13WD78/P																									1
Totals/Age	3/ 6%	7/ 14%	2/ 4%		5/ 10%			1/ 2%					2/ 4%		4/ 8%		1/ 2%			0		23/ 46%	2/ 4%		50

one individual with 11 grooves on four teeth; slight ectocranial pitting of unknown etiology on two crania (40-60 year old female and 35-55 year old male); slight periostitis on seven long bones representing a minimum of two individuals (33%); widespread periostitis on one humerus; and bilateral auditory exostoses in one individual (40-60 year old female). Bioarcheological characteristics of the subadult individuals included enamel hypoplastic defects in three of the four individuals (75%). No other pathological conditions are evident.

Remains from the Nelson site (13WR1) were salvaged from a plowed field by amateur archeologists in the early 1960s. The Nelson site is located in central Iowa on the east side of the Boone River. The bones were disturbed prior to removal but enough remained in situ to identify one interment as flexed on the right side. Osteological analysis by Morrow (1981f) identified two adult individuals, one male, 30-45 years of age, and one female. The female exhibited "well worn" teeth and microscopically identified parallel striations on her right second molars, which were concluded to be the result of using the teeth "in preparing strips of sinew or fiber." Arthritic changes affected the lower back, elbow, and wrist joints of one individual. Healed fractures of three ribs were evident.

The Northridge Subdivision site is significant because it represents the only Woodland mound in Story County and one of the few along the South Skunk drainage in central Iowa. There are over 50 recorded mound

sites in adjacent counties but almost all are located along either the Des Moines River (in Boone and Polk counties) or along the Iowa River (in Hardin County). Only four other mound sites in addition to 13SR18 are recorded in the South Skunk river drainage in central Iowa. Numerous Woodland habitation sites have been recorded in Story County during eight systematic surveys, making the absence of mounds even more puzzling. The mound (13SR18) was identified and tested related to proposed house construction in 1991. Soil probes confirmed the presence of human remains consisting of a thoracic vertebra and other vertebral fragments. The remains were reburied in the probe test hole (Schermer 1991). Additional tests of areas around 13SR18 identified an isolated burial designated 13SR19. The human remains recovered consisted of arm bone fragments and cranial fragments (Schermer 1991:15-19) representing an adult male. The distal end of a right humerus exhibited several tiny tick marks on the posterior surface that appeared to have been made with a sharp, thin bladed object rather than rodent teeth. The possible presence of cuts suggests disarticulation and defleshing as part of the burial treatment. Postmortem animal gnawing evident on a number of bones suggest the remains had been exposed on the surface for a period of time prior to the original interment. No other pathological conditions were observable.

The Prairie region includes 13ML283, 13ML428, and the Council Bluffs Ossuary (13PW1). Site 13ML283 is a well known Woodland mound group that was documented as early as 1881 by S. V. Proudfit. In 1921, Paul Rowe carried out excavations, uncovering "cremated human remains" in Mound 1, and later excavated human remains from Mound 2. A total of four mounds and a lodge were identified at this site by Ellison Orr in 1953. In 1970, a local amateur archeologist excavated human remains from an area in close proximity to 13ML283. The remains were turned over to the Iowa Office of the State Archaeologist in 1984 and are identified by Lillie (1996d). Osteological analysis suggested that the commingled unburned, charred, and burned remains came from secondary burials. A minimum of six individuals, three adults and three subadults, were identified. The three adults represent one male, one female, and one indeterminate. One adult is older based on attrition displayed by four loose molars. The only pathological condition noted on the adult remains was a small area of possible periostitis on the posterior surface of a burned left fibula shaft. The three subadults were aged newborn to 9 months, 2-3 years, and 3.5-5 years. The 3.5-5 year old exhibited 13 enamel hypoplastic defects on nine permanent teeth. Measurement of the defects after the method of Goodman et al. (1980) suggested this individual suffered from a prolonged period of nutritional or disease-related stress between the ages of 2 and 3.5 years, not long before death.

Site 13ML428 is a burial site that was first reported by Paul Rowe in 1953. In 1991, an amateur archeologist reported the excavation of a burial at the site in 1957. The burial was transferred to the Office of the State Archaeologist and identified by Lillie (1994h). The bundle burial represents the remains of four individuals. One individual was an adult. Three were subadults aged newborn to 6 months, 5.5-6.5 years, and approximately 12-13 years. The adult individual exhibited slight osteophytic lipping on the inferior articular facets of the axis and a lumbar neural arch. A lumbar neural arch appeared to be separated, antemortem, suggesting spondylolysis. Also noted were bony growths along the lateral volar surface of the right fifth metacarpal.

The Council Bluffs Ossuary (13PW1) is a multicomponent site with purported Woodland and/or Late Prehistoric Glenwood association. The human remains have lost their contextual association and therefore cannot be associated definitively with either component. Osteological analysis of the 10 individuals recovered from the site is described by Schermer (1993). The results are discussed in the Glenwood section. Of significance is the presence of diffuse periostitis in three individuals (MNI=10) suggestive of treponematosi. Pre-Columbian treponematosi has been documented in a number of sites in Western Iowa including the Late Archaic Pooler site (13WB215) and the Middle Woodland Haven site (13PW18). Bone radiocarbon dates on the affected individuals from the Council Bluffs Ossuary would help determine the archeological age and cultural affiliation.

*Summary of the Woodland Period.* Until the more extensive human remains from the Woodland component of the mounds excavated by Keyes and Orr in northeastern Iowa are analyzed, the Woodland period in Iowa will remain bioarcheologically poorly understood.

### Late Prehistoric Period (A.D. 900 - European Contact)

The Late Prehistoric/Mississippian time period was one of sweeping changes in subsistence, social organization, and technology throughout the midwestern United States related to the development of maize horticulture, more sedentary settlement patterns, and a ranked social organization. This transition has been referred to as the "Mississippianization" of Late Woodland lifeways (Dobbs 1982; Gibbon 1982) emphasizing the influence of the large Middle Mississippian site of

Cahokia at the confluence of the Mississippi and Illinois rivers. There are no Middle Mississippian sites in Iowa (Tiffany 1991) but Middle Mississippian "influences" and artifacts are found at a number of sites.

The Plains Village cultures represent another pattern strongly influencing Iowa Late Prehistoric development between A.D. 1000-1600 in the tall grass prairie/short grass plains regions of central and western Iowa. Subsistence based on maize and bison, earthlodge house settlement pattern, and a complex social organization are characteristic of these Late Prehistoric Plains villagers.

Cultures of the Late Prehistoric time period tend to display a great deal of regional distinctiveness. Cultural groups occupying Iowa during this time period include Great Oasis, Mill Creek, Glenwood and Oneota. Great Oasis and Mill Creek are Plain Village groups from central and northwest Iowa. Glenwood is a Central Plains tradition located in southwest Iowa. Oneota culture dominated much of eastern Iowa as well as extensive parts of central and northwest Iowa from A.D. 1050-1700. A good overview of these cultures and the Mississippian influence in western Iowa is presented in Tiffany (1991).

Sixty-two burial sites containing 499 individuals are identified for the Late Prehistoric period. Burial sites are most common for the Oneota with 35 sites representing 56% of the 62 Late Prehistoric sites and 11% of the total 310 burial sites with human remains, recorded for Iowa. The Oneota sites contained 270 individuals, although it is not clear whether all of these individuals were available for study. The large samples reported by M. Wedel (1959) may not have been retained or they may be part of the Keyes Collection of the Iowa State Historical Society, which is currently undergoing study. Great Oasis sites number eight with 92-93 individuals. Mill Creek sites number 12 with 119 individuals. Glenwood sites number seven with 17 individuals. An additional 20 sites in Mills County with 54 individuals are identified as possibly Glenwood. These sites are not included in the totals for Late Prehistoric sites.

### Great Oasis (A.D. 800-1260)

Great Oasis has alternately been considered to be a phase of the Initial variant of the Middle Missouri tradition (Henning and Henning 1978) or a regional Late Woodland period pottery complex (aspect) that in northwest Iowa was ancestral to the Mill Creek culture (Tiffany 1991:187). Although originally thought to be confined to a small area in southwestern Minnesota, it is now recognized as occurring in northwest Iowa, eastern South Dakota, extreme southeastern North Dakota, and northeastern Nebraska. The relationship of Great Oasis to earlier Woodland groups and later Late Prehistoric groups, particularly Mill Creek, is the subject of much speculation. The presence of exotic prestige items at Great Oasis sites but not at Late Woodland sites suggests the development of trade relationships by Great Oasis people, possibly as "middlemen," with the Emergent Mississippian peoples of the central Mississippi valley (Henning 1991). Benn and Rogers (1985) argue that this may have resulted in the domination of Great Oasis groups over other Late Woodland groups and the demise of Late Woodland cultural patterns. According to Henning (1991), the Great Oasis groups that expanded this trade relationship developed into Mill Creek. A similar view is presented by Alex and Tiffany (in Tiffany 1983:97), that "those Great Oasis groups that came under Mississippian influence became Mill Creek/Initial variant cultures, and those that did not (or did not accept Mississippian ideas in the same way) continued the more conservative Great Oasis lifeway."

Another area of debate is the degree to which Great Oasis people were agricultural. According to Henning (1991), the presence of maize kernels, but the lack of cobs and agricultural implements, suggests Great Oasis people may have traded for corn. According to Anfinson (1979),

Great Oasis groups in Minnesota maintained a more Woodland-like hunting and gathering lifestyle. He reports no evidence for Great Oasis horticulture in Minnesota. Alex (1981) develops a more explicit ecological basis for explaining this variation in Great Oasis groups and the origin of the Middle Missouri tradition. He suggests that those groups located in areas suitable for horticulture and with access to the western bison herds continued the trend toward Mississippianization, becoming settled, intensive maize horticulturists. In areas less favorable to horticulture and heavy reliance upon bison hunting, Great Oasis groups continued in the Woodland hunting and gathering pattern.

Information from human skeletal remains in the form of genetic variants for determining population relationships, skeletal indicators of trauma/conflict, and indicators of general health and diet has the potential to contribute much to both of these areas of debate. Although a number of possible Great Oasis burial sites have been reported and osteological data compiled, no attempt has been made to apply the osteological data to these larger questions. Possible Great Oasis burial sites are reported in Table 15; seven of eight are in adjacent counties in central Iowa, in the vicinity of the Des Moines and Raccoon rivers. Great Oasis sites that produced human remains include: 13BN125, Blosser; 13DA64, DeCamp; 13KH1; 13PK38, West Des Moines; 13PK63, Glen Oaks; 13PM25, Broken Kettle West; 13WB1; and 13WB57, Gypsum Quarry.

The Blosser site (13BN125) was excavated in 1969 by the Iowa State University Archaeological Laboratory and is the basis of an M.A. thesis by Broinahn (1985). The site is primarily a habitation site utilized from the Middle to Late Woodland times followed by Late Woodland to post-Woodland mortuary use, possibly affiliated with the Great Oasis habitation at nearby site 13BN130. Osteological analysis is reported by Schermer and Perez (1996). Six burial units are identified representing eight individuals—one young adult, possibly female; two older young to middle-aged adults, one possibly male and one possibly female; one middle-aged adult, possibly female; and four individuals of general adult age, two possibly female and two of undetermined sex. Demographic data are presented in Table 16. The remains are incomplete and in poor condition, but metric and nonmetric data when observable are detailed in the report. The following generalizations are possible: only one carious lesion is observable; dental attrition is moderate; enamel hypoplasia is observed in four to six individuals (50-75%). Eleven of the 30 teeth in Individual 5 (older young to middle-aged adult female) have enamel hypoplastic defects which were documented to have occurred between 3.5 and 4.0 years of age; slight to moderate postmortem erosion of bone makes nonmetric and pathological observations difficult.

The DeCamp site (13DA64) is a burial site excavated in 1965 by Jack Musgrove (n.d.). Approximately 84 primary and secondary burials were removed. Some of the burials were reportedly covered with limestone slabs but were unmarked by overlying mounds (Fisher 1986k). Some of the human remains were received from the Iowa State Historical Department for identification and reburial in 1985. A report by Fisher (1986k) identifies the site as DA7 and describes osteological analysis. A subsequent report by Hodges (1990) clarifies the designation as DA64 and provides additional osteological analysis on remains received since 1985. Hodges (1990) reports the human remains represent a minimum of 28 individuals (six subadults and 22 adults) and a maximum of 39 individuals (eight subadults and 31 adults). The subadults range in age from 9 months to 7 years of age. Most of the adults are less than 40 years of age. Adolescent individuals are notably absent. Demographic data are presented in Table 16. Fisher (1986k) reports on the low degree of dental attrition particularly in relation to the extreme degree of attrition observable in the Late Archaic Lewis Central School site (Fisher 1978a). Hodges (1990) reports on the low frequency of pathology. Dental caries

Table 15. Iowa sites with a Late Prehistoric Great Oasis mortuary component in the Prairie Lake region.

Site	MNI	Type
Blosser (13BN125) <sup>1</sup>	8	Habitation
DeCamp (13DA64) <sup>2</sup>	28-39	Cemetery
(13KH1) <sup>3</sup>	8	Burial/Habitation
West Des Moines (13PK38) <sup>4</sup>	20	Unknown
Glen Oaks (13PK63) <sup>5</sup>	12	Burial Pit
Broken Kettle West (13PM25) <sup>6</sup>	2-3	Habitation, Cache Pit, House Fill
(13WB1) <sup>7</sup>	1	Mound
Gypsum Quarry Site (13WB57) <sup>8</sup>	2	Mound

<sup>1</sup>Schermer and Perez 1996; <sup>2</sup>Fisher 1986k; <sup>3</sup>Benn and Fisher 1978; <sup>4</sup>Reported on Iowa OSA list, no published report; <sup>5</sup>Lillie 1993j; <sup>6</sup>Lillie 1990e; <sup>7</sup>Flanders and Hausman 1961; <sup>8</sup>Fisher 1977c.

is observed in five of 33 individuals (15%). Enamel hypoplasia is observed in seven of 33 individuals (21.2%). Congenital tooth absence is observed in three individuals; two individuals were missing the mandibular third molar, and a third individual was missing the mandibular central incisors. Malocclusion was observed in one individual with extreme rotation of maxillary premolars. Malocclusions in prehistoric populations are generally less frequent than in modern populations (Corruccini 1984). Pathology on cranial, mandibular and postcranial remains is rare. Degenerative changes in the form of osteophytes and erosive pits are observed on the femora of two individuals. No evidence of infectious lesions or trauma is observed.

13KH1 was reported to the State Archaeologist in 1978 and subsequent excavation recovered a burial site and habitation debris. Benn and Fisher (1978) observe that the site setting, on an exposed knoll, would not have been a comfortable habitation in inclement weather and propose that perhaps the site "represents a warm weather hunting camp of Late Woodland-Plains Village people who would have spent the greater part of their year in permanent villages." Osteological analysis is reported by Fisher (in Benn and Fisher 1978). Approximately 850 fragments of human bone represent the remains of eight individuals, one child 6-8, a female 15-19, and six adults, three males and three females (Table 16). Bioarchaeological data are not readily observable on these fragmentary remains but Fisher reports all teeth showed marked attrition of the occlusal surfaces with complete loss of the enamel in most instances.

West Des Moines (13PK38) is an ossuary burial site representing approximately 20 individuals reported on a list provided by the Office of the State Archaeologist. No published report is currently available on these remains.

Glen Oaks (13PK63) is a burial site that was accidentally uncovered as a result of residential development in West Des Moines in 1992. The human remains are fragmentary and incomplete as a result of removal by heavy construction equipment. Three small Great Oasis pottery sherds provide a tentative cultural identification although their association with the burial is unknown. Osteological analysis is reported by Lillie (1993j). A minimum of 12 individuals (six subadults and six adults) is reported based on dental remains. At least two adults were probably male and one possibly female. One of the adults was an older juvenile or young adult, three were young adults, one an older young adult, and the sixth was middle-aged. The subadults were identified as two aged 2-4 years, a 6-8 year old, a 9-12 year old, a 10-14 year old, and an 11-15 year old. Demographic data are reported in Table 16. Dental caries is observed in five of 12 (41.6%) individuals. Enamel hypoplasia is observed in five of 12 (41.6%) individuals. Two individuals had totals of 10 and 11 enamel hypoplastic defects, respectively. Episodes of growth disruption occurred in the age range of 2.5-5.5 years. Calculus formation was widespread in the dentition. Postcranial remains are fragmentary but no pathological conditions were observed.

Table 16. Iowa Great Oasis demography.

Prairie Lake	0-4			5-9			10-14			15-19			20-29			30-39			40-49			50+		Adult			Total
	?	M	F	?	M	F	?	M	F	?	M	F	M	F	?	M	F	M	F	?	M	F					
13BN125						1									1	1							2	2		8	
13DA64	3			5						2	4	1			2	1			1				1	11	3	5	39
13KH1				1																				3	3		8
13PK63	2			1						3					1				1								12
13PM25																											2-3
13WB1																											1
13WB57																											1
Totals by Age	5			7			3						11				6										33-34
Percent	6.9			9.7			4.2						15.2				8.3										72-73
																											100

Broken Kettle West (13PM25) is a Great Oasis village site. Excavation of the village site, in 1967, by Marshall McKusick (Office of the Iowa State Archaeologist) recovered human remains from Cache Pit 4 and from house fill. The remains consisted of a right ulna and two left radii, representing two to three adult individuals. The right ulna exhibited 36 cutmarks and one left radius exhibited seven cutmarks "suggesting an attempt at disarticulation and/or defleshing" (Lillie 1990e).

Two mound groups in Webster County, 13WB1 (Gypsum Quarry site) and 13WB57 have been alternately interpreted as Great Oasis (Tiffany 1977) or as Late Middle Woodland with evidence of Mississippian (Great Oasis) influence (Flanders and Hansman 1961:8).

The Gypsum Quarry site (13WB1) consists of seven conical mounds on terraces above the Des Moines River. Excavations by Flanders and Hansman (1961) produced cultural material in one of the mounds (Mound #1) that included two Great Oasis vessels. No burials were observed but fragments of human long bone and an occipital fragment with smooth edges were recovered. Flanders and Hansman (1961:8) propose that the occipital fragment may represent burial ceremonialism similar to the occiput removal practices found in burials in the Rainy River aspect of Minnesota (Wilford 1955:133) or at Aztalan (Barrett 1933:358). While mound form and material may suggest similarities to the Late Woodland, Effigy Mound aspect, the presence of the two Great Oasis vessels suggests the early Mississippian influence characteristic of Great Oasis sites.

Mound group 13WB57 was surveyed by Rex Hansman and Marshall McKusick in 1961. Artifact material (one ceramic pottery sherd and a basalt celt) and human remains were recovered from the surface adjacent to the mounds. The human remains are identified by Fisher (1977c) as representing two individuals—a female, 17-25 years of age and an adult (represented by only the diaphysis of a femur). The young adult female exhibits third degree attrition on her anterior teeth and first and second molars, second degree attrition on her premolars, and advanced first degree attrition on her third molars. The second adult femur diaphysis exhibits evidence of chronic periostitis.

*Summary of Great Oasis.* The Great Oasis culture poses a number of questions about population relationships and social interaction during the Late Woodland-Late Prehistoric transition in the Prairie Peninsula/Prairie Lake region and the effect of Mississippian influences on autonomous and widely dispersed groups. Other questions revolve around the role and impact of maize horticulture vis-à-vis bison hunting. The eight sites and 92-93 individuals (Table 15) identified for this culture have contributed little directly to these questions, primarily because the samples are small (Table 16) and the human remains are fragmentary and poorly preserved. A few tentative bioarchaeological conclusions can be made. The frequencies of carious lesions are low at Blosser and DeCamp (12.5-15%) but higher at Glen Oaks (41.6%). Enamel hypoplastic defects are pervasive with frequencies ranging from 21 to 75% and episodes of stress ranging from 1.5 to 5.5 years but clustering around 4 years. The sample and evidence is small but this may indicate stress from childhood diseases rather than weaning age malnutrition. Dental attrition is low to

moderate at Blosser and DeCamp but marked at 13KH1 and 13WB57. Evidence for disease is low with only one individual in the total sample presenting evidence of chronic periostitis. The presence of a modified occipital fragment is used to suggest similarity in mortuary ritual to the Middle Mississippian site at Aztalan.

#### Glenwood (A.D. 900-1500)

The Glenwood culture in southwestern Iowa is a local variant of the Nebraska phase of the Central Plains tradition. Although originally thought to range from A.D. 430 to 1640 (Tiffany 1981:65-67), more recent analysis by Hotopp (1978a, 1978b, 1982) suggests a narrower period of occupation of the Glenwood locality by Nebraska people dating between A.D. 1050 and A.D. 1250. Benchley et al. (this volume) summarize the subsistence of Glenwood people as heavily dependent upon the cultivation of corn, beans, and squash. Faunal remains suggest greater reliance upon forest species than groups farther west, and bison as only a small part of their diet. Benchley et al. suggest the lesser reliance on bison may have been a factor in their apparent peaceful coexistence with other groups in the region, allowing their scattered nonfortified settlement pattern while their bison hunting Mill Creek neighbors to the north required fortified villages. Since they were not in competition for bison with other groups, such as Oneota, they could develop friendly trading relationships. Tiffany (1991) reports a lack of evidence for Oneota interaction with Great Oasis and Mill Creek groups but a significant Oneota influence in the latter part of the Glenwood culture. The origins of the Glenwood culture and the Nebraska phase are unclear. Both the Steed-Kisker phase of Missouri and the Smoky Hill phase of Kansas have been proposed as possible ancestors. Bioarchaeological information from human remains has contributed little toward resolving these issues about Glenwood culture groups.

Human remains representing Glenwood culture people are primarily recovered from earthlodge excavations and are very fragmentary and incomplete. According to Abbott (1980), "Burial practices of the members of the Nebraska variant in Iowa are uncertain. Burials have been found in house sites and apparently in mounds." McKusick (1964:170) mentions that Ellison Orr reported "disarticulated skulls and human bones clearly associated with Glenwood culture (Nebraska variant) pottery and artifacts at the Hunt Mound and Wells Mound in Mills County." No osteological information could be identified for these sites.

The bioarchaeological database for the Glenwood culture is limited and diagnostic association with Glenwood is lacking in most cases. Table 17 presents sites with human remains that are defined as Glenwood based on the presence of earthlodges and/or Glenwood (Nebraska phase) potsherds. Table 18 presents sites with human remains from Mills County that are possibly Glenwood. These sites lack earthlodge structures or other identifying Glenwood features; degrees of dental attrition and/or caries are the basis for identification as Late Prehistoric in most cases. Identification as possibly Glenwood within the Late Prehistoric period is

Table 17. Iowa sites with a Late Prehistoric Glenwood mortuary component in the Prairie region.

Site	MNI	Notes
<b>Earth Lodge Structures</b>		
Council Bluffs Burial (13PW3) <sup>1</sup>	1	Disturbed Burial
Council Bluffs Ossuary (13PW1) <sup>2</sup>	10-11	Swaboda Incised Sherds Multicomponent Woodland and Glenwood
<b>Mound and Earthlodge Structures—Rowe Collection</b>		
McDowell Dig #8 (13ML134) <sup>3</sup>	1	Burned
Tipton Mound Village (13ML192/255)/ Orr Site Md Group 13 (13ML247) <sup>3</sup>	1	Charred
Mound on Old Case Place (13ML282) <sup>3,4</sup>	1	Burned
Mound 2 (13ML283) <sup>3,4</sup>	1	Cranial Deformation
Bare Site (13ML360) <sup>5</sup>	1	Caries

<sup>1</sup>Abbott 1980 and Fisher 1980c; <sup>2</sup>Schermer 1993; <sup>3</sup>Lillie 1992o; <sup>4</sup>Billeck 1992b; <sup>5</sup>Lillie 1992m.

Table 18. Iowa sites (Mills County) with possible Late Prehistoric Glenwood mortuary components in the Prairie Region.

Site	MNI	Notes
13ML0b <sup>1</sup>	1	
13ML7/Rowe C42 <sup>2</sup> Grave—Jim Severn's	24	Prehistoric or Mormon
13ML59 <sup>3</sup>	1	
13ML126 <sup>4</sup>	3	Dental Attrition
13ML128 <sup>5</sup>	1	Attrition, Caries
13ML130 <sup>6</sup>	3	Dental Attrition
13ML135 <sup>7</sup>	1	Caries
13ML138 <sup>8</sup>	1	Dental Attrition
13ML139 <sup>9</sup>	2	Dental Attrition
13ML140 <sup>10</sup>	1	Dental Attrition
13ML155 <sup>11</sup>	1	Dental Attrition
13ML301 <sup>3</sup>	1	
13ML332 <sup>12</sup>	1	Calcined
13ML349 <sup>13</sup>	4	Caries
13ML366 <sup>2</sup>	1	
13ML387 <sup>14</sup>	3	Caries, Enamel Hypoplasia, Hypercementosis
13ML461 <sup>15</sup>	1	Cribra Orbitalia, Enamel Hypoplasia
13ML473 <sup>2</sup>	1	
<b>McDowell New Institute Building, 1940 (13ML557)<sup>3</sup></b>	3	Burned, Charred, Calcined
<b>Rowe C24<sup>2</sup></b>	NA	

<sup>1</sup>Lillie 1992j; <sup>2</sup>Billeck 1992b; <sup>3</sup>Lillie 1992o; <sup>4</sup>Schermer 1982a and Lillie 1990g; <sup>5</sup>Fisher 1979a; <sup>6</sup>Schermer 1982b; <sup>7</sup>Fisher 1979b; <sup>8</sup>Schermer 1982c; <sup>9</sup>Schermer 1982d; <sup>10</sup>Schermer 1982e; <sup>11</sup>Schermer 1982f; <sup>12</sup>Lillie 1992k; <sup>13</sup>Lillie 1992d; <sup>14</sup>Lillie 1992j; <sup>15</sup>Lillie 1992n.

based on Billeck's observation that "a majority of the sites reported in Mills County are Nebraska phase sites... (which) may be considered somewhat surprising because the Nebraska phase occupation in Mills County has been estimated to date from A.D. 1050 to 1225, an age of span of about 175 years. Thus the Nebraska phase accounts for about 1% of the 12,000 year Indian occupation span of Mills County, yet is the most frequently identified component" (Billeck 1992b:127). Little osteological information is available for most of the sites/individuals identified in Table 18, primarily because of the incomplete and fragmentary nature of the remains.

The two sites with the clearest Glenwood affiliation are the Council Bluffs Burial (13PW3) and the Council Bluffs Ossuary (13PW1). The latter, however, is multicomponent, and the association of human remains with burial components has been lost. The Council Bluffs Burial (13PW3) is a disturbed burial excavated by Abbott (1980). The presence of Swaboda Incised sherds identifies it as Glenwood culture. No mound or moundlike features were present nor were other burials located, suggesting an isolated interment of an individual. A brief osteological report by Fisher (1980c) identified 62 cranial fragments, three small rib fragments, three metacarpal fragments, parts of three phalanges, and the head of a radius, representing an adult male, 30-40 years old.

The most extensive bioarcheological information of possible Glenwood people comes from the multicomponent (Woodland and Glenwood) Council Bluffs Ossuary site, 13PW1 (Schermer 1993). The burials were disturbed by earth moving activities and salvaged in 1957. Field notes (Ruppé 1957) suggest the presence of primary burials and ossuary burials. The presence of Glenwood (Nebraska phase) potsherds is reported from the "upper" grave, and four distinct burials are excavated in the "Glenwood level."

Unfortunately, the human remains have lost any contextual information that would indicate from which of the burial contexts they were recovered. Schermer identifies a minimum of 10 individuals. Five adults (one male and two females, 20-35 years of age; one male and one female, 35-50 years of age) were represented. Subadults (one 13-15 years and four 1-5 years of age) were also present. The adult dentition was characterized by antemortem tooth loss in four of the five adults. There was a moderate incidence of dental caries: three of the five adults, although only seven teeth were involved. Enamel hypoplastic lines were present on one tooth each of the in situ dentition of two adults and on two loose teeth which could not be assigned to a specific individual. Two of the adult individuals exhibited evidence of possible artificial cranial deformation. The adolescent (13-15 years of age) displayed an osseous defect on the distal femur epiphysis characteristic of osteochondritis dissecans. One of the young to middle aged females exhibited slight asymmetrical femoral torsion. Three individuals, two females (20-35 years and 35-50 years) and the adolescent, were affected by diffuse periostitis suggestive of possible endemic treponematoses. The abnormalities in these individuals are cited along with comparable evidence from the Pooler (13WB215) and Haven (13PW18) sites as possible examples of prehistoric treponemal disease in western Iowa (Schermer et al. 1994).

Many of the identifications of Glenwood culture sites are the result of the work of amateur archeologist Paul Rowe, who documented and excavated sites in Mills County from the 1920s until his death in 1968. In 1991, an archeological survey by William Billeck and the Iowa State Archaeologist's Office attempted to relocate sites recorded and collected by Rowe (Billeck 1992b). The contributions of Paul Rowe to Mills County archeology are documented in a volume of the Research Papers series of the Office of the State Archaeologist (Green 1992b) and elsewhere (Billeck 1992a; Green 1991a; Lillie 1992o). Billeck (1992b) summarizes the results of his survey of Rowe sites and provides an overview of each site, identifying the presence of burials and human remains when encountered. No osteological analysis is reported by Billeck.

During the course of Billeck's 1991 survey, a number of human remains were turned over by Glenwood area collectors and landowners. Osteological reports on these fragmentary remains representing seven individuals from five sites are presented in a volume of the Research Papers series. The sites include 13ML387 (Lillie 1992j); 13ML332 (Lillie 1992k); 13ML0b (Lillie 1992l); 13ML360 (Lillie 1992m); 13ML461 (Lillie 1992n). Only the Bare site (13ML360), which involved excavation of an earthlodge, is listed with the Glenwood culture sites in Table 17. The remaining association with Glenwood is tentative. Little substantive bioarcheological information is reported for these fragmentary remains.

Lillie (1992a, 1992o) identifies human remains from the Rowe Collection that had been housed at the Mills County Historical Museum in Glenwood and the Office of the State Archaeologist Repository. A minimum of 17 adults and three subadults are identified. The remains are fragmentary and represent a number of culture periods in addition to Late Prehistoric Glenwood. Only four sites representing four individuals from the Rowe Collection can be identified as Glenwood affiliation: 13ML134, 13ML192/247/255, 13ML282, 13ML283.



Other Mills County sites that may be of Glenwood affiliation have been reported by Fisher and Schermer. In 1979, Fisher (1979a) reported on a fragmentary human mandible that had been disturbed from Central Plains House site (13ML128). He concluded that it represented an adult male, 20-25 years of age. Dental attrition was extreme and a large carious lesion was present in a third molar. In the same Research Papers volume, Fisher (1979b) reported on human remains from Cache K, 13ML135, Institution Grounds, Glenwood. A series of excavations of the numerous earthlodges on the grounds of The State Hospital School (AKA the Institution and the Iowa Asylum for Feeble-Minded Children) uncovered human remains between 1938 and 1947. It is not clear whether these remains are from the Orr/WPA 1938 excavations or the "McDowell Digs" that occurred between 1938 and 1947 (Crimson and Green 1992), or from some other excavation/disturbance. The burial was removed in a matrix and represented a flexed burial. Fisher identified the remains as an adult female, about 40 years of age. Extensive antemortem tooth loss and the large carious lesions on the two teeth present led Fisher to conclude that "agriculture and a significant carbohydrate component of the diet probably was causative" (Fisher 1979b).

In 1982, Schermer (1982a-f) reported on fragmentary human remains from six Mills County sites from the Glenwood area (13ML126, 13ML130, 13ML138, 13ML139, 13ML140, 13ML155). The human remains were turned over to the Office of the State Archaeologist by Dr. Holmes Semken who had discovered them in the process of analyzing faunal remains from the Glenwood area. Eleven individuals were identified, nine of which are each represented by a single tooth. Moderate to extreme attrition is recorded for most of these teeth/individuals, but no other bioarcheological information is available from these fragmentary individuals. Additional human remains from 13ML126 were recovered as a result of earthlodge excavations in 1971 and are reported by Lillie (1990g). Four cranial fragments were recovered from different stratigraphic levels. Therefore they probably represent four individuals. The human remains were recovered from fill adjacent to intrusive historic aboriginal and Euro-American burials. It is not clear which of these components these individuals were affiliated with.

*Summary of Glenwood.* While numerous sites have produced possible Glenwood culture human remains, the remains are incomplete and fragmentary and have produced little substantive bioarcheological information. Tentative generalizations suggest the degree of attrition and degree/frequency of caries are consistent with Late Prehistoric agricultural diets. The lack of evidence of trauma lends cautious support to the hypothesis that Glenwood people were not in competition with other groups for bison and therefore did not need to fortify their villages. The most extensive bioarcheological information comes from a site of uncertain Glenwood affiliation, the Council Bluffs Ossuary (13PW1).

#### Mill Creek (A.D. 850-1300)

The Mill Creek culture of northwest Iowa dates from A.D. 900 to 1300 and is considered to be part of the Initial variant of the Middle Missouri tradition (Tiffany 1991:186) along with the Over focus of South Dakota and Cambria in Minnesota. Mill Creek habitation sites located on terraces above the Big Sioux and Little Sioux rivers consist of small compact villages with semisubterranean rectangular structures; later sites tend to be fortified. Mississippian influence at Mill Creek sites, in the form of ceramic styles and vessel forms, appears to shift coevally with the Mississippian sequence at Cahokia, but indigenous pottery types predominate suggesting according to Tiffany (1991:186) a "trait-unit rather than a site-unit intrusion to account for the Mississippian material culture present in

Mill Creek sites." Anderson (1987b) has developed an extensive systems model to explain the origin, development, and departure of Mill Creek groups in northwest Iowa.

The Mill Creek culture is probably one of the best known archeological complexes in Iowa; Tiffany (1977a:1-2) identifies 21 Mill Creek sites in the Little Sioux River valley. Although a number of village sites have been extensively excavated, most notably Chan-Ya-Ta (13BV1), Phipps (13CK21), Brewster (13CK15), Wittrock (13OB4), Kimball (13PM4), and some burials have been recovered from these sites, osteological data have contributed little to the models outlined above for Mill Creek development, and the burial patterns of the Mill Creek culture are poorly known. Mill Creek sites that have produced burials and osteological data are reported in Table 19. Demographic information is reported in Table 20. Eleven of the 12 sites are located in adjacent counties in the Little Sioux River valley. Mill Creek sites with identified human remains include: Chan-Ya-Ta (13BV1), Bultman (13BV2), Brewster (13CK15), Phipps Village (13CK21), Catlinite Amulet (13PM65), 13MN25, Wittrock (13OB4), Kimball (13PM23), Rock Creek Ossuary (13PM65), 13PM172, Siouxland Sand and Gravel (13WD402), and the Putnam Museum Collection (13-00-00).

The Chan-Ya-Ta site (13BV1) occupation is radiocarbon dated to A.D. 1000-1100 (Tiffany 1977a:7). Excavation of the site in 1974 produced one flexed child burial in the overburden of a house and several disarticulated human mandibles randomly scattered in storage pits, house fill, and on floors (Tiffany 1977a:12). According to Tiffany, human remains recovered in these contexts are a fairly common trait among Plains Village groups but probably represent secondary features associated with the dead, rather than actual burial practices. One mandible, found in a storage pit, provides evidence of cutmarks on the inferior surface and the anterior lingual surface. Tiffany suggests this may indicate ancestor worship, trophy-taking, cannibalism, or burial preparation. Osteological data presented by Fisher (1977b) identify the flexed child burial as about 4-5 years of age, and the mandibles as representing eight individuals: one male about 15-18 years old, three young adults of whom one was female, two middle age females, and two older individuals of whom one was male (Table 20). The mandible with the cutmarks is that of the 15-18 year old male; third molars are impacted and present evidence of bilateral follicular cysts. Fisher compares the dentition of the eight adult individuals represented by mandibles to the dentition of bison-hunting Sioux groups reported by Leigh (1925) where dental caries incidence was low (10%) and resorption of the alveolar process due to periodontitis was 13%. Tooth wear in Leigh's sample was advanced and characterized by marked polishing and abrasion. A similar pattern is found in the individuals at Chan-Ya-Ta. Individuals of middle age or greater exhibit advanced attrition, lingually slanted/angular, and

Table 19. Iowa sites with a Late Prehistoric Mill Creek mortuary component in the Prairie region.

Site	MNI	Type
Chan-Ya-Ta (13BV1) <sup>1</sup>	9	Habitation
Bultman (13BV2) <sup>2</sup>	1	Habitation
Brewster (13CK15) <sup>3</sup>	1	Habitation
Phipps Village (13CK21) <sup>4</sup>	1	Habitation
Catlinite Amulet (13CK64) <sup>5</sup>	3	Mound
13MN25 <sup>6</sup>	1	Isolated
Wittrock (13OB4) <sup>7</sup>	5	Habitation
Kimball (13PM4) <sup>8</sup>	8	Burial
Rock Creek Ossuary (13PM65) <sup>9</sup>	29	Ossuary
13PM172 <sup>10</sup>	16	Cemetery
Siouxland Sand & Gravel (13WD0402) <sup>11</sup>	31-40	Cemetery
Putnam Museum (13-00-00) <sup>12</sup>	5	Unknown

<sup>1</sup>Fisher 1977b and Tiffany 1977; <sup>2</sup>Lillie 1990f; <sup>3</sup>Fisher 1978e; <sup>4</sup>Lillie 1990d; <sup>5</sup>Anderson 1970; <sup>6</sup>Schermer 1983e; <sup>7</sup>Fisher 1978d; <sup>8</sup>Fisher 1983; <sup>9</sup>Anderson and Baerreis 1973 and Fisher 1977; <sup>10</sup>Lillie 1996y and Owsley et al. 1981; <sup>11</sup>Anderson et al. 1979, Fisher 1978j, Fisher 1980b, Lillie & Schermer 1990; <sup>12</sup>Fisher 1986n.

Table 20. Iowa Mill Creek demography.

	0-4			5-9			10-14			15-19			20-29			30-39			40-49			50+			Child			Adult			Total
	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F	? M F							
Chan-Ya-Ta (13BV1)																												9			
Baltman (13BV2)																												1			
Brewster (13BVB2)																												1			
Phipps Village (13CK64)																												1			
Catlinite Amulet (13CK64)																												3			
13MN25																												1			
Wittrock (13OB4)																												5			
Kimball (13PM23)																												8			
Rock Creek Ossuary (13PM65)																												29			
13PM172																												3			
Siouxland Sand & Gravel (13WD402)																												37			
Putnam Museum (13-00-00)																												5			
Totals by Age																												103			
Percent																												100			

highly polished. Caries is observed in one individual (1/8, 12%). Chronic periodontitis indicated by inflammatory response in the alveolar process is observed in three individuals (3/8, 37.5%).

Human remains were recovered from the surface of the Bultman site (13BV2) during 1988-1989 and osteological data are presented by Lillie (1990f). A single mandibular left first molar and a small fragment from a vertebral body were recovered. The mandibular M1 is reconstructed to represent a subadult individual, 8-12 years of age, based on the lack of an interstitial wear facet suggesting that the M2 was unerupted. The mandibular first molar exhibits the variant condition of three roots which occurs in American Indian populations at a rate of 5% (Turner 1971) and is one of the traits comprising the Sinodont dental pattern as defined by Turner.

The Brewster site (13CK15) is one of a series of village sites reported from the Little Sioux River valley. The site was extensively excavated in 1970 and was the basis for Duane C. Anderson's Ph.D. thesis (Anderson 1972) at the University of Colorado. A brief osteological analysis of human remains recovered from the site is presented by Fisher (1978e). Human remains consisted of portions of a right femur, left femur, and left tibia representing an adult male. No additional osteological information was observed.

The Phipps village site (13CK21) was excavated by Reynold J. Ruppé during 1952-1954 and was the subject of a master's thesis (Fugle 1957). Fragments of human remains recovered from a single unit at the site were identified in unpublished research notes by Fugle. Osteological analysis is reported by Lillie (1990d). The 12 human bone fragments including a clavicle, rib, foot navicular, cuneiform, calcaneus, cervical vertebra, and metatarsal suggest the presence of a single adult individual. Two cuts were identified on the posterior-superior border of the right clavicle.

The Catlinite Amulet site (13CK64) is reported by Anderson (1970) and human remains recovered from a possible burial mound on the site are described. Reexamination of the human remains by Fisher (1977q) confirm the earlier report but identify an additional individual. According to Fisher, the human remains represent the fragmentary bundle burial of three individuals, two adults, one of which is male, and one child. Reconstructed cranial shape of one individual is dolicocephalic. A projectile point is embedded in the medial condyle of an adult right femur.

The Wittrock site (13OB4) is one of the more extensively excavated Mill Creek village sites. University of Iowa excavations at the site in the late 1950s and early 1960s recovered human remains from house pits and from the fill of the site. The random assortment and location of bones could not account for the burial of a complete body or skeleton in any one place. Osteological analysis of the recovered human remains is

reported by Fisher (1978d). The fragmentary and incomplete remains represent five individuals: a 6-8 year old female, a 14 year old adolescent, one middle age female and two other adults, probably male (Table 20). A parietal bone shows evidence of partial incineration. A single carious lesion is observed in the 14 year old. The middle aged female presents evidence of periodontal disease in the first molar region of the left mandible.

The Kimball burial site (13PM23) located near the Kimball village site (13PM4) produced the remains of eight individuals, and osteological data are reported by Fisher (1983). One burial represents the articulated skeleton of an adult female, 40-50 years of age. Extensive tooth loss, caries, and periodontal disease are present. Severe localized arthritis of the left hip joint immobilized the upper leg in a flexed position. Cranial shape is dolicocephalic with a high cranial vault and a long, narrow face. According to Fisher, comparison of her cranial dimensions with those of a very small sample of Mill Creek female crania reported by Owsley et al. (1981) indicate many similarities to the Mill Creek people. A single lumbar vertebrae suggests the presence of a second individual in this burial. Bundle burials to the north of this burial represent the remains of two adult males and a preadolescent child. Bundle burials to the south of the adult female represent an adult male, 35 years old, a young adult, possible female, and a child, 3-7 years of age.

The Rock Creek Ossuary (13PM65) was disturbed by looting. Salvage excavation by the Northwest Iowa Archaeological Society in 1972 recovered a total of 10,037 bones, bone fragments, and loose teeth (Anderson and Baerreis 1973). The burial site is interpreted to represent redeposited burials. Cutmarks are observed on one humerus head and two immature femora in the region of the distal epiphyses. One femur shaft fragment evidences "hack" marks and two cranial fragments have burned interiors. Artifact material including a catlinite effigy pendant, a perforated deer phalanx, two side notched projectile points, and *Anculosa* shell beads suggest affiliation with either Mill Creek or Great Oasis culture. The similarity of the catlinite effigy pendant to one found at the Kimball site (13PM4) leads Anderson and Baerreis (1973:89) to propose Mill Creek affiliation.

Osteological analysis by Anderson and Baerreis identified a minimum of 27 individuals: 11 adults, 10 young children, three older children, and three infants (Table 20). The frequency of subadults (16/27, 59%) suggests a rigorous mortality experience for subadults or a stratified mortuary program. Skeletal pathology include moderate vertebral arthritis. Antemortem injuries include two projectile point wounds, in a thoracic vertebra and a right clavicle respectively. It is not clear whether these bones represent a single individual or two different individuals. According to Fisher (1977t:8), neither injury was "seriously incapacitating

immediately (but) the total absence of any reactive bone resorption around the embedded arrow point indicates that the victim died not long after the arrow injury was inflicted, probably from more effectively lethal means." The point embedded in the clavicle had one angle of the point base missing, suggesting possibly an attempt at removing the point. Dental pathology observations on 182 isolated teeth report caries on five adult teeth and four deciduous teeth, moderate to extreme wear on adult teeth, slight to moderate calculus development, and the presence of hypercementosis in at least one individual.

Osteological reexamination by Fisher (1977t) prior to reburial basically confirms the above analysis but identifies two additional children, giving a minimum of 29 individuals, with 18 subadults (62%). He reports caries on 10 adult teeth and four deciduous teeth and notes that the infrequent occurrence of advanced attrition in combination with the low frequency of caries is suggestive of a mixed hunting/gathering/agricultural diet.

Site 13PM172 represents a newly assigned site number for human remains that were previously identified as being from the Broken Kettle West site (13PM1). Lillie (1996d) details the history of the confusion regarding these remains which represent 14 burials recovered in 1964 (Lilly and Banks, 1965a, 1965b). Thirteen of the burials were taken to the University of Tennessee by Dr. William Bass, where they still repose (Lillie 1996d:272). Six of the individuals from this cemetery site were the basis for a craniometric study by Owsley et al. (1981) that attempted to compare Mill Creek and Early Middle Missouri tradition crania with Mandan and Arikara population samples. Their results suggest that Early Middle Missouri tradition crania are morphologically similar and therefore probably genetically related to Mandan groups. A relationship between Mill Creek and the Middle Missouri tradition is not supported by the cranial data. The Mill Creek crania from 13PM172 (identified as Broken Kettle, 13PM1 in Owsley et al. 1981) are most similar to crania from Coalescent sites, or antecedents of Arikara groups. The small sample size suggests the need for additional analysis on larger population samples. Lillie (1996d) reports on Burial 14 which had been part of the Sioux City Public Museum collections until 1994 when the burial was turned over to the State Archaeologists's Office. Burial 14 represents an almost complete 40-50 year old female, four bones from a second adult, and an occipital fragment from a 1-2 year old child. The adult female exhibited extensive osteoarthritis and degenerative changes in the vertebrae suggestive of spondylitis deformans, ankylosing spondylitis, or diffuse idiopathic skeletal hyperostosis.

The Siouxland Sand and Gravel site (13WD402) is one of the most well known Mill Creek cemetery sites because of its size and its role in the development of Iowa's burial law. Prior to extensive quarry operations in the 1970s, it was believed to contain over 200 primary burials and an unknown number of secondary burials. Disturbance of human remains in 1972 during quarrying operations led to a protest occupation of the site by American Indians representing the American Indian Movement (AIM). The incident and its role in the development of Iowa's burial law is detailed in Anderson et al. (1978:184-185; 1979). Subsequent activity at the site is outlined in a brief history in Lillie and Schermer (1990). Most of the site has been destroyed with only minimal archeological and osteological documentation. Surface collection of exposed human remains has led to a number of brief osteological reports which are detailed below.

Recovery of human remains/artifact material and observations about the burial patterns are primarily the result of the activities of amateur archeologist Eugene Fugie (Anderson et al. 1979:123-124). The burial program appeared to consist of numerous charred secondary burials and 150 to 200 primary burials in extended position under limestone slabs.

Artifact material including a portion of a classic Long-Nosed God mask, a wolf maxilla/mandible "mask," and *Anculosa* beads supports models of Mississippian/Plains contacts and interaction (Henning 1967). Although only a single Mill Creek High Rim sherd is present, a Mill Creek cultural affiliation is favored based on the only other incidence of a Long-Nosed God mask in Iowa which occurs at the Mill Creek, Jones site (13CK1).

The original disturbance in 1972 resulted in the recovery of 12 to 20 skeletons. cursory analysis of six crania at the Sioux City Public Museum identified the remains as American Indian. The remains were turned over to AIM leaders and reportedly taken to the Rosebud Reservation in South Dakota for reburial. A brief osteological report on 62 fragmentary pieces of bone recovered from the original disturbance is presented by Fisher (1978j). Two individuals are identified, a 3-4 year old child and an adult male.

Disturbance at the site in 1978 identified additional human remains on a higher bluff directly east of the earlier lower burial area. Human remains recovered from the surface consisted of 450 bones, bone fragments, and teeth. Osteological analysis is presented by Anderson et al. (1979). Sixteen individuals are identified, 10 adults and six subadults. Pathological conditions include vertebral arthritis and a small abscess lesion in a proximal right tibia. Dental observations identify two mandibles with periodontitis and one carious lesion.

Additional human remains recovered from the surface in 1979 are identified by Fisher (1980b). The fragmentary remains represent a minimum of 13 individuals, six adults and seven subadults. Fisher (1980b:12) suggests that half of these individuals may be parts of the same individuals reported by Anderson et al. (1979). Pathological conditions include a compression fracture and subsequent ankylosis of two lumbar vertebrae and severe traumatic injury to a left elbow joint as seen by extensive remodeling of a distal humerus. Two carious lesions were identified in an isolated upper first premolar and an isolated upper molar respectively.

Three additional surface collections at the site between 1986 and 1988 produced additional human remains that are reported on by Lillie and Schermer (1990). Their report also includes a brief history documenting the destruction and attempts at preservation of the site in the Appendix. Recovered human remains represent a minimum of seven to eight individuals, four adults (one possibly male, one possibly female) and three to four subadults (1-2, 3-5, and 10-12 years old). No additional information is observable.

Human remains believed to be from a Mill Creek site (13-00-00) were transferred from the Putnam Museum to the State Archaeologist's Office and are identified by Fisher (1986n) as representing a minimum of five adult individuals. Dental attrition is reported to be marked but not extreme. No other analysis is reported.

A single flexed burial, 13MN25, disturbed in 1983, is determined to be possibly Mill Creek based on the craniometric similarity of the individual to Mill Creek populations. Osteological analysis by Schermer (1983e) identifies an adult male, 20-30 years of age. Schermer suggests that cranial indices exhibit great similarity to a Mill Creek culture individual with cranial deformation from 13PM172, previously identified as 13PM1 (Owsley et al. 1981:304), and moderate similarity to Glenn's (1974) Bryan series which "represents an early horizon of Oneota which demonstrated physical affiliations with the Muskogid variety—a variety Neumann (1960) associates with the cultural expansion of Middle Mississippian" (Schermer 1983e:256).

*Summary of Mill Creek.* The Mill Creek culture is one of the best known Late Prehistoric cultural traditions in Iowa and a moderate amount of information on the biological nature of Mill Creek people can be

constructed from the bioarcheological information reported. Twelve sites have produced human remains although only six of them appear to be burial sites (Catlinite Amulet, Kimball, Rock Creek Ossuary, Siouxland Sand and Gravel, 13PM172, and 13MN25); four are habitation sites with human remains recovered from storage pits, house fill, house floors, or the surface (Chan-Ya-Ta, Bultman, Brewster, Phipps Village, and Wittrock). Provenience of the Putnam Museum collection is unknown. The largest burial site, Siouxland Sand and Gravel, which contained an estimated 200 burials was destroyed by quarrying operations. Osteological data are reported for a total of 31 to 40 individuals recovered from the surface as a result of a series of disturbances. The Mill Creek burial program includes primary extended and secondary ossuary burials. Limestone slabs covering extended burials are reported for the Siouxland Sand and Gravel site.

Postmortem preparation and disarticulation of human remains is indicated by the presence of cutmarks at three sites: Chan-Ya-Ta, Phipps Village, and Rock Creek Ossuary. Incineration or burning is evident at the Rock Creek Ossuary and Wittrock. The human remains at all sites are generally fragmentary and produce only moderate amounts of bioarcheological data. A total of 119 individuals is identified, but only 103 are represented in the literature and Table 20; 34/103 or 33% are either infants or children under the age of 10. Subadults are disproportionately represented at the Rock Creek Ossuary site (18/29, 62%) suggesting a rigorous mortality experience for this age category or selective burial practices. Dental attrition is generally advanced in individuals of middle age or greater. Caries frequencies, reported cautiously because of small sample sizes, range from 12% to 37%. These frequencies are generally greater than those reported for earlier groups in this region (Late Archaic, Lewis Central School site = 4.3%; Middle Woodland Hanging Valley site = 0%), but less than those reported for Late Prehistoric agricultural populations generally. This may reflect the bison hunting adaptation of this culture.

Periodontitis is reported at a number of sites and appears to be the basis for tooth loss. Infectious disease is not reported. Moderate vertebral arthritis is reported. Injuries resulting from conflict as indicated by embedded projectile points are reported in two to three individuals from two different sites (Catlinite Amulet and Rock Creek Ossuary). A traumatic injury to a joint (elbow) is also reported for an individual from the Siouxland Sand and Gravel site. The evidence of conflict and trauma may cautiously be suggested to support the different relationship that fortified Mill Creek villages had with their neighbors vis-à-vis the dispersed unfortified settlements of the Glenwood culture. The similarity of at least one individual (13MN25) morphologically to Glenn's (1974) Bryan series which has Muskogid, Middle Mississippian affiliation also supports the models of Mississippian-Plains contacts for Mill Creek culture. Although the Mill Creek culture is well known archeologically and a number of models have been proposed to explain its development and relationship to other Late Prehistoric cultures in Iowa and the region, bioarcheological information has contributed little to these models.

#### Oneota (A.D. 900-1600)

Oneota sites are widespread across the Upper Midwest, extending from Indiana to Nebraska, and from Minnesota and Wisconsin to central Missouri. The definition of Oneota culture is based largely on the presence of shell-tempered ceramics, small triangular projectile points, large villages but less complex social organization than Mississippian culture sites, trade materials such as catlinite and copper, European materials in historic sites, cemeteries with burials in extended positions, and fortifications on some sites (Benn 1984:6-7). Oneota people are generally reported by archeologists to have occupied the present state of Iowa from primarily

A.D. 900/1000 to historic times, although Tiffany (1991:189) reports Oneota site radiocarbon dates from A.D. 690 to historic times. The Oneota have been demonstrated to be the probable archeological ancestors of Chiwere Siouan speaking groups such as the Ioway, Oto, and Missouri Indians, as well as the Winnebago, and possibly the Omaha, Dhegiha Siouan speakers, encountered by the first Europeans to enter the Upper Midwest (M. Wedel 1959, Tiffany 1982b). Craniometric analysis by Glenn (1974) demonstrated significant differences between Oneota populations from different phases and she suggests that Oneota peoples were mixtures of several different population groups. Benn (1984, 1989) has developed a complex model for the development of the Oneota Mode of Production from the Late Woodland. Although earlier theories suggested Oneota developed from direct migration of populations from the Mississippian American Bottoms area, it is now more often seen as an in situ development. The subsistence base of Oneota culture is maize agriculture with continued reliance on local hunting/collecting and an increasing reliance on bison hunting into historic times.

Thirty-five sites yielding a minimum of 270 individuals (20% of the total Iowa sample) are identified as having an Oneota mortuary component in the bioarcheology database (Table 21).

#### Northeast Iowa Oneota - Orr Focus

The Northeast Iowa Orr focus is considered the type locality for the Oneota tradition. Early identification of Oneota sites occurred in this area because of their association with prominent Woodland mounds in the Upper Iowa River valley in Allamakee County. Col. P. W. Norris documented sites along the Lane-Hartley Terrace in 1882 under the auspices of Cyrus Thomas of the Bureau of American Ethnology of the Smithsonian Institution (M. Wedel 1959). He also "excavated" a large portion of the Lane Enclosure (13AM200) and nearly 20 of the reported 100 mounds in the Lane Farm Mound Group (13AM104). Norris' excavation procedure is quoted in M. Wedel (1959:10):

the next (day's work) was conducted with a very powerful span of horses, plow and 7 workmen superintended and assisted by Judge M. (Murdock) and myself as follows - By having one man drive the team, one hold the plow, and another side the beam a very deep furrow was thrown out usually bringing up bones etc. from beneath the surface sand, all of which, with hoes, shovels and an iron toothed rake was overhauled and removed around the Eastern one third of the circle and embankments, and after enough was thus removed for space others still deeper were run, in which way we within two days pretty thoroughly overhauled the portion of the Circle which is shaded in the sketch (missing), and also nearly 20 mounds upon the plateau south of it (Norris 1882:3-4).

Wedel notes that "none of the artifacts from (the) rectangular enclosure are in the mound survey collections transferred to the U.S. National Museum by Thomas" (M. Wedel 1959:8-9). It is not known whether any of the human remains uncovered by Norris are in the National Museum mound survey collections. Osteological data are available only for fragmentary material uncovered as a result of excavations in the enclosure by McKusick in 1950 (Young 1981b) and by the Iowa Archeological Society in 1994 (Lillie 1995m). More recent investigations have interpreted the Lane Farm Enclosure (13AM200) as an Oneota village with a palisade structure (Fred Finney, personal communication as referenced in Lillie 1995m:107).

Disturbance of human remains and excavation of mounds in the Upper Iowa River regions continued throughout the end of the nineteenth century. According to M. Wedel (1959:7), "in the 1880s and 1890s an

Table 21. Iowa sites with a Late Prehistoric Oneota mortuary component in the Eastern Woodlands (EW), Prairie Lake (PL) and Prairie (P) regions.

Site	Phase	MNI	Region	Type
Chesterfield Skull (13AM0) <sup>1</sup>	Orr	1	EW	Unknown
Paul Cota Collection (13AM0g) <sup>2</sup>	Orr	8	EW	Unknown
South of Harper's Ferry (13AM0h) <sup>3</sup>	Orr	10	EW	Unknown
Near New Albin (13AM0i) <sup>4</sup>	Orr	2	EW	Unknown
13AM0j <sup>5</sup>	Orr	1	EW	Unknown
New Galena Bridge (13AM0m) <sup>6</sup>	Orr	1	EW	Unknown
Fisherman's Point Cove (13AM0n) <sup>7</sup>	Orr	3	EW	Unknown
Hogback/Flatiron Terrace (13AM1) <sup>8,9</sup>	Orr	13*/5-6	EW	Habitation
Burke's Bridge South (13AM16) <sup>10</sup>	Orr	1	EW	Habitation
O'Regan Bench (13AM21) <sup>8</sup>	Orr	34*	EW	Cemetery
Morgan (13AM22) <sup>11</sup>	Orr	1	EW	Habitation
Spike Hollow Rock Shelter (13AM47) <sup>12</sup>	Wood./ Oneota?	5	EW	
Elephant Terrace (13AM59) <sup>8, 12</sup>	Orr	20*/7	EW	Cemetery
	Archaic- Oneota?			
Malone Cemetery (13AM60) <sup>13</sup>	Orr	6	EW	Cemetery
Flynn Cemetery (13AM51) <sup>14</sup>	Orr	17	EW	Cemetery
Woolstrom Village Cemetery (13AM61) <sup>8</sup>	Orr	4*	EW	Cemetery
Burke's Mound Cemetery (13AM67) <sup>8</sup>	Orr	13*	EW	Cemetery
Lane Farm Mounds (13AM104) <sup>9</sup>	Orr	16*	EW	Md Intrusive
New Galena MdGrp (13AM108) <sup>8, 15</sup>	Orr	4*/1	EW	Md Intrusive
Lane Farm Enclosure (13AM200) <sup>8, 16</sup>	Orr	2	EW	Habitation
Gengler (13AM269) <sup>17</sup>	Orr	3	EW	Md/Cemet.
Milford (13DK1) <sup>18</sup>	C/BE	2	P	Unknown
Kingston (13DM3) <sup>19</sup>	Burlington	1	EW	Habitation
McKinney (13LA1) <sup>20</sup>	Burlington	18	EW	Habitation
13LE183 <sup>21</sup>	Burlington	1	EW	Unknown
Blood Run Mound (13LO2) <sup>22</sup>	C/BE	16	P	Habit./Md
Howard Goodhue (13PK1) <sup>23</sup>	Moingana	40	PL	Cemetery
Single Hill (13PM49) <sup>24</sup>	C/BE	2	P	Unknown
Clarkson (13WA2) <sup>25</sup>	Moingana	1	PL	Habitation
Cribb's Crib (13WA105) <sup>26</sup>	Moingana	1	PL	Habitation
Correctionville (13WD6) <sup>27</sup>	C/BE	1	P	Habitation
Dixon (13WD8) <sup>28</sup>	C/BE	2	P	Habitation
Adamson (13WD7) <sup>29</sup>	C/BE	1	P	Habitation
Oneota Cache Pit (13WD55) <sup>30</sup>	C/BE	4	P	Habitation
Flood Damaged Burial (13WD91) <sup>31</sup>	C/BE	1	P	Unknown

\*# of burials recorded by M. Wedel 1959

Note: C/BE is Correctionville/Blue Earth

<sup>1</sup>Fisher 1986i; <sup>2</sup>Lillie 1995o; <sup>3</sup>Lillie 1995p; <sup>4</sup>Hodges 1994a; <sup>5</sup>Lillie 1993m; <sup>6</sup>Vradenburg 1994b; <sup>7</sup>Vradenburg & Hollinger 1994e; <sup>8</sup>Wedel 1959; <sup>9</sup>Malam 1976, Vradenburg 1994d, and Lillie 1996i; <sup>10</sup>Lillie 1996u; <sup>11</sup>Fisher 1977v; <sup>12</sup>Fisher & Schermer 1987; <sup>13</sup>Vradenburg 1994c; <sup>14</sup>Bray 1967; <sup>15</sup>Lillie 1995q; <sup>16</sup>Young 1981b and Lillie 1995n; <sup>17</sup>Lillie 1996j; <sup>18</sup>Young 1981g; <sup>19</sup>Lillie 1990j; <sup>20</sup>Fokken 1979a, Young 1981a, Young 1981j, and Lillie 1996v; <sup>21</sup>Lillie 1994i; <sup>22</sup>Schermer 1987; <sup>23</sup>Lillie 1996x; <sup>24</sup>Young 1981i; <sup>25</sup>Lillie 1995k; <sup>26</sup>Lillie 1996s; <sup>27</sup>Hodges 1994c; <sup>28</sup>Lillie 1990k; <sup>29</sup>Schermer 1983d; <sup>30</sup>Lillie 1990d; <sup>31</sup>Lillie 1995a.

active business developed along the Upper Iowa River, involving the digging, selling and trading of artifacts. Burials that were covered with rocks, and therefore easily detected, were looted systematically."

The most extensive documentation of sites and mounds in this region is the result of the work of Ellison Orr, a life-long resident of Allamakee County, who travelled the entire county as a telephone company representative and surveyor. In the process, he collected artifacts and recorded detailed notes on archeological sites and the location of artifacts collected. When he retired in 1930 he became Charles R. Keyes' field supervisor and, with Federal Emergency Relief Administration funds, engaged in extensive village and mound excavations in this region in 1934 and 1936. The excavations revealed that the mounds were Middle Woodland in origin, with intrusive Oneota burials, and that the village remains associated with the mounds were Oneota. The Woodland component of these excavations is summarized by Logan (1976) and the Oneota component is the basis for Mildred Mott Wedel's landmark thesis (Mott 1938) and publications (Mott 1938; M. Wedel 1959, 1976, 1981) in which she used ethnohistory to connect the Orr focus to the historic locations of the Iowa. The Upper Iowa River Oneota sites excavated by Keyes and Orr in the 1934-36 surveys that produced Oneota burials are

detailed after M. Wedel (1959) in Table 9. The probable number of Oneota burials is based on the descriptions in M. Wedel (1959). M. Wedel (1959:44-45) summarizes the Oneota burial program as consisting of cemeteries adjacent to villages (at the O'Regan, Burke, Elephant and Woolstrom sites), burials intrusive into Woodland mounds (at New Galena, Lane and Hogback/Flat Iron Terrace sites), and burials between mounds. Burials were usually single interments: primary, extended, and supine. Surface rock covers occur over burials. Pottery vessels, miscellaneous tools, pipes, and other artifacts were frequently placed with the dead. No osteological data are presented on these burials. M. Wedel (1959:46) reported that "so far as I am aware, no skulls or other skeletal material were saved from these sites dug by Keyes and Orr, except for the sternum pierced by an arrow point. Skeletal material from the Flynn cemetery is at Effigy Mounds National Monument ... and at the Department of Anthropology, University of Iowa." The sternum pierced by an arrow point is found in one of three individuals from Burial 8, Burke site (Keyes Ae6, 13AM67). This individual had the skull missing and was accompanied by a stemmed stone knife located to the right of the lumbar vertebrae and a catlinite pipe at the knee area (M. Wedel 1959:32).

Bray's (1961) report on the excavation of the Flynn Cemetery (13AM51) which was disturbed by road construction in 1958 provides additional information on Orr focus burial practices. Seventeen burials were disturbed but only 10 are discussed. Ten of the burials occurred in a row and most are single, extended inhumation. Notable exceptions include the inclusion of an extra adult human skull, without the mandible, at the left knee of one burial (Burial 6) and the burial of the skull, only, of a child (Burial 7). Bray (1961:18-19) also comments on the presence of beaded belts or "girdles" with three burials.

Orr focus burial practices are also discussed by Henning and Peterson (1965) for two burials recovered by collectors from an unspecified cemetery in the Upper Iowa River valley. Both burials contain two individuals each and present evidence of extensive cutting, suggesting dismemberment and subsequent rearticulation of some bones. Hands, feet, vertebrae, and portions of skulls are missing. Henning and Peterson (1965) discuss similar practices at the O'Regan cemetery (13AM21), the Lane Enclosure (13AM200), and the New Galena Mound Group (13AM108) as reported by Wedel (1959), and ethnohistoric documentation of defleshing and dismemberment mortuary practices in various American Indian groups. None of these reports presents osteological or bioarcheological information on the human remains.

As stated above, M. Wedel (1959:46) reports that no human remains were retained from the Keyes/Orr 1934-36 excavations, except for the sternum from the Burke site (13AM67) and the Flynn Cemetery (13AM43/13AM51) remains which were retained at the Effigy Mounds National Monument and the University of Iowa. However, the Iowa State Archaeologist's list of human remains at the Iowa State Historical Society (Keyes Collection) identifies human remains from some of these Upper Iowa River valley sites. The Keyes Collection is currently being analyzed (Schermer, personal communication) and bioarcheological information from these important sites may be forthcoming. In addition, disturbances and excavations at some of these sites since the 1934-36 excavations have produced human remains and osteological information.

Table 21 presents Oneota sites/collections in Iowa with human remains that have produced some osteological data. Thirty-five sites/collections are identified. Twenty-one or 60% are from the Upper Iowa River area of Allamakee County.

Some possible Oneota identified human remains are in the Effigy Mounds National Monument Collections. Fisher and Schermer (1987) present osteological information on these remains in an unpublished Contract Completion Report, #245. The sites identified in this report are

listed in Table 8. These remains are generally very fragmentary and have produced very little bioarcheological information. In addition, in many cases it is difficult to distinguish Woodland component remains from Oneota remains. Slightly more bioarcheological information is presented for some of the sites listed in Table 21. None of the sites with reported osteological data, however, is represented by more than 10 individuals and some represent collections with poor provenience that were turned over by collectors.

For example, a number of the identified remains were turned over to the Iowa State Archaeologists's Office from the collections of Luther College (13AM0m, 13AM1, 13AM60, 13AM108). The origin of these remains is not always clear; in some cases they represent private collections. However, Vradenburg (1991) and Vradenburg and Hollinger (1992) are attempting to develop patterns of adaptation that characterize Late Prehistoric Oneota populations based on these small collections and incomplete remains. In discussing remains from Flatiron Terrace (13AM1), Vradenburg (1994d:246) concludes that "pathological conditions common to Late Prehistoric Oneota skeletal remains were observed in this material. These included cribra orbitalia, ectocranial pitting, calculus accretion and chipped dental enamel." Additional human remains from this site are reported by Lillie (1996t). They were transferred from Luther College and represent surface collections from the Gavin Sampson collection made at an unknown time. The remains represent an older adult male. Of note are the presence of pronounced auditory exostoses in both auditory canals.

The Malone Cemetery (13AM60) group represents a minimum of six individuals, one subadult and five adults (Vradenburg 1994c). Carious lesions are common, exhibited by all four adults (100%) with observable dentition. Enamel hypoplasia is also common. Three adult individuals with observable dentitions exhibited a total of 57 enamel hypoplastic defects on a combined total of 31 teeth. Age of occurrence for these defects using the method of Goodman et al. (1980) is between 2.5 and 6.5 years of age, but most common between 3 and 4.5 years. In Late Prehistoric Midwestern populations (Goodman et al. 1980, Vradenburg 1991, Vradenburg and Hollinger 1992) linear enamel hypoplasias and growth disruptions occurred between the ages of 2 and 5 years, with a peak occurrence between 2.5 and 4 years. Vradenburg (1994c:228) suggests "there may have been a slight tendency for these developmental dental pathologies to occur at a later age in the Malone Cemetery (people)" but cautions that the small sample makes this conclusion tentative. Elsewhere, he suggests that the relatively late occurrence of growth disruptions at the Flatiron Terrace site could be the result of underrepresentation of the anterior dentition (Vradenburg 1994d:244).

Additional bioarcheological information on the Northeast Iowa Oneota Orr focus people can be gleaned from the report by Lillie (1995p) on human remains from near Harper's Ferry that were part of the Paul Cota collection. A number of sites are located in this region including a number of Woodland mound groups. The arbitrary designation 13AM0h is assigned to these remains. The remains represent a minimum of 10 individuals, five subadults and five adults. Oneota affiliation is based on the "weakly expressed sexually dimorphic cranial characteristics and overall gracile appearance of the remains" (Lillie 1995p:130). The remains were fragmentary, particularly those of the subadults. Carious lesions were observed on three of the five adults (60%) and enamel hypoplasia (three defects) was observed on one of the five adults (20%); only one subadult was represented by dental remains and no pathology was observable.

The lack of sexual dimorphism and overall gracility of human remains from another Paul Cota collection designated 13AM0g are used as the basis for identifying the remains as Oneota. The human remains are believed to have come from the Upper Iowa River area near Dorchester and could have come from any of a number of sites including 13AM17,

13AM18, 13AM172, etc. Lillie (1995o) identifies eight individuals, four adults and four subadults. The remains are fragmentary and little bioarcheological information is reported. Unassigned adult dental remains present a single carious lesion and two enamel hypoplastic defects in a single tooth. One of the subadults has three enamel hypoplastic defects on a left maxillary canine.

All of the remaining sites with identified Northeast Oneota human remains present even less bioarcheological information, and are represented by very few fragmentary remains such as a single skull (13AM0j, Lillie 1993m), two teeth (13AM16, Lillie 1996u), or a single phalanx (13AM200, Lillie 1995n).

Sites in the Upper Iowa River valley of Allamakee County in northeast Iowa represent the most ubiquitous and most visible documentation of Iowa's archeological past. The bioarcheology of the inhabitants of the Oneota Orr focus component of these sites is poorly known, however. Although extensive excavations occurred at some of these sites, few human remains have been analyzed. Recent bioarcheological analysis of fragmentary remains from small collections have attempted to characterize an Oneota pattern of adaptation and build up a small database for comparison (Vradenburg 1991, 1994d:244; Lillie 1995o). A more complete picture of Oneota biocultural adaptation might be constructed by comparing the emerging bioarcheological patterns of Oneota people in Iowa with the more extensive bioarcheological information available for the larger Oneota Orr focus mortuary sites in southeast Minnesota, including the Hogback site (21HU1), the Rushford Mound Group (21HU4), and the large, extensive, and only partially analyzed Oneota sites in Wisconsin.

#### Southeast Iowa Oneota - Burlington phase

The Southeast Iowa Oneota culture has recently been viewed as representing two regions and four localities with temporal changes connecting southeast area sites to sites in other areas of Iowa and Wisconsin (Benchley et al., this volume).

Three sites from this region have produced osteological data from human remains. They include the Kingston site (13DM3), the McKinney site (13LA1), and 13LE183.

The Kingston site (13DM3) is an Oneota habitation site that was excavated by Dean Straffin in 1967 and 1968 in conjunction with his Ph.D. thesis from the University of Iowa. Human remains recovered from the surface are described by Lillie (1990j). The remains consist of only a small maxillary fragment limited to the socket and a maxillary right first molar. Slight calculus buildup is reported. Wear on the occlusal surface of the molar produced moderate to full cusp removal in a flat wear pattern. The slight calculus buildup and moderate attrition suggest an age of juvenile to young adult.

Site 13LE183 contains fragmentary human skeletal remains disturbed as a result of construction between 1985 and 1992. A radiocarbon date of A.D. 1210  $\pm$  70 years suggests Oneota cultural affiliation. Osteological data presented by Lillie (1994i) suggest the remains represent a young adult male. Slight lipping is present on the distal articular surface of a right first metacarpal.

The McKinney Oneota village site (13LA1) presents slightly more bioarcheological information about the Oneota people in southeast Iowa. The McKinney village site is a large, compact, fortified village site that has been known and reported on since 1841 (Newhall 1841:230-235). Excavations in 1970 (Slattery et al. 1975) and in 1979-1980 (Tiffany 1988) have defined the Oneota utilization of the site as dating to A.D. 1200 to 1600. The major occupation was late and probably represents an orientation towards a "timbered hillside, floodplain and riverine ecosystem



of the Mississippi and Iowa rivers and not the surrounding upland prairie" (Tiffany 1988:306). Subsistence data from the site do not support a bison hunting prairie adaptation. Isolated human remains have been recovered from the site in the course of these excavations. The 1970 excavations by Slattery et al. (1975) produced two left parietal fragments from the plowzone and a right maxilla, deciduous molar and two hand phalanges from a feature defined as a hearth. Osteological identification is reported by Fokken (1979a). The parietal fragments are notable because both external and cerebral surfaces display a "polish attainable only by artificial means" (Fokken 1979a:1). Both parietal fragments also present incised lines across the external surface made by a "double edged tool which created a dual trail in each incision." The deciduous upper second molar displays moderate attrition and an extensive mesial carious lesion and root abscess.

The 1979 excavations produced the fragmentary remains of at least nine individuals, including six juveniles and three adults. All the remains were scattered in the fill without any specific type of burial or feature evident. Osteological data are reported by Young (1981a). The juveniles range in age from 3 to 10 years of age; two of the adults appear to be female. No caries is observable in a total of 23 teeth from six individuals. Dental attrition is slight to moderate.

The 1980 excavations produced the fragmentary remains of five individuals including three juveniles, a young adult male and a young adult female (Young 1981j). A right parietal fragment representing an older juvenile was smooth and polished on the ectocranial surface, possibly due to incineration. Eleven permanent mandibular teeth from one individual exhibited one carious lesion on the mesial aspect of the left third molar.

Additional excavations in 1995 by the University of Illinois-Urbana Department of Anthropology and the Iowa Archeological Society uncovered human remains in the process of locating evidence of house structures. Human arm bones encountered in a storage pit feature were left undisturbed. A cranial fragment and a tooth found in two separate storage/refuse pit features and a second cranial fragment recovered from the plowzone are described by Lillie (1996v). The cranial fragment from the plowzone was a small burned portion of a parietal from a juvenile or young adult. The ectocranial surface exhibited 17 incised cutmarks in a crosshatch pattern that appeared to be "purposeful, decorative incisions" (Lillie 1996v:154). The second cranial fragment consisting of a right parietal and frontal was from a juvenile. The bone was unburned but exhibited 18 cutmarks oriented in a pattern "more similar to incisions resulting from scalping." Radiocarbon dating of associated pit feature material produced a date in the early seventeenth century. The deciduous maxillary right second molar was from a refuse pit, also dated to the early seventeenth century. The tooth roots were almost completely resorbed suggesting the tooth had been lost naturally. Loss of this tooth occurs between 10-14 years of age. Therefore two to three individuals are represented by these fragmentary remains.

#### Central Iowa Oneota - Moingona Phase

A number of sites in the Red Rock Reservoir area of the Des Moines River valley in central Iowa have been defined as representing a distinct Moingona phase of the Oneota tradition based on differences in ceramics. Most of the sites in the Red Rock Reservoir region appear to be large village sites so they may represent one of the site types defined in the "aggregate-band" model of Oneota settlement pattern. The subsistence appears to reflect the riverine-forest orientation of southeast Iowa Oneota

sites. Three sites from this phase have produced human remains, including Howard Goodhue (13PK1), Clarkson (13WA2), and Cribb's Crib (13WA105).

The human remains from the Howard Goodhue site representing a minimum of 40 individuals represent the largest group of Oneota remains in Iowa and one of the few that are from burial features in a mortuary context. The Howard Goodhue site was excavated in 1965 and 1966 by the Iowa State University Archeological Laboratory under contract to the National Park Service. Seven burial features, including both primary burials and secondary human bone deposition, were located within an arc of 40 postmolds with an estimated diameter of 50-60 feet. Human remains were also recovered from several nonburial features, excavation units, and the site surface. Radiocarbon assays on charcoal suggest a date of A.D. 1650 ± 200 (Gradwohl 1973:126). Osteological identification of the human remains is presented by Lillie (1996x). In general the human remains are in fair to very poor condition because of soil adherence and polyvinyl acetate (PVA) preservative. This limited most standard observations and evaluation of pathological conditions. Twenty-nine individuals are identified in the seven burial features. The remainder were represented by isolated remains or fragments recovered in refuse pits (two individuals), shovel tests or excavation units (five individuals), the surface of the site (two individuals), and unknown provenience but possibly a burial feature (one individual). Twenty-one adults and 18 subadults were identified. Observation of pathological conditions was limited to dental remains because of the poor condition of postcranial remains. Thirteen carious lesions were observed on nine teeth representing caries in 5/24 individuals observed or 21%. Calculus was slight to moderate on 45 teeth. Thirty-one enamel hypoplastic defects were observed on 27 teeth representing defects in 11/23 individuals observed or 48%. A cautionary note to the above individual figures is important because of the few teeth represented in some individuals and the individuals represented only by a few teeth. The complete reporting of cranial, postcranial, and dental metric data where available in tables in the report provides a useful database for comparative purposes.

The Clarkson site (13WA2) is a double component prehistoric Oneota and turn-of-the-century Euro-American town site. It was excavated in 1966 as part of a survey in the Red Rock Reservoir for the U.S. Army Corps of Engineers. A single human burial was recovered from a storage or refuse pit (Osborn 1982:57). The human remains of a child "lay sprawled east/west in a prone position on the pit floor." An osteological report by Lillie (1995k) identifies the remains of a 2.5-3.5 year old child. No unusual or pathological conditions were noted except the postmortem absence of the lower right arm and right hand bones.

Salvage excavations at the Cribb's Crib Oneota village site (13WA105) in 1968 related to U.S. Corps of Engineer levee construction uncovered isolated cranial and dental remains representing three to four individuals from four excavation areas. Osteological identification by Lillie (1996s) reports the presence of 2-3 adults and one subadult, 3-12 months of age. No pathological conditions were noted.

#### Northwest Iowa Oneota - Correctionville-Blue Earth and Orr Phases

Oneota manifestations in northwest Iowa are generally less well known. Early components are assigned to a Correctionville-Blue Earth phase, though recently it has been suggested that Blue Earth is a separate phase from Correctionville (Clark Dobbs, personal communication). Later historic components are similar to northeast Iowa and are assigned to the Orr phase. Historic accounts also indicate that the Ioway, presumed descendants of the Orr phase, were present in northwest Iowa during

the historic time period (M. Wedel 1976, 1981). According to Tiffany (1991), Oneota influence is present in late Glenwood sites but not in Mill Creek sites; he concludes that Mill Creek people may have abandoned western Iowa as a result of Oneota development. Harvey (1979) suggests a time trend in Oneota sites in the Little Sioux River valley with earlier sites in the south and later sites in the north; she concludes that the Oneota could only occupy the more northerly locations after the Mill Creek people had left. Subsistence in western Iowa Oneota groups is generally seen to be more heavily reliant on agriculture and bison hunting, particularly after A.D. 1300 (Gibbon 1972; Tiffany 1982b).

Eight Northwest Oneota sites have produced human remains, including Milford (13DK1), Blood Run (13LO2), Single Hill (13PM49), Correctionville (13WD6), Adamson (13WD7), Dixon (13WD8), Oneota Cache Pit (13WD55) and 13WD91, a flood-damaged burial recovered from near 13WD8. None of the human remains, except for those from the Blood Run site, represent recovery of burials in a mortuary context. The Milford site human remains were recovered from the surface of the site in 1978. An osteological report by Young (1981g) identifies a deciduous left mandibular first molar and a femoral shaft fragment representing two individuals, a child about 9 years of age and an adult male. The Single Hill site human remains were washed out of a hilltop in the 1980s. Young (1981) identifies two individuals, a 15-25 year old female and a slightly younger female. Craniometrics of the complete cranium of one individual are reported to resemble those of Oneota Orr focus females in Glenn (1974). The Correctionville (13WD6) remains consist of a human mandible found at the site in 1957 by members of the Northwest Chapter of the Iowa Archeological Society. An osteological report by Hodges (1994c) identifies a young adult male with dental caries on each of the second molars and calculus deposits on 40% of the teeth present. The Adamson site (13WD7) remains were recovered in 1958. An osteological report by Schermer (1983d) identifies an almost complete 30-40 year old male, with extreme dental attrition and two carious lesions. The Dixon (13WD8) remains were recovered from an eroding riverbank of the Little Sioux River. An osteological report by Lillie (1990k) identifies two individuals, a young juvenile and an older young adult. Both exhibited moderate to extreme dental attrition. The younger individual also exhibited eight enamel hypoplastic defects evidencing growth disruption between .5 and 1 year of age and continuously from age 1.5 to 5 years.

A possible Oneota burial found near Sioux City, Iowa in 1961 is reported on by Bass and Berneking (1965). Cranial measurements and indices are compared to samples representing Hopewell, Central Plains, and Lakotid groups. The individual is distinct from both the Hopewell and the Central Plains groups, shows some similarities to the Lakotid group, but is most similar to two other individuals from Iowa Oneota sites, i.e. individuals from 13WD6 and O'Regan (13AM21).

The Blood Run National Landmark site (13LO2) is a large multicomponent site that has been known and reported on since the turn of the century by a number of individuals including Cyrus Thomas, Frederick Starr, and T. H. Lewis. Reports suggest the existence at one time of more than 158 mounds, an enclosure, stone circles, and an effigy earthworks (Harvey 1979:136). Village materials from the surface of the site were affiliated by Keyes with the Oneota Orr focus. A number of mounds were excavated but mound materials were seldom clearly associated with any specific cultural manifestation. Keyes (n.d.) excavated one mound and associated copper or brass ear coils and ceramic sherds with the Orr focus. M. Wedel (1959:103) refers to the site as mixed, with Oneota, Woodland, and possibly other cultures represented. In 1964, Harvey (1979) excavated a mound with five burials that exhibited clear Oneota Orr focus association including a preponderance of Oneota projectile points, Oneota ceramics, and catlinite. No osteological data

are reported for any of these excavations. Quarrying operations at the site in the 1980s led to the salvage excavation of a number of features, cache pits, and a disturbed mound. Human remains recovered as a result of the quarrying disturbance and subsequent salvage excavation in 1985, as well as remains from Williams' Collection at the Rock Rapids Historical Museum, are described by Schermer (1987). The remains from all contexts represent a minimum of 11 individuals, including nine adults and two subadults. A mandible of a young adult male, disturbed by gravel operations, exhibited 84 small cutmarks on the body and ramus. Dental observations on this same individual also showed nine enamel hypoplastic defects indicating growth disruption between the ages of 2 and 5.5 years. An almost complete but fragmented skull recovered from a cache pit represented a young adult female. Cutmarks were also observed on this individual; a total of 68 small cutmarks were recorded on the cranial vault and the mandible. This individual also exhibited 48 enamel hypoplastic lines on the dentition and moderate porotic hyperostosis on both parietal bones. A femoral shaft fragment from another individual recovered from the trench excavations exhibited three deep, wide cutmarks on the medial surface with a circular "puncture" mark ca. 1.5 mm from each cutmark. No other osteological or bioarcheological information was observed or presented on the remaining nine individuals represented by very fragmentary remains.

*Summary of the Oneota.* The Oneota period in Iowa is bioarcheologically virtually unknown. Only two sites, Howard Goodhue (13PK1) and Blood Run (13LQ2), represent human remains recovered in a mortuary context. Human remains from all of the other sites represent incomplete/fragmentary isolated or village feature associations. Rigorous bioarcheological data collection and publication on the incomplete and fragmentary remains is contributing, however, to an emerging characterization of Oneota adaptation that can be compared to bioarcheological information from other Oneota sites in Minnesota and Wisconsin. Culturally modified human remains exhibiting various types of cutmarks and burning/polishing have been reported from a number of sites including McKinney-13LA1 (Fokken 1979a, Lillie 1996v), Wever-13LE110 (Hollinger and Vradenburg 1994), Schmeister-13DM101 (Lillie and Hollinger n.d.), and others. An overall gracile appearance and weakly expressed sexually dimorphic cranial traits seem to characterize Oneota people (Lillie 1995p:130; Lillie 1996x). Pathological conditions common to Late Prehistoric Oneota people include cribra orbitalia, ectocranial pitting, calculus accretion and chipped dental enamel (Vradenburg 1994d:246).

### Historic Period (A.D. 1650-Present)

The historic period in Iowa begins with the first European movements into the North American midcontinent in the seventeenth century and continues up to the present day. Several Oneota sites in northeastern and northwestern Iowa bridge the prehistoric and historic eras (A.D. 1640-1700). These sites, generally referred to as "protohistoric," have been determined by M. Wedel, using ethnohistoric documentation, to represent villages of the Ioway (Mott 1938, M. Wedel 1976, 1981, 1986). Bioarcheological information available from these sites has been discussed in the section on the Oneota. In addition to the Ioway, Northeast Iowa was also occupied by the Oto, a Chiwere Sioux group closely related to the Ioway, as well as, the Missouri and Winnebago. Western Iowa was occupied by the Omaha and Ponca, Dhegihan Sioux groups, closely related to the Osage, Kansa, and Quapaw. Dakota Sioux groups, including the Santee and the Yanktan, also moved into Iowa from their homelands in Minnesota and South Dakota. Southeast Iowa was occupied by Algonkian speaking groups of the "Illinois Confederacy." In the late seventeenth

century and early eighteenth century as a result of pressures from the east, Algonkian groups including the Mascouten, Mesquakie and Sauk moved into eastern Iowa.

Little documentation of this period is based on the archeological record and even less documentation is based on bioarcheological data recovered from human skeletal remains. Table 22 lists the sites/collections with published osteological data representing the Historic period.

Remains possibly representing three identified historic individuals are reported. They include isolated teeth from Chief Keokuk, a noted leader of the Sauk and Mesquakie, who lived ca. 1780-1848 (Lillie 1995s); two foot phalanges from Julien Dubuque, a French entrepreneur who in 1788 received permission from the Mesquakies to mine lead, obtained a land grant from the Spanish government in 1796 for land around present-day Dubuque, established lead mining at the Mines of Spain, and died in 1810 (Hodges 1994d); and the skull of Potosi, the daughter of the Mesquakie (Fox) chief Pesota and purportedly the wife of Julien Dubuque (Hodges 1994d). The identification of the isolated teeth as Chief Keokuk is questionable because of the slight degree of attrition exhibited in an individual who died at 60-70 years of age. The individual identified as Potosi lost six teeth antemortem, exhibited periapical abscesses on four teeth that had the pulp chamber exposed due to attrition, and displayed hypercementosis on one tooth (Hodges 1994d:167).

A cranium from the Putnam Museum excavated in 1874 from the Cook Farm Mounds (13ST82) is believed to be of Sac or Mesquakie affiliation because of the associated burial goods. Osteological analysis by Lillie (1994k) identifies an older juvenile female. The cranium exhibits artificial cranial deformation in the form of parietal flattening. Slight dental attrition is consistent with an historic, nonabrasive diet.

Human remains recovered by a collector between 1869-1920 near Burlington, Des Moines County, and designated as 13DM0a are identified as possibly Iowa, Mesquakie, or Sauk based on the associated burial goods. Osteological analysis by Lillie (1996w) identifies two individuals, a middle-aged adult male and a subadult 1-1.5 years old. The adult male displayed pathological conditions on the right femur head and right innominate suggestive of a probable traumatic hip dislocation or fracture of the femoral head or neck. An anomalous accessory facet in the olecranon fossa of the

right humerus may have resulted from stress placed on the elbow joint during prolonged weight bearing on the fully extended right arm. This would be consistent with the use of a crutch.

A burial (13CY9) disturbed during construction in Spencer in 1981 is identified as historic because of the depth (5 feet), the presence of preserved wood adhering to some bones suggesting a wooden coffin, and evidence for extraction of two molars. Osteological analysis by Morrow (1981b) identifies an adult female, 20-30 years of age, reconstructed stature of 165.78 ± 4.02 cm. Cranial morphology suggests American Indian affiliation and similarity to the Orr focus Oneota female morphology presented by Glenn (1974). Dental attrition is slight, malocclusion is prevalent, three third molars appear to be congenitally missing, and nine small carious lesions are present on eight different teeth.

An adult cranium from the Iowa Masonic Library Collection, Cedar Rapids is labeled "Mandan Indian" but lacks provenience information. Osteological analysis by Lillie (1990l:96-97) identifies an adult male, 25-35 years of age. Dental attrition is moderate; no caries or other pathology are observable. Comparison of cranial measurements and indices with male Mandan individuals presented by Key (1983) show a strong similarity.

Human remains recovered from the surface of 13MK99 are identified as possibly Sauk based on artifacts recovered from this site. Osteological analysis by Schermer (1981b) identifies a single tooth, a maxillary right premolar, suggesting an individual of approximately 11-12 years of age.

An adult human cranium recovered in 1990 from a rocky ledge along the Mississippi River in Allamakee County (13AM310) is identified as historic because the slight dental attrition, the ambiguous cranial discriminant function, and interorbital classification of racial affiliation suggest mixed Native American and caucasoid. Osteological analysis by Lillie (1990p) identifies an adult male, 25-30 years of age. Malocclusion, resulting from crowding and rotation of the left lateral incisor and canine, is present. No caries is observable but 14 enamel hypoplastic defects are observable on nine teeth.

A nearly complete human skeleton recovered from a home in Allamakee County and designated 13AM0e is identified as historic based on the lack of dental attrition and the ethnic identity as probably caucasoid. No provenience is known. Osteological analysis by Lillie (1992b) identifies a young adult male, 18-25 years of age. Pathological conditions include two active lesions on the right humerus and a healed fracture of the left fourth rib. A noticeable length asymmetry in the lower leg bones is observed, associated with asymmetric femoral torsion. No carious lesions, hypercementosis, or alveolar abscesses are observed.

Two early historic burials disturbed as a result of unauthorized excavation in 1989 are dated to the mid-eighteenth century based on associated burial artifacts. Osteological analysis by Lillie and Schermer (1992b) identifies two subadults, 1-2 years and 3 years old, respectively. Sauk, Mesquakie, Iowa, and Sioux, as well as other tribes, were known to have occupied portions of eastern Iowa during this time period.

Human skeletal remains confiscated from a simulated archeological site at Kirkwood Community College in the summer of 1987 and reportedly from Saukenauk Village, Illinois are identified as representing two individuals, 6.5-8.5 years and 14-18 years of age respectively (Schermer 1989d). The older individual exhibited severe periostitis on the right tibia and fibula.

Human remains representing Dakota Sioux individuals imprisoned at Camp McClellan following the Dakota Conflict of 1862 were recovered from the Palmer College of Chiropractic Medicine, Davenport, in 1984 and from the Putnam Museum, Davenport, in 1986. They were reportedly disinterred from the Sioux graves in the camp between 1873 and 1878-1879. Osteological identification by Schermer (1984c) of the Palmer

Table 22. Iowa sites with Historic/Postcontact mortuary components in the Eastern Woodlands (EW), Prairie Lake (PL) and Prairie (P) regions.

Site/Collection	Identity/Affiliation	MNI	Reg.
Lansing (13AM0e) <sup>1</sup>	Caucasian	1	EW
13AM310 <sup>2</sup>	Caucasian/American Indian	1	EW
Old Catholic Cemetery (13BM57) <sup>3</sup>	Unknown	8	EW
Gates Cemetery (13BM58) <sup>3</sup>	Unknown	4	EW
Baskin's Grave (13BM5) <sup>3</sup>	Unknown	1	EW
13CW21 <sup>4</sup>	American Indian 17th Century	2	EW
Spencer Burial (13CY9) <sup>5</sup>	American Indian	1	P
Okoboji Mound (13DK39) <sup>6</sup>	Unknown	9	P
13DM0a <sup>7</sup>	Iowa, Meskwaki, or Sauk	2	EW
13LE0b <sup>8</sup>	Sauk	1	EW
13LE13b <sup>9</sup>	Sauk?	1	EW
Till's Bones (13MK99) <sup>10</sup>	Sauk	1	PL
Cook Farm Mound 3 (13ST82) <sup>11</sup>	Sac/Mesquakie	1	EW
Lake Meyer (13WH30) <sup>12</sup>	Black	1	EW
Collections			
Palmer Collection (Camp McClellan) <sup>13</sup>	Dakota	5	
Palmer Collection (Camp McClellan) <sup>14</sup>	Dakota	15	
Iowa Masonic Library <sup>15</sup>	Mandan?	1	
Ham House Museum <sup>16</sup>	Euro-American		
	American Indian	3	

<sup>1</sup>Lillie 1992b; <sup>2</sup>Lillie 1990p; <sup>3</sup>Collins 1992; <sup>4</sup>Lillie & Schermer 1992b; <sup>5</sup>Morrow 1981b; <sup>6</sup>Ward 1905; <sup>7</sup>Lillie 1996w; <sup>8</sup>Lillie 1995s; <sup>9</sup>Fisher & McKusick 1980; <sup>10</sup>Schermer 1981b; <sup>11</sup>Lillie 1994k; <sup>12</sup>Fisher 1981g; <sup>13</sup>Schermer 1984c; <sup>14</sup>OSA 1986, Burial Project File No. 210; <sup>15</sup>Lillie 1990d; <sup>16</sup>Hodges 1994d.

College collection identifies five individuals, two females, two males, and one adult of indeterminate sex. Statures ranging from  $159.82 \pm 3.72$  cm to  $177.29 \pm 3.27$  cm are reported. Pathological conditions include ankylosis of C2-C3 vertebrae and a possible fracture in a distal left tibia. Osteological identification of the remains from the Putnam Museum is reported in an unpublished burial project report. Cranial measurements from the total 31 individuals represented by both collections have been used to identify unaffiliated but presumed Dakota remains (e.g., Lillie 1995m). All the Camp McClellan remains were reburied in 1987 at the Lower Sioux Reservation, Morton, Minnesota.

A burial excavated by an amateur archeologist in the 1970s near the vicinity of Fort Madison and designated as 13LE136 represents an historic burial from the early nineteenth century based on associated artifacts (Fisher and McKusick 1980). Osteological analysis identifies an adult female, about 40 years of age.

An incomplete young adult female skeleton recovered from the dam surface of Lake Meyer (13WH30) in the 1980s is identified as exhibiting cranial morphology suggesting an admixture of black, white and/or American Indian ancestry (Fisher 1981g).

Three burial sites from the nineteenth century are reported in an unpublished project completion report (Collins 1992), also identified as Burial Project #571. The sites include Old Catholic Cemetery (13BM57), Gates Cemetery (13BM58), and Baskins Grave (13BM59). Old Catholic Cemetery is a historic cemetery in use from 1868 to 1873 and approximately eight burials are reported. Gates Cemetery is a family cemetery dating to the mid-nineteenth century and four burials are reported. Baskins Grave dates to the late nineteenth century and one burial is reported. No osteological or bioarcheological information is published for these remains.

**Summary of the Historic Period.** The historic period in Iowa is bioarcheologically poorly known. Most burials have been recovered in disturbed contexts and are identified as historic based on associated artifacts or the lack of dental attrition. The human remains from Camp McClellan represent a painful reminder of the history of U.S.-American Indian relationships in the first half of the nineteenth century but the information recovered from them provides a significant resource for the continued identification of disturbed remains.

## Bioarcheological Summary of Iowa and Directions for Future Research

The Iowa Office of the State Archaeologists reported approximately 1405 mortuary sites in their database in 1993 (Iowa OSA computer file). This represents approximately 10% of the 13,000 total archeological sites in the Iowa Site File as reported by Tiffany et al. (1990:90). The 1405 mortuary sites are identified as burial sites (240/17%), cemetery sites (87/6%) and mound sites (1078/76%). Approximately 405 or 28% of these mortuary sites have produced human remains as a result of excavation or accidental disturbance. Approximately 310 or 77% of these have produced some published osteological-bioarcheological data that are included in either the database or the culture/period narrative overview of Iowa bioarcheology. The approximate number of individuals represented by skeletal remains at the 310 mortuary sites is 1360 individuals. Table 23 reports the number of sites and individuals by archeological period. These numbers may differ from the figures in the database summaries because additional sites were identified and archeological-cultural affiliations were identified in the process of researching and writing the narrative summary.

The 1975 revisions to the Iowa Burial Code have resulted in a significant amount of published bioarcheological information. The law requires the filing of a report containing both physical and cultural

Table 23. Archeological periods of burial sites in Iowa.

Archeological Period	Sites	Individuals	Analyzed
Paleoindian	0	0	0
Archaic (Unspecified)	8	17	9
Archaic - Early	0	0	0
Archaic - Middle	2	16	16
Archaic - Late	8	75	54
Woodland (Unspecified)	18	55	55
Woodland - Early	5	18	8
Woodland - Middle	21	135	123
Woodland - Late	13	50	50
Late Prehistoric			
Great Oasis	8	93	71
Mill Creek	12	119	102
Glenwood	7	17	17
Oneota	35	270	166
Historic	18	58	36
Unknown/Undetermined	~155	~437	~359
<b>Total</b>	<b>~310</b>	<b>~1360</b>	<b>~1066/78%</b>

information on all disturbed ancient human remains. The Burial Programs Office of the Office of the State Archaeologist has done an impressive job of producing osteological reports in the Research Papers series. Although many of the reports are primarily descriptive, the publication of descriptive data and uncompiled measurements/observations provides a rich resource for future comparative research.

The limited number of synthetic bioarcheological works in Iowa is probably partly attributable to the absence of bioarcheological and biological anthropology programs at the graduate level. Only two dissertations or theses have focused on or incorporated human remains from Iowa sites. Mott's (1938) M.A. thesis (University of Chicago) used ethnohistoric information about the location of Ioway villages to associate Oneota Orr focus sites with the Ioway. Subsequent research (M. Wedel 1959) used information from the Oneota component of the Upper Iowa River mound sites to define the mortuary attributes of the Orr focus. Elizabeth Glenn's (1971) thesis (Indiana University) used craniometric analysis to consider the origins and biological affiliations of Oneota populations in Iowa, Wisconsin and Minnesota.

The bioarcheology of the Paleoindian period is poorly understood for all of North America and virtually unknown for Iowa. No Paleoindian human remains have been firmly identified in Iowa.

There are eighteen Archaic sites with mortuary components in Iowa and a respectable body of bioarcheology data are accumulating. None is from the Early Archaic period. Two Middle Archaic sites present interesting information on the mortuary practices and adaptations of these mid-Holocene people. The Sand Run West site (13LA38) and the Turin site (13MN2) represent small samples, 12 and four individuals, respectively, but suggest contrasting patterns of corporate (East) vs. individual (West) mortuary programs. The Late Archaic Red Ocher complex, Turkey River Mound Group presents a mortuary program characterized by the presence of red ocher and headless burials. Five of eight primary burials (62.5%) are headless. Green and Schermer (1988) interpret the pattern here as removal and reverence of ancestor skulls. Two of the headless individuals died as a result of violent trauma producing a mortality frequency of 14.3% as a result of violent trauma.

The Pooler site in the Prairie Lake region and the Lewis Central School site in the Prairie region provide additional bioarcheological information. The Pooler site exhibits quantities of red ocher as part of the mortuary program. Periosteal proliferative pathology in four of the eight adults at the Pooler site may represent the earliest evidence of treponemal infection (610 B.C.) in this region. Nonspecific periostitis was relatively frequent at the Turkey River Mound also with five individuals affected (35.7%). Infection rates at the Lewis Central School site are, however, very low with one individual of twenty-five affected (4%). Archaic people generally

exhibit a pattern of high dental attrition and low caries. One individual of twenty-three observed at the Lewis Central School site exhibited one possible carious lesion (4.3%) and a single carious lesion was observed at the Pooler site (MNI=10) resulting in an individual population rate of 10%. Enamel hypoplasia rates are high; at the Turin site one individual exhibited hypoplasias on all 22 permanent teeth present. Craniometric comparisons suggest a basic population similarity during the Middle Archaic while Late Archaic populations represent a heterogeneous population and greater affinity with populations to the east.

Woodland period mortuary sites in northeast Iowa are well documented as a result of a series of extensive mound surveys. The Early Woodland period is, however, poorly understood and bioarcheologically unknown. Five sites with a mortuary component representing eighteen individuals comprise the record of Early Woodland people in Iowa. A pattern of high abrasive attrition of the dentition is suggested. Burial patterns similar to the Archaic, as at Mound 37 of the Turkey River Mound group (13CT 1), appear to continue including the use of red ocher, cremation and postmortem skeletal modification. The presence of an admixture of Late Archaic and Woodland cultural traits emphasizes the continuity between these cultural periods.

The Middle Woodland is represented by twenty-one sites and 135 individuals. The Eastern Woodland, Adams Mound (13DB5) and Pine Creek Mounds (13MC44) present extensive bioarcheological data on 14 individuals and 25 individuals, respectively. Dental attrition is generally extreme. Caries rates vary significantly, from moderate (25%) at Adams Mound to a low (6%) at Pine Creek Mounds. A total lack of caries at most Prairie zone sites such as Hanging Valley, Pooler, Redfield Assemblage suggests the continuation of Archaic subsistence in the western part of the state. Adult infection rates vary greatly also, with 62.5% at Adams Mound and 28.6% at Pine Creek Mounds. In the Prairie Lake region the most extensive bioarcheological information is recorded for the Pooler site (13WB215) which also had an Archaic component. Craniometric and nonmetric data suggest a wide variation in morphology with relationships to both eastern Woodland groups and western Woodland, Plains groups. Relevant to dietary reconstruction and general health status, dental caries is infrequent and attrition is moderate to advanced. An excellent bioarcheological analysis of the Prairie region, Hanging Valley site (13HR28), presents a model of a rather precarious adaptation during the Middle Woodland occupation of this site. Bioarcheological data documenting nutritional stress, including porotic hyperostosis, cribra orbitalia, enamel hypoplasias (83%), Harris lines (100%), and adult infection (100%), are used as the basis for refuting an aggregate band level of society model on the Prairie-Plains (Benn 1981). While the cultural interpretations regarding adaptation, subsistence and settlement pattern may represent a large leap from the evidence of seven burials, the report is clearly a model for the use of bioarcheological data in the testing of hypotheses.

The Late Woodland period is poorly known bioarcheologically with only thirteen sites containing 50 individuals identified. Although the Effigy Mound culture is well documented with over 53 mound complexes containing over 1,426 mounds identified in Iowa (Mallam 1976:5), Late Woodland burials are uncommon or not identified. The most extensive bioarcheological information about Late Woodland people is available from the Gast Farm site (13LA12) where thirteen individuals exhibit enamel hypoplasia frequencies of 37.5% and caries frequencies of 30%.

A significant number of human remains were reportedly recovered from Woodland mounds during the 1934-36 excavations by Keyes and Orr. These remains comprise the Keyes Collection of the Iowa State Historical Society and are currently undergoing analysis relative to NAGPRA

documentation. Bioarcheological information from these remains may contribute more information about the adaptation of Woodland people in Iowa.

The Late Prehistoric period in Iowa is characterized as a "Mississippianization" of Late Woodland cultures and is represented by the following regionally distinctive cultures: Great Oasis (Plains Village) in the central Prairie Lake zone, Glenwood (Central Plains tradition) in the southwest Prairie zone, Mill Creek (Plains Village) in the northwest Prairie zone, and Oneota dominating the east and parts of central and northwest Iowa. Sixty-two burial sites containing 499 individuals are identified for the Late Prehistoric period.

The Great Oasis culture is represented by eight sites and 83 individuals. Most of the samples are small and the human remains are fragmentary. Bioarcheological data including caries rates (12.5-41.6%) and disease frequencies (low) are reported. Interesting is the observation that enamel hypoplasia with frequencies from 21% to 75% clusters around 4 years of age, suggesting possible stress from childhood diseases rather than weaning age malnutrition.

The Glenwood culture is bioarcheologically unknown. Human remains representing Glenwood people are primarily recovered from earthlodge excavations and are very fragmentary and incomplete. Other remains result from collections and diagnostic association with Glenwood is lacking in most cases.

The Mill Creek culture is one of the best known Late Prehistoric cultural traditions in Iowa and a moderate amount of information on the biological nature of Mill Creek people can be constructed from the bioarcheological information reported. Twelve sites representing 119 individuals are identified. Caries frequencies of 12-37% are greater than earlier populations from this region but lower than frequencies reported for many intensive agriculturalists, supporting the reconstruction of a mixed economy diet. Injuries resulting from conflict are reported in two to three individuals which may cautiously support the basis for fortified village for Mill Creek people vs. the unfortified Glenwood villages where no evidence of injuries from conflict are reported.

Oneota sites are the most commonly identified Late Prehistoric mortuary component sites with 35/62 (56%) sites representing 290 individuals. However, the large samples reported by M. Wedel (1989) for the O'Regan Cemetery (13AMS9) and the Elephant Cemetery (13AM61) have not produced any published bioarcheological data. Human remains from these sites may be part of the Keyes Collection which is currently being analyzed. The bioarcheology of the Oneota period is at this point virtually unknown. Only two sites, the Howard Goodhue (13PKL) and Blood Run (13LO2), contain human remains recovered in a mortuary context. Human remains from all of the other sites represent incomplete/fragmentary isolated or village feature associations. Rigorous bioarcheological data collection and publication on the incomplete and fragmentary remains is contributing, however, to an emerging characterization of Oneota adaptation (Vradenburg 1994d).

The Historic period in Iowa is represented by eighteen sites containing 58 individuals. Most are single isolated burials. The largest group of individuals (MNI=31) are identified as Dakota Sioux, probably Mdewakanton, who were imprisoned and died at Camp McClellan after being banished from Minnesota following the Dakota Conflict of 1862. Cranial measurements from these individuals have been used to identify unaffiliated but presumed Dakota remains (Lillie 1995m) but no additional bioarcheological information is reported.

The Burial Programs Office of the Iowa Office of the State Archaeologist has an excellent record of producing and publishing bioarcheological data on human remains in the state prior to repatriation and reburial. There has clearly been some loss of data and knowledge

from early analyses as the techniques of bioarcheological research and data collection have improved over the past 29 years and research questions and hypotheses have likewise been refined. However, a significant body of descriptive data has been compiled and an increasing number of synthetic and problem-oriented studies are being produced.

## Wisconsin

### Paleoindian Period (10,000-8500 B.C.)

#### Northern Forest

Numerous archeological sites dating to the Paleoindian period have been documented in Wisconsin, but only the Renier site in east-central Wisconsin at the base of the Door Peninsula has yielded human remains. The site is significant in that it is one of the few Paleoindian sites scientifically excavated and represents one of the earliest human occupations in Wisconsin and the surrounding region. The Renier site dates to 6000-8500 B.P., the Late Paleoindian period, and consists of the cremation burial of an adolescent individual of unknown sex. The burial is incomplete and fragmentary thus little bioarcheological information is available. Associated with the remains is a distinctive set of burial goods including heat-fractured points of the Scottsbluff and Eden type, as well as a side-notched point similar to the points recovered in association with extinct bison at the Simonsen site in western Iowa (Mason and Irwin 1960). The co-occurrence of the two projectile point traditions has been interpreted as evidence of a culture-contact situation between late Paleoindian and Archaic populations. The Renier burial represents one of the earliest occurrences of cremation as a burial practice in the Western hemisphere (Mason 1986).

#### Eastern Woodlands

No Paleoindian sites have yielded human remains in the Eastern Woodlands region. Consequently, the bioarcheology of the Paleoindian period in this ecological zone is unknown.

### Archaic Period (6500-1000 B.C.)

Three temporal divisions, Early, Middle and Late, characterize the Archaic period in Wisconsin. Within the Middle and Late Archaic several phases, complexes and cultures have been defined. Seventeen sites classified as Archaic have yielded human remains (Table 24). The human remains from Story Quarry (47MI30), Whitnall Park (MI144), and Thiensville (47OZ50) are curated at the Milwaukee Public Museum (MPM), but are not listed in the database. The MPM is currently inventorying their human remains collection as required by the Native American Graves Protection and Repatriation Act (NAGPRA) and a detailed inventory is forthcoming.

The Old Copper complex and the Red Ocher complex are the best known of the Archaic populations. The Old Copper complex is designated as both a Middle and Late Archaic manifestation, although a majority of the literature associated with these sites suggests a classification of Late Archaic. Only four Old Copper sites have been scientifically excavated to date, Osceola (47GT24), Oconto (47OC45), Reigh (47WN01), and Price III (47RI04). These four sites are cemetery sites and provide great insight into Old Copper mortuary practices. The Red Ocher complex is a Late Archaic manifestation exhibiting similarities to the Old Copper complex. In Wisconsin, the Red Ocher complex is known primarily from burial caches. Only one site, Convent Knoll (47WK327) has been scientifically excavated.

Table 24. Wisconsin sites with Archaic mortuary components in the Eastern Woodlands (EW) and the Northern Forest (NF) regions.

Site	Phase	MNI	Region	Type
Ben Larson (47FD395) <sup>1</sup>	Unknown	2	EW	Cemetery
Osceola (47GT24) <sup>2</sup>	Late/Old Copper	12	EW	Cemetery
Bethesda Luth. (47JE201) <sup>3</sup>	Early/Unknown	2	EW	Cemetery
Story Quarry (47MI30) <sup>4</sup>	Late/Red Ocher	1	EW	Unknown
Whitnall Park (47MI1444) <sup>4</sup>	Late/Red Ocher	1	EW	Unknown
Oconto (47OC45) <sup>5</sup>	Late/Old Copper	48	NF	Cemetery
Shannon (47ON48) <sup>6</sup>	Unknown	2	NF	Mound
Hilgen Spring (47OZ07) <sup>7</sup>	Late/Unknown	21	EW	Mound
Thiensville (47OZ50) <sup>8</sup>	Late/Red Ocher	3	EW	Cemetery
Price III (47RI04) <sup>9</sup>	Late/Old Copper	130	EW	Cemetery
Durst Rockshel. (47SK02) <sup>10</sup>	Late/Unknown	2	EW	Rock Shelter
Sites 23, 24 (47SK02)	Unknown	2	NF	Cemetery
Lawrence I (47VE154) <sup>11</sup>	Late/Unknown	1	EW	Isolated
Convent Knoll (47WK327) <sup>4</sup>	Late/Red Ocher	9	EW	Cemetery
Nick's Site (47WK—)	Late/Unknown	2	EW	Cemetery
Reigh (47WN01) <sup>13</sup>	Late/Old Copper	45	EW	Cemetery
Little Wolf (47WP47) <sup>14</sup>	Late/Unknown	4	NF	Unknown

<sup>1</sup>Holliday 1992; <sup>2</sup>Ritzenthaler 1946; <sup>3</sup>State Historical Society of Wisconsin; <sup>4</sup>Overstreet 1980; <sup>5</sup>Ritzenthaler and Wittry 1952; <sup>6</sup>Salzer 1969; <sup>7</sup>VanLangen and Kehoe 1971; <sup>8</sup>Ritzenthaler and Niehoff 1958; <sup>9</sup>Freeman 1966; <sup>10</sup>Wittry 1959; <sup>11</sup>Halsey 1974; <sup>12</sup>Freeman 1966; <sup>13</sup>Halsey 1971

### Early Archaic (6500-3000 B.C.)

No Early Archaic sites located within the Northern Forest environmental zone have contained a mortuary component. One site in the Eastern Woodlands, Bethesda Lutheran (47JE201) with two individuals, is listed as Early Archaic in the database, but no analysis has been conducted on these remains. The bioarcheology of this period is unknown.

### Middle Archaic (3000-1200 B.C.)

No Archaic sites listed in the database are identified as Middle Archaic. In fact, no major archeological excavations of sites from this time period have been conducted (Ritzenthaler 1985). The bioarcheology of both the Northern Forest and Eastern Woodland zones is unknown for this period.

### Late Archaic (1200-800/1 B.C.)

#### Northern Forest

*Old Copper Complex.* Old Copper complex sites are distributed throughout Wisconsin but the greatest concentration of these sites is in eastern Wisconsin in the Eastern Woodland zone. Only one Old Copper site in the Northern Forest region has produced human remains. The Oconto site (47OC45) was excavated in 1952 as part of a joint excavation by the MPM and the Wisconsin State Historic Society (Ritzenthaler and Wittry 1952). The site was originally encountered during gravel operations and consequently a large portion of the site was destroyed. The subsequent scientific excavation identified the site as a large cemetery of the Old Copper complex. Its location in Oconto County places it in the heart of the Old Copper territory. Eighteen burial pits were encountered. A majority of the burials contained single individuals (N=11); however, multiple burials were also encountered. Seven of the burial pits were cremation pits. One or more artifacts were recovered from eight of the burials. A minimum number of 45 individuals have been identified. Individuals at the Oconto site were moderately preserved and have been included in several studies that have provided the beginning of a reasonably good body of bioarcheological data that will serve as a comparative base for Old Copper burial sites encountered in the future (Pfeiffer 1977, 1979; Sullivan 1986, 1990a, 1990b).

Pfeiffer (1977, 1979) included Oconto as one of nine sites in her research into the relationships among Archaic populations of the Great



Lakes region. Sites included in Pfeiffer's research include human remains from the Old Copper sites of Oconto, Osceola, and Reigh from Wisconsin; Hind, a Glacial Kame site from Michigan; the Laurentian sites of Frontenac Island, Cole, Morrison's Island, and Allumette Island; and Port au Choix, a Maritime site. Data collected on the Oconto mortuary remains in Pfeiffer include skeletal and dental pathology, cranial and postcraniometrics and nonmetrics, and dental morphology. Sullivan (1986, 1990a, 1990b) uses Oconto as a population representative of early hunter-gatherers in his investigations of skeletal indicators of subsistence practices. Sullivan has presented data on the frequency of dental caries, enamel hypoplasia, porotic hyperostosis and cribra orbitalia.

Pfeiffer (1977) observed pathological conditions on seven of 48 individuals (14.6%). The pathological alteration of bone exhibited by five of the seven individuals is traumatic in origin, including four individuals who suffered inflammation of the anterior tibiae in response to some injury, and one individual who exhibits three, possibly four, healed fractures. Pfeiffer postulates the occupational hazards of woodworking using an adze as a source for the tibial trauma; warfare was not considered to be a likely source of these conditions. Additionally, one individual exhibited multiple areas of osteomyelitis, and another had cranial lesions that are similar in appearance to those associated with treponemal infection. Pfeiffer also considers the nature and frequency of osteoarthritis; however, frequencies for Oconto are not reported separately but are pooled with the other Archaic sites under investigation. Overall, the frequency of osteoarthritis is low for the Archaic period and a majority of individuals affected exhibit a slight to moderate degree. Sullivan (1990a, 1990b) also recorded skeletal pathological conditions, specifically adult porotic hyperostosis. None of the individuals included in the analysis (N=20) exhibited porotic hyperostosis.

Pfeiffer (1977) and Sullivan (1986, 1990a, 1990b) noted the occurrence of dental pathology including caries, antemortem tooth loss, attrition, linear enamel hypoplasia, and hyper- and hypodontia. Sullivan's studies were limited to the identification and analysis of enamel hypoplasia and caries. It is important to note that Pfeiffer (1977) does not provide the sample sizes for each analysis reported, so computation of percentages is not always possible. Pfeiffer observed two cases of hypodontia in 17 individuals (12%) and no cases of hyperdontia. Caries frequencies were not reported per individual, but as a percentage of individuals affected (Pfeiffer 1977, Sullivan 1990a, 1990b). Sullivan records a caries frequency of 10% and Pfeiffer reports one individual with a single carious lesion. The low percentage of individuals exhibiting caries is consistent with a diet low in carbohydrates. This situation is corroborated by the absence of porotic hyperostosis. A high frequency of linear enamel hypoplasia is reported for Oconto indicating the presence of chronic stress. Specific numbers of individuals affected by antemortem tooth loss (ATL) in the Oconto sample is not presented; Pfeiffer (1977) pools the ATL data from all nine sites. Analysis of attrition indicates a heavy degree of wear on the molars; individuals of both sexes and of all ages are affected.

Pfeiffer (1977) included Oconto in a biological distance study focusing on determining if there is an Archaic physical type and the genetic relationships between nine Archaic skeletal samples from the Great Lakes region. Forty-six cranial measurements were variously taken according to completeness of each cranium. Conclusions indicate that there is no evidence for an "Old Copper Physical Type" and that the Oconto crania show a close relationship to those of the Laurentian sites from New York. The significant degree of cranial variation exhibited within the Old Copper sample (Oconto, Osceola, and Reigh) contradicts Neumann's (1952) conclusions following analysis of six skulls from the Oconto and Osceola sites: "The 6 skulls can be characterized as long headed....All 6 are moderately high vaulted, relatively narrow faced, and relatively narrow

nosed. Morphologically the skulls exhibit great homogeneity" (Neumann 1952). Pfeiffer concludes that there may have been considerable gene exchange during the Archaic in the Great Lakes region and tentatively suggests that local populations were "involved in broad networks of trade and mate exchange, maintaining artifactual assemblages suitable to the local biome" (Pfeiffer 1979:40).

Additionally, the frequencies of 14 cranial and postcranial nonmetric traits were presented. Small sample sizes precluded using these traits to determine population affinities. Thirty-nine postcranial measurements were variously taken, depending on completeness of the remains. Stature estimates ranged from 5 ft. 3 in. to 5 ft. 6 in. for females and 5 ft. 5 in. to 5 ft. 9 in. for males.

*Red Ocher Complex.* No Red Ocher complex mortuary components have been identified in the Northern Forest zone resulting in an absence of bioarcheological information.

#### Eastern Woodlands

Thirteen of the 17 Archaic sites listed in the database as containing human burials are located within the Eastern Woodlands region. These sites have yielded an estimated 231 individuals (80% of total Archaic sample). The human remains from four of these sites (195 individuals) have undergone partial osteological analysis and have contributed to what is known about the biological nature and adaptations of Archaic peoples.

*Old Copper Complex.* Three Late Archaic Old Copper complex sites, Osceola (47GT24), Price III (47RI04), and Reigh (47WN01), have been included in substantive bioarcheological research (Bender et al. 1981; Hsu 1970; Pfeiffer 1977, 1979; Price and Kavanagh 1982; Schurr 1992). The level of analysis conducted and the overall contribution to bioarcheological knowledge varies between these three sites primarily due to preservation and completeness of the remains.

The Osceola site (47GT24), a large cemetery, was excavated in 1945 by Robert Ritzenthaler of the MPM (Pfeiffer 1988; Ritzenthaler 1946). The site is located on the banks of the Mississippi River in Grant County, on the periphery of the Old Copper distribution. It was estimated that at one time 500 individuals had been interred at the Osceola site, but erosion and collecting had reduced that number to approximately 200. All but one burial were secondary bundles of single or multiple individuals. Partially cremated remains were also observed. Little osteology has been done on the Osceola remains due to their overall poor preservation. Pfeiffer (1977) extracted as much information as possible and incorporates it into her regional overview of Archaic populations of the Great Lakes. The poor preservation of the remains precluded an assessment of skeletal pathology.

Thirteen maxillae, 16 mandibles, and their associated dentition of varying completeness were examined. One case each of hypo- and hyperdontia was observed. One carious lesion was recorded for one individual. Attrition was generally characterized as moderate to severe. No other dental anomalies or pathology were observed. The incompleteness of the Osceola site postcranial remains precluded their consideration in mean stature comparisons; no postcranial data were presented. Cranial measurements and indices were recorded for two individuals, and Pfeiffer concluded that the Osceola individuals did not show an affinity to any other group; a consideration of indices alone, however, seems to identify a western group, distinct from the more eastern skeletal samples. George K. Neumann (1952) analyzed one skull from this site and assigned it to the Otamid variety of Paleoindian. More specifically, he described it as very ancient in appearance, exhibiting a high vault, long maximum length, narrow face, relatively narrow nasal aperture, well-developed supraorbital ridges, some sagittal keeling, and a pronounced bun-shaped occiput.

Sullivan (1988) examined the dentition of the Osceola individuals for the presence of enamel hypoplasia. A minimum of 16 individuals were identified by the presence of the mandibular first molar. This estimate is higher than that reported by Pfeiffer (1977, 1988). Sullivan included 155 maxillary and mandibular adult teeth in his analysis. The buccal/labial and lingual surfaces of both the posterior and anterior teeth were observed for enamel defects. Ninety-eight of 155 teeth (63%) exhibited mild or moderate enamel hypoplasia. Anterior teeth were proportionately more frequently affected (incisors, 80%; canines, 91%; premolars, 68%; and molars, 50%). Growth disruption was determined to have occurred during most of the growth period, from less than 1 year to 6 years and from 9 to 12 years. Fifty-eight teeth (37%) exhibit multiple defects. The nature and frequency of the enamel defects observed in the Osceola sample is interpreted as evidence of chronic, episodic stress. Frequencies of enamel defects are reported for Indian Knoll in western Kentucky (89%) and Oconto (68%). Comparisons between these sites and Osceola are problematic due to the small sample size of anterior teeth, the most sensitive to expression of enamel defects (Goodman et al. 1980).

The Reigh site (47WN01) was excavated in 1953 under the auspices of the MPM. The site sits on a high gravel ridge and consists of a cemetery and later village site. The site came to the attention of archeologists when it was disturbed during gravel quarrying operations. A minimum of 45 individuals have been identified from this site; this number does not include the individuals disturbed during quarrying. Neil Ostberg reported on the skeletons recovered (Ritzenthaler et al. 1957) and presents basic demographic information in addition to details about burial mode, artifact distribution, and red ochre treatment.

The Reigh site is similar to other Old Copper cemetery sites in that it consists of a clearly separate and demarcated cemetery where both primary and secondary burials were interred. Additionally, the individuals buried at the Reigh site, like those of the Old Copper culture, were also the recipients of various copper artifacts. The original excavators, however, noted some similarities to the later Glacial Kame phase including the presence of a sandal sole shell, gorget, and fewer copper artifacts than Old Copper culture sites (Baerreis et al. 1954). They hypothesize that this situation may represent an example of culture contact between Old Copper complex and Early Woodland populations. A considerable number of additional copper artifacts have since come to light, and it is now believed that Reigh should be assigned to the Old Copper complex, but that they probably had trade contacts with the Glacial Kame people who inhabited areas south and east of them (Stoltman 1986).

The Reigh site has been the subject of three bioarcheological studies. Beyond Ostberg's cursory descriptive summary, the remains have been the subject of Master's thesis (Hsu 1970) and included in a number of other studies (Pfeiffer 1977, 1979; Price and Kavanagh 1982; Schurr 1992). Hsu did a thorough analysis of the Reigh site that focused on demography, pathology, cranial and postcraniometrics and nonmetrics, and a broad comparison with other Midwestern sites. Additionally, photographs from the site indicate the types of pathology being observed and include arthritis, spina bifida occulta, wedge fractures of vertebrae, a healed neck fracture of the humerus, and congenital fusion of two cervical vertebra.

The age and sex distribution presented by Hsu is revised by Pfeiffer (1977) to incorporate a greater number of individuals and consider the significant overlap between the sexes. Pfeiffer's age and sex distribution table is presented in Table 25. Hsu reported 26 males (70%), seven females (19%), and four indeterminate (11%). Both Hsu (1970) and Pfeiffer (1977) report the highest percentage of deaths fall within the age group of 21-34

Table 25. Age and sex distribution of the Reigh site (Pfeiffer 1977:109).

Age	N	Male	Female	Indeterm.
Infant (<2 years)	1			1
Child (2-12 years)	6			6
Adolescent (12-18 years)	6	2	2	2
Young Adult (18-35 years)	19	8	10	1
Middle Adult (35-55 years)	4	2	2	0
Adult	9	1	2	6
Totals	45	13	16	16

years. Pfeiffer's revision of sex distribution at the Reigh site identified more females; she reported 13 males (28%) and 16 females (36%), and 16 indeterminate (36%).

Fifty-one cranial measurements and indices and 24 postcranial measurements were taken on the Reigh individuals in order to assess affinities to other sites from Wisconsin (Oconto, Osceola, Millville), Michigan (Riverside), Illinois (Albany Mound), Ohio (Hopewell, Harness, Seip, Esch, and Marietta mounds), and Kentucky (Indian Knoll, Dover Mound). Only two crania and 22 long bones from the Reigh site were sufficiently complete to allow a complete set of measurements to be taken. Hsu (1970) reports that the Hopewell samples and Indian Knoll shared the closest affinities with Reigh. The small sample sizes of the Old Copper sites may affect the validity of Hsu's biological distance conclusions.

Pfeiffer (1977) included Reigh as one of nine sites in her regional comparison of Archaic populations of the Great Lakes region. She observed skeletal pathology on three individuals (8.9%) including two, possibly three, healed fractures and one instance of extensive osteoarthritic lipping characterized by severe osteophyte development and eburnation. Not including the previously discussed individual, Pfeiffer pooled the osteoarthritic data from the total Archaic sample and concluded that except for the extreme cases, the incidence of arthritis is low and severity slight to moderate for the Archaic period.

Congenital dental anomalies and acquired dental conditions were observed (Pfeiffer 1977). Two, possibly three, individuals exhibit hypodontia. Acquired dental pathology observed at Reigh include two carious lesions observed for one individual. The pattern of antemortem tooth loss (ATL) is distinct for the Reigh individuals. Whereas the posterior teeth are most commonly lost in the other skeletal samples, the anterior teeth are most frequently lost at Reigh. Furthermore, a distinct sex pattern is evident with the antemortem loss of the anterior teeth in five maxillae (33%) attributable to females and individuals of indeterminate sex, and no observed loss of teeth in male maxillae. This difference could be the result of sex-specific activity patterns. As reported for the Oconto and Osceola Old Copper sites, attrition is characterized by heavy wear on the molars and affects both sexes and individuals of all ages. Premortem chipping of the posterior teeth was observed in high frequencies at Reigh; 29% of the maxillae and 14% of the mandibles. The first and second molars were the most commonly affected teeth. Buccal edge chipping characterizes the maxillary dentition and lingual edge chipping the mandibular dentition.

The Reigh site was included along with Oconto, Osceola, and six other Archaic period sites in Pfeiffer's (1977) biological distance research. As stated above, conclusions indicate that there is no evidence for an "Old Copper Physical Type." Furthermore, contrary to earlier hypotheses postulating a relationship between Reigh and Glacial Kame peoples, Reigh shows no affinities to the Glacial Kame Hind site. The frequencies of 14 cranial and postcranial nonmetric traits were presented. Small sample sizes precluded using these traits to determine population affinities. Thirty-nine postcranial measurements were variously taken depending

on completeness of the remains. The Reigh adults were among the tallest of the total Archaic sample (average male stature, 5 ft. 6 in. to 6 ft.; average female stature, 5 ft. 3 in. to 5 ft. 9 in.).

In addition to the more in-depth and extensive analyses conducted by Hsu (1970) and Pfeiffer (1977, 1979), several more recent studies have reported trace element concentrations and/or carbon isotope ratios for a sample of individuals from the Reigh site (Bender et al. 1981; Price and Kavanaugh 1982; Schurr 1992). Each of these studies has compared trace element and carbon isotope levels across time periods in the Midwestern region. Reigh has been presented in each study as an example of an Archaic population that practiced a generalized hunter-gatherer subsistence strategy and, therefore, serves as a baseline from which to document and measure the introduction and degree of reliance on maize as dietary component.

Bender et al. (1981) explore the degree to which Hopewell economy was based on maize horticulture and the variation in reliance between major Hopewell centers in Ohio, Illinois, and Wisconsin. The  $^{13}\text{C}/^{12}\text{C}$  ratios were reported for five adult individuals (one male, one female, and three unknown) from the Reigh site and range from -21.4 to -23.1. The reported ratios fall within the expected range for a diet characterized by low to absent maize consumption and are comparable to values reported for Archaic individuals from the Koster site in Illinois and the Frontenac site in New York. Carbon isotope ratios are also reported for four other Wisconsin sites including the Middle Woodland sites of Millville and Trempealeau, the Middle Mississippian site of Aztalan, and the Historic Ottawa site of Rock Island site II. The isotope values reported for these sites will be presented in the appropriate period sections.

Price and Kavanaugh (1982) present the results of a trace element analysis of 17 human and animal bones from four Wisconsin sites spanning the period from the Late Archaic to the Mississippian. The sites selected are the same as those tested by Bender et al. (1981) for carbon isotope analysis, and the same burials were selected, when possible, in order to compare the results obtained from the trace element and isotope methods. Interpretation of the reported concentrations focus on dietary composition and social status. Concentrations of 12 trace elements (Table 3 in Price and Kavanaugh) are presented as possible dietary indicators; however, the authors focus their discussion on the more reliable strontium/calcium ratio. The strontium/calcium ratios from the Reigh site individuals are indicative of a homogeneous diet and are consistent with the carbon isotope values presented by Bender et al. (1981). Results from the other Wisconsin sites tested will be presented in the appropriate sections.

Schurr (1992) examines intrasite variability in stable carbon and nitrogen isotopic ratios and hypothesizes that increased isotopic variability is related to mortuary variability that may reflect differential access to foodstuffs according to social class. Schurr reports the results of several isotope studies including the Bender et al. (1981) research discussed above. Information presented includes average isotope ratio, sample size, standard deviation, and a corrected standard deviation. Schurr observes greater standard deviations in samples postdating A.D. 800 and primarily representative of the more socially complex Middle Mississippian groups. The greater standard deviations may reflect greater intracommunity variation in diet and, more specifically, maize consumption. The primary emphasis of Schurr's research is on the isotopic analysis of the Middle Mississippian Angel site in southern Illinois; however, he discusses the variability recorded for Aztalan and reports isotopic data for Reigh (Archaic), Millville (Middle Woodland), Trempealeau (Middle Woodland), and Rock Island site II (Historic Ottawa). The standard deviation for Reigh reflects minimal variability in dietary composition between individuals

and, therefore, equal access to and consumption of foodstuffs. Degree of isotopic variability of the other Wisconsin sites reported will be discussed in the relevant sections.

The Price III site (47RI04) was excavated during the summers of 1960 and 1961 by Joan Freeman of the Wisconsin State Historical Society (Freeman 1966). This site represents another large Old Copper cemetery site. Twenty-six features were identified during excavations; 22 were classified as burial pits, and 21 of these contained between one and seven individuals. Feature 25 was unique in that it contained 88 individuals buried in six discrete levels. A total of 130 individuals was identified from this site. The Price III site exhibits many of the features identified as characterizing the Old Copper culture: a variety of burial modes including cremations, primary and secondary interments, the presence of red ocher on some of the remains, and the presence of stone mantles covering the skeletal remains. Grave goods, however, are more infrequent at Price III than at the other large Old Copper cemeteries. Presently the remains from Price III have been only partially analyzed.

Peterson and Schact (1966) collected cranial and postcranial metric data ( $N=30$ ) and attempted to determine if the remains recovered from the site were from more than one population. Based on little data and weakly supported assumptions, they conclude that there is no significant difference between the skeletons from the sites and, therefore, the remains excavated from the Price III site are from a single population. Wilson (1966) provides descriptive data on dental and skeletal pathological conditions and anomalies. Dental data are summarized in the text; frequencies and sample size per observation are not provided. Attrition is generally severe and affects males and females equally. Both alveolar and periapical abscesses are present. Cranially, one individual exhibits a metopic suture. Pathological conditions observed are enumerated, but again percentages are not calculable due to unknown sample size per observation. Ten instances of trauma were observed and consist of four examples of "depressed areas," one instance of a calvarial fracture, four instances of postcranial fractures, and one case of an embedded projectile point in the third thoracic vertebra. Additionally, three tumors were observed. Arthritic and inflammatory changes were observed. No comparisons or interpretations based on these data are made.

The human remains from the Price III site have more recently been included in studies that have applied bone chemistry techniques to evaluate the dietary composition of Late Archaic populations in the Midwest. Price (1985) describes the Late Archaic period in the Midwest as a time of cultural transition during which hunter-gatherer societies were shifting to a more sedentary existence and beginning to manufacture pottery, domesticate certain plants, and construct burial mounds. Floral and faunal studies also suggest a subsistence shift where seeds surpass nuts as the dominant plant food. Relative to dietary shifts, however, little is known about the actual contributions of various foodstuffs to the diet. Price (1985) applies trace element analysis in order to determine the dietary composition of Late Archaic populations. Bone samples were taken from 96 individuals from three Late Archaic sites: Price III ( $N=53$ ) from Wisconsin and Williams ( $N=21$ ) and DuPont ( $N=22$ ) from Ohio. He records concentrations for nine elements including calcium, sodium, strontium, zinc, magnesium, manganese, copper, iron, and aluminum but only discusses the results of strontium. The average strontium concentration for the Price III individuals is 155 ppm (range: 74-219). Consideration of various complicating factors led to the tentative conclusion that hunting is the predominant source of food for the inhabitants of each of the sites, but he cautions that for Price III "plants appear to contribute little to the diet, but their importance may be masked by reliance on fish" (Price 1985:457).

In an article published later the same year, Price et al. (1985) continue their research into Archaic subsistence practices through the application of trace element studies by addressing methodological problems affecting the use of trace elements to reconstruct diet composition. The authors assess the strontium concentrations and strontium/calcium ratio in modern white-tailed deer who lived in a certain area and, therefore, likely ingested similar foodstuffs. Publications regarding deer diet in the area provided information on composition of their diet. Their results indicate that strontium levels in prehistoric deer may be used as a baseline to assess the actual contribution of meat and plant foods in human diets. This finding was applied to the study of two Late Archaic sites: Price III from Wisconsin and Williams from Ohio. The strontium concentrations at both sites are significantly lower than the white-tailed deer from each area. Comparison of the human strontium concentrations to those of prehistoric carnivores and herbivores from each site area indicates that dietary practices were similar. As reported in the previous study (Price 1985), the average strontium concentration from Price III was approximately 155 ppm and, from Williams, 308 ppm. Price et al. (1985) conclude that the diet of the Late Archaic Price III inhabitants was approximately 60% meat and 40% plant foods and 63% meat and 37% plant for the Williams site inhabitants. Mean strontium concentrations were compared between males and females as well for the Price III sample. No significant difference was observed, but females did exhibit slightly lower average strontium values.

*Red Ocher Complex.* The Red Ocher complex is also one of the better known burial complexes in the Late Archaic in Wisconsin, from both popular and academic perspectives. This complex is known primarily from burial caches that were reported by lay people and private landowners; however, a few known cemeteries have been excavated (Hruska 1967; Overstreet 1980; Stoltman 1986). Four sites, yielding a minimum of 14 individuals (5% of total Archaic sample), are identified as Red Ocher in the bioarcheological database. Only five of the 13 individuals are available for study; the nine individuals from Convent Knoll (47WK327) were reburied.

All Red Ocher complex sites that have contained human burials are located in the Eastern Woodlands. Only one of these sites, Convent Knoll (47WK327), provides significant bioarcheological data. Overstreet (1980) describes incidences of trauma collected during an in situ analysis of four burial features containing nine individuals. Seven adult males and two children were identified. One of the children was less than 6 years of age, the other of indeterminate age. A decision by local law enforcement personnel resulted in the transfer of the remains to a local Indian group for reburial. Consequently, more extensive analyses were not possible.

Multiple traumatic injuries were observed on the seven adult male skeletons. The trauma is violent in nature and consists of three instances of decapitation, one instance of extensive dismemberment, one occurrence of removal of the left hand, one occurrence of scalping, one instance of an embedded projectile point, two instances of projectile points in association with the skeleton, and one sharp-force injury to the shaft of a femur. It is interesting to note that five of the adult males were haphazardly placed within a small burial pit, and the sixth adult male was buried in a separate pit complete with grave goods and treated with red ocher. No traumatic injuries were observed on the skeletal remains of the children.

Trauma has been documented in other late Archaic sites, including the Riverside site in Michigan. However, the overall frequency of such incidences in the Red Ocher complex is unknown. Clearly additional Red Ocher sites need to be scientifically excavated, with the associated skeletal remains incorporated into the analysis and interpretation of each site.

Other categories of bioarcheological data than those discussed above are nonexistent resulting in a significant gap in the bioarcheological knowledge of the Red Ocher people.

#### Summary of the Archaic Period

Published bioarcheological research has focused on frequency and type of dental and skeletal pathology, determination of population affinities through the analysis of cranial and postcraniometrics, and reconstruction of Late Archaic diet composition. Osteological data categories collected include cranial and postcraniometrics and nonmetrics, skeletal and dental pathology, demographic information, carbon isotope ratios, trace element concentrations, and mortuary practices. Research questions explored for this period include the definition and relationships of various Archaic complexes, i.e., Red Ocher, Old Copper; determination of the nature and sufficiency of Archaic subsistence strategies; and the frequency of traumatic injuries of both a violent and occupational origin. Bioarcheological data are available to address each of these questions; however, very little data are available to address these research questions for the Red Ocher complex. The bioarcheological data for the Late Archaic period published to date can be summarized as follows: diets are characterized by predominant reliance on meat foods; caries frequencies are low, indicating a diet low in carbohydrates; frequencies of enamel hypoplasias indicate chronic and episodic stress; dental attrition is severe; trauma of violent origin is present though not extensive or in high frequencies; occurrences of most skeletal pathological conditions are low; and no "Old Copper type" exists craniometrically, suggesting that local populations were involved in networks of mate exchange.

#### The Woodland Period (600 B.C.-A.D. 1634/Contact)

During the Woodland tradition in Wisconsin the state can be divided into two main regions, a northern portion and a southern portion. The northern half of the state is characterized by a cool, wet climate and pine-dominated forests. This environment is similar in many respects to the adjacent portion of Minnesota and Michigan and north up to southern Canada. This northern forest area of Wisconsin has only recently been the focus of archeological interest. The southern half of the state is much better known archeologically and is characterized by relatively warmer temperatures, less acidic soils, and, prior to agricultural development, was dominated by prairies and oak forests (Salzer 1986).

#### Early Woodland (600-100 B.C./A.D. 100)

The Early Woodland period in Wisconsin represents a transitional stage between the generalized hunter-gatherer adaptation of the Middle and Late Archaic and the intensive collector adaptation of the Middle Woodland. This period commences ca. 600 B.C. and is traditionally defined by the adoption of ceramic manufacture, mound construction, and use of cultigens. Early Woodland sites are characterized by a mosaic of traits used to define the Archaic and the later Woodland periods. There is clear evidence of pottery manufacture at Early Woodland sites by ca. 500 B.C., but little indication of mound construction or of intensive reliance on cultivated plants. Alternatively, Early Woodland peoples in Wisconsin continued a generalized hunter-gatherer adaptation similar to that practiced during the Archaic, but established collector territories and practiced semisedentism as indicated by sites of seasonal occupation that were reoccupied over time.

It is reasonable to expect local variations in adaptation within the broad and generalized hunter/gatherer adaptation relative to the environmental zones occupied. Peoples who inhabited sites in the Eastern

Woodlands exhibit a definite trend toward sedentism and occupied a wide diversity of locales including rockshelters, upland knolls, terraces, and flood plains. Furthermore, despite the widespread belief in a trend toward increased reliance on cultigens, little evidence exists for this practice. The Northern Forest region of Wisconsin was occupied during Early Woodland times by semisedentary peoples with a collector orientation. Little else is known of this adaptation to the environment due to the limited amount of archeological research and poorly defined cultural traditions, a consequence of low visibility of sites in a forested environment. Salzer's work (1969, 1974) has done much to rectify this situation.

Early Woodland sites are few and limited in time and space throughout Wisconsin resulting in a limited degree of information about this period. Unequivocal evidence of mound building and the practice of horticulture did not occur until A.D. 1, about 500 years after the initiation of ceramic manufacture and, hence, the Early Woodland.

There are five sites listed in the Wisconsin database as containing an Early Woodland mortuary component (Table 26). Four are located in the Eastern Woodlands and one in the Northern Forest region. Thirty-one individuals have been recovered from these sites comprising less than 1% of the total number of individuals recovered from Wisconsin sites; 21 individuals were interred at one site.

Little is known of the biological nature of Early Woodland peoples in Wisconsin. The level of osteological analysis for each site is recorded as "none." Minimal descriptive information is provided for two sites only, the Hahn I site (47DG01) located in the Northern Forest region and Hilgen Spring (47OZ07) in the Eastern Woodland region.

#### Eastern Woodlands

Hilgen Spring was excavated in 1968 in response to a housing development project. The site consists of a group of three conical burial mounds, each of which experienced human disturbance prior to the professional excavation. Mound 1 contained three bundle burials, one isolated human skull, and a bundled dog burial in a roughly circular pit in the mound center. Mound 2 also contained a circular burial pit located at the mound center. A minimum of three individuals were recovered including the disturbed remains of an adult in a supine position, a child, also in a supine position and an intrusive bundle burial placed above the central pit in the mound fill. Mound 3 contained the remains of a minimum of five individuals most likely interred as secondary bundles (Van Langen and Kehoe 1971). Little osteological analysis has been conducted on the remains from the Hilgen Spring site beyond the initial description presented here. Van Langen and Kehoe (1971) do mention that the isolated skull in Mound 1 is classified as round-headed while the others recovered from the site are long-headed. Significantly, Hilgen Spring is believed to be the earliest known practice of mound building in Wisconsin ( $2410 \pm 55$  B.P.). Additionally, the artifact material recovered at the site, and  $^{14}\text{C}$  dates (Van Langen and Kehoe 1971; Kehoe 1975) are indicative of an Early Woodland designation while some of the artifacts suggest some relationship with a Late Archaic complex, most likely Red Ocher. More extensive osteological analysis is warranted and will contribute to our understanding of the transitional nature of the Early Woodland period in Wisconsin and its possible affinities to the earlier Archaic complexes.

#### Northern Forest

The Hahn I site (47DG01) came to the attention of archeologists when Mr. Hahn discovered bone fragments later identified as an extinct species of elephant. With the hopes of uncovering a Paleoindian site, archeologists from the University of Wisconsin commenced excavations that extended variously from 1951 to 1953. Excavations at Hahn I failed to uncover

Table 26. Wisconsin sites with an Early Woodland Mortuary component.

Site	Multicomponent	MNI/Analysis	Type
Ferryville Implement (47CR123) <sup>1</sup>	N	1/None	Cemetery
Camp Indianola Village <sup>2</sup>	N	1/None	Habitation
Hahn (47DG001) <sup>3</sup>	N	7/None	Unknown
Abraham (47FD9002) <sup>1</sup>	N	1/None	Mound
Hilgen Spring (47OZ7) <sup>4</sup>	Y	21/None	Mound

<sup>1</sup>State Historical Society of Wisconsin; Behm 1990; <sup>2</sup>Dirst 1988; <sup>3</sup>Keslin 1958; <sup>4</sup>Van Langen and Kehoe 1971

Paleoindian cultural remains; however, it was observed that the knoll had been occupied by ancient peoples, presumably Early Woodland, and that they had used the knoll as a burial area, among other activities (Keslin 1958).

Burials occurred randomly across the knoll, and some were accidentally excavated by bulldozers during gravel mining operations; however, one burial was professionally excavated. This burial comprised three levels of interment which yielded four individuals. The flexed primary burial of a 3 year old child was encountered in Level I; an adult male and a child 4-5 years old were interred as secondary bundles in Level II; and a semiflexed primary burial of an adult male was found in Level III. Very limited osteological analysis was conducted on the remains due to the small sample size; however, it was reported that both adults were dolichocephalic, or narrow, long-headed individuals. The preservation of the adults is good and future analysis may provide additional information (Keslin 1958).

#### Middle Woodland (100 B.C./A.D. 100-A.D. 500)

By the Middle Woodland period, there is unequivocal evidence of diagnostic Woodland behaviors including mound building and plant cultivation. Middle Woodland sites are found in both the Northern Forest and Eastern Woodland regions of the state and are very distinct in character and nature, clearly reflecting adaptations to their physical and cultural environments. The Eastern Woodland groups are characterized as Intensive Collectors and practiced a hunter-gatherer pattern of subsistence with the addition, in some areas, of "locally produced or intensively harvested plant resources" (Arzigian 1987). The Northern Forest region continues the hunter-gatherer adaptation with a trend towards semisedentism as seen by a growing intensity of occupation and/or reoccupation of sites. Little evidence exists for plant cultivation.

There are 20 Middle Woodland sites with mortuary components in Wisconsin (Table 27). Fifteen of these sites are located in the Eastern Woodlands and five in the Northern Forest region. A minimum number of 507 individuals have been identified from these sites comprising approximately 10% of the total number of individuals recovered from Wisconsin sites. Ninety-one percent (N=466) of all Middle Woodland individuals have been recovered from the Eastern Woodland region and 9% (N=41) from the Northern Forest, reflecting both the limited amount of archeological research in this area and differences in burial practices of the identified cultures.

Middle Woodland peoples in the Eastern Woodlands (southern region) were strongly influenced by the Hopewellian groups further south and are part of what has been called the Hopewell Interaction Sphere (Salzer 1986). The Trempealeau phase and Waukesha phase represent the two primary centers of the Wisconsin Hopewell Interaction Sphere. These two cultures share a number of traits with their more southern cousins including burial in log-covered rectangular pits, the inclusion of a variety of local and exotic grave goods, and differential burial practices defined by status.

Table 27. Wisconsin sites with a Middle Woodland component in the Eastern Woodlands (EW) and Northern Forest (NF) regions.

Site	Culture	MNI	Region	Type
Bluff Siding (47BF45) <sup>1</sup>	Millville	1	EW	Unknown
Cyrus Thomas (47BN07) <sup>2</sup>	RC Hopewell	18	NF	Mound
Unnamed (47BR243) <sup>3</sup>	Unknown	1	NF	Isolated
Altern (47BT50) <sup>4</sup>	Unknown	14	NF	Mound
Curtois (47CR—) <sup>5</sup>	Unknown	52	EW	Mound
Flucke (47CR—) <sup>5</sup>	Unknown	7	EW	Mound
Sue Coulee (47CR—) <sup>5</sup>	Unknown	42	EW	Mound
Grand Crossing (47DA03) <sup>6</sup>	Unknown	3	EW	Mound
Swanson (47DA172) <sup>6</sup>	Unknown	53	EW	Mound
Rosenbaum RS (47DA411) <sup>6</sup>	Unknown	2	EW	Cave
Richter (47DR80) <sup>7</sup>	North Bay	5	NF	Unknown
Millville (47GT53) <sup>8</sup>	Millville	6	EW	Mound
Overhead (47LC20) <sup>9</sup>	Hopewellian	16	EW	Mound
Rehbein (47RI81) <sup>14</sup>	Unknown	35	EW	Mound
Little Eau Pleine 6 (47MR68) <sup>10</sup>	Havana	3	NF	Mound
Nicholls (47TR22) <sup>11</sup>	Trempealeau	8	EW	Mound
Shrake Md Grp II (47TR24) <sup>11</sup>	Trempealeau	6	EW	Mound
White (47VE—) <sup>5</sup>	Trempealeau	36	EW	Mound
Schwert Group (47TR31) <sup>11</sup>	Trempealeau	182	EW	Mound
Blood Md. Group (47WK63) <sup>12</sup>	Unknown	13	EW	Mound
Lake Lawn Resort (46WL05) <sup>13</sup>	Unknown	4	EW	Mound

<sup>1</sup>Penman 1981; <sup>2</sup>Cooper 1933; <sup>3</sup>Overstreet 1991; <sup>4</sup>O'Connell 1981;

<sup>5</sup>Thomas 1894; <sup>6</sup>Salkin 1983; <sup>7</sup>Peske and Tappen 1970; <sup>8</sup>Freeman 1969;

<sup>9</sup>Gallagher et al. 1981; <sup>10</sup>Mason 1981; <sup>11</sup>McKern 1931;

<sup>12</sup>Sullivan and Overstreet 1991; <sup>13</sup>Brown 1973; Schlundt and Mead 1979

Present in the northern portion of Wisconsin are a number of cultures that are characterized by traits quite distinct from those of the Eastern Woodlands to the south. Material culture and burial practices in this area lack definitive Hopewellian traits. The North Bay culture/phase has been defined from the Door Peninsula and the Green Bay area.

#### Eastern Woodlands

*Hopewell Centers: Trempealeau Phase.* The Trempealeau phase was defined by McKern (1931) as a local development that occurred primarily in the southwestern counties of Wisconsin, particularly Trempealeau, Vernon, and Crawford counties. Sites classified as Trempealeau exhibit a number of local manifestations of Hopewellian traits, as well as traits diagnostic of "classic" Hopewell including the presence of rectangular tombs with extended burials, copper ear spools, and distinctive pottery vessels. A number of Trempealeau phase sites with mortuary components have been excavated, but very little osteological analysis has been done on the associated human remains. A possible explanation for this dearth of information may be the overall poor preservation of the skeletal remains from these sites.

The Trempealeau site (47TR31) was briefly mentioned in Freeman (1968). The remains recovered from this site have not undergone any systematic analysis; a description of burials in situ has not been published. Bender et al. (1981) include bone samples from two Trempealeau individuals in their research on the role of maize in Hopewell subsistence and economy. Human remains were sampled from five Hopewell sites in Wisconsin (N=2), Ohio (N=2), and Illinois (N=1). The two individuals from the Trempealeau site were recovered from Mound 4, Burial 16, and Mound 26, Burial B. These individuals, along with three individuals from the Millville site (discussed below), are presented as representative of the Wisconsin Hopewell. Both samples are from adults, sex unknown, and were submitted for carbon isotope testing. The ratios presented are -21.5 and -22.7 for the Mound 14 and Mound 26 individuals, respectively. Negative values of this size indicate a lack of maize in the diet or, at the most, a minimal consumption of this grain. The carbon isotope ratios reported for the Trempealeau site are comparable to those of the Millville individuals and the other Hopewell sites tested. Bender et al. (1981) conclude that maize played a minor role in Hopewell economy and was not an important dietary component.

Price and Kavanagh (1982) present the results of a trace element analysis of 17 human and animal bones from four Wisconsin sites spanning the period from the Late Archaic to the Middle Mississippian. Twelve element concentrations in human bone are presented for the same Wisconsin sites sampled by Bender et al. (1981) in order to compare the results and the inferred dietary behavior obtained from the trace element and stable isotope methods. Discussion focuses on the strontium/calcium ratio. Values presented are .681 (Mound 4) and .826 (Mound 26) and, as with the carbon isotope ratios discussed above, are comparable to the Millville site. Price and Kavanagh discuss several limitations that affect their results, including the effects of the cremated Trempealeau remains. The results presented from all sites sampled show a clear trend that indicates increasing reliance on plant foods through time; the diet of the Middle Woodland peoples comprised a greater percentage of plant foods than the Archaic, and the Mississippian people's was greater than the Middle Woodland peoples. The authors further conclude that the strontium data compare well with the carbon isotope data presented by Bender et al. (1981) but are indicative of a somewhat greater reliance on plant foods.

Schurr (1992), as discussed in the Late Archaic section, examines intrasite variability in stable carbon and nitrogen isotopic ratios and hypothesizes that increased isotopic variability is related to mortuary variability that may reflect differential access to foodstuffs. Schurr incorporates the carbon isotope data presented by Bender et al. (1981) as well as other researchers. Greater standard deviations are observed in the archeological skeletal samples postdating A.D. 800 and are interpreted to reflect greater intracommunity variation in diet. The standard deviations reported for the Middle Woodland Trempealeau and Millville sites are small and are interpreted by Schurr (1992) as indicative of equal access to food resources across the population.

McKern (1931) reports on the excavations of a number of mounds from the Trempealeau Lakes Mound Group and Shrake mound groups. The Trempealeau Lakes Mound Group has been divided into a number of sites including Schwert (47TR31) and Nicholls Mound (47TR22). The burial locations, an estimated minimum number of individuals interred, associated grave goods, and, when possible, relative age at death estimation and sex are reported. The importance of McKern's report lies in the excellent descriptions of the mounds explored, stratigraphy, mound features, and body position. It is unfortunate, however, that the remains recovered from these sites have never been thoroughly or systematically analyzed.

McKern (1931) states in his report that other Trempealeau phase sites were excavated and reported on by Cyrus Thomas during his mound explorations of the late 1800s. It is unknown how many, or even if, skeletons were actually recovered from some of these sites. Furthermore, the location of any recovered remains from these sites is unknown for the most part; the Smithsonian Institution collections inventory lists remains from the counties explored under the auspices of Thomas' program, but it is unclear which sites many of them actually came from. No osteological analyses have been conducted on the remains in question.

*Waukesha Phase.* The Waukesha phase is the other Hopewellian center in southern Wisconsin and encompasses an area composed of the southeastern counties: Rock, Jefferson, and Waukesha. Both mound and village sites of this phase have been excavated. The Waukesha phase is distinct from Trempealeau in that the mounds are not as elaborate, and the burials contain fewer grave goods. A large number of sites in this area have been destroyed due to development. There is no bioarcheological information available for any Waukesha phase mound sites.



*Miscellaneous Middle Woodland Phases.* Distributed between the Hopewell-affiliated Trempealeau and Waukesha phases are a number of Wisconsin sites that have not yielded distinctively Hopewellian artifacts. Several of these sites have contained mortuary components. The Millville site is the type site for the Millville phase and is situated approximately 500 feet northwest of the Wisconsin River in Grant County. Excavations in 1962 uncovered 176 features and evidence of 14 house structures (Freeman 1969).

Five individuals, three adults and two infants, were recovered from the Millville site. The adults were buried in pits, and the infants' remains were recovered from trash pits. Robert Meier published a description of the human remains recovered from the site (Meier 1969) and identified all of the adult individuals as female and over 40 years of age at the time of death. Meier (1969) also presents description of dental and skeletal pathology, frequency of cranial deformation, and cranial and postcraniometrics. Dental pathology observed were antemortem tooth loss, caries, abscessing, and periodontal disease. All three adults exhibit at least one carious tooth (100%), extensive tooth wear, slight to moderate antemortem tooth loss, and moderate to severe periodontal disease; one adult individual exhibits two abscesses (33%). No information beyond age at death was collected from the infant burials due to the incompleteness of the remains.

Bender et al. (1981) include bone samples from the three adult females from the Millville site in their research on the role of maize in Hopewell subsistence and economy. As stated above human remains were sampled from five Hopewell sites in Wisconsin (N=2), Ohio (N=2), and Illinois (N=1). The carbon isotope values from the three individuals cluster closely together and range from -22.5 to -22.7. The values are indicative of minor or no consumption of maize. Bender et al. (1981) incorporate Millville as a Hopewell sample; however, more recently, the Millville site has been classified as belonging to a different phase (Millville phase) and exhibits traits that distinguish it from the identified Hopewell phases in Wisconsin (Salzer 1986).

As discussed above, Price and Kavanagh (1982) and Schurr (1992) also report bone chemistry values for sampled individuals from the Millville site. Price and Kavanagh (1982) present concentrations of 12 elements and discuss more fully the strontium values. The strontium concentrations are indicative of increased reliance on plant foods in the Middle Woodland relative to the Late Archaic. Schurr (1992) reports a small standard deviation (.10) for the carbon isotope ratios from Millville and suggests this indicates a low level of dietary variability between the inhabitants of the Millville site and, consequently, equal access to food.

The Bluff Siding site (47BF45) is another Millville phase site that has yielded human remains. The site is a village locale on a terrace above the Mississippi River in Buffalo County (Penman 1981; Riggs 1981). A single burial was located in the eastern portion of the site, and bone fragments were found in a feature just south of the burial. The remains recovered are very fragmentary and may represent a single adult individual (Riggs 1981). Riggs presents a descriptive inventory of recovered human remains.

The Rehbein site (47RI81) is a multicomponent site with a non-Hopewell Middle Woodland, phase undetermined, mortuary component. Rehbein includes nine mounds arranged in a single line extending 800 feet along a narrow ridge overlooking the Kickapoo River valley. The site was excavated in 1979 under the direction of Joan Freeman of the State Historical Society of Wisconsin. Six mounds were excavated; the materials and human remains were analyzed, and then the mounds were reconstructed outside the proposed highway right of way and the human remains reinterred (Mead 1979). <sup>14</sup>C dates, in conjunction with material

Table 28. Age and sex distribution of individuals recovered from Rehbein (47RI81) (Schlundt and Mead 1979).

Age (years)	Male	Female	Indet.	Total
Prenatal	0	0	1	1
0-9	0	0	10	10
10-19	1	0	3	4
20-29	0	2	0	2
30-39	0	1	0	1
40-49	0	1	1	2
50-59	1	0	0	1
60-69	1	0	0	1
Subadult	0	0	2	2
Adult	2	2	6	10
Unknown	0	0	1	1
Total	5	6	24	35

culture, identified two occupations. Basically, the conical mounds are non-Hopewell Middle Woodland, and the one linear mound excavated is Late Woodland in origin.

Schlundt and Mead (1979) analyzed the human remains from Rehbein over the course of a 6-week period. Data collected included burial type, body position, age, sex, skeletal and dental pathology, cranial and postcraniometrics, and cranial nonmetric traits. Table 28 presents the age and sex distribution of the estimated 35 individuals recovered. It is noteworthy that high infant mortality exists; 45% of the individuals recovered were less than 15 years of age. Seventy-five percent of these were less than 5 years of age when they died. The high infant mortality is not unexpected and compares favorably with other hunter-gatherer populations in the Midwest and beyond (Bakken 1950; Blakely 1971; Weiss 1973). Pathological conditions were infrequently observed and consist of one instance of ankylosed vertebrae (C2 and C3), two instances of healed fractures, and, from the description, one possible case of cleft palate. Dental pathology was characterized by extensive tooth wear which resulted in the one instance of abscess and two cases of extensive antemortem tooth loss. Caries frequency was low: one individual exhibited one carious lesion. Additionally, and most interestingly, Schlundt and Mead (1979) report a probable case of trephination. "An elliptical hole, 27 x 31 mm [was observed] in the left half of the superior aspect of the occipital bone near the lambdoid suture bone" (Schlundt and Mead 1979:206). Morse (1969) claims that no cases of trephination occur in the Midwest; however, the authors perform a differential diagnosis and reasonably conclude trephination is the most probable diagnosis. Other cases of trephination are reported by Neiburger (1978) from two unprovenient sites and Cooper (1964) from the Altern site (47BT50). Stature estimates were possible for six adults. The average male stature was determined to be 5 ft. 5 in., and the average female was 5 ft. 3 in. tall.

The Outlet site (47DA03), also known as the Grand Crossing site, is located in the Frost Woods Heights area of Madison on a rise overlooking Lake Monona Bay and the Yahara River. Information on file at the Burial Sites Office of the State Historical Society of Wisconsin indicates that the site originally consisted of 19 mounds: two linear, one oval, and 16 conical. Three mounds have been excavated at the Outlet site. A large mound was excavated in 1948 by a group from the University of Wisconsin, Madison (Whiteford 1949), salvage excavation of this same mound occurred during the same year along with controlled excavations of Mound 2 (Bakken 1950), and a third mound was excavated more recently (Baerreis and Bender 1984).

Bakken (1949, 1950) reports on the individuals recovered during the 1948 excavations; data reported include age and sex, cranial and postcraniometrics, skeletal and dental pathology, stature, and cultural modification. Table 29 presents the age and sex distribution of the 15

Table 29. Age and sex distribution of individuals recovered from Outlet (47DA03).

Age (years)	Male	Female	Indeterminate	Total
Prenatal	0	0	0	0
Child	0	0	2	2
10-19	0	0	3	3
20-29	0	1	0	1
35-55	4	0	0	4
55+	2	2	0	4
Unknown	0	0	1	1
Total	6	3	6	15

individuals recovered. Age at death estimates are quite general overall, ranging from 14 to 20 to open-ended ranges for all adult individuals. Measurements of the postcrania and crania were taken on adults only. Postcranial measurements yielded mean statures of 165.73 cm for males (5 ft. 5 in.) and 156.84 cm for females (5 ft. 2 in.). Thirty-three measurements and indices were variously taken according to completeness of the crania. Complete crania were few, most were warped or exhibited cranial deformation; sample sizes per measurement ranged from one to six with a majority of measurements taken on between three to four individuals. No female cranium was complete enough to yield an index. Cranial deformation was noted for four of 10 (40%) skulls and ranged in severity from slight to moderate. Two individuals exhibited occipital deformation consistent in severity and nature to that expected from time spent in a cradle-board as an infant. Two individuals, both females, exhibited intentional fronto-occipital deformation. This cultural modification occurs only rarely in the ancient populations of Wisconsin; Barrett (1933) notes a single occurrence of fronto-occipital deformation at the Mississippian site of Aztalan (47JE01). Cranial morphology was generally characterized by small vaults tending toward brachycephalization with narrow frontal bones, sagittal keeling, and protruding occipital squamae. Bakken (1950) concludes that the Outlet cranial sample is inadequate to assess population relationships but speculates that they appear to represent "basic Eastern Woodland stock, but beyond this its closer affinities cannot be indicated with certainty" (Bakken 1950:65).

Dental pathology was reported by individual; however, the percentage of individuals affected was not reported and cannot be calculated due to the absence of reported total sample sizes per condition. Generally, all adult individuals recovered from the Outlet site are characterized by significant dental attrition and slight carious lesions. Additionally, three individuals experienced antemortem tooth loss, three individuals exhibited abscesses, and a majority of the middle- and old-aged individuals exhibited alveolar resorption.

Observations of skeletal pathology indicate a low frequency of all noted conditions. Osteoarthritic lipping was observed on five of nine adult individuals (56%), one healed fracture on the proximal end of the right fibula of an adult male (11%), and extensive periostitis involving cortical thickening and bowing was observed on all long bones of an adult female (11%). Syphilis is suggested as a possible cause of the periostitis, but this disease seems no more likely than any other as the root cause of the periostitis.

White clay facial masks were observed on two individuals recovered during the August excavation by Whiteford (1949). A female individual approximately 20 years old and an adult male were the recipients of masking. The masks observed at the Outlet site are distinct from masks at other sites (e.g., Altern site, 47BT50) in that they were not molded to the face or fired. The clay seems to have been applied to the crania in a liquid state after the individuals had been placed in their final burial position. Liquid clay masking has been observed in other sites including the Hopewellian-like Portage Mound Group of northwestern Illinois,

several Hopewellian sites in northeastern Iowa, and burial sites of the Copena culture in Alabama.

Three samples of human bone were submitted for radiocarbon dates from the most recent excavations (Barreis and Bender 1984). The dates ranged from  $1960 \pm 80$  to  $1360 \pm 70$  B.P. (A.D. 10-550). These dates overlap with expected early and later Middle Woodland time ranges. Additionally, carbon isotope analysis suggests the presence of a small amount of maize in the diet of the individuals interred in the most recently excavated mound (Benchley et al., this volume). The suggestion of maize in the diet is noteworthy as the earliest indication of maize utilization in Wisconsin.

The cultural affiliation of the Outlet site is undetermined at this date. The 1948 excavations yielded burial mode information and artifacts that exhibit traits of a generalized Woodland pattern as well as Hopewellian. More recent excavations have failed to clarify the picture beyond a more definite assignment of the burials to a Middle Woodland time frame.

### Northern Forest

The archeological manifestations during the Middle Woodland period in the Northern Forest region are only beginning to be understood. Notable work in this region has been done by Cooper (1933), Mason (1967, 1969), and Salzer (1974). Through the efforts of these archeologists and others, a number of archeological manifestations have been identified. The most clearly defined of these are the North Bay phase/culture, Nokomis phase, and the Red Cedar Hopewell.

*North Bay Phase.* The North Bay phase/culture is the best known of the Middle Woodland developments in the Northern Forest region. Archeological sites with a North Bay component are primarily found in the Door Peninsula and Green Bay areas. Knowledge on settlement patterns, subsistence practices, and trade relationships is expanding; however, information on burial practices and the biological character of North Bay peoples is minimal. To date no burial mounds have been identified as having been used by North Bay peoples nor have any cemeteries been identified. The Richter site (47DR80) is the only site that has produced human remains. Consequently little bioarcheological information is available for this phase.

Peske and Tappen (1970) report that three adult individuals were recovered from the Richter site during excavations conducted in the summer of 1968; they do not cite a report for the excavation. The bioarcheological information presented by Peske and Tappen (1970) is minimal. The research presented was methodological in nature and focused on the preservation of histological features in ancient bone. No osteological information was provided beyond a general age classification of "adult" for each of the three individuals.

*Nokomis Phase.* The Nokomis phase is another fairly well-defined Middle Woodland cultural manifestation in the Northern Forest region. Nokomis phase peoples occupied the extreme north-central area of Wisconsin, primarily in Vilas and Oneida counties. In contrast to North Bay they did not rely as intensively on the lacustrine resources. Similar to North Bay, Nokomis peoples did not utilize mounds for burial purposes. No Nokomis phase occupation or sites have yielded mortuary components, consequently this phase is unknown bioarcheologically.

*Red Cedar Hopewell.* Other Middle Woodland developments in the Northern Forest region are less clearly defined, and archeological knowledge is limited. Leland Cooper's excavations in Barron County along the Red Cedar River in the vicinity of Rice Lake have provided some indication of a Hopewell-like development, the Red Cedar Hopewell. Excavation of three mounds of the Cyrus Thomas Mound Group (47BN07), numbers 8, 10, and 13, occurred between the years 1930 and 1932 (Cooper 1933). During the excavations and subsequent analysis of recovered

materials, Cooper noted a number of similarities to the Hopewellian Trempealeau phase of southwestern Wisconsin, including the presence of shallow rectilinear burial pits, cleaned floor burial areas, the interment of numerous secondary bundled burials, and basic similarities in ceramic manufacture and design. Based on these broad cultural similarities, Cooper proposed the Red Cedar River focus, a local development characterized by Hopewell-influenced mortuary practices.

Cooper (1933) described the mound dimensions, stratigraphy, and interments in a manner similar to that of McKern (1931). The description of the interred individuals is minimal, primarily due to poor preservation. Table 30 presents the age and sex breakdown of the identified individuals by mound. A review of the age and sex breakdown indicates that there are individuals of both sexes and a variety of adult and subadult ages at death interred in Mound 8 while only adults have been identified from Mound 10.

*Miscellaneous Middle Woodland Sites.* The remainder of the sites to be discussed remain unclassified beyond belonging to the Middle Woodland period. They are clearly local developments, and their affiliations to the Middle Woodland inhabitants of the Eastern Woodlands to the south is not clear. At least one of these sites, however, shares similarities in ceramic manufacture and decoration with groups to the west, in what is now Minnesota.

The Altern site (47BT50) consists of 52 mounds and is located on a peninsula that projects into Rice Lake in Burnett County. Cooper excavated Mounds 21 and 10 during the summers of 1961 and 1963

Table 30. Age and sex distribution of individuals from Cyrus Thomas Mound Group (47BR07), Mounds 8 and 10, Red Cedar Hopewell.

Age Category	Male	Female	Indeterminate	Total
<b>Mound 8:</b>				
Infant			1	1
Child				
6 - 7 years			1	1
Adolescent				0
Young Adult				0
Mid-Adult				0
Older Adult			1	1
Adult	1	1	3	5
Total	1	1	6	8
<b>Mound 10:</b>				
Infant			0	0
Child				
6 - 7 years			0	0
Adolescent			0	0
Young Adult			0	0
Mid-Adult			0	0
Older Adult			0	0
Adult			6	6
Indeterminate			3	3
Total	0	0	9	9

Table 31. Age and sex distribution of individuals from the Altern site (47BT50).

Age (years)	Male	Female	Indeterminate	Total
0 - 0.9				0
1 - 4.9				0
5 - 9.9			1	1
10 - 19.9			1	1
20 - 29.9	2	1		3
30 - 39.9	1			1
40 - 49.9		2		2
50+				
Adult	2		3	5
Total	5	3	5	13

respectively (Cooper 1964). The human remains excavated from Mound 10 and a disturbed portion of Mound 1 of the Altern site are the most extensively studied remains from the entire Middle Woodland in any part of Wisconsin. O'Connell presented the results of an osteological analysis in the appendix of the 1981 report summarizing the Burnett County phase of the St. Croix area archeological survey (Caine et al. 1981). O'Connell provides a summary of the mortuary practices identified for Mound 10 as well as descriptive data detailing minimum number of individuals, demographic composition of the sample, cranial and dental metrics and nonmetrics, postcraniometrics, and skeletal and dental pathology. O'Connell (1981) discusses the value of osteological analyses of small and incomplete skeletal samples and their contribution to our understanding regional adaptations. Questions are posed regarding regional biological relationships between Late Middle Woodland groups in western Wisconsin and groups to the west in Minnesota and southeast in Wisconsin and Illinois. Questions were also raised as to the continuity between the Late Middle Woodland people at the Altern site and the Late Woodland Clam River focus people centered in Burnett County and their hypothesized ancestry to the historic Dakota (McKern 1963).

Table 31 presents the demographic profile of the minimum number of individuals interred in Mound 10 of the Altern site. As noted by O'Connell (1981) the incomplete nature and small size of the sample precludes a definitive discussion; however, the profile represented for Mound 10 suggests that differential mortuary treatment based on age at death and sex was not practiced at this location.

Cranial and dental metrics were obtained for six individuals. Standard indices were calculated and the crania are described as long, low, and narrow. They correspond generally to Neumann's (1952) Lakotid and Inuit types. The general shape of the Altern crania lend cautious support to the hypothesis of close affinity to more western groups rather than to the Hopewell to the southeast (O'Connell 1981).

Cranial and dental nonmetric data were collected for Mound 10 individuals. Sample sizes for cranial nonmetric observations varied between one and five individuals, and dental nonmetrics were observed on four of the six adult crania.

The frequency of caries, abscesses, and degree of dental attrition were noted for four adult individuals. The caries rate by tooth is 12.3% (eight incidences of 65 observable premolars and molars); over half of the carious lesions recorded were observed on a single elderly individual. This individual exhibited the only two periapical abscesses observed for the sample. Dental attrition was found to correlate with age; the oldest individual exhibited the most advanced degree of wear. Overall dental attrition was moderate.

The skeletal pathological conditions were diverse in nature; however, the most frequently observed category of pathology was traumatic in origin. Table 32 lists the conditions observed and age and sex of the afflicted individual. Eight of the 10 conditions were traumatic in origin and affected three of five individuals.

Table 32. Distribution of specific types of skeletal pathology in the Altern (47BT50) skeletal sample.

Pathology	Frequency	Individual affected
Cribriform Orbitalia	1	6-7 yr. old
Trephining	3	35-40 yr old, male
Sharp-force trauma	1	35-40 yr old, male
Blunt-force trauma	2	35-40 yr old, male
Projectile in eye orbit	1	20-25 yr old, male
Button osteoma	1	50+, female
Compound fracture-femur w/pyogenic osteomyelitis	1	Adult, right femur

## Summary of the Middle Woodland Period

No bioarcheological information exists for the Hopewellian Trempealeau and Waukesha phases. Human remains recovered from these sites are generally poorly preserved; however, a significant number of individuals are presently being curated at various institutions throughout Wisconsin as well as at the Smithsonian Institution. It is imperative that these remains undergo systematic analysis in order to assess the biological nature of these northern Hopewellian populations.

Only four non-Hopewellian Middle Woodland sites provided any substantive bioarcheological data: Millville, Rehbein, Outlet, and Altern. No trends are discernible from the published data. Dental pathological conditions are low in frequency. Most interesting for this period are the four cases of trephination, one at the Rehbein site and three instances (on one individual) at the Altern site. Trauma of violent origin was observed in one Middle Woodland site, Altern. More substantive research is clearly warranted for all phases in the Middle Woodland.

## Late Woodland (A.D. 500-1634/Contact)

The emergence of the Late Woodland stage in Wisconsin varies across the state; however, the earliest evidence is from southern Wisconsin at A.D. 300. The Late Woodland lifestyle extends in some places to contact with non-Native groups ca. 1634. A number of distinct groups are identifiable in the archeological record during the Late Woodland period. The biological nature of the people who comprise these populations is known only superficially for a few of them. The most extensively distributed culture, both geographically and temporally, is the Effigy Mound culture. Effigy Mound sites are distributed throughout the southern two-thirds of Wisconsin. Mortuary components are known for two other Late Woodland manifestations, the Lakes phase and Clam River focus, which occupied portions of northeast and northwest Wisconsin, respectively. During the Late Woodland, evidence for the origins of peoples identified as Oneota and Upper Mississippian are observed. The bioarcheology of these populations will be discussed below under separate headings.

There are 63 sites with Late Woodland mortuary components in Wisconsin (Table 33). A total of 861 individuals was recovered from these sites. Forty-five sites (71%) are located within the Eastern Woodlands region, 18 (29%) in the Northern Forest region. Thirty-two (52%) of the Late Woodland sites are classified as to culture/phase/focus. Mound sites are the most frequent sources of excavated remains (56/63 sites, 89%) followed by habitation sites (3/63 sites, 5%) and separate cemeteries (2/63 sites, 3%). The site type is unknown for three sites (4%). One site, Robinson, comprises both mound and cemetery burials. Despite the large number of mortuary sites excavated and the sizeable number of individuals recovered from these sites, little is known about the biological nature of the peoples who comprised the rich and vibrant cultures present in the Late Woodland. Thirty-nine sites (63%) with 164 individuals have undergone minimal to no analysis; 24 sites (38%) with 697 individuals have undergone partial analysis. These numbers suggest that a moderate level of knowledge should exist about the biological nature of Late Woodland populations in Wisconsin; however, "partial analysis" for a majority of the sites is an estimate of sex, relative age (infant, child, adult, older adult), number of individuals present, and body position as recorded by the excavator in the field. The exceptions to this situation will be discussed below.

## Northern Forest

The Late Woodland period in the Northern Forest region of Wisconsin is a time of numerous changes. Significant from a bioarcheological

Table 33. Wisconsin sites with a Late Woodland mortuary component in the Eastern Woodlands (EW) and Northern Forest (NF) regions.

Site	Culture	MNI	Region	Type
Erickson Mound Group (47AD92) <sup>1</sup>	Effigy Md	1	EW	Mound
Mound Beach (47BT1) <sup>2</sup>	Clam River	135	NF	Mound
Spencer Lake Mound (47BT2) <sup>2</sup>	Clam River	182	NF	Mound
Hammersburg Mound Grp (47BT27)	Unknown	0	NF	Mound
Haggerty Mound Group (47CR40) <sup>3</sup>	Effigy Md	16	EW	Mound
Schmitz (47CR9002)	Unknown	1	EW	Habitation
Heller (47CT9002) <sup>4</sup>	Effigy Md	1	EW	Mound
Frost Woods Mounds (47DA1) <sup>5</sup>	Effigy Md	13	EW	Mound
Burton (47DA6) <sup>6</sup>	Unknown	8	EW	Mound
Dietz (47DA12)	Unknown	1	EW	Habitation
47DA118	Unknown	1	EW	Mound
Willow Drive Md. Grp. (47DA119) <sup>6</sup>	Effigy Md	2	EW	Mound
Picnic Point Md. Grp. (47DA121) <sup>6</sup>	Effigy Md	3	EW	Mound
Edgewood Academy Mds (47DA147)	Unknown	1	EW	Mound
Farwells Point Mounds (47DA255)	Unknown	1	EW	Mound
Mayland Mound (47DA9003)	Unknown	1	EW	Mound
47DA9004	Unknown	2	EW	Mound
Wakanda Park Mound Grp (47DN1) <sup>7</sup>	Effigy Md	23	EW	Unknown
Nitschke (47DO27) <sup>8</sup>	Effigy Md	56	EW	Mound
Kolterman Mound Group (47DO155) <sup>9</sup>	Effigy Md	2	EW	Mound
Hein's Creek Burial (47DR01) <sup>10</sup>	Unknown	1	NF	Unknown
Green Lake (47GL53) <sup>11</sup>	Effigy Md	7	EW	Mound
Kingston (47GL9001) <sup>12</sup>	Effigy Md	48	EW	Mound
47GR366	Unknown	4	EW	Mound
Raisbeck (47GT112) <sup>13</sup>	Effigy Md	35	EW	Mound
Poor Man's Farrah (47GT366) <sup>14</sup>	Unknown	11	EW	Mound
The Bade (47GT356) <sup>14</sup>	Unknown	2	EW	Mound
Linden Mound Group (47GT9001) <sup>10</sup>	Unknown	2	EW	Mound
Teffler Mounds (47JE377)	Unknown	1	EW	Mound
Myrick (47LC10) <sup>15</sup>	Unknown	4	EW	Mound
LaBelle Lake (47ME2) <sup>16</sup>	Effigy Md	14	NF	Mound
Nakuti's Berry Patch (47ME5) <sup>17</sup>	Effigy Md	10	NF	Mound
Kakwatch (47ME6) <sup>17</sup>	Effigy Md	10	NF	Mound
Pewisit Lake (47ME7) <sup>17</sup>	Effigy Md	2	NF	Mound
Five Islands Mound Grp (47ME11) <sup>17</sup>	Effigy Md	8	NF	Mound
Watasa Lake Swamp (47ME13) <sup>17</sup>	Effigy Md	2	NF	Mound
Keshena Lake Md Grp (47ME18) <sup>17</sup>	Effigy Md	1	NF	Mound
Watasa Lake Catfish (47ME63) <sup>17</sup>	Effigy Md	2	NF	Mound
Trowbridge-Carey (47MI57) <sup>10</sup>	Unknown	1	EW	Mound
Merritt's Landing (47MQ14) <sup>10</sup>	Unknown	1	EW	Mound
Neale Mound Group (47MQ49) <sup>11</sup>	Effigy Md	13	EW	Mound
47MQ066 <sup>18</sup>	Unknown	6	EW	Unknown
47MQ9001	Unknown	1	EW	Mound
Kratz Creek (47MQ9002) <sup>10</sup>	Effigy Md	72	EW	Mound
McCloughry (47MQ9003) <sup>11</sup>	Effigy Md	20	EW	Mound
Maine (47MR22) <sup>20</sup>	Effigy Md	2	EW	Mound
Robinson (47ON ) <sup>21</sup>	Lakes	81	NF	Md/Cem.
Armstrong (47PE12) <sup>22</sup>	Unknown	4	EW	Habitation
Balsam Lake Mounds (47PK04) <sup>23</sup>	Unknown	10	NF	Mound
Mound G (47PT9001) <sup>24</sup>	Unknown	0	NF	Mound
Gaetz Group (47RA22) <sup>23</sup>	Unknown	2	EW	Mound
47RI59 <sup>25</sup>	Unknown	2	EW	Mound
Beloit College Md. Grp. (47RO15) <sup>26</sup>	Effigy Md	6	EW	Mound
Kletzien (47SB61) <sup>8</sup>	Effigy Md	15	EW	Mound
Henschel 10 (47SB242)	Unknown	0	EW	Mound
47TR9001	Unknown	1	EW	Mound
Earl Site II (47VE50) <sup>27</sup>	Unknown	1	EW	Mound
Serpent Mound (47VI9001) <sup>23</sup>	Unknown	1	NF	Mound
Pole Barn (47WK473) <sup>28</sup>	Unknown	4	EW	Cemetery
NW Military Naval Acad (47WL61)	Unknown	1	EW	Mound
Sanders (47WP26) <sup>29</sup>	Effigy Md	1	EW	Mound
Sanders III (47WP70) <sup>29</sup>	Effigy Md	1	EW	Mound
Lizard Mound State Park (47WT01) <sup>30</sup>	Effigy Md	1	EW	Mound

<sup>1</sup>Larson 1961; <sup>2</sup>McKern 1963; <sup>3</sup>Neiburger 1977; <sup>4</sup>Rowe 1953; <sup>5</sup>Barreis 1954; <sup>6</sup>Merbs 1966; <sup>7</sup>Wittry 1959; <sup>8</sup>McKern 1930; <sup>9</sup>Wittry 1955; <sup>10</sup>Brown 1906; <sup>11</sup>McKern 1928; <sup>12</sup>Jeske 1927; <sup>13</sup>Rowe 1956; <sup>14</sup>Penman 1985; <sup>15</sup>State Historical Society of Wisconsin; <sup>16</sup>Barrett and Skinner 1921; <sup>17</sup>Barrett and Skinner 1932; <sup>18</sup>Salkins 1979; <sup>19</sup>Barrett and Hawks 1919; <sup>20</sup>Salzer 1966; <sup>21</sup>Melbye 1969; <sup>22</sup>Hurley 1978; <sup>23</sup>Brown 1906 <sup>24</sup>Blake 1961; <sup>25</sup>State Historical Society of Wisconsin; <sup>26</sup>Bastian 1958; <sup>27</sup>Halsey and Salkin 1974; <sup>28</sup>Holliday 1992; <sup>29</sup>Hurley 1966; <sup>30</sup>Parson 1960

perspective are indirect indications of a population explosion and decrease in the trade of exotic materials and artifacts as a result of the Hopewell decline. Subsistence and settlement patterns represent an intensive collector adaptation characterized by continued and intensified hunting

and gathering of local resources, especially lacustrine. Increased and intensive utilization of wild rice (*Zinzania aquatica*) is hypothesized though empirical evidence in the form of actual botanical remains is lacking (Arzigian 1996). The Northern Forest region has great potential to expand our knowledge of the Late Woodland adaptation and answer questions regarding the relationships and/or interaction between Late Prehistoric populations and Historic non-Native groups. The potential for contribution rests with the continued protection of sites from development and agriculture and incorporation of bioarcheological data into site interpretations.

Archeological interest in the Northern Forest region of Wisconsin peaked in the 1930s. This area, however, has experienced renewed interest since 1966 through the implementation of the Northern Lakes Archeological Project (NLAP), directed by Robert Salzer (1974). The NLAP was funded by National Science Foundation and the Logan Museum of Anthropology at Beloit College. One of the goals of the NLAP was to sample archeological sites in the lakes region of north-central Wisconsin. Following this survey, a number of sites were selected for more extensive excavation in order to flesh out the culture history of the area.

Mortuary components are known from only two of the Northern Forest Late Woodland manifestations, the Lakes phase and Clam River focus. The Late Woodland Lakes phase Robinson site provides the most comprehensive bioarcheological data for this time period and region (Melbye 1969).

**Lakes Phase.** Melbye's doctoral thesis complemented the goals of the NLAP by providing a bioarcheological analysis directed toward determining the biological affinities among the identified prehistoric populations. A large multicomponent site, the Robinson site extends over 40 acres along the east shore of Lake Nokomis. Survey and test excavations of the site in March and June of 1965 located 33 burial mounds. More extensive excavations took place in 1966 and 1967. The human remains were recovered from an abandoned house site that was subsequently fenced and used as a cemetery (Area A) and five burial mounds (Areas B, C, E, J, and S). The site is believed to have been occupied between A.D. 900 and 1400. The majority of the remains are believed to date between A.D. 900 and 1100 (Areas A and S), and the remainder are later but do not date beyond A.D. 1400 (Areas B, C, E and J). Eighty-one individuals were recovered from the Robinson site. See Table 34 for the age and sex distribution of the existing sample.

Twenty-four cranial measurements were taken and 12 indices calculated for the recovered crania. All crania were incomplete. The sample sizes, mean, range, standard deviation, standard error of the mean, standard error of the standard deviation, and the coefficient of variation are presented for males, females, and total number of individuals per each measurement. Sample sizes range from three to 25 per measurement. Melbye (1969) concludes that the crania are generally large

and robust; this is reflected by the small differences between male and female means for both measurements and indices. Craniometric data were used to assess intrasite variability and biological distances. The frequencies of 47 discrete cranial traits were recorded. Male/Female/Indeterminate frequencies were pooled, since few fragments could be reliably sexed. Discrete dental traits were also assessed. All teeth present were examined for presence of Carabelli's and paramolar cusps, molar cusp number, and cusp fissure pattern. Hypo- and hyperdontia were also visually assessed, although the examination did not include the use of x-rays.

Postcranial nonmetric variation was assessed by observation of 76 traits. Twenty-four measurements and 11 indices were calculated for the postcranial remains. Sample sizes range from two to 42, with a majority of the sample sizes falling between five and 19. Stature was calculated from a pooled sample of 19 individuals. The mean stature of  $168.2 \pm 1.4$  cm (approximately 5 ft. 6 in.) is indicative of a relatively short population. Two of the 19 individuals are unequivocally male and their mean stature is  $174.6 \pm .5$  cm (approximately 5 ft. 9 in.).

Bone pathology is relatively infrequent in the Robinson site sample. The following pathology was observed: five incidences of generalized infection, two occurrences of neoplastic cysts, two cases of spondylolysis, and one instance of hip dysplasia. Nine instances of trauma were observed and all nine events occurred among the 30 individuals recovered from Unit S. Six of the nine occurrences involved sharp force trauma to six crania (eight blows), one incidence of an ossified subperiosteal hematoma, and two observed fractures (radial neck, distal shaft of ulna). Rates of trauma and other conditions could not be determined because the total number of observations was not presented. Presence and absence of osteoarthritis was recorded for the vertebral column and all major joints of the skeleton. The incidence of osteoarthritis is high for every joint observed. In a majority of cases the severity ranges from slight to moderate; only rarely is the severity extreme. Melbye (1969:101-105) summarizes the frequencies of dental caries, abscess, antemortem tooth loss, and attrition per tooth and adult age group. Overall caries frequency is 5.5% and antemortem tooth loss is 5.0%.

Intersite and intrasite comparisons were conducted using craniometric data. The methods of analysis applied are Student's T-test, Penrose's size statistic, and Penrose's shape statistic (Penrose 1954). The multivariate statistical procedures applied to questions of biological distance have advanced since 1969, but the results presented here are suggestive of a number of trends. The archeological evidence indicates that although the skeletal remains are not contemporaneous, there is no evidence for any sharp cultural discontinuity. The evidence for continuous in situ development and change leads to the inference that during its occupation the inhabitants of the site undoubtedly shared the same gene

Table 34. Age and sex distribution of individuals interred in Area A, Robinson site (47ON—).

Age	Area A		Unit B, Mound		Unit C, Mound		Unit E, Mound			Unit J, Mound			Unit S, Mound				
	N	%	Age	N	%	Age	N	%	Age	N	%	Age	N	%	Age	N	%
Birth -2	1	4	Birth -2	0	0	Birth -2	0	0	Birth -2	0	0	Birth -2	0	0	Birth -2	0	0
3-12	1	4	3-12	6	44	3-12	0	0	3-12	0	0	3-12	1	16.5	3-12	0	0
13-17	3	12	13-17	3	21	13-17	0	0	13-17	1	33.3	13-17	1	16.5	13-17	0	0
18-20	1	4	18-20	0	0	18-20	0	0	18-20	0	0	18-20	0	0	18-20	0	0
21-35	4	17	21-35	3	21	21-35	2	50	21-35	1	33.3	21-35	4	67	21-35	0	0
36-55	4	17	36-55	1	7	36-55	2	50	36-55	1	33.3	36-55	0	0	36-55	0	0
56-75+	0	0	56-75+	0	0	56-75+	0	0	56-75+	0	0	56-75+	0	0	56-75+	4	13
Adult	10	42	Adult	0	0	Adult	0	0	Adult	0	0	Adult	0	0	Adult	17	57
Total	24	100	Unknown	1	7	Unknown	0	0	Unknown	0	0	Unknown	0	0	No report	9	30
			Total	14	100	Total	4	100	Total	3	100	Total	6	100	Total	30	100

pool. Furthermore, the craniometric analysis suggests that there are no significant differences among the various areas excavated. On the basis of this evidence, Melbye pooled all individuals recovered from the Robinson site; the frequencies and percentages of various conditions reflect this. Intersite comparisons were made between a sample of the Central Plains phase (Bass 1964), the Melita focus from southern Manitoba, the Juntenen phase of Michigan, Old Birch Island, a historic Ojibwe sample from Ontario (Greenman 1951), the Burton site (47DA6) from Wisconsin (Merbs 1966), and the Backlund site from Michigan (Brose 1968).

The data presented by Melbye (1969) are extensive; however, his analysis is hindered by poor preservation with resultant small intersite sample sizes and lack of large interregional comparative samples.

*Clam River Focus.* The Clam River focus is an early Late Woodland manifestation defined by Will C. McKern in 1963 based on evidence recovered from two mound sites, Clam Lake Mound (47BT1) and Spencer Lake Mound (47BT2). McKern (1963) excavated these two sites over the course of two summers in 1935 and 1936 and recovered a large number of skeletons which are currently housed at the MPM. McKern estimated a minimum of 317 individuals, 135 from Clam Lake Mound and 182 from Spencer Lake Mound.

The remains are generally moderately to poorly preserved. Little bioarcheological knowledge is available on the remains recovered from these sites as only limited analyses have been conducted. McKern (1963) discusses the various burial practices observed at each site and describes select examples of each mode of burial. No demographic information is reported except for the two individuals recovered from Burial 7: "contained the representative bones of an old female and a young child" (McKern 1963:54). Myster and Kimmerle (1995) collected age, sex, minimum number of individuals, craniometric and nonmetric and postmortem skeletal modification data on a sample of the Spencer Lake Mound individuals. Mortuary variability is evaluated and compared to the Mille Lacs aspect populations of Minnesota in order to evaluate McKern's hypothesis that the Clam River focus people were closely related to the Mille Lacs aspect people of east-central Minnesota.

The Spencer Lake Mound (47BT02) remains were analyzed using a methodology designed to evaluate commingled remains. Seven burials were analyzed representing a minimum of 54 individuals. The minimum number of individuals was determined for each burial, and the assumption was made based on elements present and element composition of each burial that individuals were not distributed among more than one burial. In addition, 86 cranial measurements, 15 indices, and 59 discrete cranial traits were variously recorded for the commingled remains analyzed. Few crania were measurable. Nonmetric traits were more frequently recorded due to the fragmentary nature of the remains. All age groups and both sexes were represented, and indications of body preparation practices including red ochre treatment, long bone perforation, and cutmarks indicative of dismemberment are all present.

The data compiled by Myster and Kimmerle (1995) do not support McKern's hypothesis of a close biological relationship between the Mille Lacs aspect based solely on burial practices. Further research will use the discrete cranial data to further investigate the validity of McKern's hypothesis. The bioarcheological information recoverable from these two sites is limited due to the absence of the original excavation notes, many of the site photographs, and maps. Additionally, the photographs that are present in archives are not well-labeled, and field numbers present in the photographs do not correspond with burial numbers assigned in the laboratory.

Neiburger (1982) presents a case study illustrating an instance of precontact scalping. The individual showcased in the article is an adult male recovered from stratum I in Spencer Lake Mound (47BT02). Five sharp force wounds were observed and thoroughly described. Photographs and schematics highlighting the wounds are presented as well. Neiburger presents conclusions from his analysis on timing of each wound, the position of the body at various times of the assault, handedness of the perpetrator (right), and the cause of death (epidural hemorrhage). The results of this study document the occurrence of scalping prior to the arrival of Europeans and identifies North American Indians as one more group across the world that scalped their defeated adversaries.

Since McKern's definition of Clam River focus (McKern 1963), numerous other sites have been excavated that have yielded Clam River ceramics. Various surveys of Burnett County have resulted in a number of hypotheses that could be evaluated by analyses of the associated human remains. Cooper (1959) and later Caine et al. (1981) speculate about relationships between Burnett County groups (representing northwest Wisconsin populations) and Mille Lacs and Headwaters Lakes aspects in Minnesota during the Late Woodland. Caine et al. (1981) further propose that there was little interaction between populations inhabiting the Burnett County area and northern Lakes area. Many of the human remains recovered from the sites in the above mentioned areas admittedly suffer from poor preservation and fragmented condition; however, a limited number of cranial measurements, and postcranial, cranial, and dental nonmetric traits could contribute much to clarify the hypothesized relationships presented above.

#### Eastern Woodlands

*Effigy Mound Culture.* The Late Woodland Effigy Mound culture occupied an extensive territory comprising eastern Minnesota, eastern Iowa, northern Illinois, and the southern half of Wisconsin. The area of greatest site density is southern Wisconsin, although some Effigy Mound sites in Wisconsin are situated within the Northern Forest region. Hurley (1975) defines three periods within the temporal span of the Effigy Mound culture. Early Effigy Mound extends from A.D. 300 to 700, Middle Effigy Mound from A.D. 700 to 1100, and Late Effigy Mound from A.D. 1100 to 1642 (European contact). Conflicting hypotheses regarding the origin of the Effigy Mound culture exist. Griffin (1960) proposes that Effigy Mound reflects a decline from Hopewell. Hurley (1975) rejects this, proposing instead "a gradual development in place from an indigenous population which interacted with both the Havana and Hopewell phases while it in turn gave rise to the Effigy Mound tradition" (Hurley 1975:364). A great many questions regarding all aspects of this culture remain to be answered. Early investigations centered on excavation of the mounds (Barrett and Hawkes 1919; Barrett and Skinner 1932; Jeske 1927; McKern 1928; McKern 1930). More recently, nonmortuary Effigy Mound sites have been excavated (Hurley 1975). Rowe (1958) and Hurley (1975, 1986) provide overviews of Effigy Mound research, describe recently excavated sites, and synthesize what is known about this widely distributed and long-lived culture.

Of the 62 Late Woodland sites identified, 26 are classified as Effigy Mound (Table 35). Three additional Effigy Mound sites, Willow Drive Mound Group (47DA119), Picnic Point (47DA121), and Beloit College Mound Group (47RO15) are not listed in the database, but were identified as Effigy Mound mortuary sites after the database was submitted. A minimum of 387 individuals were recovered from these 29 sites and represent 45.5% of all Late Woodland individuals identified.

A review of published site reports and syntheses reveals the emphasis on excavation of Effigy Mound mounds (Barrett and Hawkes 1919; Barrett



Table 35. Wisconsin Late Woodland sites with an Effigy Mound culture mortuary component.

Site Number	Site Name	MNI	Level of Analysis
47AD92	Erickson Md. Grp.	1	None
47CR40	Haggerty Md. Grp.	16	Part
47CT9002	Heller	1	Part
47DA1	Frost Woods Mds.	13	None
47DA119	Willow Drive Md. Grp.	2	Part
47DA121	Picnic Point	3	Part
47DN1	Wakanda Park Md. Grp.	23	Part
47DO27	Nitschke	56	Part
47DO155	Kolterman Md. Grp.	2	Part
47GL53	Green Lake	7	Part
47GL9001	Kingston	48	Part
47GT112	Raisbeck	35	None
47ME2	LaBelle Lake	14	None
47ME5	Nakuti's Berry Patch	10	None
47ME6	Kakwatch	10	Part
47ME7	Pewisit Lake	2	None
47ME11	Five Islands Md. Grp.	8	None
47ME13	Watasa Lake Swamp	2	None
47ME18	Keshena Lake Md. Grp.	1	None
47ME63	Watasa Lake Catfish	2	None
47MQ49	Neale Md. Grp.	13	Part
47MQ9002	Kratz Creek	72	Part
47MQ9003	McCloughry	20	Part
47MR22	Maine	2	Part
47RO15	Beloit College Md. Grp.	6	Part
47SB61	Kletzien	15	None
47WP26	Sanders	1	None
47WP70	Sanders III	1	None
47WT1	Lizard Md. State Park	1	Part

and Skinner 1932; Bastian 1958; Hurley 1975; Jeske 1927; Larson 1961; McKern 1928; McKern 1930; Rowe 1956). Despite the archeological interest in Effigy Mound mortuary sites, little bioarcheological information is known; consequently, the biological nature of the people comprising this widespread culture remains a mystery. Discussion of the human remains encountered at the excavated mortuary sites focused on burial practices and reported such information as the frequency of primary and secondary interments, and the frequency of extended, flexed, bundled, and/or cremated burials. When possible, the authors reported the estimated number of individuals present per mound and, less frequently, their relative ages at death and sex. Table 36 presents a compilation of minimum number of individuals, age, and sex per mound and burial from the descriptions published in reports of the Kletzien, McCloughry, Nitschke, Neale, Kratz Creek, and Raisbeck sites. Bioarcheological research is admittedly hampered by poor preservation and sparse or missing excavation notes. Merbs (1966), however, makes a strong case for analyzing fragmentary and poorly preserved remains to extract as much information as possible.

Merbs (1966) demonstrates the quality and quantity of data recoverable from such remains by analyzing six individuals from three sites believed to belong to the Effigy Mound period and comparing them to 10 individuals from the Burton site, an undifferentiated Late Woodland site. Cranial and postcraniometrics and nonmetrics, dental metrics and nonmetrics, and skeletal and dental pathology data are reported, as well as the results of an experimental technique to determine ABO blood group for both sites. A various number of 17 cranial measurements and four indices were taken on eight individuals. Fifteen postcranial measurements and four indices were variously taken on 17 long bones. Most notable about the postcrania are the low platymeric and platycnemic indices indicative of marked subtrochanteric flattening on the femora (Burton site only) and medio-lateral flattening of the tibiae (both sites). Stature estimates were determined for three adult male individuals and ranged from 5 ft. 4-1/2 in. to 5 ft. 6-1/2 in. Eight discrete cranial traits were variably observed. The table that presents these data are confusing, and

Table 36. Age and sex distribution of individuals described from Mound Groups.

Age Interval	Male	Female	Indeterminate	Total
<b>Nitschke (47DO27)<sup>1</sup></b>				
Infant (Birth - 2)	0	0	0	0
Child (3-10)	0	0	5	5
Adolescent (11-18)	0	0	0	0
Yg. Adult (19-30)	0	0	2	2
Mid Adult (31-45)	0	0	0	0
Old Adult (45+)	0	0	0	0
Adult	6	7	23	36
Indeterminate	0	0	10	10
Burial present, no information	0	0	6	6
Total	6	7	46	59
<b>Raisbeck (47GT112)<sup>2</sup></b>				
Infant (Birth - 2)	0	0	0	0
Child (3-10)	0	0	5	5
Adolescent (11-18)	0	0	0	0
Yg. Adult (19-30)	1	3	0	4
Mid Adult (31-45)	1	0	0	1
Old Adult (45+)	0	1	0	1
Adult	4	0	11	15
Indeterminate	0	0	46	46
Burial present, no information	0	0	9	9
Total	6	4	71	81
<b>Neale (47MQ49)<sup>3</sup></b>				
Infant (Birth - 2)	0	0	0	0
Child (3-10)	0	0	2	2
Adolescent (11-18)	0	0	0	0
Yg. Adult (19-30)	0	0	0	0
Mid Adult (31-45)	0	1	0	1
Old Adult (45+)	1	1	0	2
Adult	1	0	0	1
Indeterminate	0	0	0	0
Burial present, no info.	0	0	10	10
Total	2	2	12	16
<b>McCloughry (47MQ--)<sup>3</sup></b>				
Infant (Birth - 2)	0	0	0	0
Child (3-10)	0	0	3	3
Adolescent (11-18)	0	0	0	0
Yg. Adult (19-30)	0	0	0	0
Mid Adult (31-45)	0	0	0	0
Old Adult (45+)	0	0	0	0
Adult	0	0	9	9
Indeterminate	0	0	3	3
Burial present, no information	0	0	0	0
Total	0	0	15	5
<b>Kletzien (47SB61)<sup>4</sup></b>				
Infant (Birth - 2)	0	0	0	0
Child (3-10)	0	0	0	0
Adolescent (11-18)	0	0	0	0
Yg. Adult (19-30)	0	0	0	0
Mid Adult (31-45)	0	0	0	0
Old Adult (45+)	0	1	0	1
Adult	3	3	0	6
Indeterminate	0	0	2	2
Burial present, no information	0	0	2	2
Total	3	4	4	11
<b>Combined Group<sup>4</sup></b>				
Infant (Birth - 2)	0	0	2	2
Child (3-10)	0	0	2	2
Adolescent (11-18)	1	0	0	1
Yg. Adult (19-30)	3	3	0	6
Mid Adult (31-45)	0	0	0	0
Old Adult (45+)	4	0	0	4
Adult	0	0	1	1
Total	8	3	5	16

Note: Some individuals were classified as "young adult," "mid-age adult" and "older adult." These relative categories correspond to the age ranges 19 - 30 years, 31 - 45 years and 45+ years, respectively.

<sup>1</sup>McKern 1930; <sup>2</sup>Rowe 1956; <sup>3</sup>McKern 1928; <sup>4</sup>includes the Late Woodland Burton site and the Effigy Mound sites of Willow Drive, Picnic Point, and Arboretum (Merbs 1966).

frequencies of the nonmetric traits of the skull seem to reflect counting bilateral expression of a trait twice. Pathological conditions observed include three cases of moderate to severe osteoarthritis, a healed fracture on a right clavicle, a depression fracture on a frontal bone, two cases of dental abscess, and one case of antemortem tooth loss. The percentage

of occurrence for the skeletal and dental pathological conditions observed is not possible because total number of skeletal and dental elements observed is not reported. Merbs (1966) concludes the comparative analysis of the sites by reiterating the importance of analyzing fragmentary and poorly preserved remains and posing a number of questions to which additional data from other Wisconsin sites may contribute.

A careful review of site reports provides some bioarcheological data. McKern (1928) reports the length, breadth, and cephalic index for four male and two female skulls recovered from the McClaughry Mound Group (47MQ9003). The average cephalic index for the males is 73.83 and 72.56 for the females. McKern compares the McClaughry skulls to a male skull from an unidentified effigy mound in Fond du Lac County and a "historic Wisconsin Indian burial." No further discussion is presented beyond concluding that despite overall poor preservation, it was consistently observed that "no artificially flattened occiputs, such as normally to be found among people who are strapped to a hard cradle board during infancy, were encountered. In fact, the occipital region of the skull is exceptionally full in every observed instance" (McKern 1928:256). It is noted that the skull of the historic skeleton exhibits artificial cranial deformation. McKern (1930) reports the same information discussed above for two additional sites, Kletzien (47SB61) and Nitschke (47DO27). Three male and two female skulls were measured from Nitschke and two males and two females from Kletzien. Some degree of occipital flattening was observed on a female skull from Mound 1 of the Kletzien group and a skull from a Nitschke site mound.

Descriptions of pathological conditions are infrequent in the site reports. McKern (1930:453) reports the occurrence of three ankylosed thoracic vertebrae in Mound 2, Burial 2 of the Kletzien Mound Group. Barrett and Hawkes (1919:28) describe observing a quartzite projectile point embedded in the anterior surface of the right innominate of an adult male from the Kratz Creek site. A determination of frequencies of the above described conditions are not possible due to the absence of a systematic analysis of pathological lesions and trauma of the remains from any of the Effigy Mound sites.

Sullivan (1985) presents a differential diagnosis of a resorptive vertebral disorder observed in a male 15 to 18 years old from the Raisbeck Mounds (47GT112). The Raisbeck Mounds site includes 80 mounds. During the excavation of 20 of them, 80 burials were encountered. Overall, preservation of the human remains was poor, resulting in the recovery of only 35 individuals. The lesions, observed on the T-11 vertebra, were resorptive in character and caused significant destruction of the cancellous bone of the centrum. The remainder of the skeletal material present is unaffected (one lumbar vertebra, sacrum, proximal humeral epiphysis, left femur, and left and right scapulae). Following a differential diagnosis (Buikstra 1981b), two possibilities were identified: blastomycosis and tuberculosis. Sullivan favors a diagnosis of tuberculosis citing the documented Middle Mississippian influence by ca. A.D. 1000 and the feasibility of sedentary, maize-dependent populations to serve as "reservoir for the development of a density dependent disease like tuberculosis" (Sullivan 1985:74). Of special interest in this case is the presence of this disease in a population practicing a Central Based Wandering settlement pattern (as opposed to sedentary village living) and subsisting on wild resources (as opposed to maize/cultigen dependency). If this young man suffered from tuberculosis, his case contrasts the general pattern of tuberculosis occurrence as discussed by Buikstra (1981b).

Several Effigy Mound skeletal samples have been included in research utilizing a comparative approach. Sullivan (1990a) includes the human remains from Nitschke (47DO27) and Raisbeck (47GT112) in his research investigating the biological effects of contact between large- and small-scale societies. Sullivan focuses on defining the impact of Middle

Mississippian populations on indigenous Late Woodland groups. To this end he compares the mortality profiles, disease frequencies, and indications of violent trauma in the Middle Mississippian site of Aztalan to representative samples of the Archaic (Oconto site), Lake Winnebago Oneota (Karow site) and the two Effigy Mound sites. The Archaic sample serves as a control group having had no contact with Upper Mississippian groups.

Dental caries were assessed in order to identify any changes in subsistence practices toward increased consumption of maize. Thirty-two percent of all individuals from Nitschke and Raisbeck presented carious lesions. This value is intermediate between the hunting/gathering Oconto (9.52%) and maize horticulturists of Aztalan (61.54%). Frequencies of porotic hyperostosis may reflect iron deficiency and, consequently, increased consumption of maize. No evidence for porotic hyperostosis was observed on the Effigy Mound skeletons. Interpretation of demographic data indicate a 5 year loss relative to life expectancy following the hypothesized introduction of infectious disease (e.g., tuberculosis), presumably from the Middle Mississippians at Aztalan. Sullivan also postulates increased intergroup warfare, although he presents little evidence to support this contention. Sullivan's (1985) research is the first attempt to document the biological consequences of contact between prehistoric groups in Wisconsin. The data presented, however, do not clearly reflect what those consequences might be. The topic is provocative and should be investigated further, perhaps with additional samples from Late Effigy Mound sites.

Glenn (1974) includes 18 Effigy Mound individuals from seven sites (Kratz Creek, Schmels, Kletzien, Raisbeck, Nitschke, Spencer Lake Mound, and Lizard Mound) in her research exploring the biological affinities of Oneota peoples. The Effigy Mound sample was included to evaluate the hypothesis of Oneota origins from a local Middle to Late Woodland group(s) (Gibbon 1972). Glenn summarizes relevant information regarding male cranial size and shape, and concludes that the Effigy Mound sample shows significant muscularity and robusticity. The biological distance analysis indicated a distinct separation between Effigy Mound and the included Oneota samples.

*Miscellaneous Late Woodland Sites.* Riggs (1985) presents an osteological analysis of the human remains recovered from the 1980 excavation of three Late Woodland mounds at the Poor Man's Farrah site (47GT356) and one mound at the Bade site (47GT365). Both mounds are located "on the tops of two interflaves overlooking the Mississippi River" (Riggs 1985:38). Assessment and  $^{14}\text{C}$  dating of material remains indicate a Late Woodland date of ca. A.D. 900, phase unspecified (Penman 1985).

Thirteen individuals were recovered from the two sites, 11 from Poor Man's Farrah and two from Bade. Age and sex determination were problematic due to the fragmentary and incomplete nature of the remains. The following age distributions were presented: seven adults; three individuals between birth and 12 months; one individual between birth and 24 months; one individual between 12 and 18 months; and one individual between 18 and 24 months. Three instances of osteitis were observed on cranial fragments. Enamel hypoplasia was observed on "several individuals and various teeth" and caries were ubiquitously absent. Cutmarks were observed on numerous cranial fragments; the location of the cuts in two instances were consistent with an origin of scalping, and the other cuts were of unknown origin. The presence of secondary burials suggests that some of the cutmarks could be part of the defleshing and/or dismemberment process. Two bone samples were submitted for stable carbon isotope analysis and yielded  $^{13}\text{C}/^{12}\text{C}$  ratios of -18.1 and -17.7. These values compare to values reported by Bender et al. (1981:349) for maize-

dependent Aztalan inhabitants (range: -12 to -19.2) and the Archaic period Reigh inhabitants (-21.4 to -23.1). Tables included at the end of the Riggs's (1985) article report skeletal element inventory, molar attrition data, frequency of enamel hypoplasias, and cranial and postcraniometrics and nonmetric data. Few broad comparisons are made with other skeletal samples; however, Riggs reminds us that few osteological studies have been conducted on Late Woodland remains and that "On their own these attributes provide only a limited view; however, their importance lies in the potential for their being used with data from other case studies to construct a broader picture of mortuary behavior and biology of the Late Woodland period" (Riggs 1985:60-61).

As discussed in the Middle Woodland, Eastern Woodlands, non-Hopewell phases section, the Rehbein site (47RI81) is a multicomponent Woodland site containing a Middle Woodland and a Late Woodland mortuary component (Mound 5). The Late Woodland component exhibits similarities to Effigy Mound, but is not distinct enough to be classified as Effigy Mound. Mound 5, a linear mound, was excavated in 1977 under the direction of Joan Freeman of the State Historical Society of Wisconsin. Two separate cremations were encountered. Little bioarcheological information was reported regarding the cremations beyond the identification of one as an adult and the observation that the paucity of cremated bone suggested the cremation was done elsewhere, and a portion of the remains were secondarily buried in Mound 5 at the Rehbein site (Schlundt and Mead 1979).

#### Summary of the Late Woodland Period

Moderate to poor preservation and fragmentation characterize the majority of the 861 individuals recovered from Late Woodland sites. The level of bioarcheological knowledge is low and can be attributable in part to the condition of the remains and also to a puzzling academic neglect. The bioarcheology of the northern Wisconsin Lakes phase is known only from Melbye's (1969) extensive analysis of the Robinson site. No contemporaneous skeletal samples from the Northern Forest region exist to facilitate an understanding of this phase and overall adaptation to the region. A preliminary exploration into the biological relationship of Robinson to surrounding non-Wisconsin populations was conducted. Several instances of violent trauma were observed in the Robinson site, and it is interesting to note that all occurrences were observed in one section of the site.

Clam River focus is represented by a minimum of 317 individuals. Very little bioarcheological information is available; no generalizations regarding this focus can be made at this time.

Individuals from the Effigy Mound culture are numerous (N=387) and have been recovered from both the northern forest and Eastern Woodlands region. Despite the extensive and continued interest in Effigy Mound from an archeological perspective, very little bioarcheological information is known about this enigmatic Late Woodland manifestation. Tidbits of information are distributed throughout the published descriptive reports, as well as the more substantive, comparative work. No trends are discernible from the available information. Interesting observations include one possible case of tuberculosis (Sullivan 1985); the presence of a few artificially deformed crania; the low frequency of trauma attributable to violence; and Glenn's (1974) conclusion that Effigy Mound skeletal remains are distinct from the neighboring Oneota, suggesting little biological interaction between the two groups. Clearly an extensive and systematic analysis of all Effigy Mound remains is warranted. The knowledge gained from such research would contribute to what is known about the Effigy Mound peoples and potentially answer many of the Effigy Mound-related questions that have been posed in the archeological literature.

#### Oneota Aspect (A.D. 800-1634)

The Oneota are encountered in the archeological record in Wisconsin during the Late Woodland period sometime between A.D. 800 and 1000 from an unknown area and existed into the period of European contact in some areas. The term "Upper Mississippi" was originally applied to the Oneota (McKern 1945) although it is infrequently applied today. The genealogical source of the Oneota is currently debated and numerous hypotheses have been put forth (Gibbon 1986, Hall 1986). Various populations of the Oneota are distributed throughout the southern two-thirds of the state; however, the densest area of occupation is in the southern half of the state in the Eastern Woodlands region. A number of phases have been identified and described; however, human remains are

Table 37. Wisconsin sites with an Oneota mortuary component in the Eastern Woodlands (EW) and Northern Forest (NF) regions.

Site	Phase	MNI	Region	Type
Bordeleau (47BR0222) <sup>1</sup>	Unknown	8	NF	Cemetery
47BR0243 <sup>2</sup>	Unknown	1	NF	Isolated
Schmitt (47BR0262) <sup>3</sup>	Unknown	1	NF	Mound
Nicolet Grove (47BR9001) <sup>4</sup>	Unknown	3	NF	Other
McEacham Ridge (47DR36) <sup>5</sup>	Unknown	22	NF	Unknown
Portage Point (47DR0135) <sup>6</sup>	Unknown	1	NF	Cemetery
Pipe (47FD0010) <sup>5</sup>	Grand River	4	EW	Cemetery
Ben Larson (47FD0395) <sup>3</sup>	Unknown	2	EW	Cemetery
Walker-Hooper Vill. (47GL0105) <sup>8</sup>	Grand River	8	EW	Unknown
Carcajou Point (47JE0002) <sup>7</sup>	KoshKonong	9	EW	Mound
Farnum St Cem. (47LC0011) <sup>8</sup>	Unknown	46	EW	Cemetery
Midway Burials (47LC0019) <sup>9</sup>	Orr	11	EW	Cemetery
Overhead (47LC0020) <sup>10</sup>	Orr	16	EW	Mound
Valley View (47LC0034) <sup>11</sup>	Valley View	1	EW	Habitation
Krause (47LC0041) <sup>12</sup>	Orr	4	EW	Habitation
Herbert (47LC0043) <sup>13</sup>	Unknown	1	EW	Habitation
Braun (47LC0059) <sup>8</sup>	Brice Prairie	3	EW	Habitation
Pammel Creek (47LC0061) <sup>14</sup>	Brice Prairie- Valley View	2	EW	Habitation
Olson (47LC0076) <sup>15</sup>	Blue Earth	1	EW	Habitation
Tremaine (47LC0095) <sup>3</sup>	Pammel Crk.	92	EW	Unknown
Dahl (47LC0148) <sup>16</sup>	Orr	10	EW	Cemetery
Filler (47LC0149) <sup>3</sup>	Unknown	1	EW	Unknown
State Road Coulee (47LC0176) <sup>17</sup>	Valley View	2	EW	Unknown
O.T. (47LC0262) <sup>18</sup>	Valley View	77	EW	Other
Sherwood Mnr. Cem. (47LC0316) <sup>19</sup>	Unknown	1	EW	Cemetery
Gundersen Clinic (47LC394) <sup>20</sup>	Brice Prairie- Valley View	1	EW	Cemetery
Trane (47LC0447) <sup>21</sup>	Valley View	5	EW	Cemetery
OT (47LC0553) <sup>3</sup>	Valley View	5	EW	Cemetery
Wataha Lk. Swamp (47ME0013) <sup>22</sup>	Unknown	2	NF	Mound
South Brch. Chapel (47ME0058)	Unknown	1	NF	Cemetery
Clark Md. Group (47MR0013) <sup>3</sup>	Unknown	3	NF	Mound
Plush Mound (47MT0018) <sup>3</sup>	Unknown	1	NF	Habitation
WA(NS)4(1)—? <sup>23</sup>				
Armstrong (47PE0012) <sup>24</sup>	Silvernale	4	EW	Habitation
Mero #2 (47PI0132) <sup>3</sup>	Grand River?	2	EW	Mound
Lasley's Point (47WN0008) <sup>25</sup>	L. Winnebago	5	EW	Unknown
Butte Des Mortes (47WN0082) <sup>3</sup>	Unknown	1	EW	Unknown
Overton Meadow (47WN0106) <sup>26</sup>	L. Winnebago	12	EW	Cemetery
Nile Roeder (47WN0197) <sup>27</sup>	L. Winnebago	4	EW	Cemetery
Karow Cemetery (47WN0198) <sup>28</sup>	L. Winnebago	74	EW	Cemetery
Cowling Portion <sup>29</sup>	L. Winnebago	14	EW	Cemetery
Furman (47WN0216) <sup>30</sup>	L. Winnebago	43	EW	Cemetery
MacDonald (47WN0251) <sup>32</sup>	L. Winnebago	1	EW	Isolated
Barefoot (47WN0280)	Unknown	1	EW	Cemetery
Brainerd (47WN0289) <sup>33</sup>	L. Winnebago	39	EW	Cemetery
47WP0039	Unknown	1	NF	Village

<sup>1</sup>Great Lakes Archaeology Research Center; <sup>2</sup>Overstreet 1991; <sup>3</sup>State Historical Society of Wisconsin; <sup>4</sup>Mittestadt et al. 1987; <sup>5</sup>Overstreet 1981; <sup>6</sup>Gibbon 1972; <sup>7</sup>Hall 1962; <sup>8</sup>Arzigian et al. 1989; <sup>9</sup>Sullivan 1986; <sup>10</sup>Gallagher et al. 1981; <sup>11</sup>Stevensen 1985; <sup>12</sup>Gallagher 1989; <sup>13</sup>Boszhardt 1985; <sup>14</sup>Arzigian and Boszhardt 1989; <sup>15</sup>Gallagher et al. 1982; <sup>16</sup>Boszhardt and Gallagher 1982; <sup>17</sup>Anderson et al. 1995; <sup>18</sup>Anderson and Westover 1992; <sup>19</sup>Boszhardt et al. 1984; <sup>20</sup>Arzigian et al. 1993; <sup>21</sup>Boszhardt and Arzigian 1992; <sup>22</sup>Barrett and Skinner 1932; <sup>23</sup>Hall 1962; <sup>24</sup>Hurley 1978; <sup>25</sup>Peske 1966; <sup>26</sup>Kadlec and Paasch n.d.; <sup>27</sup>Seurer and Faulkner 1976; <sup>28</sup>Dirst and Kreisa 1982; <sup>29</sup>Dirst and Kreisa 1982; <sup>30</sup>Kreisa 1986; <sup>32</sup>Dirst 1982; <sup>33</sup>Dirst 1984

clearly associated with only eight phases: Lake Winnebago, Koshkonong, Valley View, Orr, Blue Earth, Brice Prairie, Silvernale, and Grand River.

Forty-five sites yielding a minimum of 586 individuals (12% of the total Wisconsin sample), are identified as having an Oneota mortuary component in the bioarcheology database (Table 37). Eight Oneota phases are represented in the database including Lake Winnebago, Orr, Grand River, Silvernale, Valley View, Brice Prairie, Blue Earth, and Koshkonong. Phase designation is unknown for 18 sites and 97 individuals. Bioarcheological knowledge is moderate for the Lake Winnebago, Orr, and Valley View phases but is poorly understood for the other phases and remaining sites.

#### Eastern Woodlands

*Grand River Phase.* The Grand River phase of the Oneota aspect is centered in south-central Wisconsin and existed from A.D. 900 to 1300. Sites containing a Grand River component are distributed along the Upper Fox River drainage, primarily in Green Lake and Marquette counties (Gibbon 1986). Hall (1962) discusses Grand River as the most aberrant of the Oneota phases, an anomaly due to the Middle Mississippi influences observed in the material culture. Glenn (1974:20) summarizes some of the distinctive characteristics of the Grand River phase: "The presence of burial mounds...; the relative lack of handles on pottery and their round or ovoid shape in cross section when present; and the distinctiveness of the pottery designs." Hall (1962), however, suggests some relationship between the Grand River and Lake Koshkonong phases that indicates some contemporaneity and association. He perceives that the aberrancy may be related to the early and transitional nature of the Grand River phase.

Two sites have been reported as containing a Grand River phase mortuary component in the database. The Pipe site (47FD10) yielded a minimum of four individuals and the Walker-Hooper site (47GL105) a minimum of eight individuals. An additional site, Dalton was identified as having a Grand River phase mortuary component after submission of the database. Reference to a published report could not be found and, consequently, the minimum number of individuals recovered from Dalton is unknown. The human remains from Dalton are currently located at the Milwaukee Public Museum. Bioarcheological data are limited from these three sites. Glenn (1974) includes five adult male crania from Walker-Hooper and Dalton in her biological distance study of the Oneota. She summarizes the overall cranial morphology as "rather robust with medium to large muscularity" (Glenn 1974:73). The mean cranial index is 82.25 which falls in the brachycranial range.

*Koshkonong Phase.* The Koshkonong Oneota occupied the Rock River drainage area of southeastern Wisconsin between A.D. 900 and 1300 (Gibbon 1986). Robert L. Hall described and defined the Koshkonong phase of the Oneota tradition (Hall 1962) following excavation of Carcajou Point (47JE02). Similar to other Oneota groups, subsistence is characterized by a mixed economy consisting of maize horticulture and exploitation of locally available flora and fauna, including wild rice. Based on a number of shared traits, it is Hall's perspective that the Lake Winnebago, Grand River, and Koshkonong phases may have constituted a regional subgroup within the Oneota culture. Archeological, ethnohistorical, and ethnographic evidence suggests a lineal relationship between the Koshkonong phase Oneota and the historic Winnebago (Hall 1962).

Carcajou Point (47JE02) is the only site listed in the database as having a Koshkonong phase mortuary component. Carcajou Point was occupied beginning ca. A.D. 1000 by an early Oneota complex that exhibited Middle Mississippi influence in ceramic stylistic designs and housing construction;

ceramic designs and style are most similar to the Upper Mississippi Silvernale focus of southeastern Minnesota. As time went on, the inhabitants of Carcajou Point evolved in a more classic Oneota direction, although classic Oneota culture was never manifest at the site (Hall 1962). Eight individuals were recovered from three burials at Carcajou Point and consist of two infants, three children, two adults of indeterminate sex, and one adult male. Both secondary and primary burial were practiced at the site: Burial 2 was a multiple secondary interment comprising six individuals, and Burial 3 was a primary interment of an infant in a refuse pit. Additionally, Burial 1 consisted of fragments of parietals in a refuse pit. Grave goods were recovered from Burials 2 and 3 (Hall 1962). No additional bioarcheological information is known about the Koshkonong individuals recovered from the Carcajou Point site and, consequently, the Koshkonong phase of the Oneota aspect.

*Lake Winnebago Phase.* The Lake Winnebago phase of the Oneota aspect is represented by peoples who occupied sites along the Fox River-Lake Winnebago waterway. This phase is poorly understood, but more recent excavations have greatly expanded what is known about the Lake Winnebago phase site inhabitants (Dirst and Kreisa 1982; Kreisa 1986, 1993). The temporal span of this phase has variously been reported as from A.D. 950 to 1500 (Gibbon 1986) and A.D. 1300 to 1650 (Dirst 1982; Kreisa 1993). Lake Winnebago phase people tended to live in large villages with associated cemetery areas and relied on agricultural crops of corn, beans, and squash, supplemented by local terrestrial and lacustrine resources (Gibbon 1986; Kreisa 1986, 1993).

Eight of the 45 sites listed in the database are identified as containing a Lake Winnebago phase component (Table 37). A minimum of 192 individuals (34% of all Oneota individuals) have been recovered from these sites, and 187 individuals have undergone partial analysis; only the five individuals from Lasely's Point (47WN08) have not been analyzed to a significant degree.

Relative to other cultural manifestations in Wisconsin, the bioarcheology of the Lake Winnebago phase Oneota is moderately well known. Several researchers have described burials (Dirst 1982; Dirst and Kreisa 1982; Kreisa 1986; Seurer and Faulkner 1976) and have conducted more substantive studies (Glenn 1974; Kreisa 1993; Sullivan 1986, 1990a, 1990b). Notably absent, however, are studies comparing and summarizing bioarcheological data from all of the Lake Winnebago Oneota sites. An exception is Glenn's (1974) biological distance study which compares craniometric and nonmetric data across the various Oneota phases and between the Oneota phases and non-Oneota cultures. Additionally, Kreisa (1993) presents an excellent discussion and comparison of Lake Winnebago phase mortuary practices; however, there is little comparison of the osteological data beyond age and sex profiles. Tables 38 and 39 present combined data on the age and sex distribution, and skeletal and dental pathology, respectively.

The Nile Roeder site (47WN197) is located on the northern shore of Lake Butte des Mortes. Four individuals were recovered during a salvage excavation in 1975 after disturbance during house construction (Seurer and Faulkner 1976). The individuals were believed to be part of a multiple burial, and two were primary interments; the body position of the remaining two were indeterminable due to bulldozer disturbance. Three older adults (45+ years), consisting of two males and one female, and one neonate were recovered. One adult male was nearly complete, the remaining three individuals were all incomplete. Pathology data can be summarized as follows: severe osteoarthritis was observed on two adult individuals, including incipient ankylosis of some thoracic and lumbar vertebrae on one adult male; a healed fracture on the left ulna of the same adult male; extensive antemortem tooth loss on one adult male and

Table 38. Age and sex distribution of combined Lake Winnebago phase skeletal remains (from Brainerd, Nile Roeder, MacDonald, Cowling, and Furman sites).

Age Interval	Male	Female	Indeterminate	Total
Infant (Birth - 2)	0	0	11	11
Child (3-10)	0	0	12	12
Adolescent (11-18)	1	1	0	2
Yg. Adult (19-30)	2	4	0	6
Adult (25 - 35)	4	1	0	5
Mid Adult (31-45)	3	0	0	3
Old Adult (45+)	8	8	0	16
Adult	4	9	3	16
Total	22	23	26	71

Table 39. Summary of subsistence-related pathology of the Lake Winnebago phase Oneota (from Dirst 1982, 1984; Dirst and Kreisa 1982; Kreisa 1986; Sullivan 1986, 1990a, 1990b).

Site	N	%Caries	%EH	%AB	%PH
Nile Roeder (47WN197)	4	**	**	33.0	**
Cowling part/Karow (47WN198)	14	22.0	**	25.0	**
Karow (47WN198)	64	37.0	39.0	33.0	**
Furman (47WN216)	43	36.0	**	3.5	**
MacDonald (47WN251)	1	0.0	**	0.0	**
Brainerd (47WN289)	39	25.0	**	0.0	**

\*\* frequency not reported (1986, 1988, 1990a, 1990b).

EH = Enamel Hypoplasia; AB = Abscess; PH = Porotic Hyperostosis

the adult female (19/33 teeth, 14/16 mandibular teeth, respectively); moderate antemortem tooth loss on the other adult male (9/32 teeth); one abscess on the maxilla of an adult male; and the presence of a supernumerary mandibular incisor on an adult male. Additionally, one adult male skull was measurable and provided a cranial index of 73.68 (slightly dolichocranic) (Seurer and Faulkner (1976).

The MacDonald site (47WN251), located approximately 100 meters north of the Fox River near its junction with Lake Winnebago, was identified in 1981 following disturbance during excavation by a landowner to install a swimming pool. During salvage excavation, the incomplete remains of a single individual were recovered. The remains were of a male approximately 33 to 45 years of age at the time of death. The skull and legs were missing due to previous prehistoric and historic disturbance; the torso, arms and mandible were recovered. No dental or skeletal pathology was noted beyond the slight osteoarthritis present on the vertebrae. A Carabelli's cusp was present on the lingual surface of the left third molar (Dirst 1982).

The Karow Cemetery site (47WN198) is a large cemetery associated with a village site. As a result of numerous excavations over the decades, portions of the site have been given various names including Karow, Furman (47WN216), and Cowling (47WN198). It is recognized that these sites are all part of the larger Karow site. The Cowling portion of the Karow Cemetery was encountered in 1979 during construction of a boat ramp on private property. Ultimately 14 individuals were recovered during subsequent excavations, including five males, three females, and six individuals of unknown sex. The age distribution is as follows: three infants, two children, one adolescent, three young to middle-aged adults (25 to 35 years), two older adults (36 to 45 years), and three undifferentiated adults (Dirst and Kreisa 1982).

The individuals recovered were afflicted by a wide variety of skeletal and dental pathological conditions. Skeletal conditions observed followed by the frequency of individuals affected (in parentheses) include osteoarthritis (5 of 8), osteomyelitis (1 of 8), Perthes disease (1 of 8), healed fracture of the left ulna (1 of 8), and osteoma (2 of 8). Dental pathological conditions were observed with the following frequencies: caries (2 of 9), abscess (2 of 8), and antemortem tooth loss (3 of 8) (Dirst and Kreisa 1982).

No cranial measurements were possible but several postcranial measurements were taken for five individuals. Various robusticity indices are presented for four individuals and stature estimates for five individuals. The mean stature estimate for males (N=4) is 166 cm (5 ft. 5 in.) and the stature estimate for the one measurable female is 160 cm (5 ft. 3 in.) (Dirst and Kreisa 1982).

The Furman site (47WN216), excavated in 1966, may represent an associated cemetery of the extensive Karow site (47WN198). The 43 individuals recovered during the excavation comprised 14 males, 14 females, and 15 individuals of indeterminate sex. The age distribution is as follows: six infants, eight children, one adolescent, nine young adults, two middle-aged adults, 10 older adults, and seven undifferentiated adults. It is interesting to note that 35% of the population died before the age of 10 years, and, more specifically, six 5 year olds were present in the cemetery (Kreisa 1986).

A wide variety of skeletal pathological conditions were observed in the Furman sample. Osteoarthritis affected 15 of 28 individuals and ranged in severity from slight to severe, with a majority of those affected exhibiting a slight degree of degenerative changes. Osteomalacia, a generalized inflammation, and undiagnosed mandibular pathology affected one individual each. Finally, two individuals exhibited mastoiditis. Dental pathological conditions observed included caries (10 of 28 individuals), abscess (1 of 28 individuals), and antemortem tooth loss (3 of 28 individuals) (Kreisa 1986).

Stature estimates were possible for 17 adults of known sex and one individual of indeterminate sex. The mean stature estimate for males (N=9) is 166 cm (5 ft. 5 in.) and females (N=8), 158 cm (5 ft. 2 in.) (Kreisa 1986). The mean statures determined for the Furman individuals are comparable to those for the Cowling portion of the Karow site (Dirst and Kreisa 1982).

A portion of the Brainerd site (47WN289), located near the western shore of Lake Winnebago, was excavated in 1983 as a result of the identification of human remains from a surface collection. The subsequent excavation uncovered the remains of nine individuals: six adults; two infants; and one child. Four of the adults were determined to be female, and the sex of the five remaining individuals was indeterminate (Dirst 1984).

Skeletal and dental pathological conditions were observed on a number of individuals. Four adult individuals exhibited slight to severe osteoarthritic changes. Burial one exhibited the most drastic pathological conditions including an osteosarcoma affecting the third and fourth lumbar vertebrae and complete fusion of the fifth lumbar vertebra to the sacrum. Dental conditions observed included carious lesions on two individuals and periodontal disease on one individual. Dirst (1984:131) also reports that two female adult individuals exhibit "rotation of femur and distortion of acetabulum." Dirst's description of the direction and degree of rotation corresponds to the distinctive femoral neck torsion observed in a number of individuals from the Hogback site (21HU04), an Orr phase Oneota site in southeastern Minnesota (McConaghy 1996). The degree of torsion observed by Dirst (1984) and McConaghy (1996) has not been recorded for any other individuals from any other prehistoric or historic cultural group.

Stature estimates were reported for three adult females from the Brainerd site. The mean stature determined for adult females is 156 cm. (5 ft. 1 in.) (Dirst 1984).

The Karow site (47WN198) is a large village and cemetery site located on the western shore of Lake Winnebago just north of the city of Oshkosh. McKern reported the site in 1945 and used information recovered to place the Oneota cultural manifestation in his Midwestern taxonomic system

(McKern 1945). Including the 14 individuals recovered from the Cowling portion of the Karow site, approximately 74 individuals have been excavated from the site (Sullivan 1990a). To date, little bioarcheological information has been published regarding the individuals recovered from the Karow site; not even a distribution of the ages and sexes represented has been published. Sullivan (1986, 1990a), however, has reported the percentage of individuals exhibiting caries (37%), enamel hypoplasia (39%), and porotic hyperostosis (33%); the actual number of individuals affected per sample size is reported for enamel hypoplasias only (15 of 38 individuals).

In addition to the descriptive reports presented above, there are a few "interperiod" comparative bioarcheological studies that utilize individuals from the Karow site as representative of the Lake Winnebago phase (Sullivan 1986, 1990a, 1990b). Sullivan (1986) compared the frequency of enamel hypoplasia on the anterior mandibular teeth of adults between individuals recovered from Karow (Oneota, Lake Winnebago phase) and Oconto (Archaic, Old Copper culture) in order to assess the level of biological stress experienced by populations who practiced different subsistence strategies. Of the individuals recovered from the Oconto site, 68% exhibited hypoplastic defects as compared to 39% of the Karow population. Additionally, the nature of the defects differed, with the Oconto defects characterized by a pitted, mottled appearance more extensively distributed over the tooth crown (one-third to one-half the crown surface), indicative of long-term, chronic stress. The majority of the Karow individuals, in contrast, exhibited distinct hypoplastic bands or lines suggesting discrete episodes of stress. The results of this study contradicted the expected relative frequencies and Sullivan interprets this to mean that the subsistence base for the Lake Winnebago Oneota was more secure than that of the foraging Archaic group and most likely comprised a combination of agricultural crops and wild food resources.

Sullivan (1990b) expanded on his 1986 study by comparing the frequencies of individuals affected by dental caries and porotic hyperostosis among sites from three periods: Archaic-Old Copper culture (Oconto), Oneota-Lake Winnebago phase (Karow), and Mississippian (Aztalan). Through a comparison of skeletal and dental pathology, Sullivan (1990b) seeks to indirectly assess the subsistence practices of the Lake Winnebago Oneota. Caries observed on the mandible were scored on a four point scale based on degree of crown destruction and exposure of the pulp chamber. Small sample sizes required pooling the various degrees of caries severity into presence/absence. The occurrence of porotic hyperostosis was scored on a three-point scale: active, inactive and none. Porotic hyperostosis is believed to be indicative of iron deficiency, a state frequently observed in horticulture/agriculture-dependent populations. The relative frequencies observed by Sullivan (1990b) were as expected given the subsistence strategies which characterize each period and region occupied. The lowest frequencies of both caries and porotic hyperostosis were observed for the foraging Oconto sample, the highest frequencies for the agriculture-dependent Aztalan sample, and frequencies observed for the mixed economy Karow sample fell between the two extremes. Sullivan (1990b) concludes that the results support the hypothesis that corn was indeed a likely component of the Oneota diet, but that the Lake Winnebago phase Karow population supplemented their diet with sufficient quantities of locally available foodstuffs. Table 39 presents the frequencies of all skeletal and dental pathological conditions observed by Sullivan (1986, 1990a, 1990b) and others.

Sullivan (1990a) applied previously collected data, plus additional categories of data, to the question of biological consequences of culture contact and interaction between large- and small-scale societies. To this end, he examines and compares the health status of a Mississippian skeletal population (large-scale society) to an Archaic and two Late Woodland

cultural manifestations (small-scale societies) in Wisconsin. Skeletal samples included in this study are the Raisbeck and Nitschke Mound sites (Late Woodland, Effigy Mound culture), Karow site (Late Woodland, Lake Winnebago Oneota), Aztalan (Middle Mississippi), and Oconto (Archaic, Old Copper culture). Frequencies of infectious disease as represented by tuberculosis, caries, enamel hypoplasia, and porotic hyperostosis were determined. The results, for the most part, conform to the expectation of an increase of pathological conditions through time. The increasing frequencies are interpreted to reflect subsistence base shifts and the introduction of infectious diseases. Additionally, Sullivan (1990a) discusses mortality profiles of the sites and reports an increase in mortality and subsequent decrease in life expectancy following contact between Mississippian and Late Woodland populations as a result of both the spread of infectious disease and intergroup conflict.

Sullivan's (1990a) study is provocative in subject matter; however, the interpretations are in some cases based on weak evidence. The hypothesized increase in infectious diseases is based on one possible case of tuberculosis in the Raisbeck sample and little convincing evidence of intergroup violence is presented. Sullivan cites postmortem skeletal modification as evidence for intergroup hostilities, but he does not provide frequencies for modification except for those incidences noted at Aztalan. Certainly the presence of cutmarks may be indicative of dismemberment associated with secondary burial as part of a group's mortuary program, especially during the Effigy Mound phase, a phase characterized primarily by secondary bundle burials (Keaveny et al. 1993; Myster and Kimmerle 1995). Published descriptions indicate a greater frequency of traumatic deaths in the Archaic than in the Late Woodland and Mississippian. Nevertheless, the question posed by Sullivan (1990a) is a significant one and merits further consideration and more in-depth analysis.

As previously stated, there is a notable absence of substantive bioarcheological research addressing intraphase variability. An exception is Kreisa's (1993) research on Lake Winnebago phase mortuary practices. Data on seven variables from burials recovered from eight sites were collected. The variables included age, sex, body position, skull orientation, and the number, kind, and placement of associated grave goods. The following sites were included in the analysis: Furman (WN216); Brainerd (WN289); Cowling portion of Karow (WN198); MacDonald (WN251); Nile Roeder (WN197); Overton Meadow (WN106); Lasley's Point (WN008); and Karow (WN198). Kreisa (1993:40) concludes that "Lake Winnebago phase burials show an overall pattern that is remarkable in both its simplicity and its homogeneity." The age and sex distribution across all of the sites is similar with no significant difference between number of males and females present; however, subadults are underrepresented. The few infants present may be indicative of different mortuary practices related to burial of infants; several infant skeletons were recovered from the wall trenches at the Old Spring site. The predominant mode of interment was primary, extended burial; less frequent were flexed primary and secondary bundle burial. A majority of the burials were oriented north-northwest. Few burials contained grave goods; however, adult males were the most likely group to receive them. Kreisa (1993) noted some temporal trends including the practice of mound burial in the earlier years of the Lake Winnebago phase, as well as a greater frequency of flexed burials. Whereas Kreisa's (1993) study represents the only published intraphase analysis of the Lake Winnebago mortuary components, no osteological data are presented beyond the frequencies of relative age categories (adult, subadult) and sex.

*Brice Prairie, Pammel Creek, and Valley View Phases.* Brice Prairie, Pammel Creek, and Valley View represent sequential phases for the LaCrosse area spanning just over 300 years, from A.D. 1300 to 1625, ending



just prior to French contact. Brice Prairie is the earliest documented Oneota phase in this area, beginning in A.D. 1300-1400. Pammel Creek evolved from Brice Prairie ca. A.D. 1400-1500. The continuum of Oneota occupation for the LaCrosse area ends with the Valley View phase, A.D. 1500-1625. Due to the sequential nature of the Brice Prairie, Pammel Creek, and Valley View phases, and the transitional character of several sites containing human remains, the bioarcheology of these phases will be discussed in the same subsection (Arzigian et al. 1989; Arzigian et al. 1994).

Eight sites are known to have yielded burials assigned to either the Brice Prairie, Pammel Creek, or Valley View phases, representing a minimum of 228 individuals (39% of the total Oneota sample) (Table 37). The mortuary component at the Jim Braun site (47LC59) has been classified as Brice Prairie; a minimum of three individuals were recovered (1% of LaCrosse area Oneota sample). No bioarcheological data have been published on these remains. The Tremaine site (47LC95) has been identified as a Pammel Creek phase Oneota site; a minimum of 92 individuals have been recovered from this site (Vradenburg 1991a). Two additional sites, Pammel Creek (47LC61) and Gundersen Clinic (47LC394), each contain occupations that are transitional in nature and the mortuary components at each site are believed to contain at least some burials identified as probably from the Pammel Creek phase (Arzigian and Boszhardt 1989; Arzigian et al. 1993). A minimum of two individuals and 47 individuals were recovered from these sites, respectively. Published bioarcheological data are minimal and consists primarily of age and sex distributions, grave good associations, and body position (Arzigian et al. 1993). Four sites containing mortuary components have been classified as Valley View and have yielded a minimum of 86 individuals (38% of the LaCrosse area Oneota sample) (Arzigian et al. 1993; O'Gorman 1993; Stevensen 1985). A majority of the 86 individuals were recovered from the OT site (47LC262/553). The biological nature of Valley View individuals is better known than either Brice Prairie and Pammel Creek phases due to the recent publication of the OT site report (O'Gorman 1993) which contains a bioarcheological analysis of the recovered human remains (Vradenburg 1993).

*Pammel Creek Phase.* Three sites have Pammel Creek phase mortuary components. No bioarcheological data are available for the two individuals recovered from the Pammel Creek site (47LC61). The Gundersen Clinic site (47LC394) yielded 47 individuals (Arzigian et al. 1994) from three burial areas. Two major occupations were identified at the Gundersen Clinic site, one at the end of the Brice Prairie phase, ca. A.D. 1350-1400, and one at the beginning of the Valley View phase, ca. A.D. 1500-1550. At least some of the burials, however, are believed to be attributable to the intermediate Pammel Creek phase based on the transitional character of the mortuary ceramics. Bioarcheological data on the human remains recovered from Gundersen Clinic are minimal; one table lists the age and sex of each individual. Descriptions of each burial report age at death, sex, body position, preservation, a general inventory of skeletal elements present, and presence/absence of grave goods (Arzigian et al. 1994). Table 40 presents the age and sex distribution compiled from information in the report. Arzigian et al. (1994) note some patterns: that each burial area contained burials of a wide span of ages and both sexes; that the period of greatest mortality is between 13 and 24 years; and that grave goods were included solely with adult males, juveniles and adults of indeterminate sex. The burials recovered at the Gundersen Clinic site seem to be associated with a series of posthole structures. A similar situation was observed at the Tremaine site (47LC95) discussed below.

Table 40. Age and sex distribution of individuals described from Gundersen Clinic (47LC394) (from Arzigian et al. 1994).

Age Interval	Male	Female	Indeterminate	Total
Infant (Birth - 2)	0	0	1	1
Child (3-10)	0	0	6	6
Adolescent (11-18)	0	4	8	12
Yg. Adult (19-30)	2	3	4	9
Mid Adult (31-45)	2	0	0	2
Old Adult (45+)	3	1	0	4
Adult	1	0	7	8
Subadult	0	0	2	2
Indeterminate	0	0	3	3
Total	8	8	31	47

A majority of what is known about the bioarcheology of the Pammel Creek phase comes from the unpublished analysis of the Tremaine site (47LC95) (Vradenburg n.d.). Area H of the Tremaine site (47LC95) is dated to A.D. 1440-1670  $\pm$  60 years. Ninety-two individuals were found in 1990 associated with the postmolds of seven structures. Additionally, scattered human skeletal elements were encountered in nonmortuary contexts, primarily refuse pits; these remains were not considered in the analysis presented below. Vradenburg (1991a, 1991b) performed an extensive osteological analysis on the remains and the large, unpublished report is currently on file at the State Historical Society of Wisconsin. Two hypotheses exist regarding the nature of Oneota existence in the LaCrosse area during the Late Prehistoric period. Gibbon (1972) and Withrow et al. (1991) postulate a depopulation of the LaCrosse area ca. A.D. 1550-1650 and a westward migration of many of the settlements. Withrow et al. (1991) characterize this migration as a gradual move that occurred in response to climatic changes that affected certain resources believed to be key to Oneota existence — bison and maize.

Gallagher and Arzigian (in press) proposed that the LaCrosse area Oneota economy during the Late Prehistoric period was characterized by intensification and diversification. Several societal features should be related to this subsistence strategy. Those traits that are amenable to investigation through analysis of human remains include low levels of warfare, malnutrition, disease and mortality.

Vradenburg's (1991a) extensive bioarcheological analysis of the 92 individuals recovered from the Tremaine site seeks to evaluate the hypotheses presented by Gibbon (1972), Withrow et al. (1991) and Gallagher and Arzigian (in press). Data categories include skeletal and dental pathology and anomalies, demographic parameters, postcraniometrics, stable carbon isotope values, and injuries attributable to violent behavior. Comparisons with various sites are made throughout the paper. Sites included for comparison are: two sites representing the Lake Winnebago phase Oneota, the Cowling portion of the Karow cemetery (Dirst 1982) and the Furman site (Kreisa 1986); the Valley View phase Oneota OT site (O'Gorman 1993); the Bold Counselor phase of northern Illinois, as represented by Norris Farm (Santure 1990; Santure et al. 1990); and the Late Woodland through Spoon River Mississippian populations of Dickson Mounds (Blakely and Walker 1967; Tallo et al. 1978).

Vradenburg presents life tables for Area H at the Tremaine site and reports a 14% infant/very young childhood mortality rate and punctuated rises in mortality for the 15-20 year (20.8%) and 20-25 year (13.2%) age categories. The residents of Area H had a life expectancy at birth of almost 23 years. The Area H sample does not show the expected postweaning mini mortality peak in the young childhood age ranges; in fact, the mortality rates for age 3-5 years is quite low (5%). Additionally, elevated early adulthood mortality rates begin at an earlier age (15-20 years) than in the other ancient Midwestern groups in the sample. Finally, Vradenburg (1991a) observes that another "mini" mortality peak occurs during the

35-40 year category. An analysis of sex differences revealed that females experienced a higher mortality in the age groups of 15-20 years and 20-25 years; male mortality surpasses female mortality after 25 years of age.

The frequencies of several dental pathological conditions, including caries, abscess, antemortem tooth loss, enamel agenesis, and linear enamel hypoplasia (LEH) are reported by Vradenburg (1991a). Caries frequency was evaluated using three methods. Approximately 11% (11.23%) of all teeth assignable to individuals exhibited at least one carious lesion. The average number of carious lesions per adult individual is 2.2. Finally, of 61 individuals, 62.3% are affected by at least one carious lesion. The results of each method of calculating caries frequency suggests some reliance on maize. The 62.3% caries rate for all individuals is similar to the caries rate for the Mississippian site of Aztalan, an unequivocally maize-dependent population (Rose et al. 1984; Sullivan n.d.; Turner 1979). Dental abscesses affected 33 individuals. An abscess frequency, however, cannot be calculated because the number of individuals or tooth sockets observed was not provided. Antemortem tooth loss (ATL) was reported as "not extreme" throughout the site. Ninety-eight teeth were lost antemortem. Again, frequency of ATL cannot be determined due to unknown sample size. Enamel agenesis results from imperfect development of the crown and is most frequently observed within the fissure on the buccal aspect of the molars. Of 60 individuals, 22 (36.07%) exhibited at least one instance of enamel agenesis. LEH frequencies were recorded for anterior permanent teeth only. Of 32 individuals, 27 (84%) exhibited LEH. The average number of growth disruptions per affected individual is 3.5. The most growth disruption in the Tremaine sample was experienced in the age range of 3.0-3.5 years.

Skeletal lesions were also recorded for the Area H Tremaine site sample. The frequencies of porotic hyperostosis and cribra orbitalia were reported as 14.3% (3/21) and 3% (1/35), respectively. Of 49 individuals, 12 (24.4%) exhibited lesions indicative of nonspecific infection. Degenerative conditions observed included vertebral osteoarthritis (40% of adults over 20 are affected), degenerative joint disease (43% of observable adults are affected), and dislocations (two cases of temporal/mandibular). Poor skeletal preservation and fragmentation limits a reliable determination of frequency and identification of any patterns of incidence.

Lesions of traumatic origin were observed and can be classified into two categories: fractures and trauma related to violence. Six individuals exhibited signs of fractures in various stages of healing; three vertebral, two humeri and one femur. Three individuals exhibit unequivocal skeletal evidence of violent death. The skeleton of Burial 502, a young adult male, exhibits extensive evidence of violence including 10 puncture wounds to the cranium in the area of the inferior right side of the occipital squama, a series of cutmarks on the lower right occipital squama, and three projectile points associated with the occipital bone, the right side of the rib cage, and with the distal right arm and adjacent pelvis. Three projectile points were recovered in the midshaft area of the left humerus of Burial 967, an adult male, in addition to one projectile point embedded in the anterior surface of the fourth thoracic vertebra. Burial 841-A, an adolescent male, experienced blunt trauma to the right parietal. Burial 841-A consists of a cranium and associated first through fifth cervical vertebrae; it is believed to have been intentionally included with Burial 841. Additionally, the context of another burial (a male 35 to 39 years old) is suggestive of a violent death. Two projectile points were found next to the vertebral column within the rib cage, and the cranium plus the first and second cervical vertebrae were missing.

Vradenburg (1991a) also reports that two burials were missing the crania and he considers this situation indicative of violence-based trauma. In summary, a liberal estimate of number of individuals affected by trauma of a violent origin is six (of 92, 6.5% of total sample).

Developmental anomalies included femoral malformation, vertebral asymmetry, and the presence of a roughened cortical area on the iliac fossa. Five individuals exhibited "markedly asymmetrical/twisted right femora" (Vradenburg 1991a:63). The twisting observed on these individuals most likely corresponds to the extreme femoral neck torsion observed in the Hogback site (21HU04), an Orr phase Oneota site in southeastern Minnesota as discussed by McConaghy (1996). Asymmetrical cervical vertebrae were observed in two individuals; this is commonly found in archeological samples. Finally, a roughened cortical formation was observed on the left and right ilia of one individual that the author interprets as being possibly related to shifting demands of locomotion related to arthritic changes observed in the hips.

Two bone samples were submitted for isotopic evaluation. Vradenburg (1991a) heeds Buikstra and Milner's (1991) advice against interpreting a small number of samples from a region and site that lack a comprehensive  $^{13}\text{C}$  isotopic analysis, and states that his comments are preliminary due to the testing of a single sample. The  $^{13}\text{C}$  and  $^{15}\text{N}$  values were -13.5 and 10.9, respectively. These values suggest a diet characterized by significant reliance on maize and a concomitant decrease in meat protein.

Vradenburg (1991a) concludes the analysis of the Tremaine skeletal sample by evaluating the two hypotheses proposed by Gibbon (1972) and Withrow et al. (1991), and Gallagher and Arzigian (in press). Gallagher and Arzigian's idea of a subsistence base characterized by intensification and diversification is supported by the low levels of violence-based trauma and nutrient deficiency diseases. However, this hypothesis is not supported by the increased frequency of growth disruptions, infectious disease, and caries which all may be interpreted to indicate a generally poor state of health resulting in increased mortality and decreased life expectancy. Vradenburg's final conclusion is that the results of his bioarcheological analysis lend some support to subsistence changes related to changing climatic conditions as posited by Gibbon (1972) and Withrow et al. (1991).

*Valley View Phase.* The bioarcheology of the Valley View phase of the Oneota aspect is moderately well known. Three sites listed in the database contain a Valley View phase mortuary component: Valley View (47LC34), State Road Coulee (47LC176), and OT (47LC262, 47LC553). Eighty-five individuals were encountered during excavation of these sites (14.5% of total Oneota sample); however, five of the total 82 individuals from OT were analyzed in situ and never removed from the ground. There has never been a report on the individual from Valley View. Descriptive data of the two individuals recovered from State Road Coulee are presented in Anderson et al. (1995). The most extensively analyzed sample of Valley View Oneota is from the OT site (Vradenburg 1993).

The State Road Coulee site (47LC176) is set in an abandoned channel of Pammel Creek at the base of the sandstone bluffs in the Mississippi Valley. The site consists of a deep midden created by Valley View phase peoples, where human remains were encountered during the 1991 Phase III excavation. An isolated burial was encountered at the northeast edge of the midden which contained the incomplete remains of a 30 to 40 year old male. Slight to moderate osteoarthritic changes were observed on the vertebrae and other joints. Most noteworthy was the absence of the cranium and the first three cervical vertebrae of this individual. Cuts observed on the fourth cervical vertebra are consistent with intentional removal of the cranium (Anderson et al. 1995). Headless skeletons have been recovered at other Oneota sites (Santure 1991; Vradenburg 1991a) and, conversely, isolated crania have been included as grave goods with complete individuals (Bray 1961; O'Brien and Hart 1972; Vradenburg 1991a).

OT (47LC262) is a single component site excavated between 1986 and 1989 as part of cultural resource testing of the Highway 53 Expressway project. Excavations of the OT site uncovered a large habitation area and two smaller portions of isolated burial areas believed to belong to the Valley View phase. OT is one of several sites which comprise the Tremaine complex, a contiguous area of prehistoric use. Individual site designations were based on the surface distribution of artifacts and modern intercepts (e.g., roads). It is possible that several or all of the sites represent a single prehistoric occupation (O'Gorman 1993:1). Other Tremaine complex sites which have yielded human remains include Tremaine (47LC95) and Filler (47LC49).

The Tremaine complex sites are located in the LaCrosse area of the Mississippi Valley, near the Black, LaCrosse, and Mississippi rivers convergence. OT is located on Onalaska terrace along Halfway Creek and inhabitants of this and other Tremaine complex sites would have had access to resources from a vast array of physiographic zones. Additionally, the soils of the nearby low floodplain provided excellent possibilities for crop production (O'Gorman 1993).

Human remains were recovered from three locations at OT: the eastern ridge (Area I), the central knoll (Area II), and an area south of the central knoll referred to as the "southern burial area" (Area III). Areas I and II are believed to be contemporaneous; however, the temporal relationship between Area III and the other two areas is unknown. Skeletal remains recovered from the eastern ridge (Area I) were in seven isolated nonmortuary contexts, a majority of them in refuse pits. All but two of the bone fragments recovered were cranial and dental in origin. Vradenburg (1993) describes each isolated fragment recovered.

The remains recovered from Area II, the central knoll, were excavated in 1986 and initially analyzed by Sullivan (1989) and Sullivan and Penman (1990). Vradenburg reanalyzed these remains as part of the final project. A minimum of five individuals were recovered: a child less than 10 years of age, a female between 30 and 40 years old, an older female over 40 years old, an adolescent of indeterminate sex approximately 15 years old, and an adult of indeterminate sex between 17 and 25 years. The child and two adult females were identified by Sullivan (1989; Sullivan and Penman 1990), and the two individuals of indeterminate sex by Vradenburg (1993). Vradenburg summarizes some of the information presented earlier by Sullivan; however, he does not identify the age and sex of the individuals except for the newly identified individuals and the child. The author reports on the dental health of only one of the two adult females because additional teeth were identified as belonging to her; however, he does not identify which one it is.

The southern burial area (Area III) was encountered in 1989. The burials were excavated, analyzed, photographed and mapped in situ, and reburied. A summary of the skeletal elements present, age and sex estimates, dental and skeletal pathology, stature estimates, mode of burial, and presence of grave goods are reported for each burial. One child between the ages of 7.5 and 12.5 years, two adult females between 17 and 24 years and 28 and 52 years, a young adult male between 17 and 25 years, and an adult of indeterminate age and sex comprised the sample.

Table 41 presents the age and sex distribution for the combined sample of Areas II and III. Caries was observed in four of five adults (80%); abscess in two of five adults (40%); linear enamel hypoplasia in four of five adults (80%); and four of four adults (100%) had lost at least one tooth antemortem. Pathological conditions were reported for the southern burial area individuals only and consist of a partially healed perforation of unknown origin on the anterior surface of the proximal left femur of the child and a case of unhealed osteitis on the cranium of the 17 to 24 year old female. Only this latter individual was sufficiently complete to yield a stature estimate: 5 ft. 5 in.  $\pm$  1.3 in.

Table 41. Age and sex distribution of individuals interred in Areas II and III at the OT site (47LC262) (from Vradenburg 1993).

Age Interval	Male	Female	Indeterminate	Total
Infant (Birth - 2)	0	0	0	0
Child (3-10)	0	0	2	2
Adolescent (11-18)	0	0	1	1
Yg. Adult (19-30)	1	1	1	3
Mid Adult (31-45)	0	2	0	2
Old Adult (45+)	0	1	0	1
Adult	0	0	1	1
Subadult	0	0	0	0
Indeterminate	0	0	0	0
Total	1	4	5	10

Seven isotope values were reported: five for  $^{13}\text{C}$  (-13.2, -12.1, -13.4, -11.9, -13.3) and two for  $^{15}\text{N}$  (10.7, 10.6) for three individuals from the central knoll. The  $^{13}\text{C}$  values are indicative of a significant reliance on maize as a food source and the two  $^{15}\text{N}$  values imply either a low intake of animal protein or a high intake of legumes. The carbon and nitrogen isotope data from OT, as well as from the Tremaine site, appear to reflect hypothesized subsistence practices indicated by the skeletal, floral, and faunal analyses conducted for each site (O'Gorman 1993; Vradenburg 1991a, 1993).

#### Comparative Analysis of the Oneota

Elizabeth Glenn's (1974) monograph, *Physical Affiliations of the Oneota Peoples*, is the only existing bioarcheological treatise of the Oneota. Glenn's monograph is based on her dissertation from Indiana University (1971) and addresses primarily three areas of inquiry: the origins of the Oneota, the intratradition biological variation, and the congruence of Oneota populations with Neumann's (1952) varietal groupings (e.g., Muskogid, Lenid, Otamid). Glenn has synthesized information derived from archeology, ethnohistory, linguistics, and biological anthropology in her quest to explore and define the affiliations of the varied populations that comprise the Oneota tradition.

The affiliations of the Oneota are examined by conducting a multivariate craniometric analysis on 379 individuals arranged into 19 comparative groups. In preliminary analyses, 39 measurements and 24 indices were considered. Later analyses relied on a reduced variable set determined by discriminatory capabilities of the various measurements. Additionally, morphological variation was noted in order to visually characterize the different populations. Skeletal samples representing various Oneota foci from Wisconsin, Iowa, Minnesota, Illinois, and Missouri, as well as samples from contemporaneous, geographically proximate, and archeologically associated groups, were included in the multivariate discriminate analysis. The means of the measurements and indices are reported for each series, as well as a summary of the cranial morphology that characterizes each series. Of the 379 individuals recovered, 64 were from Wisconsin sites representing the Grand River (N=5) and Lake Winnebago (N=31) foci of the Oneota tradition, the Effigy Mound culture (N=14), Middle Mississippian (N=6; from Aztalan), and part of Neumann's Lenid variety (N=8; from Reigh site, Archaic Old Copper culture). Two hundred and fifteen individuals comprised seven of Neumann's defined American Indian "varieties." The remainder of the total sample are from Iowa, Minnesota, Illinois, Indiana, Missouri, and Nebraska.

The multivariate discriminate analyses yielded interesting results. Relative to the question of the origin of the Oneota, samples representing early Oneota populations/foci (i.e., Grand River, Silvernale) were compared to skeletal samples hypothesized to have been representative of the source populations of the Oneota (i.e., Effigy Mound, Middle Mississippian). With special reference to Wisconsin's populations, Glenn

concluded that Grand River showed no relationship to any of the other series, including the contemporaneous Silvernale focus, Effigy Mound culture, or the Middle Mississippian Aztalan series. This conclusion suggests that the Wisconsin Oneota did not share population affiliations with either the Middle Mississippian groups or the local Late Woodland populations. Glenn also reports that cranial morphology varies between the included foci and "more or less follows archeological divisions" (Glenn 1974:139). The Lake Winnebago and Grand River foci of eastern Wisconsin assort together and appear to be distinct from the western foci, suggesting that the recognized distinctions between the western and eastern Oneota foci in Wisconsin were present early in the Oneota tradition, perhaps during the Emergent horizon (Gibbon 1972; Hall 1962). Similarly, the results lend credence to Hall's (1962) conclusions that the anomalous Grand River focus is related to the later Lake Winnebago focus, perhaps as part of a developmental sequence. An added dimension of Glenn's study is the comparison of a sample of historic Sauk, who are known to be closely affiliated to the Winnebago, to the various Oneota foci. The Sauk overlapped considerably with the Lake Winnebago foci, but were quite distinct from the other foci. These results concur with the well accepted view that the precontact ancestors of the Winnebago can be found in the Lake Winnebago focus (Lurie 1960). Finally, Glenn's research exemplifies the biological heterogeneity of the total sample, as well as the complex nature of Oneota affinities, by the intermediate position of a majority of the samples under consideration relative to Neumann's typological "varieties."

#### Summary of the Oneota Aspect

A moderately interpretable body of bioarcheological data are well developed for the Oneota period. Two major areas of Oneota occupation, both located in the Eastern Woodland zone, are represented in the bioarcheological literature: the southeastern area incorporating the Grand River, Koshkonong, and Lake Winnebago phases; and the southwestern region incorporating the Brice Prairie, Pammel Creek, and Valley View phases. Reasonably large skeletal samples exist for each region; however, the earliest or Emergent phases (Grand River, Koshkonong, and Brice Prairie) are poorly represented by skeletal remains.

The bioarcheology of the southeastern area is primarily known through analysis of Lake Winnebago sites by Dirst (1982, 1984), Dirst and Kreisa (1982), Kreisa (1986, 1993), and Sullivan (1986, 1989, 1990a, 1990b). The frequencies of carious lesions (mean = 30%) and enamel hypoplasia (39%), coupled with an assessment of porotic hyperostosis (33%) are indicative of an increase in maize consumption, intermediate between Archaic and Middle Mississippian populations. No infectious lesions were reported. Trauma of violent origin was not observed on any individuals.

Bioarcheologically, the southwestern area presents a different picture of Oneota life. The bioarcheology of the western Oneota is known primarily through the analysis of remains representing the Pammel Creek and Valley View sites (Vradenburg 1991a, 1993). In some cases, caries frequencies are twice as high in the western group (mean = 71%) as in the eastern Lake Winnebago phase group (mean = 30%). Enamel hypoplasia also tends to affect twice as many individuals in the western group (mean = 82%) and the frequency of abscess is higher. The incidence of porotic hyperostosis, however, disrupts the pattern by affecting a smaller percentage of individuals (14.3%) relative to the Lake Winnebago phase individuals. The frequencies of the dental and skeletal pathology listed above, coupled with stable carbon isotope values of between -11.9 and -13.5, indicate intensive reliance on maize horticulture. Violent trauma is observable on seven individuals and is characterized by decapitation, sharp-force injuries, and projectile wounds and/or associations. Infectious lesions are present at the Tremaine site on 24.4% of the sample.

The differences in skeletal biology between the two regions of Oneota occupation are intriguing and have never been noted previously. Glenn's (1974) biological distance study investigating the affinities of the Oneota support the distinctiveness of the two regional groups by the loose alignment of the included skeletal samples into western and eastern groups. Glenn remarks that this division must have occurred early, as indicated by the separation of the earliest Oneota phases into regional groups.

#### Middle Mississippi (A.D. 1000-1500)

Three distinct cultural groups were occupying overlapping sections of Wisconsin by approximately A.D. 1000. Late Woodland peoples continued to practice a more migratory hunting/gathering strategy, the Upper Mississippians or Oneota practiced a more sedentary existence that included dependence on maize horticulture and collection of locally available wild resources, and the Middle Mississippians practiced more intensive maize agriculture with a reduced emphasis on locally available wild resources. Additionally, the Middle Mississippian groups were organized in a state-oriented sociopolitical structure with centralized leadership and an "emphasis upon community-oriented social and religious activities ... Middle Mississippi communities were centered on a temple town with one or more earthen temple mounds and open plazas as central features" (Hall 1986:368). Both Late Woodland hunter-gatherers and Oneota were less formally organized socially and their habitation areas were organized in distinctly different ways; flat-topped pyramid or temple mounds were notably absent as well. The relationship of the Middle Mississippi peoples to the surrounding populations remains unclear, although numerous researchers have hypothesized various scenarios (Barrett 1933; Goldstein and Richards 1991; Griffin 1946, 1960; McKern 1941).

The number of Middle Mississippi sites in Wisconsin is few; however, the influence of this strong culture is observable in several of the Late Woodland and Oneota phases. Three sites are identified as containing a Middle Mississippi mortuary component (Table 42). A minimum of seven individuals are listed in the database as recovered from these sites. The number reported for Aztalan is problematic and reflects only the number of individuals definitively located at an institution in Wisconsin. Two of the seven individuals (29%) were recovered from the Northern Forest region; the remaining five (71%) are from sites located in the Eastern Woodland region. All seven individuals listed in the database have undergone partial osteological analysis. Bioarcheological knowledge of the Middle Mississippian peoples is growing but is currently limited to the interpretations from the renowned site of Aztalan.

#### Northern Forest

The adaptation type practiced by inhabitants of the Northern Forest region during this time period was primarily horticultural; however, some collecting of locally available resources continues and still may have comprised a significant portion of the diet. One Middle Mississippi site listed in the database, Sikora Burial, is located in the Northern Forest region. Two individuals were recovered from this site. Partial analysis has been completed but is unpublished.

Table 42. Middle Mississippian burial sites in Wisconsin in the Eastern Woodlands (EW) and Northern Forest (NF) regions.

Site	Phase	MNI	Region	Type
(47DA—)	Unknown	1	EW	Mound
Sikora Burial (47LG9001) <sup>1</sup>	Unknown	2	NF	Cemetery
Aztalan (47JE0001) <sup>2</sup>	Unknown	4	EW	Mound

<sup>1</sup>Harris 1992; <sup>2</sup>Barrett 1933

## Eastern Woodlands

Middle Mississippi inhabitants of the Eastern Woodland region practiced an economy of intensive maize horticulture supplemented by other crops. A subsistence system based on intensive maize horticulture resulted in less collecting and hunting of local resources. The settlement pattern is characterized by large, permanent fortified villages. Two sites identified as Middle Mississippi are located in the Eastern Woodland region, an unnamed site in Dane County and the well-known site of Aztalan (47JE01). Thirty-two individuals are reported to have been excavated from Aztalan and one from the site in Dane County. Partial analysis has been completed on the remains from Dane County, but no information has been published.

Aztalan is a well known site located in Jefferson County on the west bank of the Crawfish River approximately 5 miles north of the confluence of the Rick and Crawfish rivers. Early survey, prior to partial site destruction due to agricultural activities, and numerous excavations have resulted in a detailed knowledge of the site structure. The settlement of Aztalan consisted of "a palisaded mound-and-village complex oriented around a central plaza-like area... Approximately nine hectares of gently sloping land were completely encircled by about 1,340 meters of palisade... flat-topped pyramidal mounds were located in the southwest, northwest, and northeast corners of the enclosure, while a naturally occurring gravel knoll formed a high prominence in the southeast corner" (Goldstein and Richards 1991:195). Archeological excavation uncovered two interior palisades, one bordering sections of the gravel knoll, and another enclosing the plaza area of the site. There were additional site-related features documented outside the external palisade.

A review of the archeological literature (Barrett 1933; Goldstein and Richards 1991; Rowe 1958; Sullivan 1990a, 1990b) leads to the conclusion that a reliable estimate of the minimum number of individuals (MNI) recovered from Aztalan has not been determined to date. Furthermore, the location of all the excavated remains is unknown. The MNI reported for Aztalan in the database reflects only those remains physically located. Barrett (1933) reports the discovery of six burials: one female approximately 20-25 years of age; one adult male; an adult approximately 30 years of age of indeterminate sex; an infant, and two children, one approximately 10 years old, the other between 5-6 years old. The individuals encountered by Barrett were recovered from a number of different contexts including burial within a mound and within refuse pits. Additionally, Barrett (1933) notes the presence of isolated skeletal elements, as well as whole body segments (e.g., an articulated arm) in nonmortuary contexts. These isolated elements are numerous and exhibit signs of postmortem manipulation including spiral fractures, cutmarks, and burning, which Barrett interpreted as evidence for the regular consumption of flesh, cannibalism, by the Aztalan inhabitants.

Holcomb (1952) has presented the most complete analysis of the remains excavated from Aztalan to date, including those recovered by Barrett in 1919, 1920, and 1932, as well as those excavated by the Wisconsin Archeology Survey in 1949, 1950, and 1951. Holcomb divides the skeletal series into two groups. The burial series includes all intentional burials (N=10) and the pit series refers to all human remains from nonmortuary features including refuse pits (N=28). The remains recovered from nonmortuary contexts are incomplete and fragmentary and are believed to be the remnants of individuals cannibalized by the inhabitants of Aztalan. The minimum number of individuals represented in the skeletal series analyzed by Holcomb is unstated. The total presented here represents a tally of all individuals mentioned in the report. The minimum number of individuals from the pit series was calculated by number of individuals represented per feature and not by duplicated skeletal elements. The

MNI estimate may, therefore, be larger than actual number of individuals present. Table 43 presents the demographic parameters of the 10 individuals that comprise the burial series. Table 44 presents the nonmortuary features and the minimum number of individuals present reported by Holcomb.

Rowe (1958) describes the discovery of 11 individuals buried in a truncated mound in the extreme northwest corner of the site within the stockaded village. The burials were originally placed within a structure situated on top of the second stage of mound construction. Ten individuals were placed side by side; nine were in an extended position, and one was in a slightly flexed position to fit within the pit. The eleventh individual was a secondary bundle burial and was positioned in the northwest end of the pit. The slightly flexed individual was an adult female. No additional bioarcheological information was reported.

A sample size of 32 (24 males, three females, three indeterminate) can be extracted from a chart presented by Sullivan (1990a). Eight individuals are recorded from formal burials (five males, two females, one indeterminate), and 22 (19 males, one female, two indeterminate) are from isolated elements in nonmortuary contexts. Sullivan, in another paper (1990b), reports an Aztalan sample of 62 instead of the 32 reported in his 1990a paper. Clearly a definitive estimate of the minimum number of individuals recovered from Aztalan is needed.

The remains from Aztalan have been included in several substantive bioarcheological studies (Glenn 1974; Holcomb 1952; Sullivan 1990a, 1990b). Holcomb (1952) presents the first bioarcheological analysis of all human remains excavated from Aztalan prior to 1952 in his Master's thesis. The objectives of the research are: (1) to describe the "physical type" of the individuals buried within the site boundaries of Aztalan; (2) to compare the Aztalan remains with those recovered from more southern Middle Mississippian sites as well as with local and more distant Woodland populations; and (3) to discuss the individuals identified as cannibalized and determine if certain regions of the body were preferred for consumption over others (e.g., lower limbs vs. upper limbs), and if one

Table 43. Age and sex distribution of burial series remains from Aztalan.

Burial	Relative Age	Sex
1	Juvenile	Indeterminate
2	Adult	Male
3	Adult	Male
4	Child	Indeterminate
5	Child	Probable Female
6	Adult	Male
201	Young Adult	Female
202	Young Adult	Female
203	26 - 28 yrs	Female
26862	Indeterminate	Indeterminate

Table 44. Nonmortuary features and estimated minimum number of individuals per feature from Aztalan.

Feature	MNI	Comments
25	1	remains of a skull and pelvis
34	1	cranial and undetermined long bones
37	1	undescribed fragments only
38	2	two right tarsals
39	1	incomplete humerus, right and left radius
49	1	fragments of vertebrae, pelvis, ribs
58	1	incomplete right humerus, ulna and radius
70	3	no description of remains provided
73	2	no description of remains provided
76	1	articulated right arm
77	4	four distal portions of right tibiae
79	3	fragments plus one male cranium
81	1	no description of human remains provided
82	5	157 human bone fragments; 5 proximal femora present
83	1	articulated right hand

Note: Estimated minimum number of individuals represented by feature = 28

sex was predominantly represented in the nonmortuary contexts. The above stated objectives were ambitious and laudable given the stated limitations of the skeletal material sample, including a small sample size due to poor preservation and the absence of a designated cemetery, the probable admixture between the Middle Mississippians at Aztalan and local Late Woodland populations, and a dearth of comparative Middle Mississippian and Late Woodland skeletal samples.

Data collected by Holcomb on both burial and pit series included cranial measurements and nonmetric traits, postcraniometrics and nonmetric traits, and skeletal and dental pathology. Tables present the means of the metric data, frequencies of the nonmetric data, and written descriptions of general morphology for males and females separately for each series. Stature estimates are also reported. Comparisons were variously made with the Woodland period Outlet site (Bakken 1949), Late Woodland Gooden and Hagen sites (Neumann 1937), the Middle Mississippian Black Sands (Neumann 1937), Spoon River focus (Neuman 1937), Moundville (Snow 1941), Luv 92 Koger's Island (Snow and Newman 1942), and Steed-Kisker (Stewart 1943) sites, and the historic Algonquian sample reported in Hrdlicka (1927). Of the sites listed only the Outlet site and the Algonquian sample are from Wisconsin. Univariate methods of analysis are applied to the metric data.

Holcomb's (1952) conclusions are preliminary given the limitations of his statistical methodology and the nature of the skeletal sample. There are very few pathological conditions. One individual exhibited lesions on the right tibia possibly attributable to syphilis and characterized by periostitis, cortical thickening, and Harris lines. Osteoarthritis is observed on many individuals, but an exact frequency is not presented. The teeth are characterized by extreme tooth wear and frequent, but slight, caries (seven or eight individuals, 88%). One individual of eight (13%) exhibited an abscess, one individual had a supernumerary premolar, and the dentition overall was characterized by tooth crowding and overbites. Holcomb describes the crania as generally dolichocranic and small; none of the skulls exhibit artificial cranial deformation.

The postcranial remains presented the largest number of remains to be analyzed. Holcomb describes the Aztalan individuals as primarily right-handed, hyperplatymeric, and relatively tall. The average stature of the males is 162 cm for the Burial series and 167.1 cm for the pit series, and the average stature of females is 154.3 cm and 153.3 cm, respectively. Holcomb reports that it is difficult to say anything regarding the relationship between the burial and pit series; when comparisons were possible, there were no significant differences between them in measurements or nonmetric trait frequencies. Holcomb concludes that there was very likely genetic admixture between the Middle Mississippian, Aztalan, and the local Woodland populations.

Holcomb's (1952) discussion of the isolated skeletal elements believed to have been cannibalized is sparse and disappointing. He does not present Barrett's (1933) evidence for "dietary" (as opposed to ritual) cannibalism and briefly describes the human skeletal contents of each feature in terms of an inventory only. He concludes that more males than females are represented in the nonmortuary pits and that lower limbs outnumber upper limbs. Frequencies of elements present are reported, but no frequencies of sex distribution are presented. The Holcomb thesis certainly provides a reasonably good description of the remains excavated prior to 1952; however, definitive conclusions are limited due to poor preservation, small sample sizes, and a lack of relevant comparative collections.

A graduate student in the Department of Anthropology at the University of Chicago is completing a Master's thesis on the human remains recovered from Aztalan. The bioarcheological information presented in

the thesis will undoubtedly incorporate the remains excavated since 1952 and has the potential to contribute greatly to our understanding of the biological nature of the inhabitants at Aztalan, their affinities to local surrounding Late Woodland populations and more southern Middle Mississippian populations, and the character of their daily life.

Glenn (1974) included six adult male crania in her biological distance study to identify the affinities of the Oneota. The Aztalan male sample is characterized as mesocranic with a mean cranial index of 78.80. The cranial morphology is generally robust, and muscle attachment areas are moderate to well developed. Multivariate analyses utilizing 39 measurements and 24 indices evaluated the biological relationships between 19 groups. The Aztalan series showed close affiliation to the Bryan site individuals, an early or emergent Oneota sample from southeastern Minnesota. Both the Bryan and Aztalan series also shared affinities with Neumann's Muskogid variety, "a variety associated by Neumann (1960) with the cultural expansion of Middle Mississippian" (Glenn 1974:138). The Muskogid sample comprised 48 Spoon River males from Fulton County, Illinois. A cautionary note, however, is the questionable identification of the Bryan skeletons as Oneota and the fact the sample consists of two incomplete crania.

Glenn (1974) and Holcomb (1952) differ somewhat in their conclusions regarding the population affinities of the Aztalan sample. Holcomb found some similarity to local Woodland populations (although he did not compare Aztalan to an Effigy Mound group as did Glenn) and limited affinity to the Spoon River sample. It should be noted, however, that it is unknown if the Spoon River sample used in both studies consists of the same individuals. The different results are likely attributable to the differences in sample size (two vs. six), statistical methodology (univariate vs. multivariate), and comparative samples.

Sullivan's research is dedicated to identifying the biological correlates of various subsistence practices as well as the health impact of prehistoric culture contact (1985, 1986, 1990a, 1990b). An Aztalan skeletal sample has frequently been included in Sullivan's research as representative of a population heavily dependent on maize agriculture (1990a, 1990b). Frequencies of skeletal and dental pathology have been reported that indicate that maize was an important component of the Aztalan diet; 16 of 26 individuals exhibited at least one carious lesion (62%) and 48% of all individuals exhibited porotic hyperostosis. Sullivan (1990a) further explores the frequency of intergroup warfare and hypothesizes that it is infrequent prior to Mississippian times and that, conversely, it is much more frequent during the Mississippian period. It is reported that a large number of skeletal elements were recovered from isolated nonmortuary features and that 25% of them have been "intentionally altered as indicated by cutmarks, spiral fractures and/or burning" (Sullivan 1990a:78). Furthermore, the isolated skeletal elements are primarily from adult male individuals. The evidence from isolated skeletal elements, in conjunction with the presence of a palisade, is interpreted to be suggestive of more frequent intergroup conflict.

Individuals from Aztalan have been utilized in several bone chemistry studies that have focused on dietary reconstruction (Bender et al. 1981; Price and Kavanagh 1982; Schurr 1992). Additional interpretations of isotope and chemical element results are presented in the Archaic and Middle Woodland sections of this chapter. Results directly associated with the Aztalan sample will be discussed here. Bender et al. (1981) analyzed 46 human bone samples for stable carbon isotope ratios from nine sites in the midwestern region of the United States in order to evaluate the role of maize horticulture in the economy of Hopewell centers in Ohio, Illinois, and Wisconsin. Bone samples from 19 individuals come from five Hopewell sites and the remaining 27 samples from the Archaic



site of Reigh (47WN01), the Middle Mississippian sites of Aztalan (47JE01) and Cahokia, the Late Woodland Ledders site in Illinois, and the Historic Ottawa site of Rock Island II. The carbon isotope ratios of the Archaic sample (Reigh) and Mississippian samples (Aztalan and Cahokia) function as baselines of nonmaize-consuming and intensive maize-consuming populations, respectively. The individuals sampled from Aztalan possibly represent three different social classes. Three samples were taken from definite Middle Mississippian individuals, one sample from an individual recovered from a formal burial pit of unknown population affiliation but believed to be more recent in origin, and five samples from human bone buried in refuse pits and believed to represent the remains of cannibalized, low status, individuals. Carbon isotope ratios range from -12 to -19.2 and are clearly indicative of a population dependent on maize. It is significant to note the great range in values determined for the nine Aztalan individuals. Bender et al. (1981) interpret the variability as indicative of dietary composition from individual to individual and, perhaps, differential access to food sources based on social status. They note that the known Middle Mississippian (high status) individuals from Aztalan consumed the least amount of maize.

Schurr (1992) continues to explore the application of stable isotope techniques to questions involving diet composition and subsistence practices. His research demonstrates a correlation between carbon and nitrogen isotope ratios (as indicators of dietary composition) and mortuary variability (as an indication of social position) in the Angel site, a Middle Mississippian site in southwestern Indiana. His results are supported by carbon isotope ratios from a number of other studies. Standard deviations, adjusted for sample size, increase through time and the most variable ratios are observed in sites that postdate A.D. 800, when values indicate that maize is well established in the diet of the sites' inhabitants. Some of the high standard deviations may be attributed to "intracommunity variation in maize consumption" (Schurr 1992:301). Schurr (1992) reports the variable carbon isotope ratios from the Aztalan samples analyzed by Bender et al. (1981) and critiques the interpretation that the variability correlates to social positions within the Aztalan community. Caution must be exercised in the interpretations of the Aztalan carbon isotope ratios because seven of the eight samples were likely subjected to postmortem heating and the variation may reflect the heating event as opposed to dietary composition. Schurr (1992) points out that heating has been proven to reduce carbon isotope values and that the seven Aztalan samples that may have undergone heating are significantly lower than the one sample (Burial 202) that did not experience heating.

Price and Kavanagh (1982) conducted a chemical element analysis of bone samples from 17 human and animal bones from four sites in Wisconsin. Four human samples were assayed from the Late Archaic Reigh site, two human samples from the Middle Woodland Trempealeau site, four human samples from the Middle Woodland Millville site, and four human samples from Aztalan. When possible, the same burials analyzed by Bender et al. (1981) for carbon isotope ratios were analyzed by Price and Kavanagh (1982) in order to compare degree of concurrence between isotope and element values. The four definitely Mississippian individuals tested by Bender et al. (1981) were not included in this study. Bone concentrations were presented for 12 elements, but discussion centered on strontium values. The four samples from Aztalan presented strontium/calcium ratios that ranged from .343 to .929. Generally, the element concentrations concur with the great dietary variability indicated by the carbon isotope ratios reported by Bender et al. (1981). Burial 202 (an intentional burial of an adult female), however, is anomalous. She shows a high carbon isotope ratio (-12.0) and a lower strontium/calcium ratio (.343). Nevertheless, the strontium/calcium ratios for the Aztalan sample are indicative of a diet with a significant percentage of plant foods. Price

and Kavanagh (1982) conclude that strontium concentrations increase through time from the Late Archaic through the Mississippian reflecting an increased reliance on plant foods. They report their conclusions as tentative due to various complicating factors and limitations of the element methodology, but they do stress the great potential of bone chemistry techniques to illuminate questions involving diet and subsistence.

#### Summary of the Middle Mississippian Period

A single site, Aztalan, has provided all that is known bioarcheologically for the Middle Mississippian period. At this time, the human remains from Aztalan have been the subject of one more in-depth analysis and variously incorporated into several other comparative studies. The bioarcheological research has focused primarily on the reconstruction of dietary practices and determination of the nature of biological relationships to surrounding Late Woodland populations and larger Mississippian settlements to the south in Illinois and Missouri.

Middle Mississippians are hypothesized to have expanded north into Wisconsin around A.D. 1000. During the course of their expansion and eventual settlement, they are known to have encountered local Late Woodland and Oneota populations. The nature of the contact with these other populations has been the subject of much conjecture and numerous hypotheses. The interaction of the inhabitants at Aztalan with local groups has been variously characterized, either directly or indirectly, as peaceful, antagonistic, and/or colonialistic. Data have been interpreted to reflect each type of interaction. Much discussion has focused on the dietary cannibalism believed to have been practiced at Aztalan. Barrett (1933) cited the frequent inclusion in refuse pits of fragmentary human remains that exhibited fracture patterns or cutmarks similar to those documented on more traditional animal food sources. Parmalee (1960), however, disagrees and points out that Barrett never counted the human bones relative to other faunal remains and that, in fact, human bone fragments do not comprise a significant percentage of the overall sample of faunal remains. Additionally, researchers have noted the inclusion of isolated skulls with burials and have interpreted these as trophy skulls of neighboring Late Woodland men (Barrett 1933; Holcomb 1952; Sullivan 1990a, 1990b). Conversely, the presence of great numbers of Late Woodland ceramics and the absence of any traumatic injuries that unequivocally indicate interpersonal conflict (e.g., embedded projectile points) offer insight about social interaction with neighboring populations.

The frequency of various types of skeletal and dental pathology have provided some insight into the nature and quality of Middle Mississippian existence. High frequencies of individuals affected by caries (62%), porotic hyperostosis (48%) and the presence of Harris lines are reflective of a diet characterized by high levels of maize consumption and consequential nutritional deficiencies. Chemical element concentrations and stable carbon isotope ratios are also indicative of a diet consisting of significant maize consumption; however, the values of elements and stable isotopes are variable across the skeletal samples and may reflect differential access to foodstuffs. Results suggest that higher status Middle Mississippian inhabitants consumed less maize than the presumably Late Woodland individuals recovered from the refuse pits.

#### Historic Period (A.D. 1634-Present)

Mason (1986) presents a discussion of the status of archeological knowledge of the Historic period in Wisconsin. Her chapter is organized using George Quimby's divisions of Early Historic (A.D. 1610-1670), Middle Historic (A.D. 1670-1760) and Late Historic (A.D. 1760-1820). Within each section, Mason discusses what is known for the Historic period in

Wisconsin in the broader context of Native American culture change throughout North America, including documented movements/migrations of known historic tribes. The Historic period commences with the arrival of the French explorer Jean Nicolet in 1634. The term "Protohistoric" is defined as that segment of time when European artifacts are recovered, but it is unknown whether direct contact took place.

Forty-seven sites with Historic period mortuary components are listed in the bioarcheology database (Table 45). Twenty-four of these sites are located in the Eastern Woodland region and 23 in the Northern Forest region. A minimum number of 1,911 individuals have been reported or recovered from these sites comprising approximately 38.5% of the total number of individuals recovered from Wisconsin sites. Ninety-four percent (N=1,792) of all Historic period individuals have been recovered from the Eastern Woodland region and 6% (N=119) from the Northern Forest. The significant difference between the number of individuals represented per ecological zone is skewed by the Almshouse Burial Ground

Table 45. Wisconsin sites with a Historic mortuary component in the Eastern Woodlands (EW) and Northern Forest (NF) regions.

Site	Culture	MNI	Region	Type
Ackerman Mound (47AD18)	Unknown	1	EW	Mound
Grant's Point Huron (47AS13) <sup>1</sup>	Chippewa	2	NF	Cemetery
Marina Cemetery (47AS24) <sup>2</sup>	Chippewa	0	NF	Cemetery
Gravel Pit (47CH60) <sup>3</sup>	Unknown	2	NF	Cemetery
47CR166	Unknown	2	EW	Grave
47CT50	Unknown	2	EW	Cemetery
WisEduAssCouncil (47DA9006) <sup>4</sup>	Black,White	1	EW	Unknown
Stephenson Pier Burial (47DR10)	Unknown	2	NF	Cemetery
47DR33	Unknown	2	NF	Cemetery
47DR40	Unknown	2	NF	Cemetery
47DR55	Unknown	2	NF	Cemetery
47DR109	Unknown	1	NF	Cemetery
47DR126	Unknown	1	NF	Cemetery
Rock Island (47DR128)	Ottawa	14	NF	Cemetery
Hanson (47DR185) <sup>5</sup>	Nat. Amer.	13	NF	Cemetery
47FD9001 <sup>6</sup>	Winnebago	1	EW	Isolated
47FR9003 <sup>7</sup>	Unknown	1	NF	Cemetery
Dewey Mound Group I (47GT21) <sup>8</sup>	Unknown	1	EW	Mound
St. Bridgets Cem. (47IA9001)	White	1	EW	Cemetery
Black River Falls (47JA9001) <sup>9</sup>	White	1	EW	Cemetery
Red Oak Ridge I (47LC161) <sup>10</sup>	Winnebago	1	EW	Isolated
LaCrosse March Cem. (47LC510)	Unknown	2	EW	Cemetery
Tresner Family Cem. (47LC9002)	White	1	EW	Cemetery
47MI186	Unknown	2	EW	Cemetery
47MI193	Unknown	1	EW	Cemetery
Almshouse Burial Grd. (47MI9003) <sup>11</sup>	White	1730	EW	?
Pauper Cemetery (47MI9004)	White	8	EW	Cemetery
Island Village Site (47MN101) <sup>9</sup>	Potawatomi	4	NF	Cemetery
Pioneer's Rest Cem. (47MN9001) <sup>12</sup>	White	2	NF	Cemetery
47MQ0084	Unknown	2	NF	Cemetery
Big Bull Falls (47MR9001)	White	1	EW	Cemetery
Doyle (47OC64)	Unknown	1	NF	Mound
Grignon Trading Post (47OU72)	White	2	NF	Other
McCrea Mound Cem. (47OU117) <sup>13</sup>	Unknown	55	NF	Mound
Altenburg Cemetery (47OZ68) <sup>14</sup>	White	12	EW	Cemetery
Stoltz (47OZ9001) <sup>15</sup>	White	10	EW	Cemetery
Isabelle Creek Cem. (47PI9001)	White	7	EW	Cemetery
White-Fox River Grp. (47RA0004)	Unknown	1	EW	Mound
Lac Court Ouilles (47SY9001)	White	1	NF	Isolated
47VI9002 <sup>16</sup>	Unknown	1	NF	Mound
Prairie Home Cem. (47WK9001) <sup>9</sup>	White	2	EW	Cemetery
Bigelow (47PT29) <sup>17</sup>	NAmer.	6	NF	Mound
Bell (47WN9) <sup>18</sup>	Fox	1	EW	Habitation
Hall (47WN40)	Unknown	2	EW	Mound
47WN9002	Unknown	1	EW	Unknown
47WO73 <sup>19</sup>	Unknown	2	NF	Cemetery
47WP39	White	1	NF	Village

<sup>1</sup>Overstreet and Salzer 1974; <sup>2</sup>Birmingham 1982; <sup>3</sup>Barth 1984; <sup>4</sup>Meer and Riggs 1989; <sup>5</sup>Harris 1993; <sup>6</sup>Brown; <sup>7</sup>Bruhy n.d.; <sup>8</sup>Thomas 1891; <sup>9</sup>Holliday 1992; <sup>10</sup>Boschardt and Theler 1991, Overstreet and Anderson 1986; <sup>11</sup>Richards and Kastell 1993; <sup>12</sup>Meer and Holliday 1990; <sup>13</sup>Mason 1988; <sup>14</sup>Wade 1988; <sup>15</sup>Meer 1990; <sup>16</sup>Albright 1902; <sup>17</sup>Lange 1969; <sup>18</sup>Merbs 1965; <sup>19</sup>Jones and McVean 1923

(47MI9003), located in the Eastern Woodland, which yielded approximately 1,730 individuals. Outside this very large cemetery, a majority of the sites (87%) have produced fewer than 10 individuals each. Consequently, much of what is known about the biological nature of the people who lived during the Historic period comes from small burial sites. The relatively equal number of sites in the two ecological zones more than likely reflects the accidental disturbance of historic burials during development activities, an activity that is equally likely in the Northern Forest as in the Eastern Woodlands and does not reflect differential attention by archeologists.

The effects of European contact reverberated throughout the North American continent. Native populations migrated westward in response to European contact and intertribal warfare. Consequently, Wisconsin has been home to a vast array of tribal groups, as well as European pioneer and business/missionary settlements. Ethnic groups represented by Historic period mortuary sites include Chippewa (two sites/two individuals), Fox (one site/one individual), Ottawa (one site/14 individuals), Potawatomi (one site/four individuals), Winnebago (two sites/two individuals), Native American—tribal affiliation unknown (two sites/19 individuals), "white" (14 sites/1,729 individuals), admixed black/white (one site/one individual), and unknown (25 sites/89 individuals).

The level of bioarcheological knowledge for the Historic period is disappointingly low. Mortuary components with large numbers of skeletons are rare; the most impressive exception to this is the Almshouse Burial Ground which has yielded a minimum of approximately 1,730 non-Indian individuals. Published descriptions of historic burials are few and report exclusively on Native American sites. Non-Indian sites, while numerous, have generally been absent from the literature. The exceptions in this case are two presented papers about the Almshouse Burial Ground (Haas 1993; Richards 1993).

## The Historic Period, Native American

### Protohistoric

No protohistoric sites with mortuary components have been identified. The bioarcheology of this temporal division is unknown.

### Early Historic (A.D. 1610-1670)

The Hanson site (47DR185) was discovered during gravel operations in 1990 when human remains were accidentally disturbed. The site is located near Sturgeon Bay in the Northern Forest region; no further information was provided regarding location. Salvage excavation of the site resulted in recovery of a minimum of 13 individuals and associated grave goods. Harris (1993) comments in a preliminary report that eight adult females, ranging in age from 16 years to late 40s, and five children, aged from neonate to 3 years, were present. Initial analyses suggest a high degree of genetic relatedness between the adults as indicated by the presence of unusually shaped temporal bones in six of the eight adults. Other observations include four instances of abnormal femoral neck torsion, a condition also observed in the Middle Historic Bell site (Merbs 1963) and several other sites dated to the Oneota tradition (Dirst 1984; McConaghy 1996; Vradenburg 1991a, 1991b), and two instances of Schmorl's nodes (vertebral disk defects related to occupation and/or activity levels). Dental pathology was severe. All adults present suffered from numerous carious lesions. A large number of abscesses and antemortem tooth loss were observed, but the exact frequencies were not reported. It is noteworthy that many of the adults presented an unusual wear pattern affecting the inside of the anterior teeth of the

maxilla, and that the caries was more frequently observed on the anterior teeth. One hypothesis put forth to explain these unusual conditions is that the Hanson site people had been sucking on some sort of maple sugar. Certainly the high frequencies of dental lesions are indicative of a diet high in sugar. The ethnic identity of the Hanson site individuals is Native American, tribal affiliation unknown.

No sites yielding human remains have been definitively assigned to the early Historic period in the Eastern Woodlands.

#### Middle Historic (A.D. 1670-1760)

No sites yielding human remains in the Northern Forest have been definitively assigned to the middle Historic. The bioarcheology of this period in the Northern Forest region is unknown.

The Bell site (47WN09), a fortified village site, is a well known Historic period site and has a long history of excavation, both professional and amateur. The site is located on a high bank on the south side near Big Lake Butte de Morts in the Eastern Woodland zone. Burials were first encountered in 1911. Five individuals were reported: one adult male, an adult female, a probable female adult, and two children (Blair 1911). In 1958 additional burials were disturbed during gravel removal. The five burials were excavated by Neil Ostberg but never reported on. Wittry (1963) provides a cursory description of the burials: a young adult female who experienced some vertebral osteoarthritis and abscesses on her mandible, an adult of indeterminate sex, an adult female, an adolescent female, and a child. More extensive excavations took place in 1959 under the direction of Wittry (1963) and one human burial was encountered, interred within a cache pit. Merbs (1963) provides an extensive description of the 35 to 40 year old female. Cranial and postcranial measurements, skeletal and dental pathology, and long bone anomalies are reported. The skull is generally mesocranic. This individual experienced considerable dental attrition, suffered from numerous abscesses and caries, and lost a number of teeth antemortem. Measurement of the postcranial remains indicates a living stature of approximately 5 ft. 4.5 in. A healed Colles fracture was noted on the left distal radius. This individual exhibits femoral neck torsion of the right femur. This condition has been documented in the Hanson site, 47DR185 (Harris 1993), as well as in various Oneota tradition sites. The artifacts recovered indicate the Bell site was occupied by the Fox; however, Merbs suggests the female individual recovered was of mixed heritage.

#### Late Historic (A.D. 1760-1820)

Lange (1969) reports on the historic artifacts and six intrusive Historic period burials encountered from the Late Woodland Effigy Mound Bigelow site (47PT29). The author notes: "The main focus of the excavation was the recovery of cultural materials and environmental data related to the Effigy Mound group and habitation at the site; the presence of historic materials was not anticipated and their excavation was not a major aspect of the field report" (Lange 1969:215). The Bigelow site is located on a forty foot bank overlooking the Wisconsin River. Ecologically it is set in the Tension zone, "the border between the hardwood forest province to the north and the grassland province to the south" (Lange 1969:215).

Lange (1969) focuses primarily on the historic artifacts recovered from a hypothesized habitation area. Each of the six intrusive burials is described, and the body orientation, sex, relative age, and associated artifacts are reported. One individual, a 6 to 8 year old child, was intruded into Mound A, and the other five individuals were intruded into Mound B. The age and sex distribution of the intrusive Mound B individuals is a mid-age adult male, an adult female, two children (one 8-10 years old), and one infant. No other osteological data are presented. Analysis of the

accompanying grave goods indicates that the time period during which burial took place was after A.D. 1760 and no later than A.D. 1848. Tribal affiliation is unknown; however, historic records indicate that the Winnebago, Menominee, and Potawatomi were present in this area at the time of interment (Lange 1969).

The Rock Island site II is located in Door County and its cemetery dates between A.D. 1760 and 1770. Fourteen individuals were excavated and are believed to be Ottawa (Mason 1986). Bender et al. (1981) include two individuals from Rock Island site II in their analysis of Hopewell agriculture. Bone samples from an approximately 20 year old female and a 12 year old male were assayed for stable carbon isotopes. The values were -19.4 and -19.9 for the female and male, respectively, and are on the minimal end of the maize consumption spectrum. Use of corn has been documented both archeologically and ethnohistorically for this site and tribal group, but actual consumption most likely varied between individuals as indicated by highly variable isotope values for the later groups.

No additional late Historic mortuary sites have been identified in the Eastern Woodlands.

#### Historic, Post-A.D. 1820

The Island Village site (47MN101) lies on an elevated sandy tract and is delineated on the south and west by the south branch of the Manitowoc River and north and east of Hayton Marsh in the Northern Forest zone. The remains of four individuals were encountered during agricultural activities in 1989. The remains were generally poorly preserved, but an osteological analysis yielded some information (Holliday 1992). The four individuals recovered included a young adult male, a 2- to 3 year old child, a 7 to 8 year old child, and a 12 to 14 year old adolescent. Two of the subadult individuals exhibited a total of three carious lesions. One incidence of enamel hypoplasia was observed on the 7 to 8 year old child. Although no evidence of skeletal pathological conditions was observed, Holliday (1992) cautions that a majority of the skeletal remains have lost a significant amount of cortical bone. Artifacts recovered with the remains and historic documents suggest the site dates after A.D. 1850 and is most likely part of a known Potawatomi village (Holliday 1992).

No sites yielding Native American remains have been definitively assigned to the post-A.D. 1820 Historic period in the Eastern Woodlands region.

#### Summary of the Bioarcheology of the Historic Period

The bioarcheological knowledge of the Historic period in Wisconsin is minimal. A wide variety of ethnic groups is represented; however, little substantive analysis has been conducted. In fact, only 48 (2.5%) of an estimated 1,911 individuals recovered from historic sites have been reported on in the literature. The Almshouse Burial Ground (47M19001), a European-American cemetery which yielded approximately 1,730 individuals, is currently undergoing analysis, and a report is in preparation. At the time of this writing the Almshouse Burial Ground had been the subject of two presented papers (Haas 1993; Richards 1993) and one Master's thesis was in process.

The protohistoric time segment is virtually unknown bioarcheologically. Thirteen individuals have been reported on from the Early Historic period, 11 from the Middle Historic period, 20 from the Late Historic period, and four from the post-A.D. 1820 period. Of these individuals, 14 represent Ottawa, four represent Potawatomi, two represent Chippewa, and 8 represent Fox. The predominant information presented is demographic. No trends involving described skeletal and dental pathological conditions are discernible. The analysis of the human

remains recovered from historic sites is imperative to facilitate the understanding of ancestor-descendant population relationships and the nature and quality of daily life during each timeframe within the Historic period.

### Bioarcheology Summary of Wisconsin and Directions for Future Research

The bioarcheology database lists 437 sites and a minimum number of 4,964 individuals who have been identified in Wisconsin. These numbers, unfortunately, are incomplete, as a number of sites and reports have been identified since the submission of the database. When appropriate, they have been incorporated into this overview.

A majority of the bioarcheological literature concerned with Wisconsin sites is descriptive in nature. Minimum analysis has been the rule. Most reports present demographic and mortuary practice data, including burial type, body position, and presence/absence of grave goods. The demographic tables presented within this chapter were frequently compiled from written descriptions. The presentation of the demographic data are warranted in order to facilitate future bioarcheological studies by reporting sample size, age and sex distribution, and, indirectly, overall preservation and fragmentation of the human remains.

The limited published bioarcheological sources and data may be attributable to the absence of bioarcheological and/or biological anthropology programs at the graduate level in Wisconsin, as well as the overall poor preservation of recovered human remains. Most substantive bioarcheological research has been published by individuals associated with Marquette University (Norman Sullivan), a 4 year liberal arts university, the Wisconsin State Historical Society Museum Archeology Program (Joseph Vradenburg), and the University of Wisconsin, Oshkosh (Victoria Dirst, Paul Kreisa). Additionally, few dissertations and theses have focused on or incorporated individuals from Wisconsin sites. Eight theses and dissertations present bioarcheological data (Bakken 1949; Holcomb 1952; Melbye 1969; Hsu 1970; Glenn 1971; Pfeiffer 1976; Anderson 1995; Morris 1995). Half of the theses and dissertations were the work of students from universities outside Wisconsin. Overall preservation of the human remains excavated from Wisconsin sites is generally moderate to poor. Preservation can impact the nature of conducted studies; however, Merbs (1966) and O'Connell (1981) present good arguments for the systematic analysis of fragmentary and incomplete remains and demonstrate the type and significance of data recoverable. With the above comments in mind, a summary of the bioarcheological knowledge and broad trends observed in Wisconsin are presented below.

The bioarcheology of the Late Paleoindian period is nearly nonexistent. Overall, we know very little at this juncture due to a dearth of Paleoindian mortuary sites. The Renier site illustrates one example of a mortuary program practiced in the Archaic. The Renier burial consists of cremated human remains and a rich array of grave goods. This site represents one of the earliest occurrences of cremation in North America. There is some indication that the Renier burial is representative of Late Paleoindian mortuary practices. Artifacts donated by a collector from the Pope site are remarkably similar in type and condition (lithic tools and burned) to those from Renier and, although no human remains were recovered, it is postulated that the Pope site represents a cremation burial location. The presence of both Late Paleoindian and Archaic lithic tools at both sites is suggestive of a Late Paleoindian/Early Archaic interaction.

The Early and Middle Archaic are unknown from a bioarcheological perspective as a result of an absence of sites yielding human remains. The Late Archaic is the first period to be the focus of several substantive research projects. The presence of a moderate body of bioarcheological

data for the Old Copper complex is primarily due to the research efforts of Pfeiffer (1977, 1979, 1988) and Sullivan (1986, 1988, 1990a, 1990b). Pfeiffer (1977, 1979) addresses questions of population affinities of six Archaic period skeletal samples from the Upper Great Lakes region, including three Old Copper complex sites from Wisconsin (Oconto, Osceola, and Reigh). Based on an assessment of craniometric and nonmetric traits, there are no clear affinities between the Archaic samples relative to geography or cultural affiliation. The Oconto sample showed some affinity to the Laurentian sample. Specific to Wisconsin, there does not seem to be an Old Copper "type." The results obtained by Pfeiffer were not unexpected based on the hunter-gatherer adaptation believed practiced by Archaic populations, characterized by seasonal migration of small bands active in extensive trade and, possibly, mate exchange networks. The classification of "Old Copper" reflects a distinct artifact assemblage, but it does not reflect biological homogeneity.

Frequencies of dental and skeletal pathology were variously calculated for four Old Copper sites and, for the most part, imply a diet low in carbohydrates and rough in texture. The average percentage of individuals affected by caries is 7.3, significantly lower than the 62% frequency documented for the known agricultural site of Aztalan. Dental attrition is generally reported as heavy. A high frequency of enamel hypoplasia (mean = 65.5%) was unexpected and is interpreted to indicate an unstable food base resulting in chronic, episodic stress. Skeletal pathology was generally infrequent. Degenerative changes of the joints and vertebral column are generally characterized as slight to moderate. Nonspecific infections were documented for four individuals. Healed fractures were commonly observed; nine instances were noted at the Price III site. No violent trauma was observed in any Old Copper samples.

The Red Ocher complex is known from a single report on the Convent Knoll site. Circumstances prevented an extensive analysis of the Convent Knoll remains; thus, only identification of minimum number of individuals, determination of age and sex, and description of traumatic injuries are presented. The Convent Knoll site clearly represents the interment of individuals killed as a result of a violent altercation. All seven adults present were male and had suffered multiple traumatic injuries including sharp-force and projectile injuries, scalping, decapitation, and dismemberment. Other categories of biological information are nonexistent, resulting in a significant gap in bioarcheological knowledge of the Red Ocher populations.

Future research on the Archaic should focus on problem-oriented analyses on existing collections. It is imperative that we learn everything possible from the existing Red Ocher sites and evaluate their relationship to Old Copper populations. Small sample sizes have frustrated attempts to evaluate population affinities. The isolated and smaller Old Copper sites need to be analyzed and compared to the larger sites. Other areas of research should be directed toward exploring possible reasons for the high incidence of enamel hypoplasia and the implied chronic nutritional stress. Bone chemistry studies on human samples from Reigh and Price III have indicated diets composed primarily of meat resources. Small standard deviations are suggestive of a ubiquitous diet and equal access to food resources.

The Early Woodland is unknown bioarcheologically. Five sites identified as Early Woodland are currently known to have yielded human remains. Individuals of a variety of ages and both sexes are present and have the potential to contribute much to what is known about Early Woodland adaptation. Problem-oriented skeletal analyses will reveal subsistence practices, population affinities, and the nature of daily life during this period.

The Middle Woodland is represented by a reasonable sample of individuals (N=507) from several phases. It is unfortunate that the bioarcheology of this period is virtually unknown. Little bioarcheological information is available for the two Hopewellian phases, Trempealeau and Waukesha, from the Eastern Woodland zone, or the Red Cedar Hopewell phase from the Northern Forest region. Skeletal analyses of individuals identified from these phases are essential in order to document the relationship between the Trempealeau and Waukesha phases, between these northern representatives of the classic Hopewell populations to the south, and the nature of their relationships to local non-Hopewellian populations. Additionally, skeletal and dental analyses, including chemical analyses, may contribute information on subsistence practices, including identifying increasing reliance on cultigens, sufficiency of diet, and the nature of interactions with other populations. Existing data indicate that maize was not an important component of Middle Woodland diets: caries frequencies are still low (12.3%) relative to maize-dependent populations; dental attrition, as in the Archaic, remains moderate to severe; and reported stable carbon-isotope values (Bender et al. 1981) from the Millville and Trempealeau sites are -22.6 and -22.1, respectively. Pathological conditions are few and unremarkable; however, three instances of trephination have been documented for the Middle Woodland.

The Late Woodland period is only minimally known from a bioarcheological perspective. This dismal state of knowledge is in part related to frequently practiced secondary burial resulting in fragmentary and incomplete remains, as well as to moderate to poor preservation overall. Just as culpable, however, is academic neglect. The archeology of the Late Woodland period has benefitted from intensive and continual interest; the associated human remains, however, have only been cursorily described—their body positions noted and grave goods counted. Superficial descriptions of a majority of the Effigy Mound and Clam River focus remains represent a majority of the published bioarcheological knowledge of these foci. A few studies have utilized one or two Effigy Mound sites to assess the biological changes accompanying a transition from a generalized hunting and gathering subsistence strategy to a maize-dependent horticultural practice. Caries frequencies determined from Raisbeck and Nitschke (32%) are greater than those found in the Late Archaic and Middle Woodland and suggest a diet characterized by some maize consumption; however, the absence of porotic hyperostosis complicates this interpretation. Stable isotope values from numerous individuals and sites will clarify the question of increasing use of cultigens. Glenn (1974) concluded that Effigy Mound individuals are distinct from the neighboring Oneota, reflecting little biological interaction between the two groups. Effigy Mound sites indicate a remarkably homogeneous culture: a logical follow-up question is to assess the biological homogeneity or heterogeneity.

The Late Woodland Lakes phase from northern Wisconsin is known only from one site. An extensive osteological analysis resulted in identifying low caries (5.5%) and abscess (5.5%) rates that are similar to those documented for the Late Archaic and Middle Woodland and inconsistent with the caries rate reported for the Late Woodland Effigy Mound complex in southern Wisconsin (32%). Pathological conditions are infrequent and characterized by low frequencies of infection. Violent trauma was observed affecting individuals buried in one segment of the site and consisted of six instances of sharp-force trauma and one instance of blunt-force trauma. No increase or decrease in violent trauma is discernible from earlier periods.

A respectable body of bioarcheological literature is accumulating for the Oneota tradition and is currently represented by the works of Glenn (1974); Vradenburg (1991a, 1991b, 1993), Dirst (1982, 1984), Kreisa (1986, 1993), Dirst and Kreisa (1982), and Sullivan (1986, 1989, 1990a, 1990b).

The best bioarcheologically documented phases are the Lake Winnebago phase in southeastern Wisconsin and Pammel Creek and Valley View phases in southwestern Wisconsin. Areas addressed include: interphase, intraphase, and interspect biological affinities; mortuary practices; dietary and subsistence practices; and the nature and frequency of traumatic injuries.

Significant differences exist in the skeletal biology of the southwestern Oneota and the southeastern Oneota. Frequencies of dental pathology (caries, abscesses, and enamel hypoplasias), stable carbon isotope ratios, levels of infection, and incidence of traumatic injuries of violent origin exemplify these primarily cultural differences. Glenn's biological distance study utilizing cranial morphology supports a biological separation of eastern and western phases. It should be noted, however, that the Lake Winnebago phase sites tend to yield smaller samples and have not been analyzed as exhaustively as have the southwestern sites. The differences are provocative, and future research should be directed toward further documenting and exploring these differences.

The Oneota do not share biological affinities with neighboring Late Woodland groups (Effigy Mound) or the Middle Mississippians residing at the site of Aztalan. This conclusion, as reported by Glenn (1974), questions the hypotheses that identify either a Late Woodland or Middle Mississippian source population for the Oneota and suggests further research into Oneota origins.

Exciting possibilities exist for future Oneota bioarcheological research. Suggested areas of research include further investigation of dietary and subsistence practice differences between the southeastern and southwestern Oneota phases. Stable carbon isotope ratios are recorded for two southwestern sites, OT and Tremaine; assessment of carbon isotope ratios for a greater number of individuals from a number of sites, including Lake Winnebago phase sites, would contribute much to this area of research. Glenn's (1974) biological distance research should be updated; a number of sites yielding significant numbers of skeletons have been excavated since her publication, and incorporation of these data and application of new more sophisticated multivariate statistical techniques may yield interesting results.

Further attention to the question of increased warfare during this period is also necessary. Currently, little evidence exists to support such a hypothesis; frequencies of traumatic injuries due to violence are not significantly different from documented frequencies from earlier periods. Finally, a holistic, problem-oriented biocultural study of the human remains found in nonmortuary contexts is warranted and long overdue. A study of this nature is needed to explore and utilize appropriate ethnographic analogies to explain the occurrence of isolated skeletal elements in such contexts. Such a study should compare the occurrence of elements, the specific elements represented, the age and sex of individuals represented (when possible), tool marks on the elements, and the inclusion of isolated elements with complete burials. A related question involves a treatment of the so-called trophy skulls that are encountered within other burials and the headless skeletons that are at times recovered. Does the presence of headless corpses and isolated skulls indicate ancestor veneration or warfare and trophy taking?

The Middle Mississippian period as represented by the well-known Aztalan site is only partially known bioarcheologically and little understood. Completion of a Master's thesis (in progress) from the University of Chicago on the human remains from Aztalan may result in a significant revision of the previous statement. Existing bioarcheological data, consisting of skeletal and dental pathology and carbon isotope ratios, reflect a diet containing a significant percentage of maize. Glenn's (1974) craniometric analysis indicates the Aztalan is biologically distinct from surrounding Late Woodland populations including the Oneota and Effigy Mound groups.

Barrett's (1933) original determination that the inhabitants of Aztalan consumed human flesh as another source of meat has been accepted by some. However, no systematic and thorough analysis has been conducted on the human remains recovered from the various nonmortuary features, and one researcher disagrees that these fragmentary remains comprise a significant percentage of the faunal assemblage recovered from the site. Research should focus on identifying the number of individuals represented in these pits, comparing the frequencies of human vs. faunal fragments, and reviewing early accounts of various rituals that may result in fragmentation of bone similar to that observed at Aztalan (e.g., multistage mortuary program). Further descriptive, as well as problem-oriented, research is clearly necessary to further our knowledge regarding this period in Wisconsin history. Additionally, all human remains excavated from the site should be studied for information about the biological affinities and the nature of day-to-day existence of the individuals who lived within the walls of Aztalan or in the surrounding area.

The Historic period in Wisconsin is characterized by a vast number of Native American and non-Native populations. Bioarcheological knowledge of these populations is limited. The few published accounts of historic skeletal samples all report on Native American groups. Little information currently exists for historic non-Native populations in Wisconsin. Publication of an excavation report, in addition to presented papers, of the Almshouse Pauper cemetery in Milwaukee will contribute greatly to our knowledge of non-Indian occupation of this area. Subject areas for future research are wide open. Any studies conducted will enhance knowledge of the biological nature of identified populations. Research directed at assessing relationships to precontact populations is especially important since no prehistoric site in Wisconsin contains direct evidence of contact.

Suggestions for future research per period have been presented above. More general, yet highly significant, suggestions are warranted at this point. Effort should be directed toward accurately dating existing mortuary sites. Specific occupations and/or affiliations of human remains to a specific period, aspect, or phase is in many instances unknown or based on weak data. Additionally, osteological data collection should be standardized to facilitate comparability on a regional basis. There are several standards currently available including the *Guidelines for Historic Properties Management, Southwestern Division Management Plan* (Limp 1987:87-97, 179-185) and a set of guidelines published by the Paleopathology Association (Rose 1991). Additionally, since 1990 the human remains recovered in Minnesota have been undergoing extensive and systematic osteological analysis and a protocol for analysis has been developed based on protocol used at the Smithsonian Institution and the University of Tennessee, Knoxville.

Considering the impact of the Native American Graves Protection and Repatriation Act (NAGPRA), the small amount of bioarcheological research currently published, and the extensive collections currently available for study, problem-oriented bioarcheological analysis of human remains should be a priority for all institutions and researchers interested in human occupations of Wisconsin, the Upper Great Lakes region, and/or the Central and Northern Plains area. The analysis of human remains can contribute a wealth of information germane to archeological questions of population relationships and interactions, as well as to issues of human adaptation from the Paleoindian period to the present. It is imperative that the dead tell their tales before they are silenced forever.

## Minnesota

### Paleoindian Period (10,000-6000 B.C.)

The timing, origin, ancestry and morphological characteristics of the earliest human populations into the Americas is a problem of considerable interest but with a paucity of data. The number of Paleoindian sites with human remains in North America is changing. The hypothesized Paleoindian or early human remains in Minnesota include Browns Valley (21TR5), Pelican Rapids or Minnesota Woman (21OT3), Sauk Valley (21TO1), and Gold Island (21LA2). Recent bone AMS dating (Stafford et al. n.d.) has determined that Sauk Valley (21TO1) with a date of  $4360-4190 \pm 70$  B.P. is Archaic and Gold Island (21LA2) with a date of  $1870-1750 \pm 70$  B.P. is Woodland. These individuals will be discussed in the appropriate sections following the Paleoindian period.

The Pelican Rapids-Minnesota Woman individual was uncovered in 1931 near Pelican Rapids in western Minnesota during highway construction, 10-12 feet below the road bed. Excavations the following summer by Albert Jenks of the University of Minnesota recovered additional fragmentary remains confirming the source of the remains. Jenks believed that the human remains lay in undisturbed Late Pleistocene deposits of glacial Lake Pelican dating to approximately 20,000 years ago. The depth of the skeleton, the undisturbed varves of enveloping silt and the fact that the skeleton rested on the left shoulder with leg bones higher in the silt led Jenks to conclude that Minnesota Woman "drowned in glacial Lake Pelican about one-half mile from the foot of the glacier, having fallen from a water craft or through the ice" (Jenks 1936:47). Jenks published an exhaustive monograph (1936), *Pleistocene Man in Minnesota*, that was basically a sustained argument detailing the "primitive" morphological characteristics of Minnesota Woman to support the geological age. He emphasized in particular the alveolar prognathism, the pronounced backward extension of the skull or occipital "bun," the absence of a nasal sill, the large size of the teeth and the Mongoloid affinities as represented by the shovel-shaped incisors. The emphasis on and exaggeration of "primitive" characteristics seems directed to his friend Ales Hrdlicka of the Smithsonian Institution, who had staunchly rejected all claims for the existence of glacial age humans in the Western Hemisphere. Hrdlicka's (1937) response to Jenk's report was predictable. He refuted Jenk's "primitive" morphological traits point by point and concluded that Minnesota Woman was a "modern Sioux" not possibly even a few thousand years old (Hrdlicka 1937:198-199). Minnesota Woman represents the nearly complete remains of an adolescent female. Jenks identified her as 15 year old, but more recent analysis proposes an age of 13-15 years at the time of death (O'Connell and Myster 1996). Minnesota Woman is AMS dated to  $7840 \pm 70$  B.P. which places her right on the cusp of the generally established 8000 B.P. cutoff for the Paleoindian period.

The Browns Valley skeleton is older with an AMS date of  $8790-9049 \pm 82/110$  B.P. The Browns Valley human remains were uncovered in 1933 as a result of gravel operations in Browns Valley on the western border of Minnesota and were recovered by William H. Jensen. Albert Jenks of the University of Minnesota excavated the site in 1934 and recovered additional bone fragments and a tooth that could be articulated with the earlier recovered remains. The Browns Valley individual was identified as an adult male, 25-40 years old (Jenks 1937). Jenks' (1937) analysis focused primarily on the cranium with little mention of the postcranium except for half a page reporting measurements of the humeri and commenting on the flattening of the tibia (platycnemia) and the humeri (platybrachic). His analysis of the cranium documented "primitive" characteristics including the dolichocephalic cranial shape, the large supraorbital ridges, the great width of the mandible and the leptorrhine or narrow nose. He



concluded that "Browns Valley Man is in general of the same physical type as North American Indians (Algonkian not Siouan)...but that he was less ancient than the older glacial age population of Minnesota as represented by Minnesota Man [sic]" (Jenks 1937:28). Reconstruction of the geological context suggested that the age of Browns Valley was 8,000-12,000 years ago. During the period of Jenks' study, the Browns Valley skeleton was at the University of Minnesota but the individual was subsequently returned to Mr. Jensen and was "lost" in Mr. Jensen's home for approximately 50 years. In 1987, after the deaths of both Mr. and Mrs. Jensen, the Browns Valley skeleton was relocated by the Jensen heirs and turned over to the Minnesota Indian Affairs Council and the Hamline University Osteology Laboratory. It was this event that initiated the dating and restudy of all the hypothesized Paleoindians in Minnesota. The Browns Valley skeleton is stained with red ocher and was found with a number of artifacts (four points, two knives and two sandstone abraders) including the type Browns Valley lanceolate point, although their association with the burial is not clear. Attempts at refining Jenks' skeletal age of 25-40 years which was based on dental attrition, sutural closure and moderate osteoarthritic lippling have utilized the auricular surface of the ilium (Lovejoy et al. 1985) and identified an age of 35-39 years (O'Connell and Myster 1996). A developmental abnormality is identified on two left ribs as a synostosis or fusion of two ribs immediately dorsal to the tubercle. Additional bioarcheological analysis is in process utilizing techniques and standards developed since Jenks' analysis.

Powell and Steele (1992) have utilized the Browns Valley individual in craniometric discriminant function analyses of Paleoindian populations. They conclude that the Paleoindian sample shows close affinities to South Asian (Australian-Melanesian) and European populations as opposed to North Asian (China and Japan) and more recent American Indian populations. Recently molecular anthropology has begun to provide new insights into questions of population relationships utilizing extant Amerind, Nadene and Asian mtDNA (Wallace and Torroni 1992) but analysis of ancient Paleoindian DNA is just beginning (Kaestle 1997, Smith 1997).

### Archaic Period (6000-1000 B.C.)

The Archaic period/stage in Minnesota was a time of major readaptation to the postglacial environments in the state. The large mammals of the Pleistocene were by now extinct. Hunting and gathering became increasingly more efficient and regionalization developed as adaptation reflected the exploitation of local environments. The Primary Forest Efficiency model developed by Caldwell (1958) that characterizes the Archaic adaptation throughout the Midwest probably applies only to the southeastern part of the State covered by deciduous woodlands and only for a part of the time period. During the mid-Holocene period (9000-6000 B.P.), the warmer/arid conditions resulted in the extension of the prairie to the eastern border of Minnesota. The Eastern Archaic tradition adaptation in the midwestern United States was an adaptation to deciduous forests, but it is poorly known in Minnesota.

Other important contexts (study units) or adaptations have been defined for the Archaic period in Minnesota by Dobbs (1988a). They reflect the distinct major biomes (prairie, deciduous forest, lake forest) in the state and include the Shield Archaic, Lake-Forest Archaic and Prairie Archaic. The Eastern Archaic has traditionally been divided into Early, Middle, and Late periods but Dobbs (1988a) notes that these periods are not applicable to Minnesota, at this time, because of the paucity of information and the fact that the changing environmental conditions in Minnesota make the Archaic adaptation a time-transgressive phenomenon.

In addition, Archaic sites are poorly known because many are deeply buried and/or located in areas that appear to be unlikely based on modern topography (Dobbs 1988a).

The bioarcheology of the Archaic stage in Minnesota is poorly understood. There are 13 sites represented by 43 individuals in the database that are identified as Archaic period mortuary sites (Table 46). Only one, however, Sauk Valley (21TO1), is based on a radiocarbon bone date. Seven of the sites (54%) are in adjacent counties in west-central Minnesota, an area where the Prairie, Prairie Lake, and Eastern Woodlands overlap adaptive zones, although this region of Minnesota was most likely Prairie during Archaic times. Two sites are in Beltrami County (21BL38, 21BL9007), which depending on time could represent a lake-forest or a prairie-lake adaptation. Three sites are in the Prairie Lake adaptive zone of south-central Minnesota (21BW5, 21BW7, 21CR9001). One site is from the east-central border of the state (21PN8) and represents burials in a mound suggesting a Late Archaic-Early Woodland adaptation characteristic of the Eastern Woodlands. Four of the sites, in fact, represent burials in a mound context and a number have red ocher association, suggesting that, as documented in Iowa and Illinois, red ocher, ceramics and burial mounds are associated at the Late Archaic-Early Woodland transition (Esarey 1986). The admixture of Late Archaic and Woodland stage cultural traits in Minnesota, as elsewhere, emphasizes the continuity between these cultural stages, the independent acquisition of major cultural features and the minor impact that pottery had on the overall Archaic hunting and gathering life-way (Tiffany 1986:17, Stoltman 1978:711).

The earliest and best known Archaic site in Minnesota is 21TO2 that produced the Sauk Valley skeleton. This skeleton was previously thought to be Paleoindian and is identified as such in a number of sources (Smith 1976, Steele and Powell 1992). A recent AMS bone date of 4360-4190 ± 70 B.P. associated this individual with the Archaic period (Stafford et al. n.d.). The Sauk Valley skeleton was accidentally discovered in 1935 in a gravel pit by workmen engaged in carving off an overhang on the gravel face. The exact provenience was never verified. The site was revisited later in the same year by Kirk Bryan and Franklin McCollum, geologists from Harvard University, but nothing remained in situ. The ancient age of this individual was based on the presence of a limonitic sand within the cranium which was said to indicate deposits "previous to a more humid climate that antedates the present semi-arid type of climate" (Bryan et al. 1938:118-121). Jenks and Wilford (1938) produced a descriptive report of the skeleton identifying a middle age adult male. Their report included metric and morphological characteristics of the cranium including 50 cranial measurements. Postcranial descriptions of the humeri, radii, femora and tibiae include metric and morphological traits. Stature is reconstructed based on Manouvrier's tables as 167.6 cm (5 ft. 6 in.). Jenks and Wilford (1938) enumerate 26 "primitive" traits including the long, low cranium, the bun-shaped occiput, the prominent brow ridges, the large/broad mandible and the large teeth.

Comparison to the Minnesota Woman and the Browns Valley skeletons led to the conclusion that based on the "degree of primitiveness exhibited by the skeletal remains" (Jenks and Wilford 1938:168), the Sauk Valley skeleton was probably older than the Browns Valley skeleton but not as old as Minnesota Man [sic]. It is interesting that the morphological dating of these three individuals reverses and inverts the absolute age order of these individuals determined recently by AMS bone dates, i.e., morphological dating proposed that the order oldest to youngest was Minnesota Woman, Sauk Valley, Browns Valley while AMS bone dates identify this order as Browns Valley, Minnesota Woman, Sauk Valley. Reanalysis of the Sauk Valley skeleton in conjunction with the AMS dating has refined the age at death of this individual using the auricular surface

Table 46. Archaic burial sites in Minnesota.

Site	Phase	MNI	Region	Type
Red Ochre Burial (21BE9007) <sup>1</sup>	Red Ochre	2	P	Isolated
Hay Creek (21BL38) <sup>2</sup>	Unkown	8	NF	Isolated
Bemidji Museum Skeleton (21BL9007) <sup>3</sup>	Unknown	3	NF	Isolated
Runck (21BW5) <sup>4</sup>	Unknown	1	PL	Unknown
Runck (21BW7) <sup>5</sup>	Unknown	1	PL	Unknown
Hasse Burial (21CV9001) <sup>6</sup>	Unknown	1	PL	Isolated
Peterson Burial (21GR4) <sup>7</sup>	Red Ochre	2	P	Mound
Clitherall (21OT78) <sup>8</sup>	Unknown	2	P	Mound
Pelican Rapids (21OT79) <sup>9</sup>	Unknown	3	P	Isolated
Vach (21PN8) <sup>10</sup>	Unknown	4	EW	Mound
Pelican Lake Burial (21PO3)	Unknown	6	P	Isolated
Rooney (21PO13) <sup>12</sup>	Unknown	9	P	Mound
Sauk Valley (21TO1)	Unknown	1	P	Isolated

<sup>1</sup>Oothoudt 1991; <sup>2</sup>HUOL\* 1986, File H121; <sup>3</sup>HUOL 1985, File H138; <sup>4</sup> ;  
<sup>5</sup>Valentine 1968; <sup>6</sup>Hasse 1969; <sup>7</sup>Goetzinger 1967; <sup>8</sup>HUOL 1980, File H52;  
<sup>9</sup>HUOL 1980, File H51; <sup>10</sup>Lindeman 1967, Cooper 1967; <sup>11</sup>Johnson 1962;  
<sup>12</sup>Jenson and Anderson 1960, O'Connell et al. 1990; <sup>13</sup>Jenks 1938, O'Connell  
and Myser 1996

morphology (Lovejoy et al. 1985) to an age of 40-50 years (O'Connell and Myser 1996). Tooth wear is moderate to heavy on all seven teeth present in the mandible, more extreme than that of the Browns Valley skeleton. No caries is present. Extremely robust postcranial bones evidencing enthesopathies at areas of muscle attachment and osteoarthritis suggest a rigorous lifestyle.

Other identified Archaic sites with human remains in western Minnesota include 21BK9001, 21GR4, 21OT78, 21TO79, 21PO3 and 21PO13.

The Becker County Red Ocher burial (21BK9001) is one of two burials accidentally uncovered in 1935, by a dynamite blast during road construction. One burial contained layers of red ocher beneath and covering the skeleton, although information about burial type and any associated artifacts was lost due to mode of discovery. Osteological description by Oothoudt (1991b) identified an adult male, 20-30 years of age. Dental attrition is slight and no caries was observable. Cranial and postcraniometric data are presented for comparative purposes.

The Peterson Burial (21GR4) was uncovered in 1964 in a cultivated field adjacent to Peterson Lake (Goetzinger 1967). The primary burial of a single individual was interred into a gravel deposit and overlain with layers of waterworn boulders which were probably carried from the Peterson Lake shoreline, 100 yards away. The skeleton is covered with red ocher. Associated artifacts include a single large bifacially flaked projectile point of brown chalcedony, a circular disk of limestone 2.5 cm in diameter with a central perforation, over 32 very small (<.75 cm diameter) flat disk shell beads, two large tubular marine shell beads and 14 complete and several fragmentary, worked beaver incisors with the proximal or root end removed and perforations at each end. The beads and limestone disk may have been part of a pendant/necklace. The beaver incisors may have been fastened to a garment. No osteological information is currently available about this individual.

The Clitherall burials (21OT78) were accidentally uncovered in 1980 and represent partially articulated bundle burials with extensive red ocher staining. Osteology class reports by Hamline University students have identified an adult male and two to three subadults. Stature of the adult male is reconstructed to be 175.3 cm (5 ft. 8 in.-5 ft. 10 in.). Extensive periostitis was observed on both tibiae and fibulae.

The Pelican Rapids burial (21OT79) was accidentally uncovered in 1980 and represents a flexed burial of an adult male. Additional bone fragments of a frontal and maxilla represent one to two additional individuals.

The Pelican Lake burial (21PO3) was uncovered during gravel pit operations in 1952. Excavations by Lloyd Wilford in 1954 uncovered four burial pits containing six individuals. A report by Johnson (1962) describes the burials. Three of the pits were lined with red ocher and one burial had three small irregular fragments of thin sheet copper described in the field notes as comprising a pendant. Other artifacts included a side-notched projectile point, a groundstone disc bead, disc beads of shell, an antler object and a beaver incisor. Burial mode includes both primary flexed and secondary bundle burial. Johnson (1962) identifies three adults (two of whom are male), one child and two infants. No osteological data are available for these individuals.

The Rooney Mound site (21PO13) was accidentally uncovered in 1959 as a result of construction. The Science Museum of Minnesota (SMM) was notified of the disturbance but most of the human remains had been removed and valuable archeological information was lost for most of the site before they could investigate. Only one burial of nine was removed by SMM archeologists. Recovered artifacts included one projectile point, two scrapers, one engraver and numerous stone flakes but many artifacts were likely lost during recovery. One skeleton had a green stain on the zygomatic suggestive of an associated copper artifact. The burials were excavated into a natural glacial mound. This mode of burial, the absence of ceramics and the robust cranial morphology are the basis for the identification as Archaic. An AMS bone date in process may resolve this designation.

In 1990, bioarcheological analysis by Brown (O'Connell et al. 1990) was carried out as part of the Science Museum of Minnesota repatriation of human remains to the Minnesota Indian Affairs Council. Brown identifies five male and four female individuals. Seven are adults in the age range of 20-40. Two are younger, an 18 year old male and a 16-18 year old female. Stature estimates range from 161-178 cm. Two males are quite tall, 178 cm (5 ft. 10 in.) and 180-186 cm (5 ft. 11 in.-6 ft. 1 in.) respectively. Cranial, dental and postcraniometric and nonmetric observations are reported for comparative purposes. Only two crania are complete enough for measurement and these exhibit a pattern of a very high vault, narrow frontal and narrow nose that Brown describes as reminiscent of earlier habitants of Minnesota such as Sauk Valley. Dental attrition is high with molar cusps worn flat. Caries is reported for only one individual (11%) with three carious lesions and one abscess. A second individual also exhibits evidence of a healed abscess in the mandibular first molar region. A more extensive dental analysis is the basis for a Master's thesis by Alonso (1993). She suggests that the severe dehiscence (bone loss at the root level) in a number of individuals may be a genetic trait that reflects the presence of a small gene pool.

Pathological conditions reported by Brown (O'Connell et al. 1990) include slight to moderate osteoarthritis in five individuals, periostitis related to humerus fractures in two individuals, and mild porotic hyperostosis in two individuals. One individual (45 year old male) exhibits severe vertebral osteoarthritis including a compression fracture of L4. Burial practices evidence an unusual pattern of postmortem drilled holes in the tibiae of two individuals. One individual (30 year old male) exhibits a drilled hole in the proximal lateral condyle of the right tibia and a drilled hole in the left tibia immediately superior to the malleolus. Cutmarks are also present on the anterior midshaft and distal lateral epicondylar ridge of the left tibia. The second individual (18 year old male) exhibits a drilled hole in the lateral surface of the lateral condyle of the right tibia. The modification exhibited by these individuals is reminiscent of the bone tapping practice found in later Woodland populations in Minnesota but distinctly different in its morphology and probable mode of production.

The mortuary practices and morphological features of the Rooney Mound people make them distinctive for this time period in Minnesota. Future comparative studies utilizing the bioarcheological data reported by Brown and confirmation of the date of this site based on the AMS bone date will contribute greatly to an understanding of this site, time period and adaptation of these early people in Minnesota.

#### Prairie Lake Region

In the Prairie Lake region, an archaic burial appears to be represented at 21BW7. Gravel operations in 1958 uncovered a small burial pit intruded into the gravel subsoil. Valentine (1969) reports the presence of a single primary burial and two Parkdale eared projectile points. No bioarcheological information is available for this individual.

Archeological survey in central Carver County by a high school student in 1969 related to a science fair project resulted in the excavation of a burial that was protruding from the edge of a bluff overlooking a lake (unidentified). The burial is reported by the student (Hasse 1969) and identified as Archaic based on the presence of an antler point and two Trinity type projectile points associated with the burial directly below the cranium. No osteological data are presented for this individual.

#### Eastern Woodland

In the Eastern Woodland region, the single reported possible Archaic site is the Vach Mound site (21PN8) which was excavated in 1967 by Leland Cooper (Lindeman 1967). A possible Archaic designation is based on the presence of copper fragments or copper nuggets, although burial is in a mound and ceramics are present. The site is located between the south end of Lake Pokegama and the backwater of the Snake River. Extremely fragmentary and incomplete human remains representing three adults (one male, one female, and one unknown) and an adolescent approximately 15 years of age are identified in unpublished data files at the Hamline University Osteology Laboratory. Little bioarcheological information is obtainable from the poorly preserved and fragmentary remains but of considerable interest is a rare dental development abnormality exhibited by the 15 year old juvenile. In this individual, the right maxillary first premolar (PM3) and the canine are transposed (Nelson 1992).

#### Summary of the Archaic Period

The Archaic period in Minnesota is poorly known bioarcheologically. Some sites have produced little or no osteological data. Complete bioarcheological data recovery is in process, however, on all sites/individuals extant in collections by the Hamline University Osteology Laboratory as part of the Minnesota Indian Affairs Council NAGPRA compliance. Protocol for this analysis follows methodology/techniques developed by Buikstra at Northwestern University and parallel or exceed the data collection guidelines in Buikstra and Ubelaker (1994). The Rooney Mound has produced the most significant bioarcheological information but the sample size is only nine individuals. The relationship of Archaic populations to earlier populations in Minnesota is of considerable interest and the Rooney Mound individuals suggest some cranial morphological similarities. The Late Archaic-Early Woodland transition is also of considerable interest here, as elsewhere in the Midwest, as Woodland traits appear to be transposed on top of Archaic type adaptations. Recent early radiocarbon dates for sites with Brainerd ware ceramics (Caine and Goltz, n.d.) suggest additionally the problems inherent in understanding this Late Archaic-Early Woodland transition period.

#### The Woodland Period (1000 B.C.-A.D. 1700/Contact)

The Woodland tradition in Minnesota commences with the appearance of ceramic manufacture and the construction of earthen mounds ca. 1000 B.C. Cultural developments and trends during this period include increasing population sizes, expanding participation in regional trade networks, increasingly efficient use of locally available food and raw material resources, and continued development of locally distinct groups.

During the Woodland tradition, the prairie-forest border shifts northward and the state can be broadly divided into four major ecological zones: Prairie, Prairie Lake, Northern Forest, and Eastern Woodlands. Both the Northern Forests and Eastern Woodlands were characterized by a generally forested environment that mirror those regions in contemporary times. It is hypothesized that climate may have fluctuated during the Woodland period impacting the nature and pace of cultural change; however, the reality of these changes has yet to be reliably demonstrated (Dobbs 1988).

The applicability of the Woodland period concept to Minnesota archeology has been discussed recently during a conference organized by members of the Minnesota archeology community to discuss the state of knowledge regarding Minnesota archeology and to identify directions for future research (Dobbs 1988a). Discussion centered on issues that engage archeologists in all three states of the Northeastern Woodlands study unit. Key issues included the undefined relationship between mound construction and the adoption of pottery, the variable appearance and nature of ceramic manufacture throughout the state, and absence of related social developments as defined for the Woodland period in the central part of the United States. Furthermore, reliance on cultigens and a shift to a more sedentary lifestyle do not appear until very late in the precontact period in Minnesota. The conference concluded that the utility of the Woodland concept for Minnesota archeology is primarily on the regional level and functions to relate the local manifestations during this time to the broader regional constructs. The Woodland period was renamed the "ceramic/mound stage" as a result of discussions that took place at the conference (Dobbs 1988a). Due to the current draft status of the context document written following the conference (Dobbs 1988a, 1988b) and the limited usage of the proposed new terminology, the human remains recovered from archeological sites assigned to this time period will be discussed under traditional designations of Early Woodland, Middle Woodland, and Late Woodland.

A majority of all mortuary sites identified in Minnesota are classified as Woodland (Table 47). To date, human remains have been recovered from 97 Woodland sites, 20% of all mortuary sites listed in the Minnesota bioarcheology database (N=484). Of the 97 Woodland mortuary sites, none are designated as Early Woodland, 30 as Middle Woodland, and 40 as Late Woodland. The phase designations of the remainder of the Woodland period sites are unknown (N=27).

#### Early Woodland (800 B.C.-200 B.C.)

Discussions within the archeological community questioned the existence of the Early Woodland in Minnesota. Gibbon (1986) concludes that there is no Early Woodland lifestyle nor are there Early Woodland complexes in Minnesota. The earliest dated ceramic types, including La Moille Thick and Fox Lake Trilled, are believed to date to the Middle Woodland period (200 B.C.-A.D. 900) or to what some have referred to as the Initial Woodland (Dobbs 1988a).

Only two mortuary sites listed in the database may date to an Early Woodland time frame: Morrison Mounds (21OT02) and Voight (21WN15). A <sup>14</sup>C date of approximately 690 B.C. was reported for Mound 13 of

Morrison Mounds (21OT02). The accuracy of this date has been questioned due to possible "atmospheric contamination" from open drawer storage and the fact that only a single sample was dated (Johnson 1964; Anfinson 1979:15; Aufderheide et al. 1994). The date was determined from a wood sample from one of the charred logs overlaying the central burial pit. It should be noted that  $^{14}\text{C}$  dates determined from charred wood in similar situations from different sites have resulted in acceptable, but more recent, dates (e.g., Malmo site, ca. 200 B.C.). Furthermore, several Minnesota sites are represented by a single  $^{14}\text{C}$  date and the accuracy of these dates is not questioned. Clearly the controversy regarding the validity of the early date for Morrison Mounds can be resolved only by additional  $^{14}\text{C}$  dating. If one accepts the early date, Morrison Mounds (21OT02) represents one of the few documented Early Woodland sites and the only Early Woodland site yielding human remains. Human mortuary activity at Morrison Mounds has been classified as belonging to the Malmo phase, a Middle Woodland manifestation. If the

early date is ultimately accepted, the Malmo phase may have its origins in the Early Woodland. No related habitation site was identified at Morrison Mounds; therefore, a more direct evaluation of subsistence and settlement practices is not available.

Recognizing the "Early Woodland" date, the human remains recovered from Morrison Mounds will be discussed in this section. The Morrison Mounds site is situated approximately 45 feet above the Otter Tail River at the outlet of Otter Tail Lake. The human remains recovered from the Morrison Mounds site are currently undergoing extensive osteological analysis. A preliminary estimate of a minimum of 16 individuals recovered from the four mounds excavated was reported (Wilford et al. 1969). An unreported number of individuals from Morrison Mounds were included by Ossenberg (1974) as part of the Mille Lacs culture Kathio phase in her biodistance study investigating the origins and relationships among a number of Woodland period groups located in the Great Lakes area. Data collected but not presented per site consisted of 26 nonmetric traits of the cranium. Ossenberg concludes that the Kathio phase is distinct from

Table 47. Minnesota sites with a Woodland mortuary component.

Site	Period/Phase	MNI	Region	Type	Ref.	Site	Phase	MNI	Region	Type	Ref.
Malmo Mounds (21AK01)	Malmo	26	NF	Mound	1	21MR19	Unknown	2	PL	Mound	
Battle Island (21AK09)	Sandy Lake	1	NF	Unknown	2	Lake Shetek Mounds (21MU03)	Unknown	16	PL	Mound	9
Episcopal Camp (21AK9002)	Sandy Lake	1	NF	Unknown	2	Lake Shetek Mounds #2 (21MU04)	Unknown	2	PL	Mound	9
Howard Lake Mounds (21AN01)	Howard Lake	23	EW	Mound	3	Lake Shetek Mounds #3 (21MU05)	Unknown	2	PL	Mound	9
Gun Club (21AN50)	Unknown	1	EW	Mound		Poehler Mound (21NL01)	Hopewellian	3	PL	Mound	9
Hanel Mound (21BE01)	Unknown	5	PL	Mound	4	Wolff Mound (21NO13)	Unknown	15	P or PL	Mound	
Judson Mound (21BE03)	Unknown	7	PL	Mound	5	Slininger Mound (21NR01)	Arvilla	10	PL	Mound	30
Elbow Lake (21BK38)	Blackduck	1	NF	Isolated	6	Habben Mound (21NR02)	Arvilla	2	P	Mound	30
Schocker (21BL01)	Blackduck	22	NF	Habitation	7	Peterson Mound (21OT01)	Malmo	3	EW	Mound	9
21BS13	Unknown	1	PL	Mound		Morrison Mounds (21OT02)	Malmo	18	EW	Mound	9
Theater Seasons Cafe (21BS20)	Unknown	1	PL	Isolated	8	Graham Lake (21OT05)	Malmo	3	EW	Mound	9
Synstebby Mound Village (21BW01)	Unknown	40	PL	Mound	9	Orwell (21OT7)	Unknown	24	EW	Mound	31
Sievert Mounds (21BW02)	Unknown	24	PL	Mound	9	Fertile (21PL06)	Arvilla	13	PL	Mound	32
Mud Lake Mounds (21CA02)	Blackduck	6	NF	Mound	10	Crookston (21PL09)	Unknown	29	P	Mound	32
Norway Lake (21CA22)	Sandy Lake	1	NF	Mound	11	Peter Lee (21PL13)	Arvilla	11	PL	Mound	32
Upper Rice Lake (21CE04)	Blackduck	1	NF	Habitation	12	Stumne (21PN05)	Arvilla	18	NF	Mound	33
Lower Rice Lake (21CE05)	Unknown	1	NF	Mound	13	Winter (21PN17)	Unknown	1	NF	Habitation	33
Herberg (21CE28)	Blackduck	1	NF	Mound	2	Bartke Mound (21PO01)	Kathio	5	EW	Mound	9
Talcot Lake Burials (21CO13)	Unknown	1	PL	Isolated	14	Fingerson Mound (21PO02)	Kathio	10	EW	Mound	9
Pine River Mounds (21CW01)	Kathio	4	NF	Mound	15	Noyes (21PO14)	Unknown	1	EW	Mound	34
King Mound (21CW02)	Unknown	1	NF	Mound	9	Red Lake River Mds (21RL01)	Arvilla	17	NF	Mound	32
McAloon Mounds (21CW03)	Unknown	3	NF	Mound	9	Black Tortoise Md (21SB01)	Malmo	15	PL	Mound	7
Hoffman Mound#2 (21DL01)	Unknown	28	EW	Mound	16	Huber Mound (21SC01)	Kathio	4	PL	Mound	35
Interfachen (21DL68)	Unknown	1	EW	Mound		Steele Mound Group (21SC24)	Unknown	35	PL	Mound	36
Albert Lea Lake (21FE01)	Unknown	24	PL	Mound	17	Christensen Mound (21SH01)	Kathio	37	EW	Mound	9
Riehl Mound Group (21FL08)	Unknown	10	EW	Mound	9	Moorhouse Mounds (21SH02)	Unknown	6	EW	Mound	9
Eggleston Mound (21GD05)	Unknown	1	EW	Mound	18	Sherburne Nat'l Refuge (21SH18)	Unknown	22	EW	Mound	37
Birch Lake (21GD59)	Unknown	5	EW		19	Pike Bay Mound (21SL01)	Laurel	4	NF	Mound	26
Birch Lake Mounds (21GD61)	Unknown	2	EW	Mound	19	21SL53	Blackduck	1	NF	Cemetery	2
Davis Mounds (21HE01)	Unknown	5	EW	Mound	9	Syl Sand (21SN11)	Unknown	26	EW	Mound	38
Eck (21HE02)	Kathio	16	EW	Mound	20	Berscheid (21T003)	Unknown	18	EW	Isolated	12
Halpin Mounds (21HE03)	Kathio	8	EW	Mound	9	Round Mound (21TR01)	Kathio/Cam.	37	PL	Mound	39
Preston Haglin Mound (21HE30)	Unknown	1	EW	Mound	21	Wilson Mound (21TR02)	Arvilla	5	PL	Mound	39
Willis Mound (21HE52)	Unknown	1	EW	Mound	21	K Group (21TR03)	Unknown	2	PL	Mound	39
Baker Mound (21HE61)	Unknown	1	EW	Mound	9	Fire Mound (21TR04)	Arvilla	3	PL	Mound	9
Malmsten Mounds (21HE64)	Kathio	4	EW	Mound	9	Strader Mound (21TR09)	Arvilla	1	PL	Mound	2
White Oak Point (21IC01)	Blackduck	73	NF	Mound	22	Michaud Mounds (21WA02)	Unknown	1	EW	Mound	9
Osufsen Mound (21IC02)	Blackduck/SL	94	NF	Mound	23	McKee (21WA04)	Unknown	24	EW	Mound	9
Stangland Mound (21IC03)	Blackduck	4	NF	Mound	24	Brostrom Mounds (21WB01)	Unknown	4	EW	Mound	40
Renstrom (21KA01)	Kathio	1	EW	Mound	25	Bois DeSioux Lake (21WL04)	Unknown	1	P	Mound	2
McKinstry Mounds (21KC02)	Blackduck	96	NF	Mound	26	Volkart Mounds (21WN02)	Unknown	1	EW	Mound	9
Smith Mounds (21KC03)	Laurel	206	NF	Mound	26	Voight (21WN15)	Unknown	8	PL	Cemetery	41
Hanson (21KC9001)	Blackduck	2	NF	Cemetery	27	Alton Anderson (21WW04)	Fox Lake	39	PL	Cemetery	42
Calhoun Lake (21KH01)	Kathio	2	PL	Mound	28						
Nest Lake Mound (21KH02)	Unknown	13	PL	Mound	29						
Norway Lake Mound (21KH79)	Unknown	1	PL	Mound	2						
Lake Bronson (21KT01)	Arvilla	7	PL	Mound	30						
21KT9004	Arvilla	6	P	Mound	2						
Snake River Mounds (21MA01)	Arvilla	4	PL	Mound	30						
Haarstad Mound (21MA06)	Arvilla	1	PL	Mound	30						
Karlstad Ossuary (21MA10)	Unknown	9	P	Cemetery	31						
Brower/Vanderbloom (21ML01)	Malmo	17	EW	Mound	9						
Anderson Mound (21ML04)	Malmo	4	EW	Mound	9						
Cooper Mound 2 (21ML16)	Unknown	1	EW	Mound	1						

References: 1 Aufderheide et al. 1994; 2 U of M correspondence file; 3 Wilford 1955b; 4 Wilford 1943a; 5 Wilford 1942a; 6 Radford 1986; 7 Johnson 1964; 8 Wilford 1956e; 9 Wilford et al. 1969; 10 Wilford 1938; 11 Birk 1977; 12 Helmen 1964; 13 Johnson 1959; 14 Thurston-(Myster); 15 Wilford 1937a; 16 Johnson 1963; 17 Norquist 1967c; 18 Wilford 1955; 19 Johnson et al. 1969; 20 Wilford 1964; 21 Wilford 1952a; 22 Wilford 1959; 23 Wilford 1943b; 25 Jenks 1932; 25 Wilford 1955d; 26 Stoltman 1973; 27 Oothoudt 1991; 28 Wilford 1953; 29 Wilford 1969; 30 Johnson 1973; 31 Scott and Leondorf 1976; 32 Anderson 1962; 33 Cooper 1967; 34 Anfinson 1978; 35 Wilford 1945; 36 Norquist 1967b; 37 Lane 1974; 38 Tilling 1970; 39 Wilford 1970; 40 Wilford 1960; 41 Fiske and Hume 1963; 42 Lothson 1983

the other Woodland groups and does not seem to be closely related to any of them. The historic descendant tribe(s) of the Kathio phase were not discernible. A cautionary note must be inserted here: Morrison Mounds are believed to have been used by Malmo peoples, an earlier manifestation than Kathio in the Mille Lacs area. See the Kathio section below for a discussion of the distinction between Malmo and Kathio phases.

The Voight site (21WN15) was salvaged in 1961 by students under the direction of Elden Johnson of the University of Minnesota, Minneapolis. The site is located on a ridge overlooking the Mississippi river and consists of a habitation area and associated cemetery. The nature of artifacts recovered (crudely worked bone, stone, shell and copper), the absence of pottery, and nonmound burial were suggestive of an Archaic association; however, a recent  $^{14}\text{C}$  date,  $2557 \pm 52$  years B.P., places the site in the Early Woodland period. Little bioarcheological analysis has been conducted on the remains from this site. A 1994 undergraduate senior thesis included a preliminary and cursory analysis of the human remains (Cork 1994) and a short article detailing the salvage excavation of Voight included some demographic information and details about the mortuary practices (Fiske and Hume 1963). A minimum of eight individuals of the following ages and sexes were recovered: fetal remains aged at 8-8.5 lunar months; an adolescent 12 years  $\pm$  36 months of undetermined sex; an adolescent 15 years  $\pm$  36 months; a 17-20 year old of unreported sex; two females, each 15-18 years old; and two adult males 22-25 years and 25-32 years of age, respectively. In addition to the demographic profile, the two females were reported to exhibit an absence of caries. No other bioarcheological data were reported (Cork 1994).

#### Initial/Middle Woodland (200 B.C.-900 A.D.)

The Middle Woodland is broadly characterized in the Midwest by the appearance of a variety of distinctive ceramic forms and styles, the emergence of more complex burials and mortuary-related rituals, increasing societal complexity as reflected by the presence of differential status, and participation in widespread trade networks that included the distribution of both materials (e.g., copper, obsidian, and pipestone) and ideology (e.g., social hierarchy, mortuary practices).

Middle Woodland mortuary components are reported for 30 sites in the bioarcheology database (Table 48). Eight of these sites are located in the Eastern Woodlands, two in the Prairie, 15 in the Prairie Lake, and five in the Northern Forest region. A minimum number of 461 individuals have been identified from these sites comprising approximately 32% of the total number of individuals recovered from Minnesota sites. Twenty percent (N=110) of all Middle Woodland individuals have been recovered from the Eastern Woodland region, 1% (N=8) from the Prairie region, 29% (N=160) from the Prairie Lake region, and 49% (N=271) from the Northern Forest region. Four phases/foci/complexes (Hopewellian, Howard Lake, Laurel, and Malmo) are represented by the mortuary components of the reported Middle Woodland sites. Additionally, the mortuary components of six Middle Woodland sites are unidentified as to phase, focus, or complex.

Middle Woodland peoples in Minnesota variously participated in what has become known as the Hopewell Interaction Sphere (Struever 1964, 1965). Two Middle Woodland traditions have been identified in Minnesota, Havana and Lake Forest, and represent the varied roles of Minnesota precontact cultures in the Hopewell domain (Dobbs 1988a). The Havana complex encompasses the cultural manifestations in the Upper Mississippi drainage that reflect some Hopewellian influence (Struever 1964, 1965). The extent of the influence, however, is believed to be limited and significant local cultural developments (e.g., subsistence-related

adaptations), distinct from Hopewellian cultures further to the south, exist. In Minnesota, the Howard Lake and Havana-related foci represent the northernmost extension of the Havana complex. Fitting's (1970, 1978) Lake Forest Middle Woodland is more widespread in this region and exhibits mortuary ceremonialism and ceramic manufacturing that is distinct from Hopewellian influences. The Malmo and Laurel phases are representative of the Lake Forest Middle Woodland adaptation.

#### Prairie

*Fox Lake Phase.* The earliest appearance of ceramics is attributed to the Fox Lake phase (Anfinson 1987; Dobbs 1988a). Few sites of this phase have been systematically excavated and little is known about the culture of this archeological manifestation. A majority of sites identified as Fox Lake are situated along the margins of lakes in southern and southwestern Minnesota, and subsistence practices revolved around bison hunting supplemented by seasonally available aquatic and terrestrial plants and animals. Mound burial does not seem to be associated with Fox Lake since no Fox Lake ceramics were directly associated with mound burials or even within the mound fill. No definitive Fox Lake mortuary sites have been excavated to date; However, two mortuary sites, Runck (21BW07) and Alton Anderson (21WW04), may be affiliated with Fox Lake based on associated projectile points (Anfinson 1987). The Runck site was originally designated as an Archaic site due to the absence of any ceramics; however, projectile points recovered from the site resemble those affiliated with a Fox Lake site; a single individual was identified at the site but was not retained for further analysis. This burial is listed in Table 46. The Alton Anderson site (21WW04) is the second candidate for a Fox Lake phase mortuary site. Similar to the Runck burial, the hypothesized designation

Table 48. Minnesota sites with an Initial/Middle Woodland component in the Eastern Woodlands (EW), Prairie and Prairie Lake (PL) and Northern Forest (NF) regions.

Site	Phase	MNI	Region	Type	Ref.
Malmo Mds. (21AK01)	Malmo	26	NF	Mound	1
Howard Lake Mounds (21AN01)	Howard Lake	23	EW	Mound	2
Hoffman Mound #1 (21DL01)	Unknown	28	EW	Mound	4
Albert Lea Lake (21FE01)	Unknown	24	PL	Mound	5
Riehl Mound Group (21FL08)	Unknown	10	EW	Mound	6
Smith Mounds (21KC03)	Laurel	206	NF	Mound	7
Lake Bronson (21KT01)	Arvilla	7	PL	Mound	8
Snake River Mounds (21MA01)	Arvilla	4	PL	Mound	8
Haarstad Mound (21MA06)	Arvilla	1	PL	Mound	8
Brower/ Vanderbloom (21ML01)	Malmo	17	EW	Mound	6
Anderson Mound (21ML04)	Malmo	4	EW	Mound	6
Lake Shetek Mounds (21MU03)	Unknown	16	PL	Mound	6
Poehler Mound (21NL01)	Hopewellian	3	PL	Mound	6
Slinger Mound (21NR01)	Arvilla	10	PL	Mound	8
Habben Mound (21NR02)	Arvilla	2	P	Mound	8
Peterson Mound (21OT01)	Malmo	6	EW	Mound	6
Morrison Mounds (21OT02)	Malmo(?)	18	EW	Mound	6
Graham Lake (21OT05)	Malmo	4	EW	Mound	6
Fertile Mound (21PL06)	Arvilla	13	PL	Mound	9
Peter Lee Mound (21PL13)	Arvilla	11	PL	Mound	9
Stumne Mounds (21PN5)	Arvilla	18	NF	Mound	10
Red Lake River Mound (21RL01)	Arvilla	17	NF	Mound	9
Black Tortoise Md (21SB01)	Malmo	15	PL	Mound	11
Wilson Mound (21TR02)	Arvilla	5	PL	Mound	9,13
Fire Mound (21TR04)	Arvilla	3	PL	Mound	6
Strader Mound (21TR09)	Arvilla	1	PL	Mound	14
Voight (21WN15)	Unknown	8	PL	Cemetery	15
Alton Anderson (21WW04)	Fox Lake?	39	PL	Cemetery	16
Pike Bay Mound (21SL01)	Laurel	4	NF	Mound	21
21KT9004	Arvilla	6	PL	Mound	

References: 1 Aufderheide et al. 1984; 2 Wilford 1955b; 3 Wilford 1937a; 4 Johnson 1963; 5 Norquist 1967b; 6 Wilford et al 1969; 7 Stoltman 1973; 8 Johnson 1973; 9 Anderson 1962; 10 Cooper 1967; 11 Johnson 1964; 12 Helmen 1964; 13 Wilford 1970; 14 U of M correspondence file; 15 Fiske and Hume 1963; 16 Lothson 1983.

is based on similarities in projectile points. The Alton Anderson site is located on a ridge near Wilson Lake (Lothson 1983). The human remains recovered will be discussed more thoroughly in the Phase Unknown section below.

*Havana-related.* There are several Middle Woodland sites in Minnesota that show affinities to Hopewellian groups farther to the south. Poehler Mound (21NL01) is the only mortuary site in the Prairie region of the state to exhibit such affinities. The mound group within which Poehler Mound is situated originally consisted of 26 mounds spread out some 500 feet west of the western shore of Swan Lake (Winchell 1911). Lloyd A. Wilford, University of Minnesota, excavated a single mound in 1954. Three burials were encountered during excavations and yielded a minimum of three individuals, two adults and an infant. No further bioarcheological information is available (Wilford et al. 1969).

*Phase Unknown.* One site with an Initial/Middle Woodland mortuary component, Alton Anderson (21WW04), has undergone preliminary osteological analysis. The Alton Anderson site is situated on a glacial ridge (esker) along the north side of Lake Wilson in the Lake Wilson-Watonwan River drainage and was encountered during graving operations in 1970 (Lothson 1983). Subsequent investigations in 1970 and 1971 resulted in the recovery of between 35 and 39 individuals from six burial "areas." A majority of the burials were primary interments, and the most frequent of such body positions were flexed and semiflexed. Extended primary interments, as well as secondary interments, were also present. Skeletal preservation was excellent. A relative date of A.D. 600-1000 is reported based on type and style of artifacts present. Radiocarbon dating was performed on a single bone sample; however, significant calcium carbonate contamination rendered the date unreliable.

A partial osteological analysis was performed by Lothson (1983) and he reports detailed inventory and molar attrition data, as well as the age and sex distribution of recovered individuals and stature estimates based on maximum lengths of the femora, tibiae, and humeri. The data must be regarded as preliminary since the author is not a trained physical anthropologist. Table 49 presents the age and sex distribution of individuals recovered. An equal number of males and females were present. Infant mortality rates were high and more females (21.4%) than males (10.9%) died between 13 and 20 years of age, most likely due to childbearing stresses. No pathology was reported and it is assumed that the author did not observe the presence or absence of any pathological lesions and that they may indeed be present. Lothson (1983), however, did note the absence of traumatic injuries indicative of violent altercations. Dental caries was reported as infrequent but no frequencies were presented. Molar attrition was scored according to the methodology presented in Brothwell (1965) and ranged from slight to moderate in degree; only three percent of all observed molars were severely worn. The incisors of both male and female individuals exhibited more advanced wear than the posterior teeth. Lothson concludes that the Alton Anderson sample represent hunter-gatherers and says "noticeably absent are the large dental caries and the molar wear that is often seen in sedentary populations" (Lothson 1983:56). Stature estimates are based on femoral length (most frequent bone present). Male stature ranges from 5 ft. 3 in. to 5 ft. 7.5 in. ( $161.36 \pm 3.80$  cm to  $174.26 \pm 3.80$  cm) and female stature from 5 ft. 1 in.-5 ft. 3.7 in. ( $156.42 \pm 3.80$  cm to  $163.73 \pm 3.80$  cm). In sum, the data reported by Lothson (1983) are preliminary and suggest directions for future research.

#### Eastern Woodlands

*Malmo Phase.* Malmo was first defined as an early focus of the Mille Lacs aspect by Wilford (1941). Subsequent excavations and research have resulted in a provisional designation as a ceramics phase in lieu of a distinct

archeological culture (Dobbs 1988a). Malmo represents the earliest ceramic type in east-central Minnesota in the Eastern Woodlands and sites assigned to this phase cluster in the Mille Lacs Lake area. The temporal span of this phase is 200 B.C.-A.D. 200. Fitting (1970) includes Malmo as a member of the regionally-defined Lake Forest Middle Woodland group due to similarity in artifact composition and ecological base.

Little is known about the cultural system of the Malmo phase. Johnson (1988) describes the lifestyle as one characterized by small, highly mobile bands that subsisted on a variety of seasonally available food resources. They practiced mound burial, primarily in circular or conical earthworks that represent a single construction phase. Malmo mortuary sites consist of numerous mounds that together represent a temporal series of construction over a number of years. Burials are characterized by their absence of grave goods and a secondary bundle mode of interment.

The nature of Malmo relationships to other populations is poorly defined and based solely on the analysis of artifact remains. Ceramic styles indicate some interaction with the Hopewellian groups to the south in Illinois, southwest Wisconsin, and northeast Iowa (Johnson 1988). Wilford (1955c) postulated the in situ development of the Late Woodland Kathio phase (A.D. 800-1400) from Malmo and speculated further that another Late Woodland manifestation, the more northerly Blackduck (A.D. 800-1400), also developed out of the Malmo phase. Ossenberg (1974), however, feels that the similarities in artifact styles may reflect population convergence rather than evolution as a result of a greater degree of genetic interaction. Increased reliance on wild rice would have enabled significant population growth resulting in more sedentary Late Woodland populations (e.g., Kathio and Blackduck) and fostered more frequent population interaction one consequence of which would have been technological and stylistic exchanges. The biological consequences of the more frequent and intensive contact are unknown at this time.

Seven (23%) of the 30 Middle Woodland sites reported in the bioarcheological database are classified as Malmo. Human remains recovered from these sites represent a minimum of 101 individuals, 22% of all Middle Woodland individuals (Table 48). The skeletal remains recovered from Malmo mounds are generally poorly preserved and fragmentary and few have undergone extensive osteological analysis. Aufferheide et al. (1994) report the most extensive osteological analysis of Malmo phase skeletal samples (Brower Mound, 21ML01, and Malmo Mound, 21AK01) to date.

The Brower site (21ML01) is located on what is believed to be an old beach ridge situated on the northwest side of Lake Onamia. The site consists of a series of mounds and an adjacent habitation site that is believed to be contemporaneous. Two of the mounds, Anderson and Vanderbloom, were excavated by University of Minnesota archeologists Alfred E. Jenks in 1933 and Lloyd A. Wilford in 1952. Reports of the excavations were published in 1969 when Jenks' and Wilford's notes and

Table 49. Age and sex distribution of individuals recovered from the Alton Anderson site (21WW04).

Age Category (yrs)	Male	Female	Indeterminate	Total
0 - 3.9	0	0	0	0
4 - 6	0	0	1	1
8 - 10	0	0	1	1
10 - 12	1	0	2	3
13 - 17	0	0	1	1
16 - 25	4	5	0	9
21 - 35	5	5	0	10
35 - 55	1	0	0	1
45+	1	0	0	1
Adult	0	2	3	5
Total	12	12	8	32

Compiled from Appendix V (Lothson 1983:76)



preliminary reports were compiled and published (Wilford et al. 1969). A description and preliminary inventory of each individual encountered was included in the excavation report. Since the initial excavation, the human remains have received more extensive analysis as part of a larger research project conducted to examine the biocultural nature of the human remains excavated from seven sites spanning approximately 1000 years (200 B.C.-eighteenth century) in the Mille Lacs area (Aufderheide et al. 1994). Each site will be discussed separately in the appropriate temporal section.

Both the Anderson (21ML04) and Vanderbloom (21ML01) mounds of the Brower site (21ML01) are believed to represent single phase constructions during the Malmo phase and are directly related to the early occupation at the Malmo site (21AK01). The mortuary program at these two mounds was characterized by in situ cremation of both secondary and primary burials, interment of some individuals in burial pits capped by several logs that were subsequently burned, and the absence of grave goods (Wilford et al. 1969; Aufderheide et al. 1994). A minimum of 21 individuals were identified from the site; 17 from Vanderbloom and four from Anderson Mound. Table 50 presents the age and sex distribution of individuals recovered from the two mounds. Due to the fragmentary nature of the remains little additional osteological analysis was possible. Pathological conditions observed included a healed skull fracture on a 12 year old individual, a healed fracture on an unreported bone of a 15 year old female, and severe osteoarthritis on a 40 year old female. A few postcraniometrics are reported including femoral circumference, maximum diameter of the femoral head, and maximum diameter of the humeral head. Dental remains were few and very fragmented; caries, abscess, and antemortem tooth loss were recorded. A single abscess and a single carious lesion were observed on one individual each. No individuals exhibited periodontitis.

The Malmo Mound Group (21AK01) is situated between Big Bay Creek and the northeast shore of Lake Mille Lacs and was reported in 1899 to have consisted of 127 mounds (Aufderheide et al. 1994). Seventy-one mounds remained and were recorded in 1971. G. Ekholm, a graduate student at the University of Minnesota, excavated 13 mounds in 1935 and recovered a minimum of 26 individuals (20 adults and six subadults; nine males, four females, and 13 of indeterminate sex). Table 51 presents the age and sex breakdown of the recovered sample.

Skeletal pathology observed include two instances of slight degenerative joint disease (two individuals of 26), two occurrences of diffuse periostitis (two individuals of 26), and one instance of "mastoid air cell destruction" (Aufderheide et al. 1994:364). The rate of antemortem tooth loss was reported as 7.5% for the combined sample of Brower and Malmo and represents data observed on 186 out of 1128 possible alveoli (16.5%). The frequencies of other dental pathology were not presented in the text although the raw data are recorded in the appendix. A review of the raw data indicates that no individuals exhibit caries or abscesses. Periodontitis was evaluated and two individuals exhibited moderate infection, one with severe infection, and 14 individuals were observed to be unaffected. Stable carbon isotopes ratios were reported for four individuals. An average delta value of  $-21.41 \pm 0.75$  was observed, clearly indicating a lack of  $C_4$  plants (e.g., maize) in the diet. Stature estimation was possible for one adult male individual only, 167 cm (5 ft. 6 in). Eleven postcranial measurements were reported for six individuals and consist of 10 femoral circumferences and one tibial maximum length. Together the Brower (21ML01, 21ML04) and Malmo (21AK01) sites form the basis of Wilford's definition of the Malmo focus, an early Middle Woodland manifestation.

Two mounds of the original 19 identified as the Graham Lake Mound Group (21OT05) were excavated by Wilford during July and August of 1949. A minimum of four individuals were encountered during

excavations. A young child represented by four unerupted molars was excavated from Mound 1 and three adults (two males, one female) from Mound 2. No further bioarcheological information is reported.

The Peterson Mound Group (21OT01) originally comprised three mounds. Prior to excavation by Jenks in 1937, two had been disturbed by the landowner. Jenks' excavation yielded a minimum of six individuals from two of the mounds (Wilford 1942c). No further osteological analysis has been conducted on the remains.

*Howard Lake phase.* Howard Lake was defined as a phase by Wilford (1955c) and represents one of the northernmost phases participating in Streuver's (1964) Hopewell Interaction Sphere. Fitting (1978:49) more precisely defines the Middle Woodland manifestations in this region as the Lake Forest Middle Woodland "a widely distributed group of cultures with similarities in material cultures and a similar ecological base." Clear relationships between Howard Lake and the Havana Hopewell are most evident in ceramic styles. Fitting (1978) suggests that Howard Lake site inhabitants participated in an exchange network with the more southerly Hopewellian populations and thus stylistic concepts were diffused as seen in the Havana-like decorations observed on Howard Lake pottery. Chronology of Howard Lake is estimated to be 400 B.C.-A.D. 300 (Dobbs 1988a).

Howard Lake Mounds (21AN01) is the only site in the Central and Northern Plains mortuary site database assigned to the Howard Lake phase. Wilford excavated one mound of the group of three in 1950 (Wilford 1955). A preliminary inventory of the remains recovered identified a minimum of 23 individuals. No further bioarcheological information is available.

#### Northern Forest

*Laurel Culture.* Laurel was first defined by Wilford (1941) as a focus of the Rainy River aspect of the Woodland pattern. Further research refined the temporal range of this culture in Minnesota to the Middle Woodland period, 200 B.C.-A.D. 500/800 (Wilford 1955c; Stoltman 1973; Dobbs 1988a). Analysis of the ceramics and seriation of the different types resulted in the definition of 3-4 phases: Pike Bay (200 B.C.-A.D. 300), McKinstry (A.D. 300-600); Smith (A.D. 600-900), and Hungry Hall (A.D. 900-1200) (Stoltman 1973; Lugenbeal 1977; Reid and Rajnovich 1991). As our discussion is limited to the bioarcheology of Minnesota, only the Pike Bay and Smith phases are relevant; no human burials dating to the intermediate McKinstry phase have been recovered.

The Laurel culture is the most geographically extensive Middle Woodland group in North America and extends east-west from northeastern Ontario to northeastern Saskatchewan and north-south from the Hudson Bay Lowlands to northern Minnesota;  $^{14}C$  dates range over 1400 years throughout this range (Reid and Rajnovich 1991). A hunting and gathering adaptation characterizes the Laurel culture. The annual migration patterns were determined by seasonal availability of plant and animal foodstuffs. There is little direct evidence of intensive reliance on

Table 50. Age and sex distribution of individuals recovered from Anderson and Vanderbloom Mounds, Brower site (21ML01).

Age Category (yrs)	Male	Female	Indeterminate	Total
Fetus	0	0	2	2
Newborn	0	0	0	0
0-2	0	0	2	2
3-10	0	0	5	5
11-18	0	1	3	4
19-29	0	0	2	2
30-49	1	3	2	6
50+	0	0	0	0
Total	1	4	16	21

Reported from Aufderheide et al. (1994:372)

Table 51. Age and sex distribution of the individuals recovered from the Malmo site (21AK01).

Age Category (yrs)	Male	Female	Indeterminate	Total
Fetus	0	0	0	0
Newborn	0	0	1	1
0-2	0	0	0	0
3-10	0	0	1	1
11-18	1	0	3	4
19-29	2	1	4	7
30-49	6	3	3	12
50 - 64	1	0	0	1
Total	10	4	12	26

\* Based on data reported in Aufderheide et al. 1994

any one plant food resource although it is hypothesized that exploitation of wild rice and maple sugaring were practiced. The Laurel culture is further defined by a distinctive assemblage of material items including the earliest ceramics in the Northern Forest region (Stoltman 1973). Analyses of material cultural remains clearly indicate that Laurel culture shares similarities in adaptation and material culture to other components in Fitting's (1970) Lake Forest Middle Woodland region in the upper Great Lakes area. There are also clear indications of interaction with larger Hopewellian populations to the south, however, Laurel peoples maintained their autonomy. It is a widespread belief that the Laurel culture gave rise to the local Late Woodland Blackduck phase.

Laurel is the best known bioarcheologically of all the Middle Woodland archeological manifestations. Two sites with Laurel mortuary components are reported in the database (Table 48). The remains recovered from these sites represent a minimum of 210 individuals (206 from one site), the largest skeletal sample from any Middle Woodland component. All Laurel remains, however, have been reburied as part of the Minnesota Native American Reburial Project. Osteological analyses have focused on mortuary practices, health status, and relationships to surrounding cultures (Wilford 1937; Evans 1961; Ossenberg 1974; Torbenson et al. 1992; Torbenson et al. 1994).

Four individuals were reportedly recovered from Pike Bay Mound (21SL01). The remains were not retained nor was an osteological analysis ever conducted.

The human remains recovered from Mounds 3 and 4 of the Smith site (21KC03) represent 98% (N=206) of the Laurel skeletal sample and have been the most extensively analyzed of any Middle Woodland mortuary sites. The Smith site comprises five mounds, including the Grand Mound, the largest mound in Minnesota. The mounds are situated along the bank of the Rainy River, slightly east of the mouth of the Big Fork river in a heavily wooded area. Wilford, under the supervision of Jenks and the auspices of the University of Minnesota's Department of Anthropology, conducted a complete excavation of Mound 4 in 1933 (Jenks 1935; Wilford 1950) and a partial salvage excavation of Mound 3. All recovered artifact materials from the two mounds have undergone analysis (Stoltman 1973) and there is some question whether the human remains represent the Laurel culture or the later Blackduck phase. The remains will be discussed in the Laurel section due to the more widespread acceptance of Mounds 3 and 4 as Laurel.

The results of Wilford's excavations of Mounds 3 and 4 were never published; however, unpublished manuscripts and field notes are on file at the University of Minnesota's Wilford Archeology Laboratory. Stoltman (1973) summarizes the excavation and presents the burial descriptions from the original field notes and unpublished manuscripts. The remains from Smith Mound 3 represented a minimum of 13 individuals. The poor preservation and fragmentary nature of the remains limit the amount of information determinable (Torbenson et al. 1994).

The remains from Smith Mound 4 represent the most complete and best preserved of the Laurel culture remains and, consequently, have undergone the most extensive analysis. Torbenson et al. (1994) present data and results from an analysis of postmortem mortuary treatment, a paleodemographic reconstruction, and overall health assessment. A total of 193 individuals was recovered from Smith Mound 4. One hundred and eleven individuals (58%) were classified as adult (16 years and older) and 82 (42%) as subadult. Of the adults, 41 individuals were identified as female (21%), 65 as male (34%), and five were unidentifiable as to sex. The age distribution was similar to that seen in other sites; however, individuals less than 3 years of age were underrepresented. The sex profile of the adults highlighted that females may be slightly underrepresented (1.6:1). An assessment of the sex and age at death distribution indicated that the nature of the skeletal sample precluded a reliable estimate of life expectancy; however, life expectancy was still calculated and the limitations duly noted. Taking into consideration the small number of infants present, life expectancy at birth was estimated to be approximately 20 years. This age is on the low end of life expectancies determined from other Midwestern sites (Bender 1979). Six individuals recovered during the initial excavations are not believed to be affiliated with Laurel culture. Burials 10 (female, young adult), 15 (adult), 35 (subadult), 36 (subadult), 46 (female, adult), and 77 (older adult, male) are believed to belong to the Blackduck phase. They are not included in any of the analyses reviewed here.

Twelve postcranial measurements were taken on all long bones except the fibula. Measurements recorded include maximum length and circumferences at various landmarks along the shafts to assist in sex determination. Average statures were calculated to be  $177.1 \pm 3.4$  cm for males and  $159.5 \pm 4.38$  cm for females.

The overall health status and quality of life of the individuals interred in Smith Mound 4 was assessed through observations of pathology. Health was quite good and few diseases beyond those associated with age and occupation were noted. All pathology frequencies were presented by bone. Forty-seven bones (of an unknown number of individuals) exhibited some degree of degenerative joint disease. The most frequently affected area of the body was the knee (N=13). Nontraumatic periostitis was observed on 101 bones; a majority of the cases showed evidence substantial healing. Forty-three percent of all periosteal infection could be attributed to eight individuals. Periostitis from traumatic origins was observed in four individuals (2% of the total sample). Fractures were infrequent and only eight bones were affected. Two bones exhibited avulsion fractures, two bones parrying fractures, and four bones general shaft injuries. Interpretation of the traumatic injuries suggests a low level of accidents and/or interpersonal conflict. Protuberant hyperostotic lesions were noted on five adult radii and two occurrences of calcified hematoma were seen. Two instances of congenital abnormalities were observed, one congenital hip dislocation and one instance of multiple parietal foramina.

Health was also assessed by recording episodes of growth disruption and recovery from observations of Harris lines and dental enamel hypoplasia. Sixty-three tibiae (37 adult, 26 subadult) were evaluated for Harris lines. The frequency of individuals exhibiting Harris lines was not reported; however, the total number of lines observed per age category (adult, subadult) was reported. A total of 45 lines was observed on the 37 adult tibiae and 53 lines on the 26 subadult tibiae. Age of formation ranged from less than a year to 14 years of age. Early childhood and puberty represent the stages during which most Harris lines were formed. Torbenson et al. (1994) suggest this may be due to increased susceptibility to stress at these ages and increased growth velocity. Enamel hypoplasia

was recorded for the mandibular adult canine only. Seven canines of 60 (12%) exhibited hypoplastic bands. The Torbenson et al. (1994) article reports a vast amount of data; however, it is primarily descriptive.

Mortuary practices and ritual were identified through an extensive analysis of postmortem treatment of the remains interred in Smith Mound 4 (Torbenson et al. 1992; Torbenson et al. 1994). Practices evaluated include skeletal element composition of secondary bundle burials, presence of long bone and cranial perforation, red ochre treatment, and presence and nature of cutmarks. Torbenson et al. (1994) report that a majority of all burials interred in Smith Mound 4 and identified as Laurel are secondary bundles. The composition of the bundles was assessed and it was concluded that all long bones were typically included in the bundle burials of adults while subadult bundle burials were less complete with the ulnae and radii absent in 49% of the burials. The presence of red ochre on skeletal remains is a widespread practice both temporally and geographically. The details of its use, however, are rarely provided. Torbenson et al. (1994) document the extent and nature of its use by identifying the number of individuals treated with red ochre, the number and, for a subset of individuals, the location and surface extent of the red ochre. A total of 30.1% of all individuals was treated with red ochre and 28.7% of all long bones present exhibited red ochre staining. No age breakdown was provided; however, it was stated that adult remains more frequently exhibited red ochre than subadults. No difference in red ochre presence was observed between males and females. No red ochre was observed on any of the remains interred in Smith Mound 3.

Cutmarks were frequently observed on the remains recovered from Smith Mound 4. The frequency and behavior indicated by the nature of the cutmarks was assessed for a subsample of 471 bones. Cutmarks were observed on 61.1% of all bones within the subsample. Forty percent of the bones exhibited cutmarks associated with disarticulation and 21% with defleshing. Perforation of cranial and postcranial remains was also observed. Wilford was the first to note this postmortem modification of the long bones at Smith Mound 4.

It was early noted that very many of the long bones from the bundle burials had been deliberately injured. In each of these the wall of the shaft had been deliberately crushed in near one or both ends of the shaft. This appeared to have been by a blow with a blunt instrument, such as the blunt end of a celt, in such a manner as to crush the bone. The blow had resulted in punching in the wall of the shaft to tap the marrow chamber in the inside of the bone (Wilford 1937a:15 (chapter 6)).

Wilford (1933) reports the absence of part or all of the occiput in 14 of 33 crania (42%) from Smith Mound 4. These crania were not available to Torbenson et al. (1992) for their analysis and they, consequently, focus on the pattern of perforation in the long bones. Thirty-five percent of all individuals interred in Smith Mound 4 exhibit long bone perforation, 52 adults and 13 subadults. Twenty-nine percent of all long bones exhibit perforation; however, only the three largest long bones (humerus, femur and tibia) are affected. Of these three, the femur was most frequently affected (37%), followed by the tibia (33%). The humerus was the least frequently perforated of the three long bones (15%). No significant difference in occurrence was observed between the sexes (males, 52%; females, 46%). Long bones were punctured at either the proximal or distal end and sometimes at both (19 of 157). The proximal end was preferentially perforated in the humerus (92%) and the tibia (91%); the femur was more frequently perforated distally (89%). Perforation differed in degree. A majority of punctures exposed the marrow cavity (84%) while only 16% exposed the trabecular bone of the shaft. Smith Mound 3

does not exhibit the high frequency of postmortem perforation that Mound 4 does. In fact, no crania exhibit removal of the occiput and only one long bone is perforated. Torbenson et al. (1994) explore possible reasons for tapping and conclude that the most reasonable explanation for the nature and frequency of perforations at Smith Mound 4 is the release of the deceased's spirit or soul.

The human remains from Smith Mounds 3 and 4 have also been the subject of biological distance studies and research directed at identifying *in situ* cultural development vs. migrant population movement. Ossenberg (1969b, 1974) includes Laurel skeletal samples in her regional assessment of population relationships among Woodland populations from the Upper Mississippi Valley. The primary goals of Ossenberg's research are to identify the origins of Woodland peoples from the Upper Mississippi Valley, determine their biological relationships to historic Plains tribal groups, and assess the hypothesis that Upper Mississippi Valley Woodland populations descended from classic Hopewell groups further south. To accomplish these objectives, Ossenberg calculated the frequencies of 26 cranial nonmetric traits on 942 crania from 19 sites and compared them using the measure of divergence multivariate statistical technique (Grewal 1962). Precontact skeletal samples included in her research represent the Kathio (A.D. 800-1400), Arvilla (A.D. 500-1400), Blackduck (A.D. 800-1400), Laurel (200 B.C.-A.D. 800), and Woodland-phase unknown groups from Minnesota; the Manitoba and Melita phases from Manitoba; and remains from the area near Devil's Lake, North Dakota. Historic Plains tribes are represented by samples identified as Dakota, Assiniboin, Cheyenne, and Blackfoot. Ossenberg's conclusions regarding other groups will be discussed in the relevant sections. Results pertaining to the relationships between Laurel peoples and other populations are discussed here.

Ossenberg included 39 individuals from Smith Mounds 3 and 4 in her analysis. Due to the degraded and fragmentary nature of the remains only four of the 26 discrete traits were analyzed: the marginal foramen of the tympanic plate, trochlear spur, mylohyoid bridge, and the supraorbital foramen. The results of the analysis are tentative. Although there was a relationship between Laurel and the classic Hopewell populations to the south in Illinois, Laurel shows closest affinities to the Woodland samples from the same geographic region and a very weak relationship with the Hopewell sample from Illinois. This conclusion concurs with the idea that the Middle Woodland populations in the Upper Mississippi Valley participated in the exchange networks of the Hopewell, but maintained their autonomy and expressed lifestyles adaptive to their own particular regions (Streuver 1964, 1965; Fitting 1970). Ossenberg's study suggests there was little, if any, genetic exchange between Laurel peoples and the Illinois Hopewell.

Within the Upper Mississippi Valley Laurel appears to show a close relationship with both the southern Blackduck samples (Osufsen, 21IC02, and Shocker, 21BL01) and the Manitoba phase. Accepting Ossenberg's conclusions that the Manitoba phase is ancestral to Assiniboin and the south Blackduck ancestral to Dakota, she speculates that the Laurel affinities may be indicative of a Dakota-Assiniboin split within the Laurel population base. This hypothesis is feasible given the geographic location of Laurel between these two later Woodland phases, the well-documented widespread geographic distribution of Laurel, and the apparent cultural continuity between Laurel and later Blackduck groups (MacNeish 1958; Evans 1961; Stoltman 1973). The most surprising and puzzling result is the great genetic distance between Laurel and the north Blackduck sample (McKinstry Mound 2-21KC02, Hungry Hall Mound 2-Ontario). Ossenberg postulates that the northern Blackduck sites represent an intrusive group. This conclusion appears to contradict the archeological evidence; there

is no good explanation for the disparate result at this time. Ossenbergs' study was based on cranial nonmetric traits; craniometric analyses also can contribute to the determination of biological distance. Wilford (1937) variously recorded 56 measurements from eight crania (six males, one female, and one child). The raw data are presented in the Appendix but have not, to date, been analyzed and compared to the crania of other archeological components. A biodistance study is currently being conducted utilizing 92 cranial measurements on an extensive sample of precontact and historic skeletal remains from Minnesota, North Dakota, Manitoba, Ontario, and Wisconsin (Myster 1997).

#### Summary of the Initial/Middle Woodland Period

Little bioarcheological information exists for the Initial/Middle Woodland period. The sites listed in the bioarcheology database are currently being curated by the Minnesota Indian Affairs Council at the Hamline University Osteology Laboratory and are undergoing extensive and systematic osteological analysis as part of NAGPRA compliance.

Malmö focus and Laurel culture remains provide the most substantive bioarcheological data. No trends are discernible from the published data; however, dental and skeletal pathology are low in frequency and seem to reflect the hunting and gathering adaptation of both of these Initial/Middle Woodland manifestations. Trauma is also low in frequency; however, four instances indicative of interpersonal violence were observed in Smith Mound 4 (21KC03). More substantive research is warranted for the remaining Initial/Middle Woodland sites.

#### Late Woodland (A.D. 900-1630/1700)

Dobbs (1988a:183) combines Late Woodland manifestations (e.g., Kathio, Blackduck, Sandy Lake, southeastern Minnesota) and those of the Oneota aspect and the Middle Missouri tradition (e.g., Great Oasis, Cambria) into a more expansive category, "The Late Prehistoric period." The three main groups are discussed here under the traditional headings: Late Woodland, Oneota aspect, and Middle Missouri tradition.

The Late Woodland period commences around 900 A.D. and continues in the more northern regions of Minnesota until contact with European explorers, ca. 1630/1700. A number of distinct cultural groups are identifiable during this period. Our knowledge of the biological nature of the people who comprise these populations varies from minimal (e.g., Kathio, Sandy Lake, southeastern Minnesota) to moderate (e.g., Blackduck). During the Late Woodland, the Oneota and Middle Missouri peoples are identified. The bioarcheology of these populations is discussed under separate headings.

There are 40 sites with Late Woodland mortuary components included in the database (Table 52). A total of 577 individuals was recovered from these sites. From a regional perspective 13 sites (32.5%) are located in the Eastern Woodlands region, 17 (42.5%) in the Northern Forest region, 10 (25%) in the Prairie Lake region, and 0 in the Prairie region. The 40 sites are divided among three phases: Kathio (11 sites, 118 individuals); Blackduck (12 sites, 325 individuals); and Sandy Lake (three sites, 30 individuals). Additionally, 14 sites yielding 125 individuals are classified as unknown phase. Mound sites are the most frequent sources of excavated remains (30/40 sites, 75%), followed by habitation sites (2/40, 5%), isolated burials (4/40, 10%), and separate cemeteries (2/40, 5%). The site type is unknown for two sites (5%). Despite the large number of Late Woodland mortuary sites excavated and the sizeable number of individuals recovered from these sites, relatively little is known about the biological nature of Late Woodland populations. The human remains recovered from Blackduck phase sites are the best known bioarcheologically.

Four major trends have been identified for the Late Prehistoric period in Minnesota (Dobbs 1988a). Relevant to bioarcheological research goals are the following: (1) more intensive utilization and, in some cases, production, of food resources; (2) population increase with the emergence of distinct regional complexes; (3) possible association of archeological complexes with Historic Native American groups; and (4) interaction with and influences from the more developed Middle Mississippian and Middle Missouri traditions to the south. These trends had great cultural ramifications. The biological impact of these trends on the individuals who comprised these complexes is unknown.

#### Prairie Lake

Two of 10 sites located in the Prairie Lake region have undergone a minimal degree of analysis: Round Mound (21TR01) and Talcot Lake (21CO03). Round Mound (21TR01) is believed to be the easternmost earthwork of a group of three mounds in Section 23, T. 126, R. 43 in Traverse County. It sits back from a high bluff and is approximately 1-1/2 miles from Lake Traverse. Round Mound (21TR01) first drew the attention of Wilford during his search for an undisturbed mound to excavate to explore the prehistoric lifeways of ancient Indians who lived in the Brown's Valley region (Wilford 1937a). The mound was excavated in 1934 under the direction of Jenks. Three principle features were encountered during the excavation: 52 human burials, nine bison burials, and a stone cairn located within the concentration of human burials. A majority of the human burials were located in the southeast quadrant of the mound. Wilford (1937a) presents a summary of the human remains according to relative age, mode of burial (e.g., secondary bundle, primary, fragmentary), and level of interment. Burials were assigned to one of three levels: (1) placement on or near the original ground surface; (2) the upper level being 1 foot or more above the original surface; and, (3) pit level which represents those burials placed in distinct pits. The age distribution includes 35 adults, seven adolescents, four children, three young children, and three infants. The age categories are not defined chronologically and sex is only variously reported. Secondary bundle burial is the most frequent burial mode present (N=31), followed by primary (N=11), and 10 burials are too fragmentary to make a determination as to mode. Wilford later (1970) interpreted the primary burials as intrusive to an already existing mound and classifies them as possibly affiliated with the Cambria focus. The secondary bundle burials are assigned to the Kathio focus. One burial feature contained five individuals. "Four of these skeletons were primary burials in the erect sitting posture fully flexed. All of these were adolescents. With them were the long bones of an adult also in the vertical position but not in anatomical order so that this was a secondary burial. Three of the adolescent skulls were in position on top of the heap of bones but the fourth adolescent skull together with the adult skull, no. 49, lay at the bottom of the pit. The adolescents were two females, no. 45 and 46, aged about 14, a female, no. 47, aged 15, and a male, no. 48, aged 17. The adult was a middle aged male" (Wilford 1937a:VII-8). The nature of this burial is difficult to explain and Wilford hypothesizes that it may represent sacrifices of enemies or local residents. Wilford does not present an in-depth analysis of the human remains; however, he reports the means of 17 cranial measurements and indices for eight crania, two adolescent females and six adult males.

Round Mound (21TR01) has recently undergone a paleodemographic analysis as part of an undergraduate Honor's thesis (Trdan 1997). Trdan explored the use of the Round Mound skeletal sample for paleodemographic reconstruction and concluded that the site was not well suited for such a reconstruction based on the small and somewhat

Table 52. Minnesota sites with a Late Woodland component in the Eastern Woodlands (EW), Prairie and Prairie Lake (PL) and Northern Forest (NF) regions.

Site	Phase	MNI	Region	Type	Ref.
Battle Island (21AK09)	Sandy Lake	1	NF	Unknown	1
Episcopal Camp (21AK9002)	Sandy Lake	1	NF	Unknown	1
Hanel Mound (21BE01)	Unknown	5	PL	Mound	2
Judson Mound (21BE03)	Unknown	7	PL	Mound	3
Elbow Lake (21BK38)	Blackduck	1	NF	Isolated	4
Schocker (21BL01)	Blackduck	22	NF	Habitation	5
Theater Seasons Cafe (21BS20)	Unknown	1	PL	Isolated	6
Mud Lake Mounds (21CA02)	Blackduck	6	NF	Mound	7
Norway Lake (21CA22)	Sandy Lake	1	NF	Mound	8
Upper Rice Lake (21CE04)	Blackduck	1	NF	Habitation	9
Lower Rice Lake (21CE05)	Unknown	1	NF	Mound	10
Herberg (21CE28)	Blackduck	1	NF	Mound	1
Talcof Lake Burials (21CO13)	Unknown	1	PL	Isolated	11
Pine River Mounds (21CW01)	Kathio	4	NF	Mound	12
Hoffman Mound #2 (21DL01)	Unknown	28	EW	Mound	13
Eck (21HE02)	Kathio	16	EW	Mound	14
Halpin Mounds (21HE03)	Kathio	8	EW	Mound	15
Preston Haglin Mound (21HE30)	Unknown	1	EW	Mound	16
Willis Mound (21HE52)	Unknown	1	EW	Mound	16
Baker Mounds (21HE61)	Unknown	1	EW	Mound	15
Malmsten Mounds (21HE64)	Kathio	5	EW	Mound	15
White Oak Point (21IC01)	Blackduck	73	NF	Mound	17
Osufsen Mound (21IC02)	Blackduck/SL	94	NF	Mound	18
Stangland Mound (21IC03)	Blackduck	4	NF	Mound	19
Renstrom (21KA01)	Kathio	1	EW	Mound	20
McKinstry Mounds (21KC02)	Blackduck	114	NF	Mound	21
Smith Mounds (21KC03)	Blackduck	6	NF	Mound	21
Hanson (21KC9001)	Blackduck	2	NF	Cemetery	22
Calhoun Lake (21KH01)	Kathio	2	PL	Mound	23
Cooper Mound 2 (21ML16)	Unknown	1	EW	Mound	24
Bartke Mound (21PO01)	Kathio	5	EW	Mound	15
Fingerson Mound (21PO02)	Kathio	10	EW	Mound	15
Huber Mound (21SC01)	Kathio	4	PL	Mound	25
Steele Mound Group (21SC24)	Unknown	35	PL	Mound	26
Christensen Mound (21SH01)	Kathio	37	EW	Mound	15
21SL53	Blackduck	1	NF	Cemetery	1
Round Mound (21TR01)	Kathio/Cambria	26	PL	Mound	27
McKee Village (21WA04)	Unknown	24	PL	Mound	15
Bois De Sioux Lake (21WL04)	Unknown	1	PL	Mound	1
Berscheid (21T03)	Unknown	18	EW	Isolated	9

References: 1 U of M correspondence file; 2 Wilford 1943a; 3 Wilford 1942a; 4 Radford 1986; 5 Johnson 1964; 6 Wilford 1956; 7 Wilford 1938; 8 Birk 1977; 9 Helmen 1964; 10 Johnson 1959; 11 Thurston Myster 1985; 12 Wilford 1937a; 13 Johnson 1963; 14 Wilford 1964; 15 Wilford et al. 1969; 16 Wilford 1952a; 17 Wilford 1959; 18 Wilford 1943b; 19 Jenks 1932; 20 Wilford 1955d; 21 Stoltman 1973; 22 Oothoudt 1991; 23 Wilford 1953; 24 Aufderheide et al. 1994; 25 Wilford 1945a; 26 Norquist 1967c

skewed sample recovered from the mound. Round Mound (21TR01) and two other Prairie Lake sites, Huber (21SC01) and Shakopee 4 (21SC02), were included in Ossenberg's (1969, 1974) regional assessment of population relationships between Woodland populations from the Upper Mississippi Valley. This sample of 48 individuals were identified as belonging to the Kathio phase (A.D. 800-1400).

#### Eastern Woodlands

The Late Woodland in the Eastern Woodlands zone, as elsewhere in Minnesota during this period, is a time of numerous changes. Significant from a bioarcheological perspective are indirect indications of the intensification of food production and the associated changes in population size, settlement pattern, social organization, and belief systems. In southern Minnesota and the rest of the Midwest this process revolved around maize horticulture. In northern and central Minnesota, wild rice purportedly served as the impetus for this change. This process is best understood for the central Minnesota Mille Lacs region where work by Johnson (1969) and Whelan (1990) document the presence of wild rice, a significant increase in number and size of sites, and year round occupation of village sites. The Eastern Woodlands region has great potential to

answer questions regarding population relationships among Late Woodland groups in the different regions as well as to historic Native American groups, and the biological manifestations of physical and social adaptations to increased sedentism, increased social complexity, and intensive reliance on a limited number of food resources (although supplemented by hunting and gathering of locally available resources).

**Kathio Phase.** The Kathio phase is primarily an east-central Minnesota manifestation and is most highly concentrated in the Mille Lacs region. It was first defined by Wilford (1941, 1955c) as a focus in the Mille Lacs aspect of the Lake Michigan Phase of the Woodland Pattern and finally, of the Late Woodland period. The temporal span of Kathio is defined as A.D. 900-1300 (Dobbs 1988a). Kathio is believed to represent a later manifestation of a continuum commencing with the Middle Woodland Malmo phase. Similarities in ceramic manufacture indicate relationships to Blackduck and Lake Benton ceramic series in Minnesota, and Clam River in Wisconsin (Dobbs 1988a). Wilford (1955c) associates Kathio with the Eastern Dakota, specifically the Mdewakanton.

There are no significant differences in the burial practices between Malmo and Kathio. Both phases are characterized by bundle burial in shallow pits, semiarticulation of some body elements, the overall absence of associated burial goods, logs over and/or under the skeletal remains in various stages of charring, and small stone cairns placed on the mound floor (Wilford 1955c). The generalized Woodland culture traits and similarities in material culture and burial practices between Malmo and Kathio result in some degree of uncertainty regarding site assignment. "Because of its rather generalized Woodland traits, and its wide range of pottery decorations and burial practices, Mille Lacs aspect as defined here may be somewhat of a Woodland 'catchall'" (Wilford 1955c:136). Wilford has attributed mortuary sites distributed over a wide geographic range to the Kathio focus based solely on the presence of secondary bundle burials and the lack of associated burial artifacts. Few "Kathio" mortuary sites have been radiocarbon dated, and therefore the reliability of many of Wilford's designations, especially of sites outside east-central Minnesota, is questionable.

Eleven sites in the Late Woodland period are identified as containing a Kathio phase mortuary component (see Table 52). Seven of these sites are located in the Eastern Woodlands region. Three Kathio phase sites, Round Mound (21TR01), Huber (21SC01), and Shakopee 4 (21SC02), are situated in the Prairie Lake region, and a single site, Pine River Mounds (21CW01), is located in the Northern Forest region. A minimum of 118 individuals were recovered from the 11 Kathio sites and represent 21% of all Late Woodland individuals. Eighty-two individuals were identified from the Kathio phase sites located in the Eastern Woodlands; they represent 69% of all Kathio individuals. The Eastern Woodland Kathio sample has undergone only minimal analysis (Ossenberg 1974) and therefore the bioarcheology of this region for this time period is not well known.

Six of seven Eastern Woodland Kathio sites (Calhoun Lake, 21KH01, is excluded) were included in Ossenberg's regional assessment of population relationships among Woodland populations from the Upper Mississippi Valley. However, Ossenberg included three sites in the Kathio sample that are no longer considered to be Kathio, Morrison Mounds (21OT02), Vineland Bay (21ML07), and Synstebly Mound (21BW01). Additionally, the Kathio designation of Round Mound (21TR01) is questionable due to its geographic location far west of the main concentration of Kathio phase sites in the Mille Lacs region.

**Miscellaneous Late Woodland Sites.** Cooper Village (21ML09) and Mound (21ML16) sites are located in the middle area along the east shore of Lake Ogechie. Lake Ogechie is "the first lake formed in the Rum River below its outlet at the southwestern corner of Lake Mille Lacs"

(Aufderheide et al. 1994:289). The two sites are immediately adjacent to each other and the Mound site originally consisted of five circular mounds. The village site and three mounds were excavated at various times. Burials were encountered in the habitation site, Mound 1, and Mound 2. All of the burials encountered in the village site and in Mound 1 have been attributed to the Mdewakanton Dakota occupation of the site (Cooper 1965; Lothson 1972; Aufderheide et al. 1994). Mound 2 burials were assigned to an undetermined Woodland phase based primarily on the absence of associated artifacts (especially European trade goods) and the presence of Sandy Lake ceramic sherds in the fill (Streiff 1994). Cooper Mound 2 (21ML16) is a low circular mound just east of Mound 1. A single female approximately 40-50 years of age was encountered as a primary burial. No associated grave goods were present; however, a small rock cairn was positioned over her chest and a single boulder was located by her head (Aufderheide et al. 1994). The individual exhibited a slight degree of degenerative vertebral disc disease and a moderate degree of dental attrition.

The Berscheid site (21TO03) is identified as a Late Woodland site and is dated A.D. 500-800 on the basis of an associated nearly complete St. Croix stamped pottery vessel. The site is located on a long sand ridge (120 feet) that parallels the shore of the Little Birch Lake. The burials were encountered during the filling of a trench silo by the Berscheid family in 1963. The Science Museum of Minnesota was notified and an archeological crew was dispatched to excavate the exposed burial pit (Helmen 1964). The human remains were believed to represent a minimum of six individuals, but did not undergo a systematic and more extensive analysis until 1989. Michael B. Clark and Paul F. Brown of Mankato State University undertook the osteological analysis as part of a contract between the Science Museum of Minnesota and the Hamline University Osteology Laboratory to inventory and evaluate the potential scientific contributions of the remains (O'Connell 1990).

Clark and Brown (1990) conducted the osteological analysis by accession number. A minimum of 18 individuals were identified using this approach, six males/probable males, six females/probable females, and six individuals of indeterminate sex. All reported remains were those of adults, four are age 17-25, three are 25-35, two are 45 years or older, and nine were classified only as adult. Table 2 within the text presents the demographic profile of the individuals identified under each accession number; it is observed, however, that the table and text frequently contradict one another.

A wide variety of data were collected and reported. Craniometrics and nonmetrics, dental metrics and pathology, postcraniometrics and nonmetrics, and skeletal pathology were reported. The skeletal sample was overall only minimally affected by pathology. One individual exhibited degenerative arthritis, one individual was observed to have temporomandibular joint syndrome and a cystic lesion above the external auditory meatus, and one individual presented evidence for sharp-force trauma on the skull. Dental pathology was also infrequent. A single carious lesion, one incidence of hypercementosis, and enamel hypoplasia on the canines and first premolars of one individual were observed. Three individuals exhibited alveolar resorption that was interpreted to indicate periodontal disease (Clark and Brown 1990). No discussion and/or conclusions regarding the osteological analysis were presented; the authors stated that the fragmentary nature of the skeletal collection precluded a more extensive analysis and they recommend its reburial.

#### Northern Forest

The Late Woodland period in the Northern Forest region, similar to the other regions discussed, is a time of significant culture change. As reported for the Eastern Woodlands region, much of the change may be

attributed to a shift in subsistence practices from a generalized hunting and gathering mode to one of more intensive reliance on wild rice (Johnson 1969a, 1969b; Dobbs 1988a). It has been hypothesized that this shift in utilization of wild rice resulted in an increase in population size, a decline in mound construction, and decreased reliance on widespread networks of friend and kin relationships (Lofstrom 1987). The more in-depth analysis of Late Woodland sites from the Northern Forest region will contribute significantly to the evaluation of the hypotheses presented on the social and physical consequences of intensive reliance on wild rice.

*Kathio Phase.* A single Kathio phase site, Pine River Mounds (21CW01), is located in the Northern Forest region near the mouth of the Pine River in Crow Wing County. One of the Pine River Mounds was excavated in 1932 by University of Minnesota archeological crew under the direction of Albert Jenks. Four individuals were encountered during excavation, three adults and one child/infant. The remains were very fragmentary and poorly preserved and no further bioarcheological information is reported (Wilford 1937).

*Blackduck Phase.* Like many archeological manifestations in Minnesota, Blackduck was first recognized by Wilford (1941, 1955). Based upon his work at both the Shocker habitation site (21BL01) and the Osufsen Mound site (21IC02) (Wilford 1937), Wilford defined Blackduck as a focus within the Rainy River aspect of the Lake Michigan phase of the Late Woodland period. Subsequent researchers have conducted numerous excavations that have enabled archeologists to refine and modify the initial definition of Blackduck (MacNeish 1958; Lugenbeal 1978).

The geographic distribution of Blackduck extends from northwestern Michigan and the Upper Peninsula west to east-central Saskatchewan. "In Minnesota, Blackduck is widely distributed across the state, with a particularly heavy concentration of sites in the Rainy River region, and numerous sites throughout the Mississippi Headwaters area" (Dobbs 1988a:225). Temporally the Blackduck phase extends variously from A.D. 800-1400, with a shorter time span in the Headwaters area and a longer span in the more northern Rainy River region. In the more northern reaches of its geographic distribution, Blackduck persists until contact with European explorers. In Minnesota, the Blackduck phase concludes prior to European contact and co-occurrence of Prehistoric and Historic artifacts is absent. Blackduck burials occur both in mounds and habitation sites.

Twelve sites in the Late Woodland period are identified as having a Blackduck phase mortuary component (see Table 52). A minimum number of 325 individuals were identified from the Blackduck components and represent 57% of all Late Woodland individuals. All of the sites with Blackduck components are located in the Northern Forest region. The human remains from seven sites (MNI=319/97%) have undergone partial analysis while six sites (MNI=8/3%) have been the subject of little or no research. The human remains from five of the Blackduck sites (Shocker, 21BL01; Mud Lake Mounds, 21CA02; White Oak Point, 21IC01; Osufsen, 21IC02; and McKinstry, 21KC02) have been included in a number of published/presented works (Wilford 1937; Evans 1961; Anderson 1962; Peterson 1964; Ossenbergh 1974; Johnson and Ready 1992; Keaveny et al. 1993; Torbenson et al. 1996). These sites generally present the largest skeletal samples per site in Minnesota. The data available provide a moderate level of bioarcheological knowledge for the Blackduck phase.

The human remains recovered from McKinstry Mound 2 (21KC02) have been extensively analyzed. Peterson (1964) and Ossenbergh (1974) conducted biodistance studies that included McKinstry Mound 2 individuals. Johnson and Ready (1992), Keaveny et al. (1993); and



Torbenson et al. (1996) discuss mortuary practices associated with body preparation. Torbenson et al. (1996) present the most extensive research to date on McKinstry Mound 2.

The McKinstry site (21KC02) is a multicomponent mortuary and habitation site. The site extends over approximately 20 acres at the confluence of the Little Fork and Rainy rivers. The mortuary component of the site consists of two burial mounds, Mound 1 and Mound 2. Both mounds were explored by Lloyd Wilford in 1932; Mound 1 was significantly disturbed prior to excavations and Wilford spent little time excavating it as a result. Mound 2 was undisturbed and was completely excavated by Wilford. Wilford determined that the mound was initially constructed over a single Laurel phase burial. Six episodes of intrusive interment of multiple individuals occurred later and are attributed to the Blackduck phase. Torbenson et al. (1996) summarize the spatial distribution and associated burial ritual. The following is an excerpt.

The stratigraphy indicated that burial groups 2, 3, and 6 all predated the others with either 2 or 6 being the oldest. All of the Blackduck burials were placed in pits dug into the mound (or, topsoil immediately adjacent to the mound for group 6) and the burials were then covered with soil obtained from nearby. Burials in group 5 were placed on a floor of logs that had been covered with a layer of yellow clay, a finding unique to this group. Following each of the three oldest groups of burials, large fires were set on top of the mound surface. These fires left behind extensive layers of burned clay and generated sufficient heat to cremate the skeletons to varying degrees. The skeletons in group 2 were completely calcined or blackened and close to 10% of the bones in group 6 were affected, mostly blackened. The subsequent burial groups (1, 4, and 5) had no evidence of associated fires (Torbenson et al. 1996:72).

Torbenson et al. (1996) present data and results from an analysis of postmortem mortuary treatment, a paleodemographic reconstruction, and an assessment of overall health. A total of 114 individuals was recovered from McKinstry Mound 2. Fifty-three individuals (46.5%) were classified as adult (16 years and older) and 61 (53.5%) as subadults; more precise age at death estimates were not provided. Within the adult category, 29 individuals were identified as male (55%), 17 as female (32%), and seven were unidentifiable as to sex (13%). The age distribution was similar to that seen in other Midwestern Woodland period sites (Bender 1979). The sex distribution was skewed toward males, indicating an underrepresentation of females. Life expectancy at birth was calculated to be 16.8 years. This age is definitely on the low end of the life expectancy range for other Midwestern sites (Bender 1979). Twelve postcranial measurements were taken all on long bones. Measurements recorded include maximum length and midshaft circumference. Average statures were calculated to be 169 cm for males and 159 cm for females; no range of error was provided.

The overall health status and quality of life of the individuals interred in McKinstry Mound 2 was assessed using Harris lines, enamel hypoplasia, caries, and other pathological conditions. Health overall was quite good and few diseases beyond those associated with age and occupation were noted. Ten long bones (1.4%) from four individuals exhibit slight to moderate periostitis. This frequency is quite a bit lower than that recorded for the Laurel sample from Smith Mound 4 (11.4%). Degenerative joint disease (DJD) was observed on 19 vertebrae from five individuals; four of the five exhibit degenerative changes in a single locality while one individual presents multiple affected articular areas. Fractures are virtually nonexistent with only a single occurrence of an avulsion fracture on the

tibia of an 18 year old male. Seven instances of genetic abnormalities were observed: two instances of multiple foramina; one manubrium aperture; two supratrochlear spurs; and two instances of a fused axis and third cervical vertebra.

Health was also assessed by recording episodes of growth disruption and recovery from observations of Harris lines, dental enamel hypoplasia, and caries. All tibiae were observed for the presence of Harris lines. The frequency of individuals exhibiting Harris lines was not reported; however, the average number of lines observed per tibia was presented as 1.85. The observed Harris lines were formed most frequently during early childhood and puberty. In an earlier publication Torbenson et al. (1994) suggested that this may reflect increased susceptibility to stress at these ages, as well as the increased velocity of growth that affects children of these ages. Enamel hypoplasia was recorded for the adult canine only. The total number of canines observed and the number affected were not presented, but 16.5% of all canines observed exhibited enamel hypoplasia. This frequency is higher than that recorded for Smith Mound 4 (12.0%). The number of individuals affected by caries and the nature of the lesions were also reported. Seventeen individuals exhibit at least one carious lesion (total number of individuals evaluated is not provided). A majority of the caries observed on those interred in McKinstry Mound 2 occurred on the occlusal surface in developmental pits (30 incidences) as opposed to the cemento-enamel junction (six incidences). This pattern is the opposite of that observed at the Laurel phase Smith Mound 4 (21KC03) where frequencies of 11 and 20, respectively, were recorded (Torbenson et al. 1996).

Mortuary practices and ritual were identified through an extensive analysis of postmortem treatment of the remains interred in McKinstry Mound 2 (Johnson and Ready 1992; Keaveny et al. 1993; Torbenson et al. 1996). Practices evaluated include the presence and/or absence of long bone and cranial perforation, red ochre treatment, and presence and nature of cutmarks. Red ochre was observed on 62% of all adults (N=32) and 37% of all subadults (N=22). No significant sex differences were noted (Torbenson et al. 1996).

Cuts were frequently observed on the remains recovered from McKinstry Mound 2. Twenty-two adult individuals (45%) and 12 subadults (21%) exhibited at least one bone with cutmarks. The data suggest that adults are more likely to exhibit cuts than subadults and males and females are equally likely to present cutmarks. Cutmarks are generally present on all types of long bones (Torbenson et al. 1996).

Perforation of cranial remains, or bone tapping, was also observed. Wilford was the first to note this interesting postmortem modification (1952b). Twenty individuals were observed to exhibit intentional postmortem damage to the occipital region, 13 males, six females, and one adolescent approximately 12 years old (Torbenson et al. 1996).

Several clay mask constructions occurred at McKinstry Mound 2; three had been applied to defleshed skulls and two had been constructed over a bound sphere of cattail leaves and placed with two burials. Additionally, 13 individuals were recovered with clay pressed into the eye orbits forming eye plugs when dried. Nineteen individuals were treated with masks and/or eye plugs (six males, four females, one adolescent, one child of approximately 3 years) (Johnson and Ready 1992; Torbenson et al. 1996).

The archeological context, manufacture and application techniques, and cultural inferences of the use of clay masks are discussed in great detail by Johnson and Ready (1992). They divide the five recovered masks into two groups. Group one consists of three masks that were constructed directly on the human crania and group two comprised two masks "constructed on bundles of cattail leaves which had been bound and shaped with twined cordage to create artificial head forms" (Johnson and Ready 1992:19). All five masks are incomplete. The masks were

constructed with untempered, fine-grained clay that was then applied to the skulls or the artificial head forms. The detailed impressions of plant material and skeletal features indicate that the clay was moist when applied. The firing and subsequent hardening of the masks occurred during the interment of the remains when a layer of clay was placed over some of the burial groups and a fire was built on top of it.

Clay masking was documented at several other sites in the region including the Hungry Hall mounds located on the north bank of the Rainy River in Ontario, and Wakanda Park (47DN01) and Cyrus Thomas (57BN08) sites located in Wisconsin along the Red Cedar River. Hungry Hall is classified as a Blackduck site and shares numerous similarities in mortuary practices with McKinstry Mound 2 including cranial tapping, masking, multiple primary burials, and indirect cremation. Similarities are also observed between the Cyrus Thomas (47BN08) masks and those recovered at McKinstry Mound 2. The difficulty in defining a relationship between McKinstry Mound 2 and Cyrus Thomas is the earlier Hopewell designation of Cyrus Thomas. Johnson and Ready (1992) evaluate the reliability of the Hopewell designation and conclude that it is tentative. They further conclude that the similarities in funerary mask construction, use of "grasses packed into the eye orbits and nasal apertures, the distinctive 'chisel-like' wooden splint set into the nasal cavity to aid in modeling the nose, and in the appearance of the finished masks" (Johnson and Ready 1992:27) and the application of masks to skulls that have the occipital area removed indicate cultural affinity and the possibly inaccurate attribution of Cyrus Thomas to Hopewell.

Several interpretations of the significance of masking were explored by Johnson and Ready (1992). Wilford's initial explanation that the masks served to preserve the skull (Wilford 1950) was rejected on the basis that the skulls are not completely encased within a clay mask and that some masks are constructed over artificial head forms. A more likely explanation was offered by Hall (1979) who concluded that the masks likely are associated with rituals related to the Earth Diver, Water Panther, and/or other water spirits.

The ritual of postmortem perforation crosscuts time periods and cultural boundaries. In Minnesota, tapping has been observed in sites classified as Laurel, Blackduck, Kathio and others. Explanations for such skeletal modifications have included marrow extraction and/or cannibalism (Wilford 1952b), spirit release, and skeletal mutilation to prevent a malevolent or enemy individual's soul from returning to interfere with the living. To critically evaluate the viability of these hypotheses, the occurrence of tapping must be analyzed in several archeological populations from several groups. Aufderheide et al. (1992) described the occurrence of tapping in Smith Mound 4, a Laurel sample. Torbenson et al. (1996) described postmortem modification for the Blackduck phase McKinstry Mound 2 site. Postmortem modification of the skeletal remains of individuals affiliated with the Blackduck phase were further evaluated in a paper presented by Keaveny et al. (1993) at the Midwest Archeological Conference. The frequency of long bone tapping was recorded for 114 individuals from three Blackduck sites in Minnesota including Osufsen Mound (21IC02), White Oak Point Mounds (21IC01), and the Schocker habitation site (21BL01). Patterns in the occurrence of tapping relative to a number of variables including population, sex, age at death and bone affected were identified. Frequency of individuals tapped varied significantly among the three sites. No individuals (of 20) exhibited long bone perforation at Schocker (21BL01); five of 32 individuals (16%) at White Oak Point Mound 1 (21IC01) and 13 of 62 individuals (21%) at Osufsen Mound (21IC02) were affected. Differences in frequency of perforation were assessed for the sexes and for adults vs. subadults. At the sites where individuals exhibited postcranial tapping, no significant differences between males and females were observed. Using relative

age, 60% of those tapped were adults and 40% subadults at White Oak Point Mound 1 and more dramatically, 85% of tapped individuals at Osufsen Mound were adults and 15% were subadults. The youngest individual exhibiting postcranial perforation at either site was 5 years plus or minus 16 months. The nature of postcranial tapping was evaluated by noting the location of the perforation, the most frequent bone(s) affected, and the number of bones affected per individual. At both White Oak Point Mound 1 and Osufsen Mound the most common location for tapping was the antero-proximal surface, although some individuals exhibited perforation on both the proximal and distal ends. The two most frequently modified bones were the femur and tibia. The humerus and the fibula were the next most frequently tapped bones and the radius and the ulna were the least frequently tapped. No statistically significant difference between bones tapped exists. Number of bones tapped per individual varied but ranged from a single long bone to all six long bones.

Tapping was once thought to have been evidence of cannibalism or marrow extraction. Experimentation with marrow removal indicates that the form of tapping observed at the Blackduck sites investigated would be an inefficient method of marrow extraction. It is more likely that the bones were perforated for spiritual purposes and functioned as a possible release for the soul. This hypothesis is supported by analogy to historic ethnographic accounts and recorded myths regarding different concepts of the soul and its residence within the bones of the skeleton Wyckoff (1978).

Keaveny et al. (1993) compared the results of their analysis to those of Torbenson et al. (1992). At the White Oak Point Mound 1 site (21IC01) no differences were observed in the frequency of tapping between the sexes and between subadults and adults. These results are consistent with what was observed at Smith Mound 4 (21KC03). Torbenson et al. (1992) interprets this situation to mean that since young people and both sexes were tapped equally at Smith Mound 4, an individual is not selected by virtue of earned status, but rather tapped according to inherited cultural affiliation. In contrast to these results are the significant differences between frequency of long bone perforation of Osufsen adults and subadults; 27% of all adults were tapped and 9% of all subadults. This situation is opposite that seen at Smith Mound 4 and White Oak Point Mound 1 and could suggest that social differentiation may be based on achievement rather than ascription. Another possible explanation for the Osufsen data may involve cultural concepts of the soul and varying beliefs about when an individual receives a soul.

Torbenson et al. (1992) report that 35% of all individuals buried in Smith Mound 4 (21KC03) exhibit postmortem long bone modification in the form of tapping. Furthermore, a majority of tapped individuals are from secondary burials. They hypothesize that burial took place one to a few times a year during seasonal gatherings, necessitating that individuals who died at other times of the year would need to be defleshed and transported until the appropriate season. The most common mode of interment at the Osufsen (21IC02) and White Oak Point (21IC01) sites was primary burial with the individual in a flexed, seated, or semi-seated position. In the White Oak Point Mound 1 sample, four of the five individuals exhibiting tapped long bones are from primary burials. At the Osufsen site, seven of the 13 individuals came from primary burials, four from secondary burials, and the burial mode of two individuals was unknown. The prevalence of a primary mode of burial at the Blackduck sites is not easily reconciled with the practice of seasonal burial. Blackduck individuals would be more likely to have been buried closer to the place of death, relative to Laurel individuals, and nearer to the time of death. Additionally, overall fewer Blackduck individuals (16%) were tapped than observed at Smith Mound 4 (35%).

The research presented by Torbenson et al. (1992), Torbenson et al. (1996), Johnson and Ready (1992), and Keaveny et al. (1993) contribute to a growing body of data regarding the mortuary practices of the Blackduck and Laurel peoples. The expanding bioarcheological database will contribute to the evaluation of hypotheses formulated to explain this cultural practice.

An isolated burial was recovered from Koochiching County in 1974 (Oothoudt 1991a). This burial is identified as the Hanson site, 21KC9004, in the bioarcheological database; no site number has been assigned. The human remains were eroding out of a bank of the Little Fork River near the town of Little Fork, 10 skeletal elements were collected including a complete skull and mandible. An osteological analysis was conducted by Jerry Oothoudt, an archeologist affiliated with the Minnesota Historical Society. A minimum of two individuals were identified. Individual 1 was the most complete individual consisting of the skull and mandible plus six postcranial bones. Individual 1 was identified as a 20-30 year old male and Individual 2, an 18-23 year old of indeterminate sex. Data collected on Individual 1 consist of 57 cranial nonmetric traits, 40 cranial measurements and indices, dental metrics, and skeletal and dental pathology. Individual 1 exhibited carious lesions on two of 31 teeth, one periodontal abscess, one instance of antemortem tooth loss, and Schmorl's nodes were observed on the centra of the three recovered thoracic vertebrae. Blackduck phase affiliation is postulated due to the seated position of Individual 1, the presence of conch shell beads with the burial, and the barrel-shape of the beads.

A number of Master's theses and Ph.D. dissertations have incorporated the skeletal samples from a number of the Blackduck phase mortuary sites (Evans 1961; Anderson 1962; Peterson 1964; Ossenbergs 1969, 1974). Evans' (1961) research focuses on the Blackduck phase and will be discussed below. The remaining works are more broadly based and incorporate skeletal samples from a broad array of temporal and geographic groups; these will be discussed following the Northern Forest region Late Woodland manifestations section.

Evans' 1961 Master's thesis, *A Reappraisal of the Blackduck Focus or Headwaters Lakes Aspect*, analyzes five Blackduck sites, Schocker (21BL01), Osufsen Mound (21IC02), Mud Lake Mound (21CA02), Nett Lake (21KC01), and Waskish (21BL02). Two non-Blackduck sites, Hill Point (21CE02) and Smith Mound 3 (21KC03), were also analyzed for comparative purposes. Three primary objectives guide Evans' research: (1) present a detailed description of the entire Blackduck assemblage and compile a cultural trait list; (2) identify the degree of internal and external variability in Blackduck sites; and (3) evaluate the validity of the hypothesized ancestor-descendant relationship between the Assiniboin and the Blackduck.

Four sites included in the analysis contained mortuary components. Three of the sites were assigned to the Blackduck phase (Schocker, 21BL01; Osufsen, 21IC02; Mud Lake, 21CA02) and one to the Laurel culture (21KC03). Limited osteological data are presented by Evans (1961); instead he describes each site and presents a description of the burial modes. Of the 55 Blackduck burials analyzed, 37 (67%) were arranged in a seated position, seven disturbed (13%), six secondary bundles (11%), three primary flexed (5%), one primary extended (2%), and one cremation (2%). Artifacts clearly associated with human remains were encountered in 12 burials (22%). The sex of each individual analyzed is presented in a table that details the burial mode and grave associations (e.g., artifacts, red ochre). Evans concludes that Blackduck burial practices are typified by individuals buried in a seated position with few burial goods. An evaluation of archeological, geographical, and ethnographic evidence leads Evans to

conclude that Wilford's (1945) and MacNeish's (1958) hypothesis suggesting a Blackduck-Assiniboin relationship is most likely inaccurate, and to speculate on a Algonquin, possibly Cree, relationship.

*Sandy Lake Phase.* The Sandy Lake phase is a widely distributed Upper Midwestern Late Woodland manifestation. The initial designation proposed by Cooper and Johnson (1964) was based on materials, primarily ceramic, recovered from sites in northern Minnesota and northwestern Wisconsin. The geographic range of Sandy Lake is poorly known, but associated ceramics are found from central Minnesota to Ontario and from northwestern Wisconsin westward through the Red River Valley into eastern North Dakota. Within Minnesota, then, Sandy Lake ware is found in three ecological zones, the Eastern Woodlands of the central region, the Northern Forest, and the Prairie region of the Red River Valley. The temporal distribution of Sandy Lake is hazy, but it appears to supersede Blackduck between A.D. 1100-1200 in the Headwaters area of Minnesota in the Northern Forest region and replaces Kathio in the Eastern Woodlands at about the same time. Interestingly, Sandy Lake is contemporaneous with Blackduck in the extreme northern portion of Minnesota and Ontario. Sandy Lake is documented into the early Historic period until A.D. 1700 (Dobbs 1988a).

Birk (1977) suggests that Sandy Lake ware is a material component of a larger cultural manifestation which he defines as the Wanikan culture.

I propose the formulation of the Wanikan Culture to denote the collective phenomena observed as Sandy Lake potteries and their associated cultural expressions ... Characteristics of the Wanikan Culture ... include but are not confined to: Sandy Lake ceramic wares; intrusive mound burials; exclusive circular conical mounds with shallow burial pits; primary flexed interments with associated mortuary vessels; small triangular projectile points (predominantly quartz?); formally prepared ricing jigs or threshing pits; fire hearths and pits; middens; small, seasonally occupied sites in recognizable lakes area patterns; and the inferred use of wild rice as a staple crop (Birk 1977:30-31).

One or possibly two sites provide what is known about the bioarcheology of the Sandy Lake phase. Norway Lake (21CA22) represents the only known Sandy Lake mortuary site. Norway Lake (21CA22) consists of a habitation site and associated single component mound. The mound is situated on a prominent hill 300 feet from the Northwest shoreline of Norway Lake. A single adult individual was excavated in 1958 by a group of local archeologists when it was decided to construct a cabin on the mound location. Later analysis by Birk (1977:19) concluded that the individual was a female, approximately 21-35 years of age at the time of death. The living stature was calculated as between 5 ft. 2 in. and 5 ft. 6 in. The teeth present "were not excessively worn" and there was only slight osteoarthritic lipping present on the cervical vertebra present. Mild periodontal disease was observed. Two individuals recovered from Osufsen Mound (21IC02) are thought to represent intrusive Sandy Lake burials; the results of an extensive osteological analysis of these individuals are unpublished at this time. These three individuals, recovered from two Northern Forest region sites, represent the totality of the Sandy Lake bioarcheological sample. Consequently, the bioarcheology of the Sandy Lake phase is virtually unknown.

#### Comparative Analysis of Woodland Populations

Wilda Anderson's 1964 Master's thesis, *Red River Aspect Skeletal Remains*, and Nancy S. Ossenbergs' chapter, "Origins and Relationships of Woodland Peoples: The Evidence of Cranial Morphology" (in Johnson

1974), represent the most broadly based research addressing Woodland groups. Both resources include a wide variety of Woodland skeletal samples in order to explore various questions. Anderson (1962) focuses on describing the biological nature of the peoples comprising the Red River aspect (Wilford 1970; Johnson 1978) and evaluates the cohesiveness or homogeneity of the skeletal samples representing this aspect through a comparison to Neumann's (1952) varietal groupings (e.g., Lakotid, Deneid). These research questions are examined through a comparison of the skeletal biology of 209 individuals from 11 sites that represent a minimum of five groups. The classification terminology utilized by Anderson reflects the widespread usage at the time of Wilford's 1955 classification of Minnesota's prehistoric groups. Four sites represent the Arvilla focus of the Red River aspect: Bronson (21KT01, N=10-15), Snake River (21MA01, N=6), Fertile (21PL06, N=29), and Femco (21WL01, N=13). Four additional sites represent the Red River aspect, but are not classified as Arvilla although they share some broad similarities to this focus: Red Lake River (21RL01, N=16), Habben (21MR02, N=2), Slininger (21NR01, N=8), and Wilson Mound 3 (21TR02, N=1). Three Woodland sites, two assigned to the Kathio focus of the Mille Lacs aspect (Crookston, 21PL09 and Round Mound, 21TR01) and one to the Blackduck focus of the Headwaters Lake aspect (Osufsen Mound, 21IC02) were included to assess the homogeneity of the Red River aspect peoples.

The bioarcheology of the Arvilla focus is discussed in detail by Williams (Owsley and Rose 1997) and will not be expanded on here. Anderson's methodology and conclusions are discussed here primarily as they relate to the Woodland period in general and the Mille Lacs and Headwaters Lake aspects in specific. Anderson (1962) explores her primary research questions through an extensive analysis of the human remains recovered from the 11 sites. Data collected include 46 cranial measurements and indices, 53 cranial nonmetric "morphological" traits, 11 dental nonmetric traits, standard length and width dental measurements, long bone length measurements, postcranial nonmetric "morphological" traits, a variety of skeletal and dental pathology, and postmortem modification. All data are presented in a lengthy series of tables in the appendix. The extensiveness of the data presented precludes a trait by trait discussion at this time. A reader interested in specific trait frequencies is directed to Anderson's (1962) appendix.

Anderson (1962) concludes that in general the people of the Red River aspect exhibit a great degree of intra-aspect variability and are overall a heterogeneous population. Intrasite ranges of cranial measurements always exceed the differences between site means. A univariate comparison of the craniometrics result in the identification of two main groups, the non-Lakotid and Lakotid. The Lakotid variety is represented in this study by the Fertile (21PL06), Femco (21WL01), Osufsen (21IC02), Round Mound (21TR01), and Crookston (21PL09) sites. The non-Lakotid group comprises Kallstrom (in North Dakota), Snake River (21MA01), Slininger (21NR01), and Bronson (21KT01) who are more like Neumann's Otamid, Inuid, and Deneid. The division does not follow a Red River aspect vs. non-Red River groups. Additionally, the three Woodland sites included for comparative purposes assort together and are more Lakotid than the Arvilla. Anderson believes the individuals included in her analysis are ancestral to the Dakota or other closely affiliated tribes. According to the comparison to Neumann's varieties, the ancestry is primarily Deneid.

All sites included in Anderson's analysis were pooled for the demographic, dental nonmetric, and dental pathology analyses and discussion. The specific data categories, however, are presented by site in the Appendix. The pooling clearly smooths any distinctions and may result in making the entire sample seem more homogenous. A more accurate picture of the patterns of pathology may be seen from a review of the data presented in the Appendix.

Ossenberg's chapter in Johnson (1974) is currently the only existing bioarcheological treatise of the Woodland groups distributed throughout the Upper Mississippi River Valley and the adjacent prairie region bordering the Great Plains. Ossenberg addresses three areas of interest relative to Woodland population relationships: the genetic and cultural origins of the Woodland peoples from the Upper Mississippi Valley, their biological relationships to Historic Plains tribal groups, and the validity of the hypothesis that Upper Mississippi Valley Woodland populations descended from classic Hopewell groups further south. The historic Plains and prehistoric Woodland groups cluster together. The Hopewell samples form a separate cluster indicating that they are not the source population for the northern Woodland groups.

Ossenberg (1974) presents the results of the biodistance analysis for each Woodland complex separately, interpreting the relationships of each complex to the other Woodland complexes and to the historic tribes included in the analysis. The interpretations of the Middle Woodland Laurel group are presented in the Middle Woodland section and the interpretations of the Arvilla are discussed in the chapter by John Williams (Owsley and Rose 1997). The remainder of the Minnesota complexes are discussed below.

Four Blackduck sites (three from Minnesota, one from Ontario) were included in the analysis and represent a northern Blackduck group and a southern Blackduck group. The two groups did not cluster as close together as expected and Ossenberg (1974) interprets this as support for others who have postulated that there is more than one ethnic group represented within the Blackduck phase (Evans 1961). Both Blackduck groups cluster fairly close to the Mille Lacs Kathio phase lending support to Wilford's (1955) hypothesized derivation of the Late Woodland Kathio and Blackduck from the earlier Malmo phase of the Mille Lacs aspect. The Laurel sites are more closely related to the southern Blackduck sites, contradicting their geographic proximity to the northern sites; the small sample of traits collectible from the Laurel sample, however, preclude definitive conclusions at this time. Finally, the Blackduck sites do not show close affinities to the Manitoba phase samples. This result contradicts MacNeish's (1958) classification of the two groups as belonging to the same archeological aspect, the Headwaters Lakes aspect.

The historic affinities of the Blackduck sample are complementary to the prehistoric results. North Blackduck shows a closer relationship to the Cheyenne than any of the other three Plains tribes included in the analysis. South Blackduck clusters closest to the Dakota groups, closer than any other Woodland group. This split in historic affinities is interpreted as further support for the idea of multiple populations comprising the Blackduck (Evans 1961). The south Blackduck-Dakota grouping is interpreted as very strong evidence for an ancestor-descendant relationship. The results further support the identification of north-central Minnesota as the ancestral homeland of the Dakota corresponding to Dakota legend (Schoolcraft 1851-54,2:172).

The Mille Lacs aspect Kathio phase group is somewhat isolated from the other Woodland complexes. Kathio's closest affinity is with the southern Blackduck group and next to the southern Arvilla group. The relationship between Kathio and south Blackduck could represent genetic convergence from gene flow between the two neighboring and contemporaneous populations that is reflected materially in similar ceramic styles. The somewhat close affinity between southern Arvilla and Kathio is more difficult to explain and Ossenberg postulates it reflects a relationship between the earlier Malmo and the earliest of the southern Arvilla groups.

The affinities of Kathio to the Historic Plains tribes is elusive and Ossenberg concludes that the "tribe (or tribes) descended from Mille Lacs are not revealed by this study" (Ossenberg 1974:32). Although it has

been postulated that Kathio is ancestral to the Santee Dakota, the results of this study do not support such a conclusion. Ossenbergs considers a Kathio-Dakota relationship, however, by referring to the potentially significant contribution to be made by their unanalyzed seventeenth century remains recovered from the Cooper Village site (21ML09).

Crookston Mound (21PL09), representing a Woodland period site from an unknown phase, was included by Ossenbergs (1974) as a test of the ability of discrete trait analysis to classify an unknown site. In general the distance relationships between Crookston and the other Woodland complexes are not very revealing. The closest affinities are with the north Arvilla and Manitoba samples. Consistent with the prehistoric relationships, Crookston is most closely aligned with the Cheyenne and Assiniboin. The small sample size (N=19) precludes definitive assessment of population affinities. Ossenbergs concludes (1974:38) with the caveat that many of her interpretations are speculative and more reliable conclusions require additional data and further analysis. She feels more confident about three specific conclusions: (1) the south Blackduck sample is ancestral, though likely not exclusively, to the Dakota; (2) Laurel represents the ancestral source of both the Assiniboin and Dakota and the divergence of these two groups occurred toward the end of the Laurel time period; and (3) Arvilla is ancestral to the Cheyenne.

### Oneota Aspect (A.D. 1000-1650)

The Oneota are encountered in the archeological record in Minnesota as early as A.D. 1000 in the Red Wing area. Wilford (1941, 1955) initially defined the Oneota as an aspect in the Upper Mississippi Pattern of the Late Woodland period. He delineated four foci within the Oneota aspect: Orr, Blue Earth, Silvernale and Cambria. More recent research has resulted in a reorganization of Wilford's taxonomic categories and the removal of Oneota from the Middle Mississippi tradition. Silvernale is currently considered a Middle Mississippi manifestation, Cambria has been transferred to the Plains Village tradition, and the Orr and Blue Earth foci remain within the Oneota.

Oneota currently refers to "a series of related archeological cultures that is distributed widely throughout the Prairie Peninsula, adjacent woodlands (Wisconsin, northwestern Indiana, and Illinois), and eastern portion of the Plains (western Iowa, South Dakota, Nebraska, Missouri)" (Dobbs 1988a:198). Culture traits characterizing the Oneota include shell-tempered globular ceramic vessels with distinctive decorative motifs, reliance on maize horticulture, and a complimentary reliance on both bison and aquatic faunal and floral resources. In Minnesota the Oneota are a moderately well studied group. Three regions within the state have dense Oneota occupations that have been systematically studied: the Red Wing Locality of the southeastern area of the state, the Blue Earth River Valley of southern Minnesota, and the Root River region also in the southeastern area of the state. Additionally, Oneota ceramic sherds and a few other examples of Oneota material culture are more widely distributed and occur in the central, northern and northwestern regions (Dobbs 1988a; Gibbon 1995). Human remains are unequivocally associated with each of the three main regions of occupation, and possibly with the more peripheral locations as well, although the level of bioarcheological knowledge for each of them and for the Oneota in general is minimal.

Twelve sites yielding a minimum of 119 individuals (7% of the total Minnesota sample), are identified as having an Oneota mortuary component in the bioarcheology database (Table 53). A phase designation is known for seven of the 12 sites and 101 of the individuals.

### Eastern Woodlands

*Red Wing Locality.* The earliest appearance of the Oneota in Minnesota occurs in what Dobbs (1988a) refers to as the Red Wing Locality. Temporal placement of the Oneota within this area is between A.D. 1000 and 1300. Two distinct groups are identifiable in this area during this time frame, the Silvernale focus which is frequently classified as a Middle Mississippi focus, and the Oneota. The Bryan site (21GD04) is the only site in the Red Wing Locality that may contain an Oneota mortuary component. Bryan is a habitation site that is situated on a terrace along the south side of the Cannon River. It was estimated that the original habitation area of the site encompassed approximately 20 acres. Human remains were recovered from a variety of contexts within the Bryan site including both nonmortuary and mortuary contexts. A minimum of eight individuals is reported. This number is certainly low; however, not all remains encountered were described in reports and some skeletal material currently being curated is unprovenienced beyond site affiliation.

The affiliation of the human remains recovered from the Bryan site is largely unknown. A number of individuals have been reported as "storage pit burials" and these are clearly affiliated with the Silvernale focus (Glenn 1974). These burials have received the most attention from a bioarcheological perspective. Glenn (1974) includes four individuals from the Bryan site in her biological distance study of the Oneota. She describes their morphology separately and reports that only one skull was measurable. The skulls generally resemble one another and are, overall, robust with medium to large muscle attachment areas. The cranium is described as hyperbrachycranial with a cranial index of 85.14. Two additional individuals were encountered during the 1983-1984 excavations at the Bryan site (Dobbs 1984). Their affiliation with the Oneota occupation of the site is unknown. The results of an extensive analysis (Thurston and O'Connell 1984) of the individual recovered from Area B, Feature 410 were summarized, but not referenced, in Dobbs (1984). The remains represent a nearly complete female older than 40 years at the time of death. Severe osteoarthritis affected nearly every joint including the vertebral column. Dental pathology was extensive and likely reflect the age of the individual as well as dietary and cultural practices. Thirteen of 16 teeth were lost antemortem and the three remaining teeth were affected by severe carious lesions.

Delta values for stable carbon and nitrogen isotopes were reported for five individuals recovered from the Bryan site (Pratt 1994). Provenience, sex, and age of the individuals were not reported. The  $^{13}\text{C}$  values range from -12.6 to -13.9 for four individuals indicating a diet characterized by significant consumption of maize. The  $^{15}\text{N}$  values range from 8.4 to 10.0 and may be interpreted to reflect a low intake of animal protein or a high intake of legumes.

*Root River Valley (Orr focus).* The Orr focus was first defined by Keyes (1934) and refined and expanded more recently by several others (Wedel 1959; Henning 1970). Orr includes sites located in both Iowa and Minnesota. Minnesota Orr focus sites are concentrated along the Root River in southeastern Minnesota and are believed to date between A.D. 1400-1650 (European contact). The historic Iowa tribal group are well demonstrated to be the later representatives of the Orr focus (Mott 1938; Wedel 1959, 1976).

Three sites, yielding a minimum of 80 individuals, are listed in the bioarcheology database as containing an Orr focus mortuary component. The Orr focus is only minimally known from a bioarcheological perspective. The remains have been included in a number of osteological analyses (Peterson 1964; Glenn 1974; Pratt 1994). The remains are currently undergoing extensive analysis at the Hamline University

Osteology Laboratory by contract with the Minnesota Indian Affairs Council.

The Hogback site represents a protohistoric Orr focus cemetery utilized by the Iowa Indians during the latter half of the seventeenth century. The site has fallen victim to pothunters; most recently eight individuals were identified from scattered remains that were collected between 1981 and 1990. Hogback was professionally excavated in 1947 and 1953 by Wilford under the auspices of the University of Minnesota. The site is located approximately 2 miles from the town of Yucatan on a bluff rising above the west bank of Riceford Creek. Wilford and Brink (1974) describe the burials and artifacts recovered during the formal excavations. A number of tables present age, sex, burial mode, and artifact associations for each burial. A more recent analysis reports a minimum number of 55 individuals (Blue 1996). Table 54 gives the age and sex distribution of the Hogback skeletal sample.

Human remains from the Hogback site have been incorporated into several studies. The earliest research was conducted by Peterson (1964) and summarized in his Master's thesis entitled *The Estimation of Relationship and Biological Distance Between Selected Minnesota Prehistoric Indian Groups*. Peterson conducted a biodistance study to evaluate the population relationships between four Late Prehistoric skeletal samples. Hogback (21HU01) was included as representative of the Oneota and was compared to the human remains from the Crookston (21PL09), Lindholm (21BS03), and McKinstry (21KC02) sites representing the Kathio, Cambria, and Blackduck manifestations, respectively. Twenty-five cranial measurements were variously taken on 43 crania, nine from Hogback, 11 from Lindholm, 12 from Crookston, and 11 from McKinstry. Peterson presents his results with little confidence and minimal interpretation of the results is provided. He notes that the McKinstry sample is significantly distant from the other three samples. Hogback, Lindholm, and Crookston cluster together. The distance of McKinstry is interesting in light of Johnson's hypothesis of a Woodland base for the Cambria focus. Peterson's research is hampered by poor sample selection for the questions asked. The greatest contribution of this research is the raw data presented in the appendix and a cursory summary of perspectives on the origin of the various archeological manifestations represented.

Pratt (1994) reports carbon and isotopic values for Rushford Mound (21FL09), Hogback (21HU01), and Wilsey (21HU04) sites. Three adult individuals from Rushford Mound were assayed, and  $^{13}\text{C}$  values are reported as -18.0, -13.7, and -13.4 and the  $^{15}\text{N}$  values as 8.6, 9.7, and 9.6. The  $^{13}\text{C}$  values from nine Hogback individuals, seven adults and two adolescents, vary only slightly and range from -12.5 to -14.4. The  $^{15}\text{N}$  values range more broadly from 6.0-11.1. Six adult individuals were tested at Wilsey and present similar values for both the  $^{13}\text{C}$  and  $^{15}\text{N}$  isotopes, ranging from -12.5 to -14.6 and from 10.2-12.0, respectively. All of the carbon isotopic values are indicative of a diet which included a significant

proportion of maize. The -18.0 value for a single Rushford Mound individual suggests less maize but still some consumption. The nitrogen isotope values seem to reflect either a low intake of animal protein or a high intake of legumes. The carbon and nitrogen isotopic values are comparable to those reported for the Bryan site.

#### Prairie Lake

*Blue Earth River Oneota.* The Blue Earth Oneota sites are concentrated in the Blue Earth River valley of south-central Minnesota. The Oneota in this region are first documented ca. A.D. 1050/1100 and subsequently became the dominant group in southern Minnesota between approximately A.D. 1200-1400. The termination of this manifestation is unknown, but may have continued until A.D. 1450/1500. The Blue Earth Oneota are somewhat distinct from the other Oneota complexes in the state in subsistence practice and settlement patterns. Subsistence centered on maize horticulture coupled with bison hunting. The settlement pattern differs from the earlier Woodland populations from the region who settled "along the margins of the prairie lakes and in stream valleys. These sites are widely distributed across the landscape. Oneota sites, however, are found on the west side of the Blue Earth River and are tightly clustered in two localities. These have been termed the Center Creek and Willow Creek Locality" (Dobbs 1988a:209).

Four Blue Earth Oneota mortuary sites are listed in the bioarcheology database (Table 54). These sites are located within the Center Creek Locality and have yielded a minimum of 21 individuals. Similar to the skeletal samples of the other Oneota manifestations, the Blue Earth remains are currently undergoing extensive osteological analysis. Vosberg (21FA02) is included in Glenn's (1974) research on the population affiliation of the Oneota and is the only Blue Earth skeletal sample to have undergone any degree of osteological analysis. The bioarcheology of the Blue Earth Oneota is virtually unknown.

#### Comparative Analysis of the Oneota

Crania from six Minnesota sites, representing four foci, were included in Glenn's (1974) craniometric analysis. The Bryan site (21GD04) represents the Silvernale focus, the Hogback (21HU01), Wilsey (21HU04), and Rushford (21FL09) sites comprise a portion of the Orr focus, the Vosberg site (21FA02) part of the Blue Earth/Correctionville focus, and the Lindholm (21BS03), Schoen Mounds (21BA01, 21BS02), and Lewis Mounds (21BE06) sites comprise the Cambria focus sample. The multivariate analysis included 379 individuals; however, the exact number of Minnesota crania analyzed is unknown since sample sizes were not provided per site. The remainder of the total sample are from Iowa, Wisconsin, Illinois, Indiana, Missouri, and Nebraska.

Glenn concluded that Bryan showed close affinities only to the Middle Mississippian sample from the Wisconsin site of Aztalan (47JE01). Both Bryan and the Aztalan sample are closely affiliated with Neumann's Muskogid variety. Neumann (1960) associates Muskogid with Middle Mississippian populations. This result suggests a Middle Mississippian influence in the early Oneota groups in Minnesota. Bryan is distinct from the Grand River phase in Wisconsin, another early/emergent Oneota group, suggesting an early and different developmental trajectory for the western and eastern Oneota. The results relative to the early Oneota foci, however, must be viewed as tentative since the sample sizes are so small (Bryan, N=1) and the individuals may not be representative of either the sites or the foci. Glenn also reports that cranial morphology varies among the included foci and "more or less follows archeological divisions" (Glenn 1974:139). A clear division was observed between the Silvernale, Orr and Periphery Oneota and the Grand River-Lake Winnebago groups,

Table 53. Oneota burial sites in Minnesota.

Site	Phase	MNI	Region	Type	Ref.
Vosberg (21FA02)	Blue Earth	13	PL	Unknown	1
21FA68	Blue Earth	3	PL	Unknown	2
Center Creek Locality	Blue Earth	3	PL	Unknown	2
21FA84	Blue Earth	2	PL	Cemetery	2
Rushford Mound 34 (21FL09)	Orr	5	EW	Mound	3
Bryan (21GD04)	Unknown	8	EW	Habitation	4
Eggleston (21GD05)	Unknown	1	EW	Mound	5
Hogback (21HU01)	Orr	55	EW	Cemetery	6
Wilsey (21HU04)	Orr	20	EW	Cemetery	7
Van Gunde (21HU26)	Unknown	1	EW	Habitation	2
High Island Mound (21SB01)	Unknown	1?	PL	Unknown	2
Femco Mound (21WL01)	Unknown	7	P	Mound	2

References: 1 Wilford 1952f; 2 U of M correspondence file; 3 Wilford 1937a; 4 Johnson 1964; 5 Wilford 1956; 6 Wilford and Brink 1974; 7 Wilford 1952g



indicating that the eastern and western Oneota division continued into later times. Both Orr and the Peripheral Oneota series (including the Blue Earth focus) overlap with portions of the Cambria distribution. Wilford (1955c) observed a degree of cultural overlap between Cambria and the Minnesota Oneota foci and Glenn's results lend some support to this relationship. Glenn's research demonstrates the biological heterogeneity of the total sample.

### Plains Village Tradition (A.D. 900-1675)

Plains Village is an archeological manifestation that flourished on the Great Plains and adjacent prairies to the east between A.D. 900-1675. This Late Prehistoric pattern incorporates three traditions: the Central Plains, Middle Missouri, and Coalescent. Plains Village manifestations in Minnesota represent the eastern periphery of this pattern and all fall within the Initial Variant of the Middle Missouri tradition (Lehmer 1971; Gibbon 1993; Dobbs 1988a). Six phases have been defined for the eastern range of the Initial variant (Henning 1989); only two of these phases, Great Oasis and Cambria, are present in Minnesota. All Middle Missouri tradition sites in Minnesota are within the Prairie and Prairie Lake ecological zones. Eight Middle Missouri tradition sites are identified in the bioarcheology database (Table 55); all are from the Cambria phase. All Middle Missouri tradition mortuary sites of the Plains Village pattern were classified as Mississippi due to Wilford's early assignment of them to the Mississippi period; they are more accurately classified as Plains Village.

*Great Oasis Phase.* Great Oasis was initially defined by Wilford (1941, 1955c) and placed within the Mississippian pattern. Subsequent research resulted in a reclassification of Great Oasis as a phase within the Initial Variant of the Middle Missouri tradition and identification of the greatest concentration of affiliated sites in central and northwestern Iowa. Henning and Henning (1978) speculate that Great Oasis may be a local development and "appears to be ancestral to and partially contemporaneous with the Mill Creek and Over focus groups" (Dobbs 1988a:193). Knowledge of the cultural nature of Great Oasis in Minnesota is limited and the temporal range is believed to span from A.D. 900-1200. No affiliated burials have been discovered to date.

*Cambria Phase.* Similar to Great Oasis, Cambria was initially defined by Wilford (1941, 1955c) and placed within the Mississippian pattern. Subsequent research resulted in a reclassification of Cambria as a phase within the Initial variant of the Middle Missouri tradition.

Cambria phase sites in Minnesota have been divided into four categories including large village sites, secondary villages in close proximity to the larger villages, smaller prairie-lake and riverine sites, and mortuary sites (Johnson 1961). All sites are concentrated in the Prairie and Prairie Lake regions of southwestern Minnesota. The temporal distribution of Cambria is unclear but appears to be A.D. 900-1300. Subsistence practices varied according to category of site. "The four categories of Cambria phase sites are assumed to be integrated together in a seasonal settlement-subsistence pattern that involved maize horticulture at village sites, bison hunting on the prairies, and the exploitation in the trench of the Minnesota of a wide variety of plant and animal resources" (Gibbon 1993:179-180). Two competing models have been proposed to explain Cambria settlement and subsistence practices. Johnson (1986:10-11) suggests "that populations in this larger region were interacting in a system of exchange dominated by populations at the Cambria site and that their system was tied to a larger Cahokia-based trade network ... the Cambria Phase was one sub-set of that extractive network, Mill Creek [in Iowa] another, and Silvernale the third in this northern Cahokia-based system." Watrall (1974) has hypothesized quite a different model based on the deterioration of

the subsistence environment which necessitated the westward migration of Cambria and other peoples in the region at this time. Further data are needed to evaluate the validity of the two models.

There are eight Cambria phase mortuary sites (Table 55); all are located in the Prairie Lake ecological zone. A minimum of 79 individuals have been identified from these sites. All eight sites are mounds. Five are located on Big Stone Lake on the Minnesota/South Dakota border.

Burials recovered from the mound sites, with the exception of Lewis Mound (21BE06), are all flexed primary interments. The individuals buried in Lewis Mound are all in a primary extended position (Gibbon 1993). Johnson (1961) reviews the burial patterns from the Lou Miller Mound (21BS04), Schoen Mound 1 (21BS02), and Schoen Mound 2 (21BS01) from Wilford's unpublished manuscripts. The human remains recovered from the Lindholm Mounds site (21BS02) are the only Cambria phase individuals to have undergone some osteological analysis. The Lindholm Mounds site consists of two mounds overlooking Big Stone Lake. After experiencing long-term continuous cultivation, the mounds were excavated in 1946 by an archeological crew from the University of Minnesota under the direction of Lloyd Wilford. A minimum number of 39 individuals have been tentatively identified. Four crania from the site were included in Peterson's biodistance study (1964) as representative of the Cambria phase; the results of this study were discussed above in the Oneota aspect section. Because of the limited results of Peterson's analysis (1964) and the absence of any further research, the bioarcheology of the Cambria phase is only minimally known at this time.

### Middle Mississippi (A.D. 1000-1400)

Several distinct cultural groups were occupying overlapping areas of Minnesota in the southern half of the state by approximately A.D. 1000. Peoples of the Cambria and Great Oasis phases of the Initial Middle Missouri tradition were present in the southern Prairie and Prairie Lake areas, Oneota groups inhabited the portions of central and southern portions of the Eastern Woodlands as well as the Prairie Lake ecological zones, Late Woodland peoples were also present in the deciduous forests of the Eastern Woodlands zone in the southeastern portion of the state, and a small Middle Mississippi presence, represented by the Silvernale phase, is documented in this region as well. These groups practiced a sedentary existence that included a dependence on maize horticulture complemented by the hunting and gathering of locally available flora and fauna.

The Middle Mississippi influence in the regions peripheral to Mississippian center of Cahokia has been discussed at great length (see Emerson and Lewis 1991). Middle Mississippi groups were organized in a state-oriented sociopolitical structure with centralized leadership and an "emphasis upon community-oriented social and religious activities .... Middle Mississippi communities were centered on a temple town with one or more earthen temple mounds and open plazas as central features" (Hall 1986:368). The contemporary Cambria, Great Oasis, Oneota, and Late Woodland groups were less formally organized socially and their habitation areas were organized in distinctly different ways. The nature of the relationship, presence, and influence of the Middle Mississippi peoples to the contemporary Late Prehistoric populations in Minnesota remains unclear although several researchers have hypothesized various scenarios (Johnson 1961, 1986, 1991; Gibbon 1974, 1979, 1991; Emerson 1991).

Gibbon summarizes the impact of the Middle Mississippian "cultural sphere" in Minnesota and presents evidence for its influence at several sites. He concludes that the greatest influence occurred between A.D. 1050 and 1300 in the Red Wing locality but sees

Table 54. Age and sex distribution of individuals recovered from the Hogback site (21HU01).

Age Category (in years)	M	F	Indeterm.	Total (%)
0-2	0	0	9	9 (18.4%)
3-12	0	0	12	12 (24.5%)
13-17	0	1	4	5 (10.2%)
18-20	1	0	0	1 (2.0%)
21-35	2	4	0	6 (12.2%)
36-55	1	2	0	3 (6.12%)
56+	0	0	0	0 (0.0%)
Adult	0	1	9	10 (20.4%)
Old Adult	3	0	0	3 (6.12%)
Total (%)	7 (14.3%)	8 (16.3%)	34 (69.4%)	49 (100%)

no evidence of a site-unit intrusion of any kind. Instead only selected Middle Mississippi traits occur in what I interpret as culture contact situations involving a largely local population base. Such traits are most abundant in Silvernale phase sites in the Red Wing area at the juncture of the Mississippi and Cannon rivers. ... The general assemblage of Silvernale phase sites is dominated, however, by Oneota and what may be Oneota-Middle Mississippi "blended" artifacts and structures. Middle Mississippian-related traits also appear in a few Cambria phase sites along the Minnesota River in a still more diluted form" (Gibbon 1991:220).

Gibbon (1991:220) explains the presence of these traits and the syncretistic nature of the Mississippi Silvernale phase by the participation of the Oneota and Cambria peoples in a "Cahokia-centered extractive-exchange network in southern Minnesota between A.D. 1050 and 1100." There are no Middle Mississippi mortuary sites listed in the Minnesota bioarcheology database. However, several individuals from the Bryan site (21GD04) may be attributed to the dominant Mississippian Silvernale phase documented at the site. Human remains have been recovered during the numerous excavations conducted over the past 130 years (Dobbs 1984; Wilford 1984; Muller 1995) and can be assigned to two categories, isolated skeletal elements in nonmortuary features and intentional interments. The affiliation of these remains to either the Oneota or Silvernale occupation is unknown. The remains are currently undergoing extensive osteological analysis at the Hamline University Osteology Laboratory as part of NAGPRA compliance and are scheduled for repatriation to the Iowa tribe in 1997.

Bioarcheology of the Middle Mississippi manifestation in Minnesota is unknown.

### Historic Period (ca. A.D. 1630-Present)

The Historic/Contact period in Minnesota covers the time from the first European incursions into the state in the seventeenth century up to the present day. In the Minnesota Historic Context Outlines working draft document, Dobbs (1988b) makes a good case for viewing this period as part of a continuum of adaptation of American Indian groups and immigrant Euro-American groups to changing environmental conditions, including the Little Ice Age (A.D. 1550 to 1850), and changing political conditions. He defines five Native American contexts or study units: (1) Chiwere-Winnebago language group (Ioway, Oto, Winnebago), (2) the Dakota, (3) the Teton and Yankton, (4) the Chippewa and (5) the Assiniboin that represent a loose chronological sequence of replacement of groups as a result of westward expansion and adaptation, alternately or seasonally, to woodland and/or prairie biomes. Three Euro-American contexts or study units are defined, including the French, the British, and initial United States presence, which represent a chronological sequence of occupation in Minnesota.

Table 55. Minnesota sites with a Middle Missouri mortuary component.

Site	Phase	MNI	Region	Type	Ref.
Lewis Mound (21BE06)	Cambria	8	PL	Mound	1
Schoen Mound #2 (21BS01)	Cambria	4	P	Mound	2
Schoen Mound #1 (21BS02)	Cambria	9	PL	Mound	2
Lindholm Mounds (21BS03)	Cambria	39	PL	Mound	3
Lou Miller Mound (21BS04)	Cambria	4	PL	Mound	2
Holtz Mound (21BS05)	Cambria	2	PL	Mound	4
Round Mountain (21TR01)	Cambria	11	PL	Mound	3
Camden (21LY02)	Cambria	2	PL	Mound	5

References: 1 Wilford 1951; 2 Johnson 1962b; 3 Wilford 1970; 4 Wilford 1939b; 5 Chamberlain 1942.

The Oneota represents a transitional protohistoric context between the Late Prehistoric period and the Historic period. In southeastern Minnesota, northeastern Iowa and southwestern Wisconsin, Oneota Orr focus sites provide clear evidence of European contact and Wedel (1959; Mott 1938) has demonstrated that they were occupied by historic Ioway groups. Orr focus sites with mortuary components, most notably Hogback (21HU1), Wisley (21HU4), and Rushford (21FL9), are discussed in the Late Prehistoric section.

Thirty-seven sites with Historic period mortuary components are identified in the bioarcheology database (Table 56). Of these, 14 are in the Northern Forest region, 12 in the Eastern Woodland, four in the Prairie Lake and seven in the Prairie region. A minimum number of 256 individuals have been reported or identified from these sites. The number of individuals in some cases is based on archeologically reported burials; osteological analysis frequently identifies additional individuals. Many of the sites represent single isolated burials that are identified as historic based on the presence of coffins or associated artifact material including European manufactured or trade objects. Approximately twenty-three sites or 68% fall into this category. Six sites represent historic burials intrusive into a mound context, sometimes a single burial as at the Fingerson Mound (21PO2) or the Osufsen Mound (21IC2). In other cases the number of intrusive burials is more extensive as at the Steele/Shakopee Mounds (21SC24), the Syl Sand Mound (21SN11), the Cooper Mound (21ML16) or the Saienga Mound (21CP2). The Saienga Mound involved three intrusive coffin burials of Sisseton Wahpeton affiliation into a Woodland mound. Six sites represent excavation of larger numbers of burials in a cemetery or habitation context. Finally, two individuals were identified in private or institution collections and were turned over to the Minnesota Indian Affairs Council.

Ethnic groups represented by Historic period mortuary sites are those that have figured most prominently and numerous in Minnesota's history, i.e., the Dakota and the Chippewa or Ojibwa. Dakota affiliation is identified at seven sites represented by 131 individuals. Chippewa or Ojibwa affiliation is identified at nine sites represented by 27 individuals. No individuals have definitively been associated with the Teton, Yankton or Assiniboin, although the presence of these groups in Minnesota has been documented in historic sources (Dobbs 1988b). American Indian affiliation, tribal designation unknown, is identified at five sites representing 54 individuals. The early Euro-American presence is unknown bioarcheologically. No sites with a mortuary component associated with either the early French or British contact period have been identified. "white" or Euro-American affiliation is identified for five sites representing 28 individuals. Two of these represent pioneer family burial plots dating to the late nineteenth and early twentieth century, the Monson and Watson sites. One is a Finnish immigrant cemetery dating to the early twentieth century, Hamalainen (21IC106).

## Native American

The most extensive published bioarcheological information for Historic period Native American sites in Minnesota is by Aufderheide et al. (1994) on Dakota and Ojibwa cemeteries and burials in the Mille Lacs area of east-central Minnesota. Sites in the Mille Lacs area have been the focus of research on the adaptation of Woodland populations to the intensive cultivation of wild rice (Johnson 1969a, 1969b, 1985; Lofstrom 1987; Whelan 1990). Late nineteenth century mound surveys by Brower and Bushnell (1900:129) identified 1,125 mounds in the Mille Lacs area. Seven burial sites in this area were excavated between the 1920s and the 1960s by various researchers associated with the University of Minnesota including Albert Jenks, Lloyd Wilford, Leland Cooper, Gordon Eckholm, Gordon Lothson and Jan Streiff. The burial sites include: (1) Middle Woodland sites, Brower (21ML1) and Malmo (21AK1); (2) Late Woodland and Early Historic Dakota sites, Cooper Village (21ML16) and Cooper Mounds (21ML16) and (3) Historic Ojibwa sites, Vineland Bay (21ML7), Petaga Point (21ML11), and Strawberry Hill (21ML14). A Master's thesis (University of Minnesota) by Lothson (1972) presents a good summary of the history of archeological work in this area, ethnohistorically derived burial patterns of the historic Dakota, and the mortuary program for the Cooper Village and Cooper Mounds sites. Aufderheide (1994) presents bioarcheological information for all seven sites. The discussion here is limited to the historic component sites.

The Cooper Village site (21ML9) is affiliated with the Mdewakanton Dakota and represents burials in pits within the habitation area. Burial mode appears to be primary, partially exhumed burials that have been reburied elsewhere, specifically within the Cooper Mounds (21ML16). Aufderheide (1994:329) notes unusual bone inventory patterns for this site that conform neither to typical primary nor to secondary burial mode patterns leading him to propose primary inhumations with subsequent exhumation. The Cooper Mounds exhibit a variety of burial modes including secondary ossuary burial, secondary bundle burial, and primary articulated burial; primary disarticulated inhumation and/or secondary partially decomposed bundle burials are additional possible burial modes. Based on comparable numbers of missing elements and number of individuals, Aufderheide argues that the partially exhumed Cooper Village burials were reburied in the Cooper Mounds. The Cooper Village site represents 19 individuals including 11 adults (four males, five females, two indeterminate) and eight subadults. Infants and young children are underrepresented; only one subadult was less than 6 years old (a fetus) and three were 15-16 years old. The Cooper Mound 1 site represents 15 burials containing 50 individuals including 45 adults (19 males, 18 females, eight indeterminate). Gross underrepresentation of infants/children is also evident here. Only four of the 50 individuals were under age 15 and none of these was an infant under 2 years of age. The frequency of children for these sites is 11.4% which is even lower than the 25% frequency in the earlier Brower and Malmo sites.

Aufderheide (1994:346) suggests that the Dakota remains "present the picture of a robust, healthy, and well-nourished population." Dental caries is generally absent and no dental hypoplasia is identified. Severe periodontitis with abscess formation associated with severe attrition is evident in four individuals (21%) from the Cooper Village and seven individuals from the Cooper Mounds (14%). Harris lines occur at a low rate of 2.0 per individual. Carbon isotope values of -20.90 for the Cooper Village and -20.24 for the Cooper Mounds reflect an almost pure C<sub>3</sub> vegetal diet. Tieszen (1994) attributes the 1-2% more positive value to be the result of the consumption of bison who have been feeding on C<sub>4</sub> grasses such as big blue stem. Degenerative joint disease appears to be correlated with age and is found in 12 of the 51 adults (24%) at the Cooper Mound

Table 56. Historic burial sites in Minnesota.

Site	Culture	MNI	Region	Type
Savanna Portage StPk (21AK9011) <sup>1</sup>	White?	1	NF	Unknown
Brown's Point (21AK9012) <sup>2</sup>	Ojibwe	?	NF	Cemetery
21BK9005 <sup>1</sup>	Unknown	1	NF	Isolated
Concordia College (21BW9003) <sup>3</sup>	Dakota	1	PL	Unknown
Peterson (21CA64) <sup>4</sup>	Ojibwe	1	NF	Mound
Horseshoe Bay (21CA201) <sup>5</sup>	Unknown	3	NF	Cemetery
21CK0889 <sup>1</sup>	Ojibwe	1	NF	Unknown
Grand Portage (21CK6) <sup>6</sup>	Ojibwe	4	NF	Isolated
Birk Historical Burial <sup>7</sup> (21CL9002)	Indian	1	NF	Isolated
Saienga (21CP02) <sup>8</sup>	SW Dakota	3	PL	Mound-I
Crow Wing Co. Skull <sup>1</sup> (21CW9006)	White	1	NF	Isolated
Kennealy (21DK25) <sup>9</sup>	M Dakota	15	EW	Cemetery
Black Dog Burial (21DK26) <sup>10</sup>	M Dakota	39-41	EW	Cemetery
Osufsen (21IC02) <sup>11</sup>	Ojibwe	1	NF	Mound-I
Hamalainen (21IC106) <sup>12</sup>	Finnish	22	NF	Cemetery
Fort Snelling (21HE9001) <sup>1</sup>	Unknown	1	EW	Isolated
21HE9003 <sup>1</sup>	Unknown	1	EW	Unknown
21KA34 <sup>1</sup>	Ojibwe	1	NF	Isolated
Mora Burial (21KA9002) <sup>1</sup>	Unknown	2	NF	Unknown
Monson (21KH9006) <sup>13</sup>	White	2	P	Cemetery
Vineland Bay (21ML07) <sup>14,15</sup>	Ojibwe	12	EW	Habitation
Cooper Village (21ML09) <sup>15,16</sup>	Dakota	19	EW	Habitation
Petaga Point (21ML11) <sup>15,17</sup>	Ojibwe	2	EW	Isolated
Strawberry Hill (21ML14) <sup>15</sup>	Ojibwe	3	EW	Isolated
Cooper Mound (21ML16) <sup>15,16</sup>	Dakota	50	EW	Mound
21OT4 <sup>1</sup>	Ojibwe	3	EW	Isolated
OT Co. Sheriff's Dpt. (21OT9006) <sup>1</sup>	Unknown	1	P	Isolated
Otter Tail Lake (21OT9008) <sup>1</sup>	Unknown	2	P	Above
Fingerson Mound (21PO02) <sup>18</sup>	Dakota	1	PL	Mound-I
Watson Burial (21RL04) <sup>19</sup>	White	2	P	Isolated
Kenmitz Burial (21RN14) <sup>20</sup>	Dakota	1	P	Isolated
21RO9001 <sup>1</sup>	Unknown	1	NF	Isolated
Redwood Falls Cemetery (21RW9001) <sup>21</sup>	Unknown	1	PL	Cemetery
Steele/Shakopee Mounds (21SC24) <sup>1</sup>	Indian	38	EW	Mound-I
Nett Lake Burial (21SL9002) <sup>22</sup>	Indian	1	NF	Unknown
Syl Sand Mound (21SN11) <sup>23</sup>	Unknown	13	EW	Mound-I
Wiener (21TO7) <sup>1</sup>	Unknown	2	P	Isolated
Presley Skull (21TR9002) <sup>24</sup>	Indian	1	P	Unknown

Note: SW = Sisseton-Wahpeton; M = Mdewakanton; I = intrusive

<sup>1</sup>Unpublished file notes, letters, manuscripts; Hamline University Osteology Laboratory and University of Minnesota Wilford Archaeology Laboratory; <sup>2</sup>Hart 1956; <sup>3</sup>Hamline University Osteology Laboratory (HUOL) 1990, File H160; <sup>4</sup>HUOL, File H118; <sup>5</sup>HUOL 1990, File H174; <sup>6</sup>Woolworth 1968; <sup>7</sup>HUOL 1984, File H72; <sup>8</sup>Wilford et al. 1969; <sup>9</sup>Wilford 1944, Peterson 1977a,b,c, 1978; <sup>10</sup>Whelan et al. 1989a,b, O'Connell et al. 1989; <sup>11</sup>Wilford 1943; <sup>12</sup>Thurston 1987, Blue 1990, Luecke 1997; <sup>13</sup>HUOL 1990, File H179; <sup>14</sup>Dickinson 1969; <sup>15</sup>Aufderheide et al. 1994; <sup>16</sup>Lothson 1972; <sup>17</sup>Bleed 1969; <sup>18</sup>Wilford et al. 1969; <sup>19</sup>HUOL 1988, File H148; <sup>20</sup>Norquist 1967; <sup>21</sup>HUOL 1992, File H209; <sup>22</sup>HUOL 1985, File H69; <sup>23</sup>Kimmerle 1997; <sup>24</sup>HUOL 1987, File H136

and Village sites. A 25 year old female from the Cooper Village site demonstrated congenital fusion of two cervical vertebrae. One individual from Cooper Mounds, a 40 year old female, revealed diffuse moderate periostitis of the tibia of unknown etiology. Trauma resulting from conflict is evident in only one individual from the Cooper Mound site. A 45 year old male had a broken stone point embedded in the anterior proximal tibia with no bone reaction. Additional points discovered between his bones during excavation suggest that these points were embedded in soft tissue at the time of burial.

Throughout the seventeenth and eighteenth centuries intense intertribal warfare was a constant theme of the Dakota experience around Lake Mille Lacs and elsewhere. Warfare between the Dakota and the Cree, Ojibwa, and other eastern groups was the result of both increasing climatic stress caused by the Little Ice Age and the westward displacement of other Indian groups by both Europeans and the Iroquois Confederacy (Dobbs 1988b). The Chippewa-Dakota wars, which lasted from the 1730s until 1854, represent one of the dominant themes in Minnesota history during this period. The Chippewa invaded the Mille Lacs region in the 1740s

and permanently displaced the Dakota from Mille Lacs. Chippewa victories over the next 40 years, resulted in complete control of the Mississippi Headwaters and most of the lake-forest region of Minnesota by the Chippewa people. The Dakota moved south and west and established villages along the Minnesota and Mississippi Rivers which they occupied until the series of events in the middle to late nineteenth century that resulted in formal surrender of their land rights following the treaty of 1851, movement to western Minnesota, and culmination in the Dakota Conflict in 1862 and removal of all Dakota from Minnesota by the U.S. government.

The archeological record of the Ojibwa for this time period is very poorly known. Dobbs (1988b:48) acknowledges that, "Although there are components at several sites that may be associated with the Ojibway, no eighteenth or early nineteenth century sites that can be positively associated with the Ojibway have been identified and studied," and recognizes further that, "Given the tremendous changes taking place during this time, this gap in our knowledge is regrettable." Even less is known bioarcheologically about this time period.

Aufderheide (1994) reports on three sites with mortuary components from the Mille Lacs region that are associated with the Ojibwa, Vineland Bay (21ML7), Petaga Point (21ML11) and Strawberry Hill (21ML14).

The Vineland Bay or Kathio School site is a multicomponent habitation and wild rice collection and processing site that includes both Late Woodland and Historic period Native American and Euro-American components. Archeological testing in 1949 by Lloyd A. Wilford located one burial in the habitation area. More extensive excavations by D. W. Dickinson in 1967 uncovered seven burials. An Master's thesis (University of Minnesota) by Dickinson (1969) identified the burials as Ojibwa based on burial mode. Aufderheide (1994) identified 12 individuals, seven adults and five subadults. Two of the five subadults are fetuses, probably representing the premature birth and neonatal death of twins. The eight adults represented three males and five females. Pathological conditions included two individuals (42 years old of indeterminate sex and 45 year old female) with chronic mastoiditis, an adult male with a Schmorl's node in a vertebral body and an adult female with congenital fusion L4 and L5 vertebrae.

Petaga Point (21ML11) is a large multicomponent site with Late Archaic, Woodland, and Historic Ojibwa components. Excavations by Bleed (1969) uncovered two burials of either Dakota or Ojibwa affiliation. Aufderheide (1994) identified three individuals, an 8 year old child and a newborn in one burial and a 42 year old female in the second burial.

Reconnaissance survey on the southeast corner of Lake Mille Lacs in 1966 recovered human remains disturbed by gravel operations at Strawberry Hill (21ML14). Cultural affiliation is uncertain but the reported recovery of a President's Medal is the basis for historic designation. Aufderheide (1994) identified three individuals (newborn, child and adult male).

The various health indicators applied by Aufderheide (1994) indicate a pattern in the Ojibwa that is basically similar to that reported for the Dakota people. Caries and enamel hypoplasia are absent, Harris line frequency is low and bone pathology is infrequent. The Strawberry Hill individuals present the less negative carbon isotope values, but with a value of -18.9, maize consumption probably represents a very small proportion of the diet even in these later A.D. 1800-1850 individuals.

In addition to Aufderheide's (1994) summary of the Mille Lacs historic population, significant bioarcheological information for the historic/contact period in Minnesota is represented by the unpublished work on the Black Dog Burial Site (21DK26) by Whelan et al. (1989a, 1989b) and O'Connell et al. (1989).

The Black Dog Burial site was a nineteenth century Eastern Dakota Indian cemetery located on a sandy river terrace above the Minnesota River about 7 miles south of St. Paul. Two separate burial areas were identified, the Kennealy site (21DK25) and the Black Dog Burial site (21DK26). The two sites are located about 1 mile apart in close proximity to the nineteenth century Mdewakanton Dakota settlement known as Black Dog's Village and were presumed to represent the burial area for this village. The Kennealy site (21DK25) was disturbed by sand quarry operations in 1943, and four coffin burials were removed by archeologists (Wilford 1944). In 1968 unrelated construction activity northeast of the Kennealy site disturbed human burials in the second cemetery area, the Black Dog Burial site (21DK26). Archeologists from the Minnesota Historical Society, working ahead of construction equipment, quickly excavated 24 additional burials in a week. In 1977 renewed highway construction threatened the Kennealy site and an additional seven burials were removed by archeologists with the Minnesota Department of Transportation in consultation with the State Archeologist's Office and the Minnesota Indian Affairs Intertribal Board. Two weeks after the excavation, in accordance with the wishes of Indian leaders, the 1943 and 1976 human remains and associated artifacts from the Kennealy site were reburied. No osteological analysis was undertaken prior to reburial but an excavation memo/report by Peterson (1977c) identifies 11 individuals in the seven burials including seven adults (three males, two females, two indeterminate), two adolescents (8-14 years old, 12-16 year old male) and two unidentifiable as to age/sex.

The Black Dog series remained unanalyzed for 20 years due to limited funding for study and a lack of bioarcheological research in Minnesota. In 1988, a 2 month study of the human remains and associated funerary objects was initiated in response to a formal request for return of all material from this site for reinterment by the Minnesota Indian Affairs Intertribal Board and the Minnesota Sioux Intertribal Council. These coffin burials date between 1830 and 1860, although the majority of the burials (60%) fall in the decade of the 1840s and 95% date between 1835-1855. Black Dog's village was probably occupied from about 1815 to 1851. Although coffin burial suggests Euro-American and Christian influence, analysis of the burial mode and associated material culture suggest the Dakota maintained a significant degree of continuity with past traditions. Whelan et al. (1989a:5) detail this continuity:

Important elements of traditional Dakota burial practices found at Black Dog include: 1) continued use of aerial scaffolds and log tombs; 2) interment of individuals as wrapped primary burials without coffins; 3) the interment of individuals as secondary bundle burials, some wrapped in birch bark as they were 2,000 years earlier; 4) the practice of group interment represented by the placement of more than one individual in a single coffin, and/or the placement of more than one coffin in a single grave; 5) the continued placement of food gifts and other objects with the deceased; and (6) the persistence of Dakota ceremonialism, including the probable burning of sacred grasses and herbs at the time of burial.

Osteological analysis identified between 39 and 41 individuals interred in 24 burials. The human remains are extremely fragmented and "weathered," possibly due to exposure on scaffolds, subsequent deterioration in the ground and/or hasty excavation techniques. The condition of the bones adversely affected age/sex determination and pathology analysis. Only one age determination was based on pubic symphysis morphology. Sex determination relied heavily on fragmentary cranial morphology and midshaft circumference of the femur (Black 1978).

Demographic reconstruction of this small and fragmentary sample presents a surprisingly normal profile. The male/female ratio is .88. Subadults (less than 15 years of age) represent 39% of the population. Infants (less than 2 years of age) are somewhat underrepresented at 10%. There is a total absence of individuals in the 2-5 year range, providing no evidence of weaning age mortality. The adult mortality experience is more severe for females than males with a mean age of death for females of 28.5 years, as compared to 36.7 years for males. Females are overrepresented in the 15-25 year range and underrepresented in older age categories (35-50 years), with only one female aged less than 50.

Reconstruction of the general health and nutritional status of people from the Black Dog cemetery is of great interest as this time period represents a difficult period in Dakota history due to widespread epidemic disease, crop failures and reported food shortages, loss of their resource base, and disruption of their economy. The impact of these factors on the Dakota people is not always reliably recorded in historic documents. Osteological analysis of general health, while constrained by the poor preservation and fragmentary state of the skeletal material, offered some general conclusions. Stature estimates could be determined for only three adult individuals, two males (mean=168.6 cm) and one female (158.8 cm) but both are within the normal range and are not indicative of malnutrition. Long bone length relative to dental age is observable in two subadults. Growth retardation is clearly evident in the one individual, determined to be 11-12 years old based on dental eruption but with a femur length of only 310 mm suggesting an age of 8.5-9.5 years. Another juvenile does not exhibit this pattern with a dental age of 8-9 years and a femur length age of 7.5-8.5 years.

Harris lines provide evidence of nutritional and disease stress; radiographs of nine individuals with observable femora and/or tibiae did not exhibit any visible lines. The complete lack of this stress indicator is unusual but consistent with the findings of Aufderheide (1994) for prehistoric and historic Dakota populations from the Mille Lacs region. Gross observation of all skeletal material for indications of infection identified only one femur exhibiting elevated periosteal reaction, although observation was clearly compromised by the extreme "weathered" condition of the skeletal material. A number of skeletal features document strenuous physical labor and stress. Degenerative joint changes could not be observed due to the paucity of long bone ends. Vertebral arthritis and Schmorl's nodes were observable in three individuals, two males and one female, representing the oldest individuals in the population. The striking frequency and extreme expression of platycnemic tibia (mediolateral flattening) provides evidence of a rigorous lifestyle. Ten of the 14 individuals (71%) with measurable tibiae exhibited platycnemic tibia (index=55.0-62.9) with four in the hyperplatycnemic range. In a biomechanical analysis of tibial remodeling, Lovejoy et al. (1976) argues that platycnemic tibiae are best explained in terms of antero-posterior and torsional strains resulting from active locomotion on uneven substrates. This trait is evenly distributed between the sexes with four males and four females, plus two individuals of indeterminate sex, exhibiting the trait.

Osteological observations reveal little evidence of subnormal health status for this population generally. This is consistent with the findings of Aufderheide (1994) for the Mille Lacs Lake Dakota populations which were also characteristically very healthy. This picture is seemingly at odds with the drastic changes reported to be affecting Dakota people in the historic documents of this time period. Possible explanations include biased osteological observations due to the fragmentary and poorly preserved nature of the skeletal material. Alternately, the lack of pathology and general good health status may be interpreted in terms of the

persistence of traditional lifeways—both continued dietary diversity and a rejection of Euro-American pressures to abandon traditional subsistence patterns. The persistence of traditional burial practices despite the Euro-American influence of coffin burials supports this explanation. Finally, many of the acute stresses such as catastrophic epidemic diseases that result from contact do not show up in the skeleton and larger demographic samples are necessary to see their demographic effects.

The significance of the combined study of human remains and funerary objects to an understanding of history based primarily on written documents is summed up by Whelan et al. (1989a):

These observations are important because of the Euro-American bias present in historic descriptions of 19th century life and the general lack of information about Dakota responses to colonization. We do NOT argue that colonization had no effect, or that the Dakota benefited from this contact situation. However, until military force and treaty obligations forced the Dakota onto reservations the picture we reconstruct is one of both continuity and change: incorporating many new (Euro-American) elements while preserving a host of traditional customs. We believe it is important to document this kind of response for it points out that the Dakota people were in control of their lives and making active choices about change in their culture well into the 19th century.

Additional mid-nineteenth century burials were uncovered at the Grand Portage National Monument in 1962 as a result of fur trade post excavations. Woolworth (1968) reports on the excavations and funerary artifacts associated with the four burials that are identified as Chippewa/Ojibwa and date to approximately 1800-1825. A great quantity of funerary objects are identified including 11,368 cane beads with Burial 3. Of particular interest was the presence of an unusual headband made of six rectangular silver plates fastened to a strip of red cloth. The silver plates are engraved with portions of a large bird, a bow with an arrow across it and an ornamented circle. The engraved plates appear to have been parts of an ornament, possibly a hair circlet, that were cut and modified. The burials represent four adults (three females and one male). The human remains were returned to the Grand Portage National Monument from the Minnesota Historical Society in the mid-1960s but were consumed by fire that destroyed the Grand Hall in 1969. No bioarcheological information is available for these individuals.

Most of the Historic/Postcontact American Indian burial sites identified in the Minnesota database represent single isolated burials. The larger samples represented at sites such as Syl Sand (21SN11), and the Steele/Shakopee Mounds (21SC24) are currently undergoing extensive osteological analysis at the Hamline University Osteology Laboratory.

#### Euro-American

Most of the identified Euro-American burials in Minnesota are relatively recent representing late nineteenth century and early twentieth century immigrants and pioneers. There are no known mortuary sites representing the early Euro-American presence in the state identified in the Historic Context document by Dobbs (1988b).

Burials uncovered at the early nineteenth century fur trade Horseshoe Bay site (21CA201) suggest American Indian burial mode in terms of quantity and type of associated funerary objects. However, one of the three individuals identified at the site presents cranial morphology that identifies the individual as white/caucasoid. Many postcontact American Indian remains identified on the basis of associated artifacts "misclassify"

as white/caucasoid in Minnesota. Possible explanations include genetic admixture, inadequate forensic population variability standards and/or adoption of American Indian mortuary practices.

The most significant Euro-American bioarcheological data in Minnesota comes from the Hamalainen cemetery site (21IC106) in north central Minnesota. The site was excavated in 1986 under the direction of Barbara H. O'Connell and Christy Hohman-Caine as part of a Hamline University archeological field school. The cemetery was located on an island and high water levels threatened destruction of the graves. Grave stones and county records, including death certificates, identified the cemetery as ethnically Finnish and dating between 1908 and 1925. A preliminary report of the excavations was presented by Thurston (1987). Senior Honors theses by Blue (1990) and Luecke (1996) have focused on demography/causes of mortality and ethnicity as reflected in tombstones/coffins, respectively.

Twenty-one burials/individuals were identified representing 12 adults (seven females and five males) and nine subadults (three females, four males and two indeterminate). The nine subadults (less than 15 years) represent a subadult mortality rate of 43%; 39% of the population was less than 5; and 24% were less than 1. The mortality curve suggests increased survivorship after the age of 5. No deaths are reported between 5 and 9 years of age. One accidental drowning death occurs in an adolescent male, aged 10-14 years of age. The majority of adult female deaths were 20-35 years of age with only one woman living to be 40-45; the majority of male deaths were 30-50 years of age. Causes of mortality include Spanish influenza and tuberculosis, both of which disproportionately affect young adults. Causes of mortality are based primarily on death certificates and informant interviews; influenza is not observable skeletally and bone pathology indicative of tuberculosis was rare. Dental disease was severe. Caries rates in the 11 adults with dentitions identified 8/73% with greater than one carious lesion, 10/91% with greater than one abscess; and 10/91% with greater than one tooth lost antemortem. One individual had lost 17 teeth antemortem. Caries rates were greater in males than females; 43.2% of male teeth exhibited caries while 26.5% of female teeth exhibited caries. Molars were disproportionately affected with greater than 50% of molars observed exhibiting caries; premolars had a caries rate of 29.2%. Males were disproportionately affected by abscesses, 11% for males vs. 8.7% for females. Bone pathology evidencing infectious disease was rare. Degenerative pathology has been recorded but not tabulated. One individual had a bullet embedded in the ethmoid with a remodeled/healing entrance lesion evident in the left maxilla.

The ethnicity study by Luecke (1996) examined coffin shape, construction, surface treatment, hardware, and design as characteristic of Finnish or American mortuary patterns. Only three of twenty-one coffins could be characterized as "Finnish," one exhibited a mixture of Finnish and American characteristics. Therefore a striking 81% exhibited primarily American mortuary characteristics. Two of the Finnish coffins represent the earliest burials at the cemetery (1908), suggesting a rapid assimilation of American mortuary customs in a time period spanning less than 15 years. Additional analysis of this significant cemetery sample is in process.

Early pioneer graves were relocated by the Minnesota Office of the State Archeologist's Office because of highway construction in south central Minnesota in 1990. Two graves were reported to exist on a farmstead; a grader located one grave and a metal detector identified the coffin hardware on the second. Two individuals, purported to be a father and daughter who died in 1876 and 1881, respectively, were identified. Osteological identification of sex and age indicated a male, 50 years of age, and an adolescent female, 16-17 years of age. Additional evidence of

genetic relationship was exhibited by the presence of metopic sutures in both individuals. Skeletal evidence of tuberculosis corroborated the recorded cause of death for the young female.

## Bioarcheology Summary of Minnesota and Directions for Future Research

The bioarcheology database lists 485 sites and a minimum number of 3,205 individuals that have been identified in Minnesota. Table 57 reports the number of sites and individuals per period. These numbers, unfortunately, are incomplete since a number of sites and reports have been identified and more extensive osteological analysis has refined estimated minimum number of individuals for specific sites since the submission of the database. When appropriate, the more current information has been incorporated into the narrative portion of this overview.

A majority of the human remains excavated and retained have been from the Woodland period. This is a function of the emphasis on mound documentation, exploration and systematic excavation throughout the history of amateur and professional archeology in Minnesota, as well as the fact that, in a majority of the state, the Woodland lasts from approximately 500 B.C. to Native American-European contact. Furthermore, until recently, less interest was directed to the Archaic and Paleoindian periods. In the last five years, however, numerous Archaic and Paleoindian sites have been excavated as a result of highway construction and development and as the reports are submitted, our knowledge of the nonmortuary aspects of these people will expand. Final reports for two large, multicomponent sites in the Rainy River area (near the Canadian border), the Hannaford (21KC25) and McKinstry (21KC02) sites that contain human remains, are nearing completion. An unusual feature at the Hannaford site may represent a location for human cremation where the remains were subsequently removed and buried elsewhere (O'Connell and Myster 1995). Finally, there is currently a statewide survey being conducted that promises to fill the gaps in our knowledge of the ancient history of Minnesota (Gibbon 1993).

Human remains in Minnesota are currently undergoing extensive analysis under contract with the Minnesota Indian Affairs Council as part of NAGPRA compliance. Data collected include inventory, age and sex determination, craniometrics and nonmetrics, postcraniometrics and nonmetrics, dental metrics and nonmetrics, and skeletal and dental pathology. Additionally, all long bones and pathological elements are x-rayed and all skulls, skeletal anomalies, pathology and potentially informative traits are photographed. Stable maxillae and mandibular dentition are cast. Osteological data collected and draft reports are on file at the Hamline University Osteology Laboratory.

A majority of the bioarcheological literature incorporating Minnesota sites is primarily descriptive. Few publications report problem-oriented research or synthesize and compare data from a broad temporal or spatial range of sites. A high percentage of Minnesota mortuary samples have undergone partial or minimal levels of analysis although the results have yet to be published. Those that have undergone only minimal analysis generally present a description of burial features from unpublished field report manuscripts including burial type, body position, presence/absence of burial goods, number of individuals represented, sex, and relative age at death. This information provides background and associations relevant to more in-depth bioarcheological analyses; and these reports have been cited within the tables and text.

The limited number of published bioarcheological sources and data may be attributable to the absence of bioarcheological and/or biological anthropology programs at the graduate level and the overall low number



Table 57. Archeological periods of burial sites in Minnesota.

Period	Sites	Individuals	Number Analyzed
Paleoindian	1	1	1
Archaic	13	43	20
Woodland	28	194	144
Woodland-Middle	29	450	347
Woodland-Late	41	579	474
Oneota	12	119	63
Middle Missouri	7	68	21
Historic	37	255	186
Unknown	316	1389	556
Total	484	3098	1812 (58%)

of physical anthropologists in Minnesota. A flurry of graduate level bioarcheological research took place in the 1960s when Lloyd Wilford, the premier archeologist and renowned mound explorer of the state, was a professor at the University of Minnesota. Nine bioarcheological Ph.D. dissertations and Master's theses have been completed (Wilford 1938; Peterson 1964; Anderson 1962; Evans 1961; Lothson 1973; Alonso 1990; Ossenbreg 1969; Glenn 1971; Mott 1938). Several articles and one memoir have been published under the direction of Aufderheide of the University of Minnesota, Duluth (Torbenson et al. 1992; Torbenson et al. 1994; Torbenson et al. 1996). More recently, two reports have been published in response to federal legislation (NAGPRA) and/or institutional requests for inventories of human skeletal remains as part of compliance with NAGPRA requirements (O'Connell 1990; Aufderheide et al. 1994). Additionally, extensive bioarcheological analyses are being conducted on human remains collections in the care of the Minnesota Indian Affairs Council and other governmental agencies and housed at the University of Minnesota and Hamline University. The publication of descriptive reports and more substantive bioarcheology research will be forthcoming following completion of NAGPRA requirements.

The Paleoindian period in Minnesota is represented by two individuals. This is significant in a total North American sample of 20-25 individuals. Rediscovery of the Browns Valley skeleton in 1987 initiated AMS bone dating which confirmed the ancient age of both the Browns Valley individual and Minnesota Woman. More extensive bioarcheological and comparative continental/population studies were also initiated.

The bioarcheology of the Archaic stage in Minnesota is poorly understood. There are 13 sites representing 43 individuals. The earliest and best known Archaic site in Minnesota is 21T02 that produced the Sauk Valley skeleton that was recently AMS bone dated to 4360-4190 +/- 70 B.P. The most extensive bioarcheological information comes from the Rooney Mound (21P013) although it represents only nine individuals. Cranial morphology of these individuals suggest similarities to earlier individuals/populations in Minnesota.

The presence of an Early Woodland period is under discussion by archeologists in Minnesota. The classic Early Woodland lifestyle documented for the central and southern portions of the United States is absent in the northern regions. However, a number of sites have recently been carbon dated and the reported dates fall within the traditional Early Woodland time frame. The validity of these dates is questioned by some; however, the existence of contemporary dates for several sites is tantalizing. More research, both archeological and bioarcheological, is necessary to understand the Late Archaic-Early Woodland transition period.

The Middle Woodland is represented by 30 mortuary sites and 549 associated individuals. A number of phases are represented, most notably the Eastern Woodland Malmo phase and the Northern Forest Laurel Culture; however, our knowledge of these two manifestations is based on basically three sites, two classified as Malmo and one as Laurel. The human remains from the Malmo sites are very fragmentary and provide a

limited amount of information. Bioarcheological analyses report low frequencies of skeletal and dental pathology and traumatic injury. The Smith site (21KC03) represents the largest sample of Laurel individuals, and they have undergone partial analysis. Similar to the Malmo phase individuals, skeletal and dental pathology and traumatic injury are infrequent, and the remains reflect the hunting and gathering subsistence mode they are believed to have practiced. An in-depth analysis of Laurel burial practices has been conducted and include detailed data on mode of burial (e.g., secondary), nature and frequency of cutmarks, red ochre treatment, and cranial and postcranial "tapping." The Smith site remains have also been included in a number of biodistance studies that attempt to define the relationship of the Laurel Culture to later manifestations. Overall, more substantive work is necessary. Of particular interest are the social, biological, and economic relationships between the Middle Woodland peoples in Minnesota and the Hopewell centers to the south. Additionally, further skeletal and dental analyses, including bone chemistry, may contribute information on subsistence practices, including dietary sufficiency, increasing reliance on cultigens, the origins of the practice of maple sugaring and the consequent consumption of high levels of unrefined sugar.

There are 40 Late Woodland mortuary sites yielding a minimum of 571 individuals. Overall, the Late Woodland is only minimally known from a bioarcheological perspective, however, similar to the Middle Woodland, what is known comes from the analysis of a limited number of Late Woodland sites. The best known phase in the Late Woodland is Blackduck, a Northern Forest zone manifestation. The McKinstry site (21KC02) has undergone the most extensive analysis resulting in the collection and interpretation of both skeletal and general mortuary practice data. Additionally, McKinstry has been incorporated into broader studies that have focused on biodistance. The Osufsen Mound (21IC02), White Oak Point (21IC01), and Schocker (21BL01) sites have also undergone extensive analysis, however, none of the skeletal data has been incorporated into a report or published at this date. An analysis of the mortuary practices was presented and these sites have also been included in a biodistance study. What is generally known about the Late Woodland Blackduck phase is consistent with what is seen in the Laurel Culture remains of the Middle Woodland. The frequencies of skeletal and dental pathology are low, as is evidence for traumatic injury and interpersonal violence. Again, the frequencies are consistent with a general hunter-gatherer adaptation. What is interesting, however, is that there is evidence for increasing reliance on wild rice at this time. The skeletal consequences of this intensified consumption of a single food resource, and the hypothesized concomitant population increase, are unknown. Unpublished data suggest there are limited, in any, adverse health effects associated with this shift. Future research, particularly chemical analyses, may shed light on the skeletal expressions of this practice.

Biodistance studies have done much to elucidate intraperiod (Late Woodland) population relationships, as well as ancestor-descendant relationships between the Late Woodland groups and earlier Middle Woodland groups and later historic tribes. These studies were conducted in the 1960s and 1970s and, not surprisingly, some reclassification of sites and phases has occurred. Future research should take these changes into consideration and additional samples should be included. Of particular interest are the relationships between the populations in Minnesota and the more developed Middle Mississippian and Middle Missouri traditions to the south.

The mortuary practices of the Late Woodland peoples have been extensively analyzed. There are similarities in burial ritual of groups inhabiting the northern and central portions of Minnesota, as well as similarities to neighboring groups in Wisconsin, Michigan, North Dakota,

Manitoba, and Ontario. The burial practices include perforation (generally into the marrow cavity) of long bones at either the distal or proximal posterior ends, removal of the articular ends of all long bones, and/or removal of the base of the skull or higher on the occipital squama. The practice affects individuals of all ages and both sexes. The practice is widespread and crosscuts cultural designations/boundaries; it may represent the diffusion of religious beliefs in spirit release. Research should focus on securely dating the sites where "tapping" occurs and a thorough search of historic documents reporting on the practices of known tribes that lived in this region.

Only a minimal amount of bioarcheological knowledge exists for the Oneota period. This lack of knowledge contrasts sharply with the growing body of knowledge available for Oneota groups in both Wisconsin and Iowa. Oneota groups in Minnesota are best documented in the Red Wing area, the Root River Valley, and the Blue Earth River Valley. Stable carbon and nitrogen isotope data have been presented and a majority of the values for all individuals assayed are indicative of a diet high in maize and either low in animal protein or high in legumes. Glenn's (1974) research represents the only existing bioarcheological treatise of the Oneota. Her biological distance study of the Oneota in five states presents some insights into Oneota origins, intratradition relationships, and biological homogeneity. Most interesting is the great distance of the Oneota samples from local Woodland groups in Wisconsin and the tentative affinity of the Bryan site (21GD04) to the Mississippian Aztalan sample. Future biodistance research should be directed to comparing Minnesota Oneota to local Woodland populations. Also of interest is the relationship between the Minnesota Oneota and Later Woodland populations to the north since Oneota sherds have been recovered in these northern sites and the social, economic, and biological implications of this are unknown. Much more bioarcheological research, both descriptive and problem-oriented needs to be conducted on the Oneota samples in Minnesota.

The bioarcheology of both the Plains Village and Middle Mississippi tradition is relatively unknown. There is a good sample of Cambria (Plains Village) sites available; the analysis of these remains will contribute much to what is known about this manifestation of the Plains Village tradition. The Middle Mississippi tradition is only minimally represented in Minnesota. Key areas to be addressed include whether the Middle Mississippi is biologically present in Minnesota and what the biological nature of the cultural interaction/influence of Middle Mississippi populations on local Minnesota groups was during this time period. Any and all bioarcheological studies will contribute much needed knowledge about this period.

The Historic period in Minnesota has produced a respectable body of bioarcheological information for both Native American and Euro-American contexts. Most significant are the Mille Lacs (Dakota and Ojibwe) research by Afderrheide (1994), the Black Dog Village site which presents information on the process and consequences of culture contact for the Mdewakanton Dakota, and the Hamalainen cemetery site which documents the adaptation of a Finnish immigrant population in the early twentieth century. A sizeable number of individual/isolated burials and mound intrusive burials are currently being analyzed; these will contribute more bioarcheological information to this period.

Effort should be directed toward accurately dating existing mortuary sites. Occupations and/or affiliations of human remains to a specific period, aspect, or phase is in many instances unknown or based on minimal data. Additionally, osteological data collection should be standardized to facilitate comparability on a regional basis. There are several standards currently available including the *Guidelines for Historic*

*Properties Management, Southwestern Division Management Plan* (Limp 1987:87-97, 179-185) and a set of guidelines published by the Paleopathology Association (Rose 1991). Since 1990 the human remains recovered in Minnesota have been undergoing extensive and systematic osteological analysis and a protocol for analysis has been developed based on the one used at the Smithsonian Institution and Northwestern University and formalized in the *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994).

With the impact of the NAGPRA, the small amount of published bioarcheological research, and the extensive collections currently available for study, problem-oriented bioarcheological analysis of human remains should be a priority for all institutions and researchers interested in human occupations of Minnesota, the Upper Great Lakes region, and the Central and Northern Plains area.

## 10 Human Adaptation Types, by Elizabeth D. Benchley, Blane Nansel, and Clark A. Dobbs

The northeast edge of the Northern Plains study area has a qualitatively different environment from the rest of the region due to its different landscape history and climate. In particular, the recently glaciated sections of Iowa, Minnesota, and Wisconsin include a topographically variable and well watered landscape which supports a complex mosaic of lithic, plant, and animal resources. John Douglas has termed this youthful landscape the "Woodfordian Northeast" (Douglas 1976). As Douglas noted, this patchy environment has provided a setting for human adaptations which tend to be flexible, mobile, and varied. Major cultural innovations such as residential stability, domesticated plants, pottery technology, mound building, and agriculture all occur earlier outside the region to the south and east. In contrast with areas to the south and east, material culture in the Woodfordian Northeast appears to be highly variable and transmutable and artifact typologies are difficult to recognize and delimit. The fuzzy nature of the material culture probably reflects the flexible and changeable nature of social relations and organization in the region.

### Environmental Setting

The Northeast Woodlands region can be subdivided into four broad environmental zones or subregions which have provided different varieties and distributions of resources to human groups through time (Figure 23). For our purposes, the zones are termed Eastern Woodland, Northern Forest, Prairie Lake, and Prairie. The composition and configuration of the zones shifted from the end of the Pleistocene through the Middle Holocene, but the location and characteristics of the zones has been fairly stable since approximately 3000 B.P.

The Eastern Woodland zone covers southern Wisconsin, southeastern Minnesota, and eastern Iowa. In the recently glaciated portions of the Eastern Woodlands zone, wetlands, lakes, and undeveloped drainages contribute to the patchy nature of resource distributions. In the unglaciated sections, and particularly along the Mississippi River trench, resource distributions tend to be more

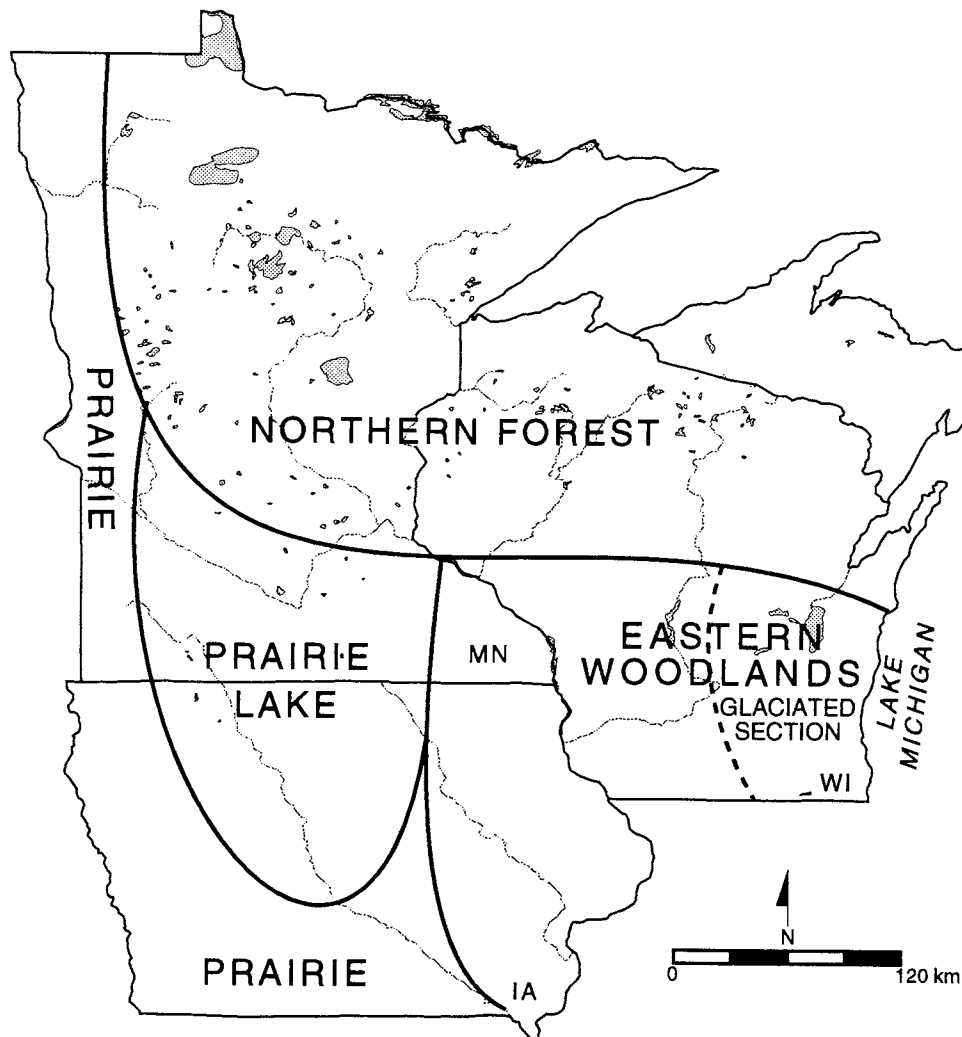


Figure 23. Environmental zones.

linear following topographic breaks and river floodplains. The zone is characterized by a deciduous forest dominated by oak, hickory, and elm. Prairie openings are small and scattered in eastern Wisconsin, and become more extensive oak savannas dominated by prairie grasses and shrubs in eastern Iowa. Wild resources which were important for human exploitation include deer and fish, most importantly, along with shellfish, birds, small mammals, nuts, tubers, and seeds. During later prehistoric times, cultivated resources appear to have included *Polygynum* (knotweed), *Phalaris* (maygrass), *Hordeum* (little barley), domesticated Eastern Agricultural complex plants [*Iva* (marshelder), *Chenopodium* (goosefoot), and *Helianthus* (sunflower)], perhaps a locally domesticated *Cucurbita* (squash/gourd), and ultimately tropical domesticates (maize and, much later, beans). Bison also became increasingly important in the Eastern Woodlands east of the Mississippi River during Late Prehistoric times.

The Northern Forest zone covers northern Wisconsin and Minnesota. It is characterized by a mixed northern conifer-hardwood forest dominated by various pines, maple, birch, and aspen. A northern subboreal forest dominated by spruce is also present in northeast Minnesota and was present at times in northern Wisconsin. The entire Northern Forest zone was glaciated during the Late Wisconsinan. Consequently, it is a subregion with a youthful landscape, poorly developed drainages, and a patchy distribution of plant and animal resources. Small to large lakes are abundant, as are wetlands and sluggish streams. Extensive areas of bog and swampland dot the landscape. The closed canopy forests were not particularly good deer habitat, but deer were present. Other important mammal resources included moose, wapiti (elk), beaver, and muskrat. Fish and waterfowl were also exploited. Fish such as sturgeon, whitefish, and lake trout may have been particularly important during spawning seasons. Important plant resources included seeds and berries. Maple sugar may not have been significant until historic times. During late prehistory the wild rice harvest was a particularly important part of human subsistence in the Northern Forest zone, and there are some indications that maize also may have been grown.

The Prairie Lake zone is congruent with the till plain and end moraine systems left in the wake of the Des Moines Lobe's intrusion into southwest Minnesota and north central Iowa during Late Wisconsinan times. The topography ranges from level to rugged and numerous wetlands and kettle lakes occur. The Minnesota and Des Moines rivers are the principal drainageways of the region. Most of the zone lies within the Prairie Peninsula, and uplands and terraces were dominated by prairie vegetation including big and little bluestem and grasses. The lakes and river valleys supported forest vegetation of oak, elm, and hickory with willow and cottonwood along the floodplains and secondary streams. Major mammalian resources included bison, wapiti (elk), pronghorn, and deer along with small mammals. Lakes and wetlands provided valuable resources such as fish, molluscs, migratory waterfowl, and important plants. Outside the major river valleys, there is little evidence for the cultivation of plant foods until the introduction of maize in Late Prehistoric times. In the northern portions of the zone, intensive wild rice collecting and processing was practiced in Late Prehistoric times in lieu of maize production. Archeologically, an Eastern Woodlands adaptation continued along the major rivers of this zone.

The Prairie zone extends across western Iowa and Minnesota. As with most things in nature, the transition from the eastern zones

to the Prairie zone is not abrupt. In the area south of the Des Moines Lobe, for example, the mosaic of oak-hickory forest gradually gives way to savannah, and upland prairie comes to dominate the western region. The dominant vegetation is bluestem prairie, with deciduous trees such as willow, elm, and cottonwood along river bottoms and oak, elm, and hickory along bluff edges. The prairie provided bison as the most important resource for human subsistence in a relatively homogeneous distribution across the zone. The human exploitation of bison may have persisted in basically the same form from the end of the Pleistocene until the introduction of the horse and the fur trade in historic times. The prairie and forest edges also supported wapiti (elk), deer and small mammals. The well watered river bottoms appear to have become important foci for settlement throughout prehistory and often served as "oases" in the relatively dry prairie region. The river bottoms were particularly important after the adoption of maize horticulture and relatively sedentary settlement. A forest-fringe area appears to have existed between the prairie and the eastern and northern forests. The location of the forest fringe shifted east and west with climatic fluctuations. During later prehistoric times, at least, woodland and northern forest groups were drawn to the prairie seasonally to hunt bison. This pattern continued into the early nineteenth century.

Because of the different nature and distribution of resources across the region, each zone has a slightly different trajectory of adaptation types. The following discussion of adaptation types will address the variability across the region with reference to each environmental zone. Adaptation types should be considered provisional since subsistence and settlement data for the region are so poorly known.

## Late Pleistocene Hunters

The first recognizable American Indian inhabitants of the region appear to have been hunters of Late Pleistocene large mammals. The limited archeological data suggest that small, highly mobile family groups of foragers moved across the recently deglaciated landscape following game including mastodon, mammoth, bison, and caribou. The great antiquity and small group size of this type produced poorly preserved and sparse material remains, particularly organics. Consequently, it is difficult to be precise about subsistence and settlement patterns for the type in the region. The Late Pleistocene Hunter adaptation type is congruent with early Paleoindian in the region and dates 11,500-10,000 B.P.

Environmental conditions during the Late Pleistocene were markedly different from the present. The climate was substantially cooler and moister across the region. Many areas were inundated by glacial lakes, wetlands, and active outwash channels, and the northern rim of the region was still subject to episodic ice advances. Periglacial and boreal environmental conditions gradually began to shift northward as the ice retreated and forests and prairies of varying compositions became established in dry land areas.

The Late Pleistocene Hunter tool kit included fluted lanceolate projectile points and characteristic bifacial and scraping tools. Diagnostic point forms include fluted Clovis and Folsom types, as well as regional variants such as Gainey and Chesrow. The lithic raw materials from which tools were made came from abundant, localized sources which were sometimes found at a great distance from the final tool discard location. This suggests to some archeologists that bands were traveling long distances to acquire

and renew their lithic raw material supply. Other archeologists suggest that interregional trade produced the distribution of lithic exotics. Regional variants of Early Paleoindian groups have been identified in the Eastern Woodland zone of Wisconsin (Stoltman 1992a, Overstreet 1993a, 1993b) which suggests that in some areas band territories may be visible in the archeological record.

A variety of site types have been identified for Late Pleistocene Hunters in the region. Most sites are isolated, upland finds of diagnostic points which may represent hunting stations. Some sites have produced abundant bifaces, scrapers, processing tools, and chipping debris. These sites may represent camps or residential bases, although the repeated reuse of their locales may have contributed to the apparent site complexity. The reused locales are often found on terraces along waterways or wetlands. A few mammoth and mastodon butchering sites have been reported, particularly in southeast Wisconsin (Overstreet 1993a, 1993b). No bison or caribou associated with humans have been documented in the region, however. The variety of localized lithic raw materials from which tools were manufactured suggests that quarry sites may also be present.

Since diagnostic Early Paleoindian materials have only been found in disturbed or isolated surface contexts in Iowa and Minnesota, and no synthetic studies have been published, regional variants and settlement patterns for these areas are unknown. Fluted points are seldom found in northern Minnesota and Wisconsin in areas which would have been glaciated or under postglacial lakes. Many Early Paleoindian sites along meltwater channels such as the Minnesota, Mississippi, and St. Croix rivers would have been washed away or buried during the final deglaciation and emptying of postglacial lakes. Evidence of Late Pleistocene Hunters is known or expected from high Pleistocene outwash terraces, bluffs, and the margins of tributary streams and former wetlands.

Although this adaptation type is labeled Late Pleistocene Hunters, there is no firm subsistence data associated with diagnostic tools for the region. We presume early Paleoindians hunted large mammals such as mammoth, mastodon, and extinct forms of bison because these associations have been demonstrated in other parts of the Plains and Midwest. Elephant butchering sites including stone tools have recently been located in southeast Wisconsin and it is likely these are associated with the local Paleoindian Chesrow complex (Overstreet 1993a, 1993b). A possible mastodon kill site has been reported in western Wisconsin (Palmer and Stoltman 1976), but Late Pleistocene bison remains in the region have not been found with humanly produced tools (Boszhardt et al. 1993). It also seems logical that smaller animals and plant resources were also used for subsistence, but no sites with floral and faunal remains have been reported to date.

No Late Pleistocene Hunters mortuary sites have been reported in the region.

## Holocene Hunter-Foragers

What we are calling Holocene Hunter-Foragers includes Late Paleoindian and Early Archaic manifestations throughout the region and extends into the late Archaic in the Prairie zone. We view this adaptation type as consisting of small bands of foragers exploiting the increasingly modern flora and fauna of the Early Holocene landscape. The small groups probably had a flexible social organization and a generalized tool kit in order to adjust readily to

new resources and opportunities. The adaptation type generally dates 10,000-8000 B.P. In the Prairie zone, this adaptation type persists throughout the Archaic period to 2000 B.P.

The environment of the region continued to warm, although it was cooler and moister than present conditions. The final advances and retreats of glacial ice occurred, and glacial lakes formed and drained, some catastrophically. By the end of the period, Lake Michigan was approaching its all time low level. Vegetation in the region consisted of a forest of mixed pine and oak in the northeast, and prairie was becoming firmly established in the southwest. The boreal forest retreated well to the north.

The material culture of Holocene Hunter-Foragers includes stone tools used for hunting, woodworking, and processing plants and animals. Lanceolate points include Agate Basin, Scottsbluff, Hardin, Dalton, and others. A variety of large stemmed and notched points are present on Early Archaic and some late Paleoindian sites. Characteristic scraper, chopper, and knife forms are also present. Stone adzes apparently for woodworking are found on Late Paleoindian and Dalton sites.

Settlement patterns are characterized by residential mobility with the minimal social group moving frequently to exploit a wide range of resources across the region. Late Paleoindian and Early Archaic sites are known primarily as isolated finds of lanceolate points on uplands and high terraces throughout all parts of the region. The isolated finds may reflect resource extraction sites or zones, especially tool loss and discard associated with hunting large game. These types of locales along the major river drainages are also the only Early Holocene land surfaces that have not been buried or eroded by more recent alluvial episodes (Bettis and Littke 1987; Bettis and Hoyer 1986; Bettis 1988).

A variety of other site types have been identified for Holocene Hunter-Foragers. Excavated sites in the Eastern Woodlands and Northern Forest of Wisconsin include residential camps along rivers and at lake outlets. Some of these sites were repeatedly occupied over time (Wendt 1985; Salzer 1974; Meinholz and Kuehn 1996). Residential camps have also been reported in the Prairie zone such as the Hill site in western Iowa, which produced a hearth, a variety of chipped and ground stone tools, and large and small mammal remains (D. Anderson et al. 1980; Frankforter and Agogino 1959a). The reuse of prime locales may have increased the apparent intensity and complexity of the occupations. Lithic quarries and workshops for cherts, Hixton silicified sandstone, rhyolite, and siltstone have been reported in the Eastern Woodlands and Northern Forest (Boszhardt 1993; Stoltman et al. 1984; Malik and Bakken 1991). Bison kill and processing sites have been excavated in the Prairie zone in western Iowa and Minnesota including Cherokee Sewer (Anderson and Semken 1980), Granite Falls (Dobbs and Christianson 1991), and Canning (Michlovic 1986), but kill sites have not been reported east of the Prairie Lake zone.

The paucity of preserved floral and faunal material makes it difficult to be specific about the subsistence pursuits of Holocene Hunter-Foragers. The distribution of projectile points has suggested to some that the procurement of deer may have been a primary focus of winter hunting in the Eastern Woodlands zone (Luchterhand 1970). Faunal remains recovered recently from the Deadman's Slough site in the Northern Forest indicate that deer, medium size mammals, turtle, birds, and fish were exploited (Meinholz and Kuehn 1996). Large and small mammals were found at the Hill site in the Prairie zone (D. Anderson et al. 1980; Frankforter and Agogino

1959a). Bison hunting appears to have been particularly important for many centuries in the Prairie zone (Michlovic 1986, 1987). Excavations at the Cherokee Sewer site in Iowa revealed a stratified sequence of Late Paleoindian and Archaic materials. All occupations appeared to involve the late winter hunting and processing of bison by small family groups. The only significant differences the excavators could discern among the archeological horizons were in projectile point styles (D. Anderson et al. 1980; Benn 1986). Bison were also important in the Prairie Lake zone during the Cherokee and Itasca phases of the Archaic, along with aquatic and forest edge faunal resources (Anfinson 1987).

The nature of mortuary sites for Holocene Hunter Foragers is not well known. A Late Paleoindian cremation at the Renier site in Wisconsin was accompanied by burned lanceolate points (Mason and Irwin 1960). Similar clusters of burned lanceolate points have been reported across the Northern Forest region, but no human remains have been preserved at these sites (Ritzenthaler 1972; Buckmaster and Paquette 1988; Meinholz and Kuehn 1996). In the Prairie zone one burial accompanied by lanceolate points (Browns Valley) was recovered from a Minnesota gravel pit (Jenks 1937; Shane 1991). The Turin burials in western Iowa included red ocher, shell beads and a side notched point (Fisher et al. 1985).

## Hunter-Gatherers

As environmental conditions became warmer and drier during the Middle Holocene, the prairie expanded across eastern Iowa and Minnesota and into Illinois and southern Wisconsin. Flood frequency was reduced in the major river systems, but occasional high magnitude floods caused episodic aggradation in stream valleys. Terraces and alluvial fans were formed which provided habitable surfaces that were buried by subsequent depositional events. By about 3000 B.P. land surfaces and lake levels had stabilized, and the vegetation and fauna approached modern conditions. During this time we begin to see increasing regionalization and the beginning of different trajectories in the four environmental zones of the region.

We view the Hunter-Gatherer adaptation type as consisting of a collector orientation to a diversity of seasonally available lithic, plant, and animal resources. The increasing size and complexity of human groups across the landscape results in a variety of settlement types, and in some areas at least, the establishment of regular territories marked by symbolic constructs such as burials in knolls, burial mounds, and possibly rock art.

## Eastern Woodlands

In the Eastern Woodlands zone the establishment of collector territories and trends toward sedentism are suggested, although these trends are probably more visible and better understood in the non-Woodfordian regions to the south and east of the study area. Cultural units include Middle and Late Archaic (Hemphill, Titterington/Sedalia; Raddatz, Old Copper, Durst; Eastern Archaic), and Early Woodland (Marion/Ryan/Indian Isle; Liverpool/Polk City/Lake Farms/Prairie/Dane) in southern Wisconsin and eastern Iowa. Evidence for occupation of southeast Minnesota by this adaptation type is scarce, perhaps because much of the state had been transformed into prairie by the Mid-Holocene warming episode. The

date range for the Hunter Gatherer adaptation type in this zone is 6000 B.C. to approximately A.D. 100.

The environment of the Eastern Woodlands was affected by the warming and drying trends evident across the Plains during the Mid-Holocene warming period. The effects, however, were variable across the landscape and appear to have been somewhat ameliorated by the well watered landscape of the Woodfordian landforms. In some parts of the Midwest, the expansion of the prairie into the drying uplands is seen as a stimulus for plants, animals, and humans to move into the major river trenches. This appears to have been the case along the Mississippi River in the study region, but such trends are not evident in the more recently glaciated sections. Variations in major lake levels and fluvial conditions were also caused by climatic fluctuations and vegetation changes. Following the warming period, the region returned to a generally cooler, moister climate during the Late Archaic.

The material culture of the Eastern Woodlands Hunter Gatherers includes large stemmed and notched projectile points, drills, and scrapers, ground stone axes and adzes, copper tools and ornaments, and bone tools. In Early Woodland times, thick-walled pottery containers as well as with straight and contracting stemmed projectile points are added to the assemblage. Along the Mississippi River large quantities of fire cracked rock are associated with roasting pits and middens in stratified Archaic sites (Benn, ed 1988).

Site distributions and debris density suggest that while settlements were moved seasonally, sites areas were reoccupied over time. A diversity of locales was exploited, particularly during the Archaic, including rockshelters, upland knolls, terraces, alluvial fans, and floodplains. A pattern of winter use of upland rockshelters and warm season exploitation of floodplains has been suggested along the Mississippi River (Theler 1987). Through time there is a shift in emphasis to floodplains and river terraces along the Mississippi River and to wetland margins in glaciated eastern Wisconsin (Goldstein 1987).

The Hunter-Gatherer subsistence focus in the Eastern Woodlands was primarily on deer, but small mammals, birds, fish, shellfish, and probably nuts and seeds were also important. Elsewhere in the East, archeologists have documented the development of locally domesticated plants (gourd, squash, and oily and starchy seeds), but evidence for cultigens and plant remains is rare in the Eastern Woodland zone of the study area.

Mortuary sites include cemeteries on knolls and bluff crests, and occasionally on river terraces. Early Woodland cemeteries may also be marked by humanly constructed mounds. The cemeteries appear to serve territorial markers and/or sacred space for localized groups. There is considerable variability in cemetery and grave form and content across the zone. Evidence for interregional exchange comes from burial contexts primarily, where copper tools and ornaments, marine shell beads, and chipped stone blades made from high quality, nonlocal cherts are interred with the dead, often along with red ocher.

## Northern Forest

The Hunter-Gatherer adaptation type of the Northern Forest can be characterized as being a collector orientation. Through time territories appear to be become more localized and base camps and prime locales are regularly reoccupied. Cemeteries and mounds in some areas may mark group aggregation locales or boundaries. The variability in material culture, however, suggests that group



boundaries are indefinite and reform as needed. Cultural units include Middle Archaic (Lake Forest, Squirrel Dam, Shield Archaic), Late Archaic (Burnt Rollways, Old Copper), and Middle Woodland (North Bay, Nokomis, Brainerd, Malmo, Laurel, Lake Forest Middle Woodland). In the Northern Forest zone, this adaptation type dates approximately from 5000 B.C. to A.D. 400.

The material culture of Northern Forest Hunter-Gatherers includes varied lithic and copper tools, and during Middle Woodland ceramic vessels. Antler harpoons and other bone tools were also present, but are rarely preserved. Lithic projectile points include stemmed and notched forms of varying sizes. Chert and quartzite from various sources were also knapped into scrapers, knives, choppers, and expedient tools. Ground stone tools such as axes and mauls are present. Copper tools including points, knives, awls, gouges, fishhooks, and ornaments are common. Copper was probably used in inter-regional trade, and nonlocal cherts were traded into the region. The presence of several contemporary Northern Tier ceramic varieties indicates that regional traditions were developed, although their boundaries and character are sometimes difficult to discern.

The variety and patterning of settlement types for Northern Forest Hunter-Gatherers are poorly understood due to the limited amount of archeological research, the low visibility of sites in forested environments, and the lack of clearly defined cultural traditions. A diversity of settlement locales appears to be important and sites are found at lake outlets, river margins, peninsulas, and particularly at fish spawning areas. By Middle Woodland times the intensity of occupation, or reoccupation, of locales increases and sheet middens and semi-subterranean houses are recorded for some areas of northern Wisconsin. Settlements continue to be shifted with the seasons. In northern and central Minnesota burial mounds are present at sites with Middle Woodland middens.

Important subsistence resources include fish (especially sturgeon), moose, beaver, deer, elk, turtle, and muskrat by Middle Woodland times. These resources were also probably important to Late Archaic hunter-gatherers as well, but the archeological data are sparse. Bison remains are present on Laurel sites near the Prairie zone, and Archaic and Woodland peoples in this area may have made occasional hunting forays into the prairie. While there is little data on Archaic subsistence, Northern Forest Middle Woodland plant foods include starchy seeds, hazelnut, and berries. Wild rice has been found occasionally at Middle Woodland sites in Minnesota, but not in Wisconsin, and it is nowhere as abundant as it is at later sites.

Mortuary traditions of Northern Forest Hunter-Gatherers include cemeteries and mound burials. Archaic cemeteries have been excavated in northeast Wisconsin, but few Middle Woodland burial sites have been reported. In Minnesota no Archaic cemeteries have been reported, but Middle Woodland burial mounds are relatively abundant. Cemeteries and mounds include a variety of primary and secondary burial treatments. Grave goods including copper artifacts and red ocher, as well as lithic tools and ceramic containers appropriate to the time period are present.

### Prairie Lake

Hunter-Gatherers in the Prairie Lake zone appear to have developed a more sedentary collector orientation focusing on the lakes of the region after the end of the Mid-Holocene Warm period. The adaptation type persists in the region until the introduction of

maize horticulture around A.D. 900. Archeological units for this zone include the Archaic Mountain Lakes phase, the Early and Middle Woodland Fox Lake phase, and the Late Woodland Lake Benton phase.

The material culture of the Prairie Lake Hunter-Gatherers includes a variety of stone tools and ceramics which are added in the Woodland period. The lithic assemblage consists of small lanceolate and stemmed points and medium side-notched points similar to those found to the east on the Prairie Peninsula, end and side scrapers, and retouched and utilized flakes, as well as some ground stone. No copper has been reported. Ceramics in the region reflect stylistic trends that are more pronounced in the Eastern Woodlands, but there do not appear to be any concomitant social or cultural changes.

According to Anfinson (1987), settlement consisted of major habitation sites on peninsulas and islands in prairie lakes. He suggests that this lacustrine orientation produced an increased sedentism, although the habitation sites are seasonally occupied. There is no evidence for major residential sites being located in river valleys.

Subsistence appears to be dominated by bison, as it was in earlier periods in this region. Evidence for the exploitation of fish, deer, elk, small mammals, turtle and waterfowl is also present at the lake shore sites. There is little evidence for an increasing reliance on plant foods, no intensive nut collecting, and no evidence of the use of cultigens.

There is little evidence for Archaic burial patterns, but Anfinson (1987) believes that burials are probably single interments. By Late Woodland times in the region, low conical burial mounds appear and exhibit a variety of burial treatments but little evidence for social differentiation.

### Prairie

The Hunter-Gatherer adaptation type in the Iowa Prairie zone involves collecting strategies which include both upland prairie and riverine/forest edge settings and resources. Cultural units include the Late Archaic Nebo Hill phase, and Early (Crawford) and Middle Woodland (unnamed, Valley Ware) phases in southwest Iowa. The adaptation type persists in the region until the introduction of maize horticulture around A.D. 900.

Exploitation of the Prairie zone in Minnesota, on the other hand, does not appear to involve resident hunter-gatherers, but is limited to mobile hunter-forager groups exploiting bison. By Woodland times in Minnesota, there is evidence that both the forest and the prairie are used by the same groups, with residents of the Woodland zone moving onto the prairie seasonally to hunt bison. This pattern appears to continue until horticulturists expand into the Prairie zone.

The material culture of the Prairie zone Hunter-Gatherers includes lanceolate, side-notched, and stemmed points made out of fine-grained cherts including Knife River Flint from North Dakota. Exotic Archaic point types found in caches and at mortuary sites are related to Eastern Archaic manifestations. The introduction of ceramics in Woodland times appears to have had little effect on subsistence or settlement, and ceramic traditions in the zone appear to be relatively cohesive through time (Benn 1983). Fire-cracked rock suggesting roasting or heating activities is abundant.

Settlement patterns during Late Archaic Nebo Hill includes high density sites on interfluvial summits and small, low density sites on alluvial terraces (Reid 1983). By the Early Woodland Crawford phase

settlements appear to be seasonal extractive camps utilized by family-size bands practising diffuse collecting (Benn 1983). Houses may have been present at some of these sites (Benn ed. 1990). Benn proposes that the territorial packing evident in the Mississippi Valley was not a factor in the Prairie zone, and more diffuse collecting and less sedentary lifestyle continued through much of the Woodland period.

Subsistence remains from Prairie zone Hunter-Gatherer sites are varied. Faunal remains recovered from Nebo Hill sites include deer, fish, turtle, duck, and squirrel, and floral remains are limited to black walnut (*Juglans nigra*), and *Chenopodium* seeds. By Woodland times exploited flora include walnuts, acorns, grasses, cucurbits, sunflowers, and chenopods (Benn 1983, Benn ed. 1990). Fauna included deer, bison, small mammals, birds, mussels, and fish.

Mortuary sites are not well known. Nebo Hill burials, which are extended and accompanied by exotic points, may include narrow earthen mounds. Other nonmounded burial sites include the Late Archaic Lewis Central School ossuary, which has been interpreted as a single event burial of articulated and bundled remains of over ten individuals (D. Anderson et al. 1978). A similar, nonmounded Middle Woodland ossuary (Hanging Valley) produced evidence of severe nutritional stress and intergroup conflict (Tiffany et al. 1988), which suggest increasing environmental and social constraints.

## Intensive Collectors

This adaptation type represents an intensification of the hunting and gathering pattern with the addition of locally produced or intensively harvested plant resources. In other parts of the Midwest, particularly in the riverine areas outside the Woodfordian Northeast, this adaptation type could be called Incipient Horticulturist due to the use of domesticated plants in the Eastern Horticultural complex. The presence of actual domesticates in the Northeast Woodlands region, however, is extremely rare, and we have opted to label this adaptation type as Intensive Collectors. There is considerable diversity in the Intensive Collectors adaptation type both within and between environmental zones in terms of subsistence pursuits, settlement patterns, and social organization.

## Eastern Woodlands

The Intensive Collector adaptation type in the Eastern Woodlands includes both semi-sedentary and nonsedentary lifeways. Subsistence focuses on intensified use of a variety of plant and animal resources, and some plants may be cultivated or domesticated. Population levels appear to increase and settlements spread throughout preferred niches. Burial mounds constructed to house the dead may mark group territories, aggregation locales, and sacred landscapes. Mortuary facilities appear to be communal and rarely include exotic or elite grave goods. Cultural units in the Woodfordian glaciated section include Middle Woodland (Waukesha) and early Late Woodland (Effigy Mound, Horicon), and in the unglaciated area include early Middle Woodland (Havana, McGregor, Trempeleau), late Middle Woodland (Weaver, Allamakee, Millville, Mill), and early Late Woodland (Effigy Mound, Eastman, Minott's, Keyes).

The Intensive Collectors of the study area are different from groups found to the south in Illinois. Patterns identified from the Illinois River valley include Middle Woodland (Havana) groups

residing at relatively permanent river valley sites which have associated burial mounds and mortuary camps (Struever 1968). The Hopewell Interaction Sphere (Caldwell 1964) is expressed in Illinois at the local level in finely made artifacts and exotic raw materials found at regional exchange centers and in burial mounds. Mounds include central tombs and a multistage mortuary program which includes the caching of finely made and nonlocal offerings. Other Middle Woodland trends evident in Havana sites include an increasing reliance on a diversity of domesticated or cultivated plants such as gourd, squash, oily seeds (*Iva*/marshelder/sumpweed, *Helianthus*/sunflower), and starchy seeds (*Chenopodium*/goosefoot, *Polygonum*/knotweed, *Phalaris*/maygrass, and *Hordeum*/little barley) (Ford 1985). Accompanying the increasing reliance on starchy seeds are thinner, harder ceramic vessels which may be more effective in porridge preparation (Braun 1983, 1987). Floodplain faunal resources are also increasingly emphasized. Early Late Woodland trends in the Illinois River valley include increasing populations, an intensified use of localized riverine subsistence resources, new emphases on storage facilities, and increasing regional social integration (Styles 1981).

Archeological data on Intensive Collectors in the Eastern Woodlands zone, particularly during the Middle Woodland, is relatively sparse, especially compared with better known areas in Illinois and Ohio. Only a few mounds have been excavated, and practically no major habitations sites have been investigated. Data are more abundant for late Middle Woodland and early Late Woodland in the region, however.

The material culture of Eastern Woodlands Intensive Collectors includes grit-tempered ceramic containers for food preparation and storage, which are used occasionally as mortuary offerings. Regional trends include thinning of vessel walls which appears to be related to technological shifts in processing starchy seeds. Lithic tools include small to medium size stemmed projectile points, and later in time small notched or triangular points which suggest the use of the bow and arrow. Lithic raw materials are derived from local and nonlocal sources. Copper tools and ornaments are present, but not abundant. The presence of nonlocal items of chert, obsidian, shell, and copper suggest a far-reaching exchange network, at least during Middle Woodland times.

Along the Mississippi River valley, early Middle Woodland habitation and mound sites have been reported, but few have been examined in recent years and there is little information about subsistence or settlement patterns. Most habitation sites in the region are multicomponent and the Middle Woodland occupations have not been isolated and described. Short term Middle Woodland habitation sites are situated along the Mississippi valley terraces and floodplain, and in inland rockshelters. Some researchers suggest that seasonal occupations are suggested by the rockshelter (winter) and floodplain (summer) settings (Theler 1987). The few excavated mounds include interior tombs or crypts and exotic artifacts. The overall mortuary program suggests an egalitarian social organization to some archeologists (Benn 1979), but other archeologists believe a ranked system is present (Stoltman 1979).

Later Middle Woodland (Millville, Allamakee) settlement in the unglaciated portions of the Eastern Woodland zone include substantial, permanent village sites located in river terrace settings which have houses, storage/refuse pits, and occasional burials. Habitation sites are also reported along floodplains, alluvial fans, secondary streams, and in rockshelters. Mounds and burial sites

have not been identified, however. Subsistence remains include a variety of large (deer, elk) and small (raccoon, dog, beaver, muskrat, etc.) mammals, birds, turtles, fish and shellfish (Pillaert 1969; Theler 1987; Whelan et al. 1992). A variety of plants including squash, sumpweed, goosefoot, amaranth, dock, knotweed, maygrass, little barley, hickory, acorns, berries, fruits, and wild rice are being harvested, if not cultivated (Arzigian 1987; Hodgson 1992).

During early Late Woodland times in the unglaciated portions of the Eastern Woodland zone, settlement becomes more dispersed across the landscape, and villages are not evident. Small habitation sites are found on floodplains, river terraces, stream valleys, uplands, and in rockshelters (Arzigian 1987; Theler 1987; Stoltman 1990). Some sites include middens and storage pits. Specialized sites for processing mussels suggest an intensification of riverine resource exploitation. Other important faunal resources include deer, fish, and small mammals. Nuts and starchy seeds continue in importance, and maize is also present at some sites. The presence of maize suggests an intensification in the production of plant foods. Most researchers characterize social groups as being small, mobile hunting and gathering bands who aggregate seasonally into maximal groups. The abundant small burial mounds in geometric and effigy forms may mark aggregation locales or groups territories. Burial mounds contain primary and secondary burials with occasional grave goods, and little social differentiation is indicated.

The interior of eastern Iowa has also produced sites from this same time frame (Amana Havana, Henry), but the materials are not well known and the adaptation type remains unclear. Small sites are reported along river valleys and in rockshelters. In some areas residential base camps are located in the uplands overlooking major valleys and field camps are situated on high terraces (Perry 1991).

In the glaciated section of the Eastern Woodlands zone, similar patterns are suggested for Intensive Collectors, but the archeology is less well known. Early and late Middle Woodland cannot be distinguished in the archeological record, and many Woodland sites appear to be multicomponent. Habitation sites focus on river terraces and floodplains near wetlands and a variety of forested environments (Goldstein 1987). Intensively occupied sites may include a midden and storage features, but no houses have been identified. Smaller early Late Woodland sites are also found in a variety of settings along rivers, adjoining wetlands, and in the uplands. Subsistence focused on deer, small mammals, birds, fish, turtle, and mussels (Lippold 1973). A variety of plants may have been important, but archeological data are lacking. In Middle Woodland times, burial mounds are large with submound tombs but few grave goods. Early Late Woodland smaller mounds in geometric and effigy forms are abundant, but contain limited numbers of individuals and grave goods. There is no evidence for social differentiation or ranked socio-political organization at any time. Mounds and rock art may mark sacred or socially significant space.

### Northern Forest

The Intensive Collector adaptation type is found among Late Woodland cultures in the Northern Forest zone. Subsistence focuses on the harvest and processing of wild rice and fish, although a wide range of other resources are also utilized. Populations appear to increase in size, large villages appear in prime niches, and smaller sites are found in a wide variety of settings. Sites are probably used seasonally, with populations aggregating along lakes and rivers in

warm months and dispersing in small family units into the interior in the winter (Franzen 1986). Mortuary facilities include a variety of mound forms, with primary and secondary burials and few grave goods. Cultural units include Late Woodland cultures (Heins Creek, Point Sauble, Lakes phase, Clam River, Kathio, Blackduck, Sandy Lake).

The material culture of Intensive-Collectors in the Northern Forest zone includes grit-tempered ceramic vessels used for food preparation and storage. Lithic tools include small stemmed and triangular projectile points which indicate the use of the bow and arrow. Expedient flake tools are also present. Bone tools include harpoons, awls, pins, and conical points. Copper tools include awls, fishhooks, and beads. Birch bark containers have also been found. In some areas special pit facilities for the processing of wild rice have been identified.

Settlements are found in a variety of settings along lakes, bays, islands, rivers, waterways, and wetlands. The abundance and variety of sites suggest a regional population increase. Extensive middens are present at some sites, but few houses have been recognized. In some areas it appears that large warm season residential bases are situated along lakes or confluences, and smaller extraction sites or possibly winter camps are dispersed across the interior (Buckmaster 1979; Benchley 1989).

Although subsistence focuses on harvestable fish and wild rice, a variety of other plant and animal resources are also collected. Important fish include sturgeon, lake trout, whitefish, catfish, walleye, and sucker. Cleland (1982) has suggested that harvesting lake trout and whitefish would require the use of gill nets. Deer and beaver are particularly important mammals, but muskrat, moose, bear, waterfowl, and turtles are also exploited (Theler 1991, 1992, 1993). Wild rice has not been reported along Lake Michigan, but it is abundant at sites in the interior of northern Wisconsin and Minnesota (Arzigian 1992, 1993). Other plant remains include berries, cherry, hazelnut, and hawthorn. Corn has been found occasionally, but may be associated with later occupations.

Burial mounds are associated with the Northern Forest Intensive Collectors. Mounds are usually medium to small size conicals, but linear and catfish effigy or tapered mounds have also been reported. Some mounds appear to record single event burials, and others are accretional. Burials are often flexed, primary interments with limited grave goods. Secondary bundle burials and ossuaries have also been reported. There is no mortuary evidence for social ranking.

### Prairie Lake

Intensive Collectors are rare in the Prairie Lake zone, and have been identified only along the Des Moines River. Middle Woodland (Van Hying) and early Late Woodland (Riverbend) occupations in the Saylorville reservoir appear to represent intensive collectors. The locally produced ceramics are related to Havana and Weaver pottery to the east, and suggest ties to Eastern Woodland traditions and resource niches. Middle Woodland settlements include base camps on river terraces and alluvial fans. Smaller, possibly seasonal extractive sites are found in upland settings. Early late Woodland sites are found in similar locales. Base camps include substantial middens, storage/refuse pits, and roasting features (Benn and Rogers 1985; Osborn and Gradwohl 1982). Faunal remains include deer, small mammals, birds, turtles, and mussels. No floral data are available. Bluff top burial mounds are associated with the later Riverbend phase in this zone.

Great Oasis (late Late Woodland) groups in Minnesota may also have been intensive collectors, as there is little evidence for maize in the region (Anfinson 1979). Farther south in Iowa, however, maize is abundant on Great Oasis sites along the Des Moines River (Mead 1981). Benn (ed. 1990) has observed that the Prairie Lakes and Prairie ecotone supported a patchwork of cultures which relied on wild resources and maize horticulture to varying degrees in Late Prehistoric times.

## Prairie

The Intensive Collector adaptation type is variable in the Prairie zone, and occurs primarily along the Des Moines River. Middle Woodland (Havana, Van Hying) and early Late Woodland (Weaver, Riverbend) occupations in the Lake Red Rock reservoir appear to represent intensive collectors. The ceramics are related to Havana and Weaver pottery to the east, and suggest ties to Eastern Woodland traditions and resource niches (Roper 1986; Moffat et al. 1988). Middle Woodland settlements include large base camps and small, seasonal extractive sites. At least one large burial mound containing stone and log structures and the scattered remains of multiple individuals was present at a base camp (Benn and Rogers 1985). Early Late Woodland habitation sites and small, blufftop burial mounds are present but poorly understood in the region.

In the western Prairie zone of Iowa, the Intensive Collector adaptation type may appear in the late Middle Woodland or early Late Woodland Floyd phase (Benn ed. 1990). Here the local Held Creek ceramic wares become thinner-walled following a trajectory similar to eastern Woodland ceramics, which may reflect an increased use of starchy seeds (Braun 1983, 1987). While a seasonal round of hunting and collecting continued as the main subsistence strategy, more permanent base camps with evidence for houses and storage facilities appear. There also appears to be a broadening and intensification of the resources exploited including greater utilization of the eastern horticultural complex. Tobacco first appears on the prairie during this phase.

The presence of Prairie zone sites in western Minnesota with Blackduck (Late Woodland) pottery suggests that groups from the Northern Forest and Prairie Lakes zones may have periodically exploited bison by moving in and out of a forest fringe area onto the prairie. There does not appear to be any permanent occupation of this region by Intensive Collectors, however.

## Horticulturists

The Horticulturist Adaptation Type becomes evident across much of the study region in the Late Prehistoric period with the adoption and increasing reliance on maize for subsistence. The intensification of plant food use is evident in the increase of plant storage and processing facilities. Other domesticates include squash, and at Oneota sites, beans. Starchy and oily seeds are also harvested, if not cultivated. Fish, shellfish, and deer continue as important food and tool sources, and bison become increasingly visible in the archeological record of the eastern Woodland. Settled villages, which are sometimes fortified, increase in number and at times populations nucleate in definable territories or localities.

The climate was essentially modern during this era, but substantial climatic variations did occur. Our understandings of the timing and nature of the fluctuations have become more refined

and regional variability has been identified. Some researchers have suggested that the climatic shifts can be correlated with changes in cultural adaptations across the region and the ascendancy and demise of various cultural groups (Griffin 1961; Baerreis and Bryson 1965; Wendland 1982). Other researchers do not see climatic variability and culture change as being easily linked. While the articulations of culture and climate and mechanisms of culture change have not been identified, it seems reasonable to propose that fluctuations in the length or effectiveness of the growing season could affect the distribution and adaptations of horticultural groups.

## Eastern Woodlands

The Horticulturist adaptation type in the Eastern Woodlands includes sedentary lifeways in villages and dispersed settlements. Subsistence focuses on maize horticulture along with other intensively harvested plant and animal resources. Cultural units include late Late Woodland (Aztalan, Kekoskee, post-Eastman, Hartley), Mississippian (Aztalan, Silvernale), and Oneota (Koshkonong, Grand River, Lake Winnebago, Green Bay, Blue Earth, Brice Prairie, Pammel Creek, Valley View, Orr). The adaptation type begins around A.D. 1000 and may extend into the historic contact period.

The material culture of Eastern Woodland Horticulturists initially includes grit-tempered collared ceramics which are replaced by shell-tempered vessels for cooking, storage, and serving in Mississippian and Oneota cultures. Lithic tools include predominantly small triangular projectile points which indicate the use of the bow and arrow. Stone and bone scraping tools used in hide preparation also become abundant. Bone tools include scapula hoes (deer, elk, bison), awls, matting needles, fish hooks, and ornaments. The presence of marine shell, catlinite, and copper adornments indicates contact with groups outside the region.

Several types of nonportable facilities are associated with Horticulturist sites. The storage of food stuffs becomes particularly important in the economy, and storage pits filled with refuse are very abundant at Late Prehistoric sites. Houses also become more common in the archeological record. House forms range from oval structures with long entryways, to oval and rectangular single post structures, to rectangular wall trench buildings, to multiple family long houses.

Settlement types range from clusters of a few houses, sometimes enclosed by a light fence, to intensively occupied villages with major fortification walls. The fortification suggests periods of increased regional conflicts, perhaps among contemporary Late Woodland, Mississippian, and Oneota groups. Smaller farmsteads and extractive sites are also present, however, and not all sites are fortified. Garden beds are present across the Eastern Woodlands in a variety of forms. By Oneota times, definable territories are visible in the archeological record. Cemetery areas are sometimes located near the villages, but few mound burials have been documented.

Subsistence is based on growing maize and other domesticates along with continued use of wild plant and animal resources. Besides maize, domesticates include squash and, at least at Oneota sites, beans. Other important plant foods include wild rice, starchy and oily seeds, nuts, and berries. Fish, shellfish, and deer are particularly important faunal resources, and bison hoes and possibly hides are also important at Oneota sites. In the glaciated section of the Eastern Woodlands, wetlands continue as an important source of food resources particularly for wild rice and winter deer. The historic

record suggests that some groups may have dispersed seasonally, particularly to hunt bison on the Prairie.

The burial practices of Eastern Woodland Horticulturists have not been well documented in the region. With the exception of a row of burials in a charnel house mound at Aztalan and several Oneota burials in an effigy mound at Diamond Bluff, no Late Prehistoric burials have been documented in primary association with burial mounds. Mounds associated with Oneota sites appear to be refuse piles or house locations, but rarely include human burials. Cemetery areas or precincts are present at Oneota sites and may be associated with knolls. Oneota burials are also found in village contexts.

### Northern Forest

Evidence for a Horticulturist adaptation type is rare in the Northern Forest. Over much of this region, the intensive collection of wild rice appear to have persisted until Historic times. Oneota sites, sometimes with associated corn, are abundant in northeast Wisconsin where the waters of Lake Michigan may provide a slightly warmer environmental niche. Farther to the west shell-tempered pottery and maize are present on only a few Late Prehistoric sites and may represent Oneota groups moving into the region.

### Prairie Lake

The Horticulturist adaptation type in the Prairie Lake zone is only evident late in prehistory. What appear to be initial Horticulturists in the Prairie zone are still following a Late Woodland-like Intensive Collector adaptation in the Prairie Lakes region. Great Oasis (Late Woodland/Plains Village) sites are located along lakeshores in the same locales as Woodland settlements, and there is no evidence for domesticates at Minnesota sites (Anfinson 1979). A variety of upland and aquatic animals are exploited. Farther south in Iowa, however, maize is abundant on riverine Great Oasis sites along the Des Moines River (Mead 1981). Great Oasis sites in the Prairie zone do fit the horticultural Plains Village pattern. Benn (ed. 1990) has observed that the Prairie Lakes and Prairie ecotone supported a patchwork of cultures which relied on wild resources and maize horticulture to varying degrees in Late Prehistoric times.

Another variety of Horticulturist found in the Prairie Lake zone is Cambria. Cambria is recognized by its ceramic varieties which are related to Plains Village, Mississippian, and Oneota styles. Lithics include the usual Plains Village assemblage, except that catlinite is rarely found. Settlement patterns are not well understood, but the type site is large and intensively occupied judging by the number of refuse pits and midden. No domestic structures have been identified. Domesticated plants include maize, squash, and sunflower. Animal resources are dominated by deer, and bison, elk, dog, beaver, raccoon, and fish are also present. Bison remains are often found as tools including scapula hoes. Burials are placed extended in mounds.

The Correctionville and Blue Earth Oneota phases are also examples of Horticulturists in the Prairie Lake zone. Their material culture is similar to other Oneota manifestations in the Prairie. The settlement pattern involves a few clearly delimited localities within which villages and smaller camps and extraction sites occur. Maize horticulture is the primary focus of food production, but wild resources are also collected. Bison hunting provides the primary

source of meat and bone tools and increases in importance through time. Burials occur in cemeteries and not in mounds.

### Prairie

The Horticulturist adaptation type in the Prairie zone includes sedentary lifeways in permanent or semi-permanent villages that may be vacated seasonally for bison hunts, and moved periodically to new locations. Subsistence focuses on maize horticulture along with bison hunting and wild resource collecting. Cultural units include Plains Villager (Great Oasis, Big Stone, Mill Creek, Glenwood), and Oneota. The adaptation type begins around A.D. 1000 and extends into the historic contact period.

The material culture includes grit and shell-tempered globular vessels comprising a variety of ceramic types. Small triangular arrow points indicate the use of the bow and arrow for hunting tools and weaponry. Other important lithic tools include scrapers, small ground stone axes, and grinding stones. Bone tools are dominated by bison and include scapula hoes, awls, matting needles, fish hooks, and other implements and ornaments. Deer jaw sickles are also present. Catlinite, which is mined in the region, is manufactured into pipes and ornaments for ritual and personal use. Catlinite is widely exchanged within and beyond the Prairie. Knife River flint, obsidian, marine shell, and copper are also traded into the region. In some phases ceramics styles and imported objects suggest a sustained interaction with Middle Mississippian cultures to the south and east.

Nonportable facilities of Prairie Horticulturists include storage pits and well-constructed houses. Storage pits are commonly bell shaped and found filled with village refuse. House forms include substantial semisubterranean earth lodges as well as less massive structures including oval, rectangular, and longhouse forms.

Settlement types consist of nucleated villages along river terraces and lakes as well as more dispersed farmsteads and camps. Nucleated settlements are sometimes fortified with walls and ditches. The settlement patterns suggest there were periods of regional intergroup conflicts followed by more peaceful times. Burial mounds are associated with some habitation sites.

Subsistence focuses on maize cultivation and bison hunting. Other cultivated plants include squash, sunflower, beans, and tobacco. Wild plant resources are also collected. Besides bison, faunal resources include deer, elk, dog, fish, turtle, bird, beaver, and raccoon.

The burial practices of Prairie Horticulturists includes low mound features with inclusive and intrusive graves. Both extended and flexed burial types have been identified as well as secondary bundle reburials. Grave goods include mortuary vessels, shell ornaments, and projectile points with little evidence for status differences.

### Euro-American Expansion

It is difficult to fit the concept of adaptation types to the Historic period and Euro-American Expansion because the scale, technology, and economy of the colonizing-industrial state systems are so enmeshed with global events and processes. Although aspects of the environment are important in terms of specific resources and landscape settings, overall Euro-American settlement appears to be influenced in only minor ways by local environmental conditions.

The following scheme proposes three general adaptation themes which may be useful in working with the limited archeological record of the historic period. Important elements in each theme include population, resources, technology and transportation.

### Exploration and Initial Extraction

The era of Euro-American exploration across the Northeast Woodlands region extends from initial contact circa 1630 until Indian removal circa 1830-1850. It involves both resident and immigrant Indian populations as well as a variety of European and ultimately American groups. For the most part, the goal of Euro-American exploration was to locate and extract important resources, rather than to colonize or settle the region. The focus during this era was on obtaining furs and hides and controlling Indian and Euro-American access to them.

There were two types of Native American groups present in the region, indigenous Indians and immigrant groups. Indigenous Indians included Intensive Collectors such as the Menomini, Santee Sioux/Eastern Dakota, and possibly the Assiniboine. Indigenous Horticulturists included the many Siouan-speaking prairie groups (Winnebago/Ho Chunk, Ioway, Oto, Ponca, Omaha). These indigenous groups do not represent the full range of American Indian cultures that existed in the region in Late Prehistory, however. The archeological record suggests that episodes of population movement, nucleation, and depopulation occurred across the region during Late Prehistory in response to climatic shifts, social pressures, adaptive realignments, and possibly European diseases. The widespread distribution of Oneota groups (who were ancestral to the Winnebago, Ioway, Oto, Omaha, and Ponca) was a very late Late Prehistoric phenomenon. The descendants of other Late Prehistoric groups related to Late Woodland (Effigy Mound, Kekoskee, Great Oasis) and Mississippian-like cultures (Aztalan, Silvernale, Cambria, Mill Creek) are impossible to discern. These cultures may have become extinct.

Immigrant Indian groups moved into the region from the East under pressure from social and military perturbations related to the fur trade and European colonization. Immigrant groups included the Ojibwa, Sauk, Fox (Mesquakie), Potawatomi, Kickapoo, Mascouten, Illini, and a few New York tribes. While many of these groups came from Horticulturist adaptations in southern Michigan, some derived from Hunter-Gatherer adaptations to the north. By the time they reached the Northeast Woodlands study area, their social organization and adaptations reflected the rapidly changing social and economic environment of the contact period.

Both the indigenous and the immigrant Indian groups developed new configurations to articulate with the demands of the fur trade and competing colonial powers, and to respond to population reductions from disease and warfare. Although the new configurations varied with time, space, and historical conditions, they generally included an increased emphasis on hunting, production of surplus foodstuffs, a demand for European trade goods, and new social mechanisms for the display and redistribution of wealth.

Other participants in the Exploration and Initial Extraction theme included the traders, missionaries, military men, and entrepreneurs who began the Euro-American intrusion into the region and were instrumental in opening the area to eventual American settlement. Hides of bison and deer and furs from beaver and small mammals were the initial resources extracted from the

region by Europeans. French, British, and American fur traders were assisted in their endeavors by the establishment of missions, trading posts, and forts across the region. These settlements were placed along water transportation routes where local resources could support a sizeable population of Indians and traders. Subsequently mineral resources such as lead were extracted with the protection of militia outposts. Lead was particularly important in the production of armaments, pewter, and pigments.

### Settlement

American Settlement of the region began as Native American groups were removed to the West or placed on reservations. Settlement was permitted only after the U.S. government mapped and subdivided the land, although the prior claims of squatters were eventually honored. Americans dominated as land speculators and homesteaders, but enclaves of European immigrants and several free black communities also developed. Farming focused on subsistence and the production of wheat as a cash crop. Mills for processing wheat were constructed along waterways in agricultural areas. Other extractive and commercial ventures included fishing, ship building, logging and lumber mills, potteries, and the mining of coal, lead, limestone, and clays. Towns and service centers developed at transportation nodes along waterways and roads. Transportation was by steamboat, sailboat, wagon, or foot.

### Industrialization

After the 1850s settlement of the region increased rapidly and urban, industrialized centers began to dominate commerce. Railroads, canals, and improved overland roads stimulated new transportation networks and settlements. Improved transportation and technology spurred the growth and spread of industry and commerce, and immigrants provided an urban labor force. Industrial production had a major impact on the landscape in the form of factories, mills, tanneries, lime and cement works, brickyards, shipyards, and railroad yards, among others. Industrial extraction included mining of clay, lead, zinc, gypsum, coal, limestone, and iron in urban and rural settings. By the end of the nineteenth century, the contrasts between urban and rural life were marked.

Rural populations also expanded from new immigrants as well as internal growth during this era. Farm production and consumption were integrated into the national market economy. Following an initial focus on wheat as a cash crop, rural production shifted to more diversified crops and livestock. Rural towns and service centers arose or dwindled depending on their linkages to the transportation networks and the national economy. Harvest of the northern forests by lumber companies initially emphasized pine which was transported by water to mills and markets. The focus of lumbering later shifted to hardwoods which were moved by railroad to industrial production centers and markets.



## References Cited

- Abbott, L. R.  
 1980 Burial at Council Bluffs (13PM3) [actually 13PW3]. *Research Papers* 5(01): 14-23. Office of the State Archaeologist, Iowa City.  
 1982 *An Archaeological Assessment of the Mines of Spain Area, Dubuque County, Iowa*. Contract Completion Report 195. Office of the State Archaeologist. University of Iowa, Iowa City.  
 1983 *The Cultural Resources of the Mines of Spain Area*. Contract Completion Report 206. Office of the State Archaeologist. University of Iowa, Iowa City.  
 1988 Frontier Lead Mining in the Upper Mississippi Valley. *Journal of the Iowa Archeological Society* 35:1-15.
- Abbott, L. R., and E. A. Bettis III  
 n.d. Erickson Creek Drainage: a Preliminary Report of Geological, Pedological, and Archaeological Potential of the Area. Ms. on file, Iowa State University Archaeological Laboratory, Ames, Iowa
- Abbott, L. R., and S. J. Schermer  
 1983 The Pooler Site (13WB215). *Research Papers* 8(03): 109-214. Office of the State Archaeologist, Iowa City.
- Abler, T. S.  
 1964 Pipes and Pottery of the DuBay Site. *The Wisconsin Archeologist* 45(3):127-138.
- Agogino, G. A., and W. D. Frankforter  
 1960 A Paleo-Indian Bison Kill in Northwestern Iowa. *American Antiquity* 25:414-415.
- Ahler, S. R.  
 1993 Stratigraphy and Radiocarbon Chronology of Modoc Rock Shelter, Illinois. *American Antiquity* 58(3):462-489.
- Ahler, S. R., M. J. Bade, F. B. King, B. W. Styles, and P. J. Thorson  
 1991 *Late Archaic Components at Modoc Rock Shelter, Randolph County, Illinois*. Reports of Investigations No. xx. Illinois State Museum, Springfield, Illinois.
- Albright, J. G.  
 1902 Exploration of a Mound on Gox Island in Rest Lake, Vilas County. *Wisconsin Archeologist* 2:14-15.
- Aldrich, C.  
 1884 Antiquities of Hamilton County, Iowa. *American Antiquarian* 6:42-43.
- Alex, L. M.  
 1973 *An Analysis of Fish Utilization at Four Initial Middle Missouri Sites*. Unpublished Master's thesis. Department of Anthropology. University of Wisconsin-Madison. Madison, Wisconsin.  
 1978 The Poison Ivy Site: A New Oneota Site in Southeastern Iowa. *Journal of the Iowa Archeological Society* 25:78-91.  
 1980 Exploring Iowa's Past: A Guide to Prehistoric Archaeology. University of Iowa Press. Iowa City, Iowa.
- Alex, L. M., and W. Green  
 1995 *Toolesboro Mounds National Historic Landmark Archaeological Analysis and Report*. Research Papers 20(4), Office of the State Archaeologist, University of Iowa, Iowa City, Iowa.
- Alex, R. A.  
 1968 *The Rock Run Shelter: a Stratified Woodland Site in East-Central Iowa*. Unpublished Master's thesis. Department of Anthropology. University of Iowa. Iowa City, Iowa.  
 1971 Upper and Plains Mississippian. Ms. on file, Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.  
 1973 Architectural Features of Houses at the Mitchell Site (39DV2), Eastern South Dakota. *Plains Anthropologist* 18:149-158.  
 1976 Problem Oriented Contract Archaeology and Some Thoughts on the Prehistory of Eastern Iowa. *The Keystone* 1:5-9. Newsletter of the Charles R. Keyes Chapter of the Iowa Archeological Society.  
 1981a Villages Off the Missouri River. In *The Future of South Dakota's Past*, edited by L. J. Zimmerman and L. C. Stewart, pp. 39-46. Special Publication No. 2. South Dakota Archaeological Society. University of South Dakota Archaeology Laboratory. Vermillion, South Dakota.
- 1981b *The Village Cultures of the Lower James River Valley, South Dakota*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin-Madison. Madison, Wisconsin.
- Alonso, A.  
 1993 *An Anthropological Approach to the Dental Status of a Prehistoric Native American Population from the Midwest*. Unpublished Master's thesis. Mankato State University, Mankato.
- Anderson, A., A. Westover, T. J. Martin, M. L. Murray, S. M. Y. Myster, B. O'Connell and L. A. Zalucha  
 1995 The State Road Coulee Site: 47 Lc-176. *The Wisconsin Archeologist* 76(1-2):48-230.
- Anderson, A. D.  
 1957 Report on Turin Skeleton No. 3. *Iowa Archeological Society Newsletter* 19:4-5.  
 1961 The Glenwood Sequence: A Local Sequence for a Series of Archeological Manifestations in Mills County, Iowa. *Journal of the Iowa Archeological Society* 10(3):1-101.  
 1969 *Highway Salvage Archaeology: A Status Report (1966-1969)*. Office of the State Archaeologist, University of Iowa. Iowa City, Iowa.  
 1971a Review of Iowa River Valley Archaeology. In *Prehistoric Investigations*, edited by M. B. McKusick, pp. 1-23. Report No. 3. Office of the State Archaeologist. University of Iowa. Iowa City.  
 1971b The Late Woodland Walters Site. In *Prehistoric Investigations*, edited by M. B. McKusick, pp. 24-52. Report No. 3. Office of the State Archaeologist. University of Iowa. Iowa City.
- Anderson, A. D., and B. Anderson  
 1960 Pottery Types of the Glenwood Foci. *Journal of the Iowa Archeological Society* 9(4):12-39.
- Anderson, A. D., and J. A. Tiffany  
 1972 Rummels-Maske: A Clovis Find Spot in Iowa. *Plains Anthropologist* 17:55-59.
- Anderson, A. D., and L. J. Zimmerman  
 1976 Settlement - Subsistence Variability in the Glenwood Locality, Southwestern Iowa. *Plains Anthropologist* 21(72):141-154.
- Anderson, D. C.  
 1969 Mill Creek Culture: A Review. *Plains Anthropologist* 14:137-143.  
 1970 The Catlinitic Amulet Site (13CK64). *Northwest Chapter - Iowa Archeological Society Newsletter* 13(2):3-12. Cherokee, Iowa.  
 1971 The Rubel Burial Site (13PM413). *Northwest Chapter - Iowa Archeological Society Newsletter* 19(2):3-9.  
 1972 *The Ceramic Complex at the Brewster Site (13CK15): A Mill Creek Component in Northwest Iowa*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Colorado, Boulder.  
 1973 Brewster Site (13CK15): Lithic Analysis. *Journal of the Iowa Archeological Society* 20.  
 1975a A Long-Nosed God Mask from Northwest Iowa. *American Antiquity* 40(3):326-329.  
 1975b *Western Iowa Prehistory*. Iowa State University Press. Ames, Iowa.  
 1975c The Development of Archeology in Iowa: An Overview. *Proceedings of the Iowa Academy of Science* 82(1):71-86.
- 1980 Stone Tool Assemblages from the Cherokee Site. In *The Cherokee Excavations: Holocene Ecology and Human Adaptations in Northwestern Iowa*, edited by D. C. Anderson and H. A. Semken, Jr., pp. 197-238. Academic Press. New York.
- 1981a *Eastern Iowa Prehistory*. Iowa State University Press, Ames.  
 1981b *Mill Creek Ceramics: the Complex from the Brewster Site*. Report 14. Office of the State Archaeologist. University of Iowa, Iowa City.  
 1985 Models of Mill Creek Midden Formation: Implications for Future Research. *Proceedings of the Iowa Academy of Science* 92(2):53-57.  
 1986 The Wittrock Excavations: Implications for the Study of Culture Process within the Initial Variant of the Middle Missouri Tradition. *North American Archeologist* 7(3):215-241.

- 1987a The Keystone Site (13JK23): A Multicomponent Rockshelter in Jackson County, Iowa. *Journal of the Iowa Archeological Society* 34:1-6.
- 1987b Toward a Processual Understanding of the Initial Variant of the Middle Missouri Tradition: the Case of the Mill Creek Culture of Iowa. *American Antiquity* 52(3):522-537.
- Anderson, D. C., and D. A. Baerreis  
1973 The Rock Creek Ossuary, Iowa. *Proceedings of Iowa Academy of Science* 80:85-191.
- Anderson, D. C., M. Finnegan, J. A. Hotopp, and A. K. Fisher  
1977 Archaeology and Indian Religion: Precedents and Data from an Archaic Cemetery in Western Iowa. *Research Papers* 2(03): 1-93. Office of the State Archaeologist, Iowa City.
- 1978 The Lewis Central School Site (13PW5): A Resolution of Ideological Conflicts at an Archaic Ossuary in Western Iowa. *Plains Anthropologist* 23:183-219.
- Anderson, D. C., and H. A. Semken, Jr. (editors)  
1980 *The Cherokee Excavations Holocene Ecology and Human Adaptations in Northwestern Iowa*. Academic Press, New York.
- Anderson, D. C., R. Slattery, Jr., and D. M. Wendland  
1980 The Cherokee Sewer Site and the Cultures of the Atlantic Climatic Episode. In *The Cherokee Excavations: Holocene Ecology and Human Adaptation in Northwestern Iowa*. Edited by D. C. Anderson and H. A. Semken, Jr., pp. 257-274. Academic Press, New York.
- Anderson, D. C. and R. Shutler, Jr.  
1974 The Preceramic Archaeology of Northern Minnesota. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 64-73. Minnesota Prehistoric Series 11, Minnesota Historical Society, St. Paul.
- 1975 The Cherokee Sewer Site (13CK405): A Preliminary Report of a Stratified Paleo-Indian/Archaic Site in Northwestern Iowa. *Journal of the Iowa Archeological Society* 21.
- 1978 The Cherokee Sewer Site: A Summary and Assessment. *Plains Anthropologist Memoir* 14: 132-139.
- Anderson, D. C., R. Shutler, Jr., and W. M. Wendland  
1980 The Cherokee Sewer Site and the Cultures of the Atlantic Climatic Episode. In *The Cherokee Excavations Holocene Ecology and Human Adaptations in Northwestern Iowa*, edited by D. C. Anderson and H. A. Semken, Jr., pp. 257-274. Academic Press, New York.
- Anderson, D. C., and M. L. Spriestersbach  
1982 The Stone Tool Assemblage. In A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa, edited by J. A. Tiffany, pp. 86-117. *Research Papers* 7(1). Office of the State Archaeologist. University of Iowa, Iowa City.
- Anderson, D. C., J. A. Tiffany, M. Fokken, and P. M. Williams  
1979 The Siouxland Sand and Gravel Site (13WD402): New Data and the Application of Iowa's New State Law Protecting Ancient Cemeteries. *Journal of the Iowa Archeological Society* 26:119-146.
- Anderson, D. C., and P. M. Williams  
1974 Western Iowa Proboscids. *Proceedings of the Iowa Academy of Science* 81(4):185-191.
- Anderson, D. G.  
1990 The PaleoIndian Colonization of Eastern North America: A View from the Southeastern United States. In *Early PaleoIndian Economies of Eastern North America*, edited by K. B. Tankersley and B. L. Isaac, pp. 163-216. Supplement 5. *Research in Economic Anthropology*. JAI Press, Greenwich, Connecticut.
- Anderson, G. C.  
1980 Early Dakota Migration and Intertribal War: A Revision. *Western Historical Quarterly* 11:17-36.
- 1984 *Kinsmen of Another Kind*. University of Nebraska Press, Lincoln.
- Anderson, J. D., and D. F. Overstreet  
1986 *The Archaeology of Coralville Lake, Iowa Volume II: Landscape Evolution*. Reports of Investigation No. 167. Great Lakes Archaeological Research Center, Wauwatosa, Wisconsin.
- Anderson, R.Y  
1993 The Varve Chronometer in Elk Lake: Record of Climatic Variability and Evidence for Solar/Geomagnetic/<sup>14</sup>C-Climate Connection. In *Elk Lake, Minnesota: Evidence for Rapid Climate Change in the North-Central United States*, edited by J. P. Bradbury and W. E. Dean, pp. 45-68. Geological Society of America Special Paper 276. Denver, CO.
- Anderson, R. Y, W. E. Dean and J. P. Bradbury  
1993 Elk Lake in Perspective. In *Elk Lake, Minnesota: Evidence for Rapid Climate Change in the North-Central United States*, edited by J. P. Bradbury and W. E. Dean, pp. 1-6. Geological Society of America Special Paper 276. Denver, CO.
- Anderson, W.  
1962 *Red River Aspect Skeletal Remains*. Unpublished Master's thesis. Department of Anthropology, University of Minnesota, Minneapolis.
- Anderson, W. I.  
1983 *Geology of Iowa Over Two Billion Years of Change*. Iowa State University Press, Ames.
- Anderton, J. B.  
1993 Geoarchaeology of Paleoshorelines in the Northern Great Lakes, Hiawatha National Forest, Michigan. United States Forest Service, Hiawatha National Forest *Heritage Program Monograph* No. 1. Escanaba.
- Anfinson, J. O.  
1980 The Wilford Site: 21ML12: The Historic Component J.A. Plan B paper, University of Minnesota.
- Anfinson, S. F.  
1977 *An Analysis of the Big Slough Site (21 MU 1) with Particular Emphasis on the Ceramic Body Sherds*. Unpublished Master's thesis. Department of Anthropology. University of Nebraska, Lincoln.
- 1977b Faunal Remains from the Big Slough Site (21MU1) and Cultural Stability in Southwestern Minnesota. Paper presented to the Second Annual Council for Minnesota Archaeology Spring Symposium, St. Paul.
- 1978 Notes on the 1978 Excavation of the Noyes Sites (21PO14). Ms. on file at Hamline University, St. Paul.
- 1979a Great Oasis. In *A Handbook of Minnesota Prehistoric Ceramics*, edited S. F. Anfinson, pp.87-94. Occasional Publications in Minnesota Archaeology No. 5, Minnesota Archaeological Society, Ft. Snelling.
- 1979b *A Handbook of Minnesota Prehistoric Ceramics*. Occasional Publications in Minnesota Anthropology No. 5. Minnesota Archaeological Society, Ft. Snelling, Minnesota.
- 1982a Faunal Remains from the Big Slough Site (21MU1) and Woodland Cultural Stability in Southwestern Minnesota. *The Minnesota Archaeologist* 41(1):53-71.
- 1982b Prehistoric archaeology of the Prairie Lake Region: a summary from a Minnesota perspective. *Journal of the North Dakota Archaeological Society* 1:65-90.
- 1986 *Minnesota Municipal and County Highway Archaeological Reconnaissance Study, 1985 Annual Report*. Minnesota Historical Society, St. Paul.
- 1987a Investigations at two Oneota sites in Center Creek Locality. *Minnesota Archaeologist* 46(1):31-46.
- 1987b *The Prehistory of the Prairie Lakes Region in the Northeastern Plains*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Minnesota, Minneapolis.
- 1989 Archaeology of the Central Minneapolis Riverfront Part 1: Historical Overview and Archaeological Potentials (1990). *The Minnesota Archaeologist* 48 (1-2).
- 1990 Archaeology of the Central Minneapolis Riverfront Part 2: Archaeological Explorations and Interpretive Potentials *The Minnesota Archaeologist* 49 (1-2).
- Anfinson, S. F. editor  
1979 *A Handbook of Minnesota Prehistoric Ceramics*, Occasional Publications in Minnesota Anthropology No. 5, Minnesota Historical Society, Fort Snelling.
- Anfinson, S. F. and C. Dobbs  
1993 *Minnesota History in Sites and Structures: A Comprehensive Planning Series*. State Historic Preservation Office, Minneapolis.
- Anfinson, S. F., M. G. Michlovic, and J. Stein  
1978 *The Lake Bronson Site (21KT1): A Multi-component Prehistoric Site on the Prairie-Woodland Border in Northwestern Minnesota*. Occasional Publications in Minnesota Anthropology No. 3, Minnesota Archaeological Society, Ft. Snelling.

- Anfinson, S. F. and R. J. Peterson  
1988 *Minnesota Municipal and County Highway Archaeological Reconnaissance Study: 1987 Annual Report*. Minnesota Historical Society, St. Paul.
- Anonymous  
1988 Desperately Seeking Souians: The Distribution of Sandy Lake Ware. *The Wisconsin Archeologist* 69(4):347-353.
- Arndt, A.  
1935 Indian Pictographs in Minnesota. *Minnesota Archaeologist* 1:7-8.
- Arnott, S., A. Brooks, H. Esser, and J. Sluss  
1996 Surveying and Evaluating Minnesota's Historic Farmsteads: An Example from TH14. Paper presented at the Second Historical Archaeology Conference of the Upper Midwest, Red Wing, MN.
- Arthurs, D. W.  
1978 Sandy Lake Ware in Northwestern Ontario: A Distributional Study. *Manitoba Archaeological Quarterly* 2(1-2):57-64, Winnipeg.  
1982 *The Long Sault Site: cultural dynamics in the Rainy River Valley of Northwestern Ontario*. Masters thesis, University of Manitoba.  
1986 *Archaeological investigations at the Long Sault Site (Manitou Mounds)*. Conservation Archaeology Report, Northwestern Region, Report Number 7, Ministry of Citizenship and Culture.
- Artz, J. A.  
1991 *Prehistory, History, and Geomorphology of the Mississippi River Valley in the Montrose Bottom: A Phase I Archaeological Survey of Primary Roads*. Project F-61-1(55)—20-56 a.k.a. PIN 79-56040-1, Lee County, Iowa. Project Completion Report 14(9). Highway Archaeology Program. University of Iowa, Iowa City.  
1993 The Preservation of Cultural Stratigraphy in Loess-Mantled Terrains of Iowa. *Journal of the Iowa Archeological Society* 40:50-62.
- Arzigian, C. M.  
1981 The Archaeology of Gran Grae: A Survey of the Valley and Headlands of a Small Stream in the Driftless Area, Crawford County, Wisconsin. *The Wisconsin Archeologist* 62(2):207-246.  
1987 The Emergence of Horticultural Economies in Southwestern Wisconsin. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by William Keegan, pp. 217-242. Southern Illinois University, Carbondale.  
1991 Prehistoric Plant Remains. In *Archaeological Site Evaluations at Eight Lakes in the Wisconsin River Headwaters*, edited by C. R. Moffat et al., pp. 350-363. Reports of Investigations No. 118. Mississippi Valley Archaeology Center, La Crosse.  
1992 Charred Floral Remains from Rice Reservoir. In *Archaeological Site Evaluations at Rice and Willow Reservoirs, Lincoln and Oneida Counties, Wisconsin*, edited by C. R. Moffat et al., pp. 256-267. Reports of Investigations No. 141. Mississippi Valley Archaeology Center, La Crosse.  
1993 Prehistoric Plant Remains from 1993 WVIC Investigations. In *Further Archaeological Investigations in the Wisconsin River Headwaters: The Results of the 1992 Field Season*, edited by C. R. Moffat et al. Reports of Investigations No. 159. Mississippi Valley Archaeology Center, La Crosse.  
1996 Wild Rice Utilization Along the Wisconsin River. Paper presented at the 64th Annual Minnesota Academy of Science Meeting, St. Paul, Minnesota.
- Arzigian, C. M. and R. F. Boszhardt  
1989 Introduction, Environmental setting and History of Investigations at the Pammel Creek Site. In *Human Adaptation in the Upper Mississippi Valley: A Study of the Pammel Creek Oneota Site (47Lc61)*, La Crosse, Wisconsin. *The Wisconsin Archeologist* 70:1-40.
- Arzigian, C. M., R. F. Boszhardt, H. Halverson, D. Connell, J. Theler and M. J. Scott  
1993 *The Gundersen Site: An Oneota Village and Cemetery in La Crosse, Wisconsin*. Reports of Investigation No. 155, Mississippi Valley Archaeology Center, University of Wisconsin, La Crosse.
- Arzigian, C. M., R. F. Boszhardt, H. P. Halverson, and J. L. Theler  
1994 The Gundersen Site: An Oneota Village and Cemetery in La Crosse, Wisconsin. *Journal of the Iowa Archeological Society* 41:3-75.
- Arzigian, C. M., R. F. Boszhardt, J. L. Theler, R. Rodell, and M. Scott  
1989 Human Adaptation in the Upper Mississippi Valley: A Study of the Pammel Creek Oneota Site (47 Lc-61), La Crosse, Wisconsin. *The Wisconsin Archeologist* 70(1-2).
- Asch, D. L., and N. B. Asch  
1978 The Economic Potential of *Iva Annua* and its Prehistoric Importance in the Lower Illinois Valley. In *The Nature and Status of Ethnobotany*, edited by R. I. Ford, pp. 300-341. Anthropological Papers 67. Museum of Anthropology. University of Michigan, Ann Arbor.
- Asch, D. L., K. B. Farnsworth, and N. B. Asch  
1979 Woodland Subsistence and Settlement in West Central Illinois. In *Hopewell Archaeology: The Chillicothe Conference*, edited by D. S. Brose and N. Greber, pp. 80-85. Kent State University Press, Kent, Ohio.
- Ashworth, M. J., and M. B. McKusick  
1964 *Archaeological Resources of Saylorville Reservoir Drainage, Iowa*. State University of Iowa, Iowa City.
- Attig, J. W., L. Clayton, and D. M. Mickelson, eds.  
1988 *Pleistocene Stratigraphic Units of Wisconsin: 1984-1987*. Information Circular 62, Wisconsin Geological and Natural History Survey.
- Aufderheide, A. C., E. Johnson and O. Langsjoen  
1994 Health, Demography, and Archaeology of Mille Lacs Native American Mortuary Populations. *Plains Anthropologist* 39-149, Memoir 28.
- Baerreis, D. A.  
1948 The Wisconsin Archeological Survey. *The Wisconsin Archeologist* 29(1):18-22.  
1953a The Airport Village Site, Dane County. *The Wisconsin Archeologist* 34(3):149-164.  
1953b The Blackhawk Village Site (Da 5), Dane County, Wisconsin. *Journal of the Iowa Archeological Society* 2(4):5-20.  
1954 Further Information on the Frost Woods Mound Group. *The Wisconsin Archeologist* 35: 43-49.  
1958 Aztalan Revisited: An Introduction. *The Wisconsin Archeologist* 39(1):2-5.  
1966 Early Salvage Excavations in the Madison Area, Dane County, Wisconsin. *The Wisconsin Archeologist* 47(1):101-131.
- Baerreis, D. A., and R. A. Alex  
1974 An Interpretation of Midden Formation—the Mill Creek Example. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 143-148. Minnesota Prehistoric Archaeology Series No. 11. Minnesota Historical Society, St. Paul.
- Baerreis, D. A. and M. M. Bender  
1984 The Outlet Site (47DA3): Some Dating Problems and a Reevaluation of the Presence of Corn in the Diet of Middle and Late Woodland Peoples in Wisconsin. *Midcontinental Journal of Archaeology* 9:143-154.
- Baerreis, D. A. and R. A. Bryson  
1965 Climatic Episodes and the Dating of Mississippian Cultures. *The Wisconsin Archeologist* 46(4):203-220.  
1967 *Climatic Change and the Mill Creek Culture of Iowa*. Archives of Archaeology No. 29. The Society for American Archaeology and the University of Wisconsin Press. Madison, Wisconsin.
- Baerreis, D. A., R. A. Bryson and J. E. Kutzbach  
1976 Climate and Culture in the Western Great Lakes Region. *Midcontinental Journal of Archaeology* 1:39-57.
- Baerreis, D. A., H. Daifuku, and J. E. Lundsted  
1954 The Burial Complex of the Reigh Site, Winnebago County, Wisconsin. *The Wisconsin Archeologist* 35(1):1-36.
- Baerreis, D. A. and J. E. Freeman  
1958 Late Woodland Pottery in Wisconsin as Seen from Aztalan. *The Wisconsin Archeologist* 39(1):35-61.
- Baerreis, D. A., M. L. Staab, R. A. Alex, D. H. Scott, L. M. Betzler, A. C. Fortier, J. E. Dallman, R. Treat, J. E. Kelly, L. A. Conrad, and E. Lugaenbeal  
1970 Environmental Archaeology in Western Iowa. *Northwest Chapter of the Iowa Archeological Society Newsletter* 18(5):3-15.
- Bailey, A. W.  
1977 *A Report on the Bennett-Roth Site, 11-He-62: A Surface-Collected Site in Henderson County, Illinois*. Unpublished Master's thesis. Department of Anthropology. Northern Illinois University, DeKalb.
- Bailey, K. P.  
1975 *Journal of Joseph Marin*. Private printing, Irvine, CA.

- Baker, R. G., L. J. Maher, C. A. Chumbley, and K. L. Van Zant  
1992 Patterns of Holocene Environmental Change in the Midwestern United States. *Quaternary Research* 37:379-389.
- Baker, R. G., and M. K. Whelan  
1992 Eastern Iowa Paleoenvironments and Cultural Change: Introduction and Paleocological Background. Paper presented at the 57th annual meeting of the Society for American Archaeology, Pittsburgh, Pennsylvania, April 8-12, 1992.
- Bakken, C. T.  
1949 Preliminary Investigations at the Outlet Site (DA 3). Unpublished Master's thesis, Department of Anthropology, University of Wisconsin, Madison.  
1950 Preliminary Investigations at the Outlet Site. *Wisconsin Archeologist* 31:43-70.
- Bakken, K.  
1985 Lithic Raw Materials in Northwest Minnesota. *Minnesota Archaeologist* 44(1): 34-46.
- Ballard, D. N., Jr.  
1984 Nineteenth Century Mills and Milling Industries in Story County, Iowa. *Journal of the Iowa Archeological Society* 31:137-190.
- Banta, W. V., and J. Garretson  
1881 Description of Mounds at Snake Den, Near Salem, in Henry County, Iowa. *Annual Report of the Smithsonian Institution*, 1883:532-533. Washington, D.C.
- Barnhardt, M. L., D. C. Dycus, E. B. Jelks, F. W. Lange, F. R. Mansberger, J. S. Phillippe, and F. S. Thomas.  
1983 Preliminary Cultural Resource Survey and Geomorphological Assessment of Selected Areas in Navigation Pool 16, Mississippi River. *The Wisconsin Archeologist* 64(1-2):9-110.
- Barrett, S. A.  
1933 Ancient Aztalan. *Bulletin of the Public Museum of the City of Milwaukee*. 13:1-602.
- Barrett, S. A. and E. W. Hawkes  
1919 The Kratz Creek Mound Group. *Bulletin of the Public Museum of the City of Milwaukee*. 3:17.
- Barrett, S. A. and A. Skinner  
1932 Certain Mounds and Village Sites of Shawano and Oconto Counties, Wisconsin. *Bulletin of the Public Museum of the City of Milwaukee*. 10(5):401-552.
- Barth, R. J.  
1985 Synthesis of Region 3 Prehistory. In Final Report of Regional Archaeology Project: Region 3, pp. 5-19. Ms. on file, State Historical Society of Wisconsin.
- Bartlein, P. J. and C. Whitlock  
1993 Paleoclimatic Interpretations of the Elk Lake Pollen Record. In *Elk Lake, Minnesota: Evidence for Rapid Climate Change in the North-Central United States*, edited by J. P. Bradbury and W. E. Dean, pp. 275 - 294. Geological Society of America Special Paper 276. Denver, Colorado.
- Bass, W. M.  
1964 The Variation in Physical Types of the Prehistoric Plains Mississippi Indians. *Plains Anthropologist* 9:65-145.
- Bass, W. M., and C. L. Berneking  
1965 A Possible Oneota Burial Found Near Sioux City, Iowa. *Journal of Iowa Archeologist* 13: 17-23.
- Bastion, T.  
1958 The Beloit College Mound Group (RO15) — A Preliminary Report. *Wisconsin Archeologist* 39:155-173.
- Bastian, T. J.  
1963 *Prehistoric Copper Mining in Isle Royale National Park, Michigan*. Unpublished Master's thesis, Dept. of Anthropology, University of Utah, Salt Lake City.
- Bauxar, J. J.  
1978 History of the Illinois Area. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 15; *The Northeast*, edited by B. G. Trigger, pp. 594-601. Smithsonian Institution, Washington, D.C.
- Beals, J.  
1965 Simonsen Site Revisited. *Northwest Chapter of the Iowa Archeological Society Newsletter* 13(5):3-5.
- Beaubien, P. L.  
1952 Preliminary Notes on an Archaeological Project in Northeast Iowa. *Journal of the Iowa Archeological Society* 1(3):3-5.  
1953 Cultural Variation Within Two Woodland Mound Groups of Northeastern Iowa. *American Antiquity* 19(1):56-66.
- Behm, J. A.  
1981 Request for Information on the Distribution and Shape of Some Midwestern Late Paleo Indian and Early Archaic Stage Projectile Points: Eden, Scottsbluff, and Hardin Barbed Points. *The Wisconsin Archeologist* 62(2):247-253.  
1984 Collections from 47 Ch-52, A Multicomponent Site in Chippewa County. *The Wisconsin Archeologist* 65(1):49-82.  
1986 Preliminary Report on Excavations at the Metzger Garden Site (47 Wn-283), Winnebago County, Wisconsin. *Fox Valley Archeology* 8:1-19. R. Ritzenthaler Chapter of the Wisconsin Archeological Society, Oshkosh, Wisconsin.  
1987 Rock Art at the Silver Mound Quarries and Workshops. *The Wisconsin Archeologist* 68(4):376-387.  
1988 47 Gl-142: A Rhyolite Quarry and Workshop Area in Green Lake County, Wisconsin. *Fox Valley Archeology* 12:7-22. R. Ritzenthaler Chapter of the Wisconsin Archeological Society, Oshkosh, Wisconsin.  
1992 *The 1990 and 1991 Archaeological Survey and Evaluation of the Bellhaven Estates Property, Section 7, Town of Algoma, Winnebago County, Wisconsin*. Reports of Investigations Number 1. Archaeology Laboratory, University of Wisconsin-Oshkosh.  
1993 *The 1992 and 1993 Archaeological Survey and Evaluation of the Bellhaven Estates Property, Section 7, Town of Algoma, Winnebago County, Wisconsin: Further Excavations at the Bell (47 Wn-9) and Findeisen (47 Wn-394) Sites*. Reports of Investigations Number 4, Archaeology Laboratory, University of Wisconsin-Oshkosh.
- Benchley, E. D.  
1970 Mississippian Calendrics: Some Suggestions. Paper presented at Symposium on Mississippian Social Organization, American Anthropological Association Annual Meeting, San Diego, CA.  
1974 Mississippian Secondary Mound Loci: A Comparative Functional Analysis in a Time-Space Perspective. Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin-Milwaukee.  
1976 *An Overview of the Prehistoric Resources of the Metropolitan St. Louis Area*. Cultural Resources Management Studies. U.S. Department of the Interior National Park Service. Washington, D.C.  
1981 *Summary Report on a Controlled Surface Collection of the Ramey Field, Cabokia Mounds Historic Site, Madison County, Illinois*. Report of Investigations No. 51. University of Wisconsin-Milwaukee Archaeological Research Laboratory  
1989a A Settlement Model for Prehistoric Sites in the Inland Areas of Northern Wisconsin. Paper presented at the Midwest Archaeological Conference, Iowa City, October.  
1989b The Patrick Walsh Site and the Greenfield Lime Industry District, Milwaukee County, Wisconsin. In *The Southeastern Wisconsin Archaeology Program: 1988-89*, edited by L. Goldstein, E. D. Benchley, and J. Kolb. Report of Investigations No. 101. University of Wisconsin-Milwaukee Archaeological Research Laboratory  
1992 *Final Report on Site Evaluation Studies at the Remains of Building 9, V.A. Medical Center, Milwaukee, Wisconsin*. Report of Investigations No. 111. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1995 "The Sky Was Brass, the Earth Was Ashes:" The Williamsonville Site and the Peshtigo Fire of 1871. Paper presented at the Midwest Archaeological Conference, Beloit, WI, October.  
1996a Summary of Archaeological Investigations, STH 57 Improvement Project, Brown, Kewaunee, and Door Counties, Wisconsin. Report submitted to Wisconsin Department of Transportation.  
1996b Nineteenth Century Logging along the Indian River in the Upper Peninsula of Michigan. *The Michigan Archaeologist*. In press.
- Benchley, E. D., R. A. Birmingham, and J. N. Vogel  
1983 *Final Report of a Cultural Resources Survey and Evaluation of the Proposed Menomonee Valley Correctional Facility Site, Milwaukee County, Wisconsin*. Report of Investigations No. 72. University of Wisconsin-Milwaukee Archaeological Research Laboratory.

- Benchley, E. D. and P. J. De Puydt  
1981 *Final Report of 1980 Test Excavations at the Interpretive Center Tract, Cabokia Mounds Historic Site*. Report of Investigations No. 61. University of Wisconsin-Milwaukee Archaeological Research Laboratory
- Benchley, E. D., and M. L. Gregg  
1975 *Final Report of an Intensive Archaeological Survey of the Meredostia Levee Project*. Report of Investigations No. 5. Archaeological Research Laboratory. University of Wisconsin-Milwaukee.
- Benchley, E. D., M. L. Gregg, and M. J. Dudzik  
1977 *Recent Investigations at Albany Mounds, Whiteside County, Illinois*. Illinois Archaeological Survey Circular No. 2. Urbana, Illinois.
- Benchley, E. D., H. Hassen, and W. Billeck  
1979 *Final Report of Archaeological Investigations at the Sloan Site (11-Mc-86) FAS Project 1210, Mercer County, Illinois*. Report of Investigations No. 36. Archaeological Research Laboratory. University of Wisconsin-Milwaukee, Milwaukee, Wisconsin.
- Benchley, E. D., D. J. Marcucci, Cheong-Yip Yuen, and K. L. Griffin  
1988 *Final Report of Archaeological Investigations and Data Recovery at the Trout Point I Site, Alger County, Michigan*. Report of Investigations No. 89. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Benchley, E. D., B. Nansel, C. A. Dobbs, S. Myster, and B. O'Connell  
1997 *Archeology and Bioarcheology of the Northern Woodlands*. Arkansas Archeological Survey Research Series No. 52.
- Benchley, E. D. and L. Newell  
1990 The Patrick Walsh Site. In *The Southeastern Wisconsin Archeology Program: 1989-90*, edited by L. Goldstein and E. D. Benchley. Report of Investigations No. 103. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Benchley, E. D., G. M. Weston, B. Nansel, and R. Brubaker  
1994 *Interim Report on Archaeological Investigations of the STH 57 Improvement Project, Brown and Kewaunee Counties, Wisconsin*. Report of Investigations No. 120. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Benchley, E. D., G. M. Weston, and C. Koster  
1995 *Preliminary Report of 1995 Archaeological Investigations, State Highway 57 Improvement Project, Brown, Kewaunee, and Door Counties, Wisconsin*. Report of Investigations, No. 126. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Benchley, E. D. and L. Whitman  
1989 *Final Report of Site Evaluation Studies at Twelve Prehistoric Sites, Lakewood District, Nicolet National Forest, Wisconsin*. Report of Investigations No. 97. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Bender, B.  
1985 Emergent Tribal Formations in the American Midcontinent. *American Antiquity* 50(1):52-62.
- Bender, M. M., D. A. Baerreis, and R. L. Steventon  
1981 Further Light on Carbon Isotopes and Hopewell Agriculture. *American Antiquity* 43:346-353.
- Bender, M. M., R. A. Bryson, and D. A. Baerreis  
1970 University of Wisconsin Radiocarbon Dates VII. *Radiocarbon* 12(1):336-338.
- Bender, S. J.  
1979 Paleodemographic Analysis of a Late Woodland Site in Southeastern Michigan. *Midcontinental Journal of Archaeology* 4(2):183-208.
- Benn, D. W.  
1976 *Woodland Cultures of Northeast Iowa: Perspective from the Hadfields Cave Site*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin-Madison.  
1978 The Woodland Ceramic Sequence in the Culture History of Northeastern Iowa. *Mid-Continental Journal of Archaeology* 3(2):215-283.  
1979 Some Trends and Traditions in Woodland Cultures of the Quad-State Region in the Upper Mississippi River Basin. *The Wisconsin Archeologist* 60(1):47-82.  
1980 *Hadfields Cave: A Perspective on Late Woodland Culture in Northeastern Iowa*. Report 13. Office of the State Archaeologist, University of Iowa, Iowa City.
- 1982a The Ceramic Assemblage. In *A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa*, edited by J. A. Tiffany, pp. 38-85. Research Papers 7(1). Office of the State Archaeologist, University of Iowa, Iowa City.  
1982b Arthur Site Ceramics in Regional Perspective. In *A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa*, edited by J. A. Tiffany, pp. 161-188. Research Papers 7(1). Office of the State Archaeologist. University of Iowa, Iowa City.  
1983 Diffusion and Acculturation in Woodland Cultures on the Western Prairie Peninsula. In *Prairie Archaeology: Papers in Honor of David A. Baerreis*, edited by G. E. Gibbon, editor. pp. 75-86. Publications in Anthropology No. 3. Department of Anthropology. University of Minnesota. Minneapolis.  
1984a *Archaeological Salvage Excavations at Sid's Site (13KK16): A Woodland Campsite in Keokuk County, Iowa: 1983*. CAR-574. Center for Archaeological Research. Southwest Missouri State University, Springfield.  
1984b *Salvage Excavations at the Christenson Oneota Site (13PK407), Central Des Moines River Valley, Iowa*. CAR-592. Center for Archaeological Research. Southwest Missouri State University, Springfield.  
1986 *The Western Iowa Rivers Basin An Archaeological Overview*. Iowa River Basin Report Series 3. CAR-677. Center for Archaeological Research. Southwest Missouri State University, Springfield.  
1987 *Archeology in the Mississippi River Floodplain at Sand Run Slough, Iowa*. Center for Archaeological Research, Southwest Missouri State University, Springfield.  
1988 *Archeology and Geomorphology in Pools 17 & 18 Upper Mississippi River*. CAR-714. Center for Archaeological Research. Southwest Missouri State University. Springfield, Missouri.  
1989a Hawks, Serpents, and Bird-Men: Emergence of the Oneota Mode of Production. *Plains Anthropologist* 34:233-260.  
1989 Another View of the Hanging Valley Site (13HR28). *Plains Anthropologist* 34:179-181.  
1990 *Woodland Cultures on the Western Prairie; the Rainbow Site Investigation*. Report 18, Office of the State Archaeologist. University of Iowa, Iowa City.  
1991 The Christenson Oneota Site, 13PK407. *Journal of the Iowa Archeological Society* 38:16-55.  
1993 Review of Phase 3 Investigations at 13LC17: A Randolph Phase Winter Camp in the White Breast Creek Valley, Lucas County, Iowa. *Journal of the Iowa Archeological Society* 40:95-96.  
1995 Woodland People and the Roots of the Oneota. In *Oneota Archaeology: Past, Present, and Future*, edited by W. Green, pp. 91-140. Report 20. Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.
- Benn, D. W. (editor)  
1981 *Archaeological Investigations at the Rainbow Site, Plymouth County, Iowa*. Luther College Archaeological Research Center, Decorah, Iowa.  
1984 *Salvage Excavations at the Christenson Oneota Site (13PK407), Central Des Moines River Valley, Iowa*. CAR-592. Center for Archaeological Research, Southwest Missouri State University. Springfield, Missouri.  
1987 *Big Sioux River Archaeological and Historical Resources Survey, Lyon County, Iowa: Volume I*. Center for Archaeological Research, Southwest Missouri State University. Report on file with Iowa State Historic Preservation Office.
- Benn, D. W., and E. A. Bettis, III  
1981 *Archaeological and Geomorphological Survey of the Downstream Corridor, Saylorville Lake, Iowa*. Luther College Archaeological Research Center, Decorah, Iowa.
- Benn D. W., E. A. Bettis, and R. C. Mallam  
1993 Cultural Transformations in the Keller and Bluff Top Mounds. *Plains Anthropologist* 38(145), Memoir 27:53-73.
- Benn, D. W. and A. K. Fisher  
1978 Report of Investigations at 13KH1, Kossuth County, Iowa. *Research Papers* 3(5): 1-15. Office of the State Archaeologist, Iowa City.
- Benn, D. W., and S. Harris  
1983 *Testing Nine Archaeological Sites in the Downstream Corridor, Saylorville Lake, Iowa: 1982*. CAR-489. Center for Archaeological Research. Southwest Missouri State University, Springfield.
- Benn, D. W., and D. M. Hovde  
1981 *Intensive Survey of Archaeological Site 13AN52, Rathbun Lake, Iowa*. Luther College Archaeological Research Center, Decorah, Iowa.

- Benn, D. W., R. C. Mallam, and E. A. Bettis, III  
 1978a Bluff Top Mound (13AM243). *Research Papers* 3(03): 54-87. Office of the State Archaeologist, Iowa City.  
 1978b Archaeological Investigations at the Keller Mounds (13AM69) and Related Manifestations: Insights into Woodland Indian Mythology. *Research Papers* 3(03): 1-53. Office of the State Archaeologist, Iowa City.
- Benn, D. W., and D. J. Marcucci  
 1981 *A Survey of Selected Rock Shelter Archaeological Sites in Eastern Iowa*. Luther College Archaeological Research Center, Decorah, Iowa.
- Benn, D. W., and L. D. Rogers  
 1985 *Interpretive Overview of Cultural Resources in Saylorville Lake, Iowa*. CAR-627-II. Center for Archaeological Research. Southwest Missouri State University, Springfield.
- Benn, D. W., S. Schermer, and J. Sellars  
 1992 *Excavations of Human Remains from the Sand Run West Site (13LA38) Louisa County, Iowa*. Report Prepared for U.S. Army Corps of Engineers, Rock Island District, Contract No. DAC1025-91-M-0982. Office of the State Archaeologist, Iowa City.
- Benn, D. W., and D. M. Thompson  
 1977 The Young Site, Linn County, Iowa, and Comments on Woodland Ceramics. *Journal of the Iowa Archeological Society* 24:1-61.
- Benoit, V.  
 1987 Contact and Consequence: An Introduction to over 300 Years of French Presence in the Northwest. In *L'Heritage Tranquille: The Quiet Heritage*, edited by C. H. Glassrud, pp. 22-28. Concordia College, Moorhead, MN.
- Berger, R.  
 1975 Advances and Results in Radiocarbon Dating: Early Man in America. *World Archeology* 7: 174-184.
- Bernabo, J. C.  
 1981 Quantitative Estimates of Temperature Changes over the Last 2700 Years in Michigan Based on Pollen Data. *Quaternary Research* 15:143-149.
- Bettis, E. A., III  
 1988 Quaternary History, Stratigraphy, Geomorphology, and Pedology. In *Archaeology and Geomorphology in Pools 17 and 18 Upper Mississippi River*, edited by D. W. Benn, pp. 18-91. CAR-714. Center for Archaeological Research. Southwest Missouri State University, Springfield.  
 1991 Geological Fieldwork and Analysis. In *Upper Mississippi River Prehistory and Paleoenvironments Project. Final Report to the Iowa Science Foundation*, by M. K. Whelan, pp. 12-17. Department of Anthropology. University of Iowa, Iowa City.
- Bettis, E. A., III, and D. W. Benn  
 1984 An Archaeological and Geomorphological Survey in the Central Des Moines River Valley, Iowa. *Plains Anthropologist* 29(105):211-227.  
 1987 Geomorphology, Pedology and Cultural Stratigraphy. In *Archaeology in the Mississippi River Floodplain at Sand Run Slough, Iowa*, edited by D. W. Benn, pp. 21-25. CAR-690. Center for Archaeological Research. Southwest Missouri State University, Springfield.
- Bettis, E. A., III, and N. S. Goldman-Finn  
 1992 Landscape Evolution and the Disposition of the Archaeological Record in the Mississippi Valley of Southeastern Iowa. Paper presented at the 57th annual meeting of the Society for American Archaeology, Pittsburgh, Pennsylvania, April 1992.
- Bettis, E. A., III, and B. E. Hoyer  
 1986 *Late Wisconsinan and Holocene Landscape Evolution and Alluvial Stratigraphy in the Saylorville Lake Area, Central Des Moines River Valley, Iowa*. Open File Report 86-1. Iowa Geological Survey, Iowa City.
- Bettis, E. A., III, and J. P. Litke  
 1987 *Holocene Alluvial Stratigraphy and Landscape Development in Soap Creek Watershed Appanoose, Davis, Monroe, and Wapello Counties, Iowa*. Iowa Quaternary Studies Group Contribution No. 14. Open File Report 87-2. Geological Survey Bureau, Iowa Department of Natural Resources, Iowa City.
- Bettis, E. A., III, and D. M. Thompson  
 1981 Holocene Landscape Evolution in Western Iowa: Concepts, Methods, and Implications for Archaeology. In *Current Directions in Midwestern Archaeology: Selected Papers from the Mankato Conference*, edited by S. Anfinson, pp 1-14. Occasional Publications in Minnesota Anthropology No. 9. Minnesota Archaeological Society, St. Paul.
- Billeck, W. T.  
 1985a Archaeological Investigations at the Smith Site: A Multi-Component Early to Late Woodland Habitation in Southeastern Iowa. Paper Presented at the 43rd Annual Plains Anthropological Conference. Iowa City, Iowa.  
 1985b BRF-61-1(30), a.k.a. PIN 79-56020-1, Lee County, Primary Roads. Project Completion Report 8(194). Highway Archaeology Program. University of Iowa, Iowa City.  
 1987 Functional Variation at Two Short-Term, Multicomponent Sites in Black Hawk County, Iowa. *Journal of the Iowa Archeological Society* 34:7-22.  
 1992a Archaeological Survey of Paul Rowe Sites in Mills County, Iowa. *Journal of Iowa Archeological Society* 39:66-67.  
 1992b Archaeological Survey of Paul Rowe Sites in Mills County, Iowa. In Mills County Archaeology: The Paul Rowe Collection and Southwestern Iowa Prehistory. *Research Papers* 17(5): 98-143. Office of the State Archaeologist, Iowa City
- Billeck, W. T., and E. D. Benchley  
 1982 *Regional Summary Northern Illinois*. Archaeological Research Laboratory. University of Wisconsin-Milwaukee.
- Billeck, W. T., and P. R. Rowe  
 1992 Excavation Reports by Paul Rowe: 13ML272, 13ML297, 13ML299, and 13ML396. *Journal of the Iowa Archeological Society* 39:91-98.
- Binford, L. R.  
 1988a *In Pursuit of the Past: Decoding the Archaeological Record*. Thames and Hudson, New York.  
 1988b Review of *Reading the Past: Current Approaches to Interpretation in Archaeology*. *American Antiquity* 53:875-876
- Birch, J. and P. S. Jensen  
 1963 Archaeological Survey of Southern Minnesota. *Minnesota Archaeologist*, 25-2:45.
- Birk, D. A.  
 1977a Two Sandy Lake Ware Vessels from Onigum Point, Cass County, Minnesota. *The Minnesota Archaeologist* 36(1):9-15.  
 1977b The Norway Lake Site: A Multicomponent Woodland Complex In North Central Minnesota. *Minnesota Archaeologist* 36(1):16-45.  
 1979a Brainerd Ware. In *A Handbook of Minnesota Prehistoric Ceramics*, edited by S.F. Anfinson, pp. 45-50. Occasional Publications in Minnesota Anthropology No. 5, Minnesota Archaeology Society, Ft. Snelling.  
 1979b Sandy Lake Ware. In *A Handbook of Minnesota Prehistoric Ceramics*, edited by S.F. Anfinson, pp. 175-182, Occasional Publications in Minnesota Anthropology No. 5, Minnesota Historical Society, Fort Snelling.  
 1981 John Sayer and the Fond du Lac District: A Study in the History and Archaeology of the Fur Trade. Ms. on file, The Institute for Minnesota Archaeology, Minneapolis.  
 1982 The La Verendryes. Reflections on the 250th Anniversary of the French Posts of Le Mar de l-Quiest, In *Where Two Worlds Meet: The Great Lakes Fur Trade*, edited by C. Gilman, pp. 116-119, Minnesota Historical Society.  
 1984 John Sayer and the Fond du Lac Trade: The North West Company in Minnesota and Wisconsin. In *Rendezvous: Selected papers of the Fourth North American Fur Trade Conference 1981*, edited by T.C. Buckley. Minnesota Historical Society. St. Paul, MN.  
 1985 *The Continuing Search for 21GD88, a Suspected French-period Fort Site on Prairie Island, Goodhue County, MN*. Reports of Investigations No. 5. Institute for Minnesota Archaeology, Minneapolis.  
 1987a Tracking the Voyageur: Archaeologists in Search of our French Connection. *HSP Journal* 3-6. La Compagnie des Hivernants de la Riviere, Saint Piere Historical Society, Burnsville, MN.  
 1987b *The Continuing Search for Fort l'Huillier: A Phase I Archaeological Survey at Le Hillier, Blue Earth County, MN*. Reports of Investigations No. 24. Institute for Minnesota Archaeology, Minneapolis.  
 1988a French Presence in Minnesota: The View from Site MO20 at the Little Elk River. Paper presented at the French Colonial Archaeology Conference, Springfield, IL, in press.



- 1988b *Early French Presence in Minnesota: The Historic Context*. Document prepared for MN State Historic Preservation Office. Reports of Investigation Number 41. Institute for Minnesota Archaeology, Minneapolis.
- 1994 *A Preliminary Survey of Site 47 PE 22 and Other Areas of Suspected French Presence on the Southeast Shore of Lake Pepin, Pepin County, Wisconsin*. Reports of Investigation, No. 305. Institute for Minnesota Archaeology, Minneapolis.
- Birk, D. A. and D. C. George  
1976 A Woodland Survey Strategy and its Application in the Salvage of a Late Archaic Locus of the Smith Mounds Site (21-KC-3), Koochiching County, Minnesota. *Minnesota Archaeologist* 35:3:1-30.
- Birk, D. A. and E. Johnson  
1988 *The Mdewakanton Dakota and Initial French Contacts: The Archaeological and Historical Evidence*. Paper presented at the French Colonial Archaeology Conference, Springfield, IL. Reports of Investigations No. 32. The Institute for Minnesota Archaeology, Minneapolis.
- Birk, D. A. and J. Poseley  
1978 *The French at Lake Pepin: An Archaeological Survey for Fort Beauharnois*. Minnesota Historical Society, St. Paul.
- Birk, D. A. and R. C. Wheeler  
1975 Fort Charlotte Underwater Archaeology Project. *National Geographic Research Reports* 1975, pp. 791-799. National Geographic Society, WA.
- Birks, H. J. B.  
1976 Late-Wisconsinan Vegetational history at Wolf Creek, Central Minnesota. *Ecological Monographs* 46: 395-429.
- Birmingham, R. A.  
1984 Dogtown: A Historical and Archaeological Study of a Late Historic St. Croix Chippewa Community. *The Wisconsin Archeologist* 65(3):183-300.  
1985 The Pinerias Era on the North Branch of the Oconto River: A Regional Historical Study. In *Final Report on a 1994 Cultural Resources Survey of Lands on the Nicolet National Forest*, edited by K. L. Griffin and D. L. Lehman, pp. 453-476. Report of Investigations No. 79. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1992 Historic Period Indian Archaeology at La Pointe in Lake Superior: an Overview. *The Wisconsin Archeologist* 73(3-4):177-198.
- Birmingham, R. A. and W. Green (eds.)  
1987 Wisconsin Rock Art. *The Wisconsin Archeologist* 68(4):173-472.
- Birmingham, R. A. and R. J. Salzer  
n.d. *The Marina Site: Excavations on Madeline Island*. Report submitted to the Wisconsin State Historic Preservation Office.
- Bishop, C. A. and M. E. Smith  
1975 Early Historic Populations in Northwestern Ontario: Archaeological and Ethnohistorical Interpretations. *American Antiquity* 40 (1):54-63.
- Black, T. K.  
1978 A New Method for Assessing the Sex of Fragmentary Skeletal Remains: Femoral Shaft Circumference. *American Journal of Physical Anthropology* 48:227-232.
- Blaine, M. R.  
1979 *The Ioway Indians*. University of Oklahoma Press, Norman.
- Blair, E. H. (editor)  
1911 *The Indian Tribes of the Upper Mississippi Valley and Region of the Great Lakes*, 2 volumes. Arthur H. Clark Co., Cleveland.
- Blake, B.  
1961 Portage County Site Report. *The Wisconsin Archeologist* 42:57-77.
- Blakely, R. L.  
1971 Comparison of the Mortality Profiles of Archaic, Middle Mississippian Woodland, and Middle Mississippian Skeletal Populations. *American Journal of Physical Anthropology* 34:43-54.
- Blakely, R. L. and P. L. Walker  
1967 Mortality Profile of the Middle Mississippian Population of Dickson Mound, Fulton County, Illinois. *Proceedings of the Indiana Academy of Science* 77:102-108.
- Blakeslee, D. J.  
1975 *The Plains Interband Trade System: An Ethnohistoric and Archeological Investigation*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin-Milwaukee.
- 1978 Assessing the Central Plains Tradition in Eastern Nebraska: Content and Outcome. In *The Central Plains Tradition*, edited by D. J. Blakeslee, pp. 134-143. Report 11. Office of the State Archaeologist. University of Iowa, Iowa City.
- 1981 The Origin and Spread of the Calumet Ceremony. *American Antiquity* 46(4):759-768.
- 1983 Kinks in the Calibration Curve: Reassessing Radiocarbon Dates. In *Man and the Changing Environments in the Great Plains*, edited by W. W. Caldwell, C. B. Schultz, and T. M. Stout, pp. 29-35. Transactions of the Nebraska Academy of Sciences, Vol. 11 (special Issue).
- Blakeslee, D. J., and W. W. Caldwell  
1979 *The Nebraska Phase: An Appraisal*. J & L Reprint Company. Lincoln, Nebraska.
- Bleed, P.  
1966 Petaga Point Site (21ML11). *Minnesota Archaeological Newsletter*, Nos. 10-11.  
1969 *The Archaeology of Petaga Point: The Preceramic Component*. Minnesota Prehistoric Archaeology Series No. 2, Minnesota Historical Society, St. Paul.  
1970 Notes on Aztalan Shell Tempered Pottery. *The Wisconsin Archeologist* 51(1):1-20.
- Blessing, F. K., Jr.  
1977 *The Ojibway Indians Observed, Papers of Fred K. Blessing Jr. on the Ojibway Indians from the Minnesota Archeologist*. Minnesota Archaeological Society, St. Paul.
- Blue, K. B.  
1990 A Demographic Analysis of an Historic Finnish Population in Northern Minnesota. Senior Honors thesis, Department of Anthropology, Hamline University.  
1996 Osteological Analysis of Human Remains from the Hogback Site (21HU01). Unpublished manuscript on file at the Department of Anthropology, Hamline University, St. Paul.
- Bluhm, E. A., and G. J. Fenner  
1961 The Oak Forest Site. *Illinois Archaeological Survey Bulletin* 3:139-162.
- Bluhm, E. A., and A. Liss  
1961 The Anker Site. *Illinois Archaeological Survey Bulletin* 3:89-138.
- Bolz, J. A.  
1960 *Portage in to the Past*. University of Minnesota Press, Minneapolis.
- Bonney, R. A.  
1962 *A Chronological Analysis of Southern Minnesota Woodland*. Unpublished Master's thesis, Department of Anthropology, University of Minnesota.  
1965 Evidence for Early Occupations in Southwestern Minnesota. *The Minnesota Archeologist*, 21(1):2-48.  
1970 Early Woodland in Minnesota. *Plains Anthropologist* 15-50(Pt 1):302-304.
- Bonnichsen, R., D. Stanford, and J. L. Fastook  
1987 Environmental Change and Developmental History of Human Adaptive Patterns; The Paleoindian Case. In *North America and Adjacent Oceans During the Last Deglaciation*, edited by W. F. Ruddiman and H.E. Wright, Jr., pp 403-424. Geological Society of America. Boulder, Colorado.
- Borchert, J. R.  
1950 The Climate of the Central North American Grassland. *Annals of the Association of American Geographers* 40:1-39.
- Boszhardt, E.  
1987 Indian Cemeteries at Lacrosse. *Archaeology News* 7:8-14.
- Boszhardt J. P. and C. Arzigian  
1992 *Phase III Archaeological Mitigation at the Trane Site (47LC447) LaCrosse, WI*. Reports of Investigations No. 138, Mississippi Valley Archaeology Center, University of Wisconsin-La Crosse.
- Boszhardt, R. F.  
1977 Wisconsin Radiocarbon Chronology-1976: A Second Compilation. *The Wisconsin Archeologist* 58(2):87-143.  
1982 Wisconsin Radiocarbon Compilation Update, 1981. *The Wisconsin Archeologist* 63(2):128-152.  
1985 Herbert Site (47LC43). Unpublished notes on file, Mississippi Valley Archaeology Center, University of Wisconsin-La Crosse.

- 1989a *The Paleo-Indian Study Unit in Region 6, Western Wisconsin*. Reports of Investigations No. 83. Mississippi Valley Archaeology Center, La Crosse.
- 1989b Ceramic Analysis and Site Chronology of the Pammel Creek Site. *The Wisconsin Archeologist* 70(1-2):41-94.
- 1990 *The Fiscal Year 1989 Region 6 Archaeology Program in Western Wisconsin: Overview*. Reports of Investigations, No. 116. Mississippi Valley Archaeology Center, University of Wisconsin-La Crosse.
- 1992 *Archaeological, Geomorphological, and Historical Investigations at the Bad Axe Battle Site, Vernon County, Wisconsin*. Reports of Investigations No. 143. Mississippi Valley Archaeology Center, La Crosse.
- 1993 *An Archaeological Survey at Silver Mound in Jackson County, Wisconsin, 1992-93*. Reports of Investigations No. 160. Mississippi Valley Archaeology Center, La Crosse.
- 1994 Oneota Group Continuity at La Crosse: The Brice Prairie, Pammel Creek, and Valley View Phases. *The Wisconsin Archeologist* 75(3-4):173-236.
- Boszhardt, R. F., T. W. Bailey, and J. P. Gallagher
- 1985 Oneota Ridged Fields at the Sand Lake Site (47 Lc-44), La Crosse County, Wisconsin. *The Wisconsin Archeologist* 66:47-67.
- Boszhardt, R. F. and J. P. Gallagher
- 1982 *The Dabl Site*. Reports of Investigations No. 1, Mississippi Valley Archaeology Center, University of Wisconsin-La Crosse.
- Boszhardt, R. F., W. Holtz, and J. Nienow
- 1995 A Compilation of Oneota Radiocarbon Dates as of 1995. In *Oneota Archaeology: Past, Present, and Future*, edited by W. Green, pp. 203-227. Reports of Investigations, No. 116. The University of Iowa Office of the State Archaeologist, Report 20. Iowa City.
- Boszhardt, R. F., and D. F. Overstreet
- 1983 Preliminary Investigations: Archaeology and Sediment Geomorphology, Navigation Pool 12, Upper Mississippi River. *The Wisconsin Archeologist* 64(1-2):111-183.
- Boszhardt, R. F. and J. Theler
- 1991 *Recovery Excavation of a Burial at the South end of Red Oak Ridge in Lake Onalaska, Navigation Pool 7 of LaCrosse County, Wisconsin*. Reports of Investigations No. 122, Mississippi Valley Archeology Center, University of Wisconsin-La Crosse.
- Boszhardt, R. F., J. Theler, and J. P. Gallagher
- 1984 *A Cultural Resources Evaluation of the Pammel Creek Site (47Lc61): An Oneota Occupation at LaCrosse, Wisconsin*. Reports of Investigations No. 19. Mississippi Valley Archaeology Center, University of Wisconsin-La Crosse.
- Boszhardt, R. F., J. L. Theler, and T. F. Kehoe
- 1986 The Early Woodland Stage. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 243-262. *The Wisconsin Archeologist* 67(3-4).
- Boszhardt, R. F., J. L. Theler, and D. G. Wilder
- 1993 *Megafauna of Western Wisconsin*. Reports of Investigations No. 161. Mississippi Valley Archaeology Center, La Crosse.
- Bowers, M. H., H. Muessig, and L. J. Soike
- 1990 Historic Shipwrecks of Iowa. *Journal of the Iowa Archeological Society* 37:4-39.
- Bradbury, J. P. and W. E. Dean (editors)
- 1993 *Elk Lake, Minnesota: Evidence for Rapid Climate Change in the North-Central United States*. Geological Society of America Special Paper 276. Denver, CO.
- Bradbury, J. P., W. E. Dean, and R. Y. Anderson
- 1993 Holocene Climatic and Limnologic History of the North-Central United States as Recorded in the Varved Sediments of Elk Lake, Minnesota: A Synthesis. In *Elk Lake, Minnesota: Evidence for Rapid Climate Change in the North-Central United States*, edited by J. P. Bradbury and W. E. Dean, pp. 309-328. Geological Society of America Special Paper 276. Denver, CO.
- Bradley, L. E.
- 1988 *Subsistence and Settlement at Ratbun Reservoir Area in South Central Iowa*. University of South Dakota Archaeology Laboratory, Vermillion.
- Brashler, J. G.
- 1991 When Daddy Was a Shanty Boy: The Role of Gender in the Organization of the Logging Industry in Highland West Virginia. *Historical Archaeology* 25(4):54-68.
- Braun, D. P.
- 1983 Pots as Tools. In *Archaeological Hammers and Theories*, edited by J. A. Moore and A. S. Keene. Academic Press, New York.
- 1985a Absolute Seriation: A Time-series Approach. In *For Concordance in Archaeological Analysis: Bridging Data Structure, Quantitative Technique and Theory*, edited by C. Carr. Westport Publishers, Kansas City, Missouri.
- 1985b Ceramic Decorative Diversity and Illinois Woodland Regional Integration. In *Decoding Prehistoric Ceramics*, edited by B. A. Nelson. Southern Illinois University Press, Carbondale, Illinois.
- 1986 Midwestern Hopewellian Exchange and Supralocal Interaction. In *Peer Polity Interaction and Socio-political Change*, edited by C. Renfrew and J. F. Cherry, pp. 117-126. Cambridge University Press, Cambridge.
- 1987 Coevolution of Sedentism, Pottery Technology, and Horticulture in the Central Midwest, 200 B. C.-A. D. 600. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by W. F. Keegan, pp. 153-181. Occasional Paper No. 7. Center for Archaeological Investigations. Southern Illinois University, Carbondale.
- 1988 The Social and Technological Roots of Late Woodland. In *Interpretations of Cultural Change in the Eastern Woodlands during the Late Woodland Period*, edited by R. W. Yerkes, pp. 17-38. Occasional Papers in Anthropology No. 3. Department of Anthropology. Ohio State University. Columbus, Ohio.
- 1991 Why Decorate a Pot? Midwestern Household Pottery, 200 B.C.-A.D. 600. *Journal of Anthropological Archaeology* 10:360-397.
- Braun, D. P., J. B. Griffin, and P. F. Titterton
- 1982 *The Snyders Mound and Five Other Mound Groups in Calboun County, Illinois*. Technical Reports No. 13. University of Michigan Museum of Anthropology, Ann Arbor.
- Bray, R. T.
- 1961 The Flynn Cemetery: An Orr Focus Oneota Burial Site in Allamakee County, Iowa. *Journal of the Iowa Archeological Society* 10(4):15-25.
- 1963 Southern Cult Motifs from the Utz Oneota Site, Saline County, Missouri. *The Missouri Archeologist* 25:1-68.
- Brazeau, L. A., C. Johansen, D. Witkowski, and D. F. Overstreet
- 1990 *Archaeological Investigations at the Wisconsin Valley Improvement Company Reservoir System, Gogebic County, Michigan and Vilas, Oneida, Lincoln, Forest, and Marathon Counties, Wisconsin*. Reports of Investigations No. 244. Great Lakes Archaeological Research Center, Milwaukee.
- Brazeau, L. and G. A. Lusk
- 1992 *Thematic Context: Lead Mining in the Mineral Point-Linden-Dodgeville District, Iowa County, WI*. Reports of Investigation, No. 279. Great Lakes Archaeological Research Center, Milwaukee.
- Breakey, K. C.
- 1981 Description of Some Ceramics from the Red River Valley, Minnesota-North Dakota. *Minnesota Archeologist* 40(1):33-41.
- Breternitz, D. A., A. C. Swedlund, and D. Anderson
- 1971 An Early Burial from Gordon Creek, Colorado. *American Antiquity* 36:170-182.
- Brice Petrides and Associates
- 1985 *Cultural Resources of the CBD Loop Arterial Project Area Phase II Investigations*. Project No. M-2787(1)—81-77. Brice Petrides and Associates, Waterloo, Iowa. Report submitted to the Iowa Department of Transportation, Ames, Iowa.
- Broihaun, J. H.
- 1985 *The Blosser and Old Moser Archaeological Sites: Woodland through Post-Woodland Manifestation in the Central Des Moines River Valley*. Unpublished Master's thesis. Department of Sociology and Anthropology, Iowa State University, Ames.
- Brose, D. S.
- 1968 The Backlund Mound Group. *Wisconsin Archeologist* 49:34-51.
- 1970a *The Archaeology of Summer Island: Changing Settlement Systems in Northern Lake Michigan*. Anthropological Papers, No. 41. University of Michigan Museum of Anthropology, Ann Arbor.

- 1970b *The Summer Island Site: A Study of Prehistoric Cultural Ecology and Social Organization in the Northern Lake Michigan Area*. Studies in Anthropology, Number 1. Case Western Reserve University, Cleveland.
- 1983 Rethinking the French Presence in the Upper Great Lakes, In *Lulu Linear Puctated: Essays in Honor of George Irving Quimby*, pp. 209-252. Anthropological Papers No. 72, Museum of Anthropology, University of Michigan, Ann Arbor.
- Brothwell, D. R.  
1965 The Paleopathology of Early-Middle Bronze Age Remains from Jericho. In Kenyon, K.M., *Jericho* 2:685-693.
- Brower, J. V.  
1900 *Memoirs of Explorations in the Basin of the Mississippi*, Volume 2, Mille Lac. H. L. Collins, St. Paul.  
1901 *Memoirs of Explorations in the Basin of the Mississippi*, Volume 4, Kathio. H. L. Collins, St. Paul.  
1903 *Minnesota: Discovery of its Area 1540-1665*. Minnesota Historical Society, St. Paul.
- Brower, J. V. and D. I. Bushnell  
1900 *Memoirs and Explorations in the Basin of the Mississippi: Mille Lacs*. Vol III - Report to the Minnesota Historical Society, St. Paul.
- Brown, C. E.  
1904 Native Copper Implements of Wisconsin. *The Wisconsin Archeologist* (old series) 3(2):49-98.  
1906 A Record of Wisconsin Antiquities. *The Wisconsin Archeologist* (old series) 5(3-4):289-429.  
1909 Wisconsin Garden Beds. *The Wisconsin Archeologist* (old series) 8(3):97-105.  
1912 Fourth Addition to the Record of Wisconsin Antiquities. *The Wisconsin Archeologist* (old series) 10(4):165-185.  
1916 Archaeological History of Milwaukee County. *The Wisconsin Archeologist* (old series) 15(2):25-105.  
1919 Stone Celts. *The Wisconsin Archeologist* (old series) 18(1):7-18.  
1923 Waukesha County, Northern Townships. *The Wisconsin Archeologist* 2(1):7-59.  
1924 Indian Gravel Pit Burials. *The Wisconsin Archeologist* 3(3):65-82.  
1930 Pine, Beaver, and North Lakes. *The Wisconsin Archeologist* 10(1):7-45.  
1939 Triangular Arrowpoints. *The Wisconsin Archeologist* 19(3):59-63.  
1940 Red Paint with Wisconsin Burials. *Wisconsin Archeologist* 21:74-76.  
1945 The Achen Mound Group. *The Wisconsin Archeologist* 26(2):40-42.
- Brown, J. A.  
1973 The Lake Lawn Mound Group. *The Wisconsin Archeologist* 54.  
1982 What Kind of Economy did the Oneota Have? In *Oneota Studies*, edited by G. E. Gibbon, pp. 107-112. Publications in Anthropology, Number 1. University of Minnesota.  
1983 Summary. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 5-10. New World Archaeological Record. Academic Press, New York.  
1985 Food for Thought: Where Has Subsistence Analysis Gotten Us? In *Archaic Period Subsistence and Settlement in the Eastern Woodlands*, edited by S. W. Neusius, pp. 315-330. Occasional Paper No. 6. Southern Illinois University at Carbondale Center for Archaeological Investigations, Carbondale.  
1986 Early Ceramics and Culture: A Review of Interpretations. In *Early Woodland Archaeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 609-620. Center for American Archaeology, Kampsville Seminars in Archaeology Volume 2, Kampsville, Illinois.  
1990 The Oak Forest Site: Investigations into Oneota Subsistence-Settlement in the Cal-Sag Area of Cook County, Illinois. In *At the Edge of Prehistory: Huber Phase Archaeology in the Chicago Area*, edited by J. A. Brown and P. J. O'Brien, pp. 120-308. Illinois Department of Transportation, Springfield and Center for American Archaeology, Kampsville, Illinois.
- Brown, J. A. (editor)  
1916 *History of Cottonwood and Watonwan Counties, Their People, Industries, and Institutions*, Vol 1. B. F. Bowen and Co., Indianapolis.
- Brown, J. A. and C. Cleland  
1968 The Late Glacial and Early Postglacial Faunal Resources in Midwestern Biomes Newly Opened to Human Adaptation. In *The Quaternary of Illinois*, edited by R. E. Bergstrom. Special Publication No. 14. University of Illinois College of Agriculture, Urbana.
- Brown, J. A. and P. J. O'Brien  
1990 *At the Edge of Prehistory: Huber Phase Archaeology in the Chicago Area*. Illinois Department of Transportation, Springfield and Center for American Archaeology, Kampsville, Illinois.
- Brown, J. A. and R. K. Vierra  
1983 What Happened in the Middle Archaic? Introduction to an Ecological Approach to Koster Site Archaeology. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. A. Phillips and J. A. Brown. Academic Press, New York.
- Brown, J. A., R. Willis, M. A. Barth, and G. K. Neumann  
1967 *The Gentleman Farm Site, La Salle County, Illinois*. Report of Investigations No. 12. Illinois State Museum, Springfield.
- Brown, K. L.  
1985 *Pomona: A Plains Village Variant in Eastern Kansas and Western Missouri*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Kansas. Lawrence, Kansas.
- Brown, L.  
1968 The Gavins Point Site (39YK203): An Analysis of Surface Artifacts. *Plains Anthropologist*, 13-40:118-131.
- Brown, L. A.  
1966a Temporal and Spatial Order in the Central Plains. *Plains Anthropologist* 11(34):294-301.  
1966b *An Appraisal of the Archeological Resources of the Saylorville Reservoir, Dallas, Boone, and Polk Counties, Iowa*. River Basin Surveys, Smithsonian Institution. Lincoln, Nebraska.  
1967a *Pony Creek Archeology*. Publications in Salvage Archeology No. 5. River Basin Surveys. Smithsonian Institution. Lincoln, Nebraska.  
1967b Archeology of the Rathbun Reservoir, Iowa. *Journal of the Iowa Archeological Society* 14:1-36.
- Brown, R. D. et al.  
1944 The Harvey Rock Shelter on the St. Croix River, Minnesota. *The Minnesota Archeologist* 10(4):118.
- Brown, R. D. and W. R. McIver  
1935 Further Exploration of the Harvey Rock Shelter. *The Minnesota Archeologist* 2(2):1
- Broyles, B. J.  
1971 *Second Preliminary Report: The St. Albans Site, Kanawha County, West Virginia*. West Virginia Geological and Economic Survey Report Archaeological Investigations No. 3.
- Brubaker, R. and L. Goldstein  
1991 Jefferson County: Archaeological Investigations at Carcajou Point in the Lake Koshkonong Region. In *The Southeastern Wisconsin Archaeology Program: 1990-91*, edited by L. Goldstein. Report of Investigations No. 107. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Bruder, E. G. and W. L. Wittry  
1955 Salvage Operations at the Kolterman Mound Group, Dodge County. *Wisconsin Archeologist* 36:3-11.
- Bruhy, M. E.  
n.d. Survey notes on file at the State Historic Preservation Office, Wisconsin.  
n.d. Archaeological Investigations at the Zarleng Lake Site (47 Fr-186), Forest County, Wisconsin. Ms. on file, author.
- Bruhy, M. E. and J. F. Wackman  
1980a *Cultural Resource Assessment: Butternut and Franklin Lakes, Nicolet National Forest*. Reports of Investigations No. 84. Great Lakes Archaeological Research Center, Waukesha, Wisconsin.  
1980b Test Excavations at the Butternut Lake Site (47 Fr-122), Forest County, Wisconsin. *The Wisconsin Archeologist* 61(4):389-451.
- Bruhy, Patricia B.  
1981 *The Historic Winnebago: Settlement and Subsistence in the Crawfish and Rock River Valleys*. Unpublished Master's thesis, Department of Anthropology, University of Wisconsin-Milwaukee.

- Bruhy, P. B. and L. Goldstein  
1983 Historic Native American Groups and the Fur Trade. In *The Southeastern Wisconsin Archaeology Project: 1982-83*, edited by L. Goldstein, pp. 240-252. Report of Investigations No. 68. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- BRW, Inc.  
1994 *Geoarchaeological Data Recovery, East Terrace Site (21BNs6) and Gardner Site (21SN14), Benion and Stearns Counties, Minnesota*. Report prepared for the Minnesota Department of Transportation (SHPO Referral File Number 91-1570) by BRW, Inc., Minneapolis, MN.
- Bryan, A. L. (editor)  
1978 *Early Man in America from a Circum-Pacific Perspective*. Occasional Papers No. 1. Department of Anthropology. University of Alberta. Edmonton, Alberta.
- Bryan, K., H. Retzek and F. T. McCann  
1938 Discovery of Sauk Valley Man of Minnesota with an Account of the Geology. *Texas Archaeological Society* 10:114-135.
- Bryce, G.  
1904 *Among the Mound Builders' Remains*. Transactions: Historical and Scientific Society of Manitoba, No. 66, pp:1-33, Winnipeg.
- Bryson, R. A. and D. A. Baerreis  
1968 Climatic Change and the Mill Creek Culture of Iowa. *Iowa Archaeologist* 15-16:1-358.
- Bryson, R. A., D. A. Baerreis, and W. M. Wendland  
1970 The Character of Late Glacial and Post-Glacial Climatic Changes. In *Pleistocene and Recent Environments of the Central Great Plains*, edited by W. Dort, Jr., and J. K. Jones, Jr., pp 53-76. Special Publication 3. Department of Geology, University of Kansas. Lawrence, Kansas.
- Bryson, R.A. and Murray  
1977 *Climates of Hunger*. University of Wisconsin Press, Madison.
- Buck, S. J.  
1965 The Story of Grand Portage. In *Selections from Minnesota History*, edited by R. R. Gilman and J. D. Holmquist, pp. 26-38. Minnesota Historical Society, St. Paul.
- Buckmaster, M. M.  
1979 Woodland and Oneota Settlement and Subsistence Systems in the Menominee River Watershed. Paper presented at the Central States Anthropological Society, Milwaukee, March.
- Buckmaster, M. M. and J. R. Paquette  
1988 The Gorto Site: Preliminary Report on a Late Paleo-Indian Site in Marquette County, Michigan. *The Wisconsin Archeologist* 69(3):101-124.
- Buikstra, J. E.  
1977a Biocultural Dimensions of Archaeological Study: A Regional Perspective. In *Biocultural Adaptation in Prehistoric America*, edited by R. L. Blakely, pp. 67-84. Southern Anthropological Society Proceedings 11.  
1977b Differential Diagnosis: An Epidemiological Approach. *Yearbook of Physical Anthropology* 20:316-328.  
1979 Contributions of Physical Anthropologists to the Concept of Hopewell: A Historical Perspective. In *Hopewell Archaeology: The Chillothe Conference*, edited by D. Brose and N. Greben, pp.: Kent State University Press, Kent, Ohio  
1981 *Prehistoric Tuberculosis in the Americas*. Scientific Papers No. 5, Northwestern University Archeological Program, Evanston.
- Buikstra, J. E. and G. R. Milner  
1991 Isotopic and Archaeological Interpretations of Diet in the Central Mississippi Valley. *Journal of Archaeological Science* 18:319-329.
- Buikstra, J. R. and D. H. Ubelaker  
1994 *Standards for Data Collection from Human Skeletal Remains: Proceedings of a Seminar at the Field Museum of Natural History Organized by Jonathan Haas*. Arkansas Archeological Survey, Research Series No. 44.
- Bullock, H. R.  
1940 Lasley Point Mounds. *Wisconsin Archeologist* 21(2):28-33.
- Burpee, L. J. (editor)  
1968 *Journals of LaVerendrye*. Reprint Edition, Greenwood Press, New York.
- Butler, W. B.  
1978 Some Comments on Contracting with the Federal Government: Types of Contracts. *American Antiquity* 43:741-746.
- 1987 Significance and Other Frustrations in the CRM process. *American Antiquity* 52:820-829.
- Butzer, K. W.  
1982 *Archaeology as Human Ecology*. Cambridge University Press, New York.
- Caine, C. A. H.  
1966 The Neubauer Late Woodland Site in Pine County Minnesota: An Analysis Showing Temporal and Spatial Relationships. *The Minnesota Archaeologist*, 28(2):74.  
1969 *The Archaeology of the Snake River Valley*. Unpublished Master's thesis, University of Minnesota, Minneapolis.  
1974 The Archaeology of the Snake River Region in Minnesota. In *Aspects of Upper Great Lakes Anthropology*, edited by E. Johnson, pp. 64-73. Prehistoric Archaeology Series, Minnesota Historical Society, St. Paul.
- Caine, C. A. H. and G. E. Goltz  
n.d. Brainerdware and the Early Woodland Dilemma. *Minnesota Archaeologist*, Institute of Minnesota Archaeology St. Paul.
- Caine-Hohman, C. A.  
1983 *Normative Typology and Systemic Stylistic Approaches to the Analysis of North Central Minnesota Ceramics*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Minnesota, Minneapolis.
- Caldwell, J. R.  
1958 *Trend and Tradition in the Prehistory of the Eastern United States*. Scientific Papers X. Illinois State Museum, Springfield.  
1964 Interaction Spheres in Prehistory. In *Hopewellian Studies*, edited by J. R. Caldwell and R. L. Hall, pp. 133-143. Scientific Papers Vol. 12. Illinois State Museum, Springfield.
- Caldwell, K. L.  
1994 *Level 1 Archaeological Survey for Army Reserve Aviation Facility, Fort McCoy, Wisconsin*. Archaeological Resource Management Series, Research Report, Number 3. U.S. Army Fort McCoy Environmental Management Division.
- Caldwell, W. W.  
1961 *Archeological Investigations at the Coralville Reservoir, Iowa*. Bureau of American Ethnology Bulletin 179. River Basin Surveys Papers No. 22. Smithsonian Institution, Washington, D.C.
- Callander, C.  
1978a Illinois. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 15, *Northeast*, edited by B. G. Trigger, pp. 673-680. Smithsonian Institution, Washington, D.C.  
1978b Fox. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 15, *Northeast*, edited by B. G. Trigger, pp. 636-647. Smithsonian Institution, Washington, D.C.  
1978c Sauk. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 15, *Northeast*, edited by B. G. Trigger, pp. 648-655. Smithsonian Institution. Washington, D.C.
- Capes, K. H. (editor)  
1963 *The W. B. Nickerson Survey and Excavations, 1912-15, of the Southern Manitoba Mounds Region*. National Museum of Canada Anthropology Papers No. 4.
- Carmichael, P. H.  
1977 *A Descriptive Summary of Blackduck Ceramic from the Wanipigow Lake Site Area (EgKx-1), 1975 and 1976*. Papers in Manitoba Archaeology, Miscellaneous Paper No. 5.
- Carrell, T.  
1985 *Submerged Cultural Resource Report: Noquebay*. Professional Papers No. 7. National Park Service Southwest Cultural Resources Center, Santa Fe.
- Carver, J.  
1956 *Travels Through the Interior Parts of North America, in the Years 1766, 1767, and 1768*. Reprint, Ross and Haines, Minneapolis,
- Cassell, M. S. and W. K. Holtz  
1995 Ordinary People and Extraordinary Complexity: An Archaeology of Agriculture in Wisconsin's Central Sands. Paper presented at the Midwest Archaeological Conference, Beloit, Wisconsin.
- Cassell, M. S. and J. Broihahn  
1996 Thoughts on Agrarian Cultural Resources and the Conduct of Historical Archaeology in Wisconsin. Paper presented at the Historical Archaeology Conference of the Upper Midwest, Redwing, Minnesota.

- Cassidy, F.  
1954 Summary Report of Archaeological Excavations of Sullivan Rock Shelter, East Central Iowa. *Journal of the Iowa Archeological Society* 3(4):6-11.
- Chang, K. C. (editor)  
1968 *Settlement Archaeology*. National Press Books, Palo Alto.
- Chapman, C. H.  
1975 *The Archaeology of Missouri, I*. University of Missouri Studies LXII. University of Missouri Press, Columbia.  
1980 *The Archaeology of Missouri, II*. University of Missouri Press, Columbia.
- Chapman, J.  
1975 *The Rose Island Site*. University of Tennessee, Dept. of Anthropology, Reports of Investigations No. 14, Knoxville.
- Charles, D. K., and J. E. Buikstra  
1983 Archaic Mortuary Sites in the Central Mississippi Drainage: Distribution, Structure, and Behavioral Implications. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 117-146. New World Archaeological Record. Academic Press, New York.
- Charles, D. K., J. E. Buikstra, and L. Konigsberg  
1986 Behavioral Implications of Terminal Archaic and Early Woodland Practices in the Lower Illinois Valley. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 458-474. Center for American Archeology Press, Kampsville.
- Charlton, T. H. (compiler)  
1980 Southeast Iowa Lake Calvin Area Paleo-Indian Survey. Manuscript prepared for the Division of Historic Preservation, Iowa State Historical Department, Iowa City.
- Charlton, T. H., C. O. Charlton, S. C. Lensink, and J. A. Sartain  
1988 Historical Archaeology at Plum Grove. *Journal of the Iowa Archeological Society* 35:40-69.
- Chumbley, C. A.  
1988 Late Glacial and Holocene Vegetation. In *Archaeological and Paleoenvironmental Studies in the Turkey River Valley, Northeastern Iowa*, edited by W. Green, pp. 74-109. Research Papers 13(1). Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.
- Chumbley, C. A., R. G. Baker, and E. A. Bettis III  
1990 Midwestern Holocene Paleoenvironments Revealed by Floodplain Deposits in Northeastern Iowa. *Science* 249:272-274.
- Clark, C.  
1996 Old Fort and Old Copper: the Search for the Archaic Stage on Isle Royale. In *Investigating the Archaeological Record of the Great Lakes States: Essays in Honor of Elizabeth Baldwin Garland*, edited by M. B. Holman, J. G. Brashler, and K. E. Parker. New Issues Press, Western Michigan University, Kalamazoo.
- Clark, D. E.  
1911 Early Forts on the Upper Mississippi. *Mississippi Valley Historical Association, Proceedings*, 1910-11: 91-101.
- Clark, F.  
1984 Knife River Flint and Interregional Exchange. *Midcontinental Journal of Archaeology* 9(2):173-198.
- Clark, J. A.  
1982 Some Early and Late Paleo-Indian Points from Winnebago County. *The Wisconsin Archeologist* 63(2):117-127.
- Cleland, C. E.  
1982 The Inland Shore Fishery of the Northern Great Lakes: Its Development and Importance in Prehistory. *American Antiquity* 47(4):761-784.
- Clark, L. A., and J. R. Nixon  
1975 *Soil Survey of Fremont County, Iowa*. USDA Soil Conservation Service. Washington, D.C.
- Clark, M. B. and P. F. Brown  
1990 Osteological Analysis of Human Skeletal Remains from the Berscheid Site. In *Osteological Analysis of Human Skeletal Material: Science Museum of Minnesota Collections*, edited by B. H. O'Connell, P. F. Brown and M. H. Regan. Report submitted to the Science Museum of Minnesota, on file, Hamline University and Science Museum of Minnesota.
- Claussen, C. J., H. K. Brooks, and A. B. Wesolowsky  
1975 The Early Man Site at Warm Mineral Springs, Florida. *Journal of Field Archaeology* 2:191-213.
- Cleland, C. E.  
1982 The Inland Shore Fishery of the Northern Great Lakes: Its Development and Importance in Prehistory. *American Antiquity* 47(4):761-784.
- Cleland, C. E. (editor)  
1971 *The Lasanen Site. An Historic Burial Locality in Mackinac County, Michigan*. Publications of the Museum, Michigan State University, East Lansing.
- Clifton, J. A.  
1978 Potawatomi. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 15, *Northeast*, edited by B. G. Trigger, pp. 725-742. Smithsonian Institution, Washington, D.C.
- Cole, F.-C., and T. Deuel  
1937 *Rediscovering Illinois Archaeological Explorations in and around Fulton County*. University of Chicago Press, Chicago.
- Collins, J. M.  
1989 The Des Moines Rapids and Western Oneota Socio-Political Patterns. *Journal of the Steward Anthropological Society* 18(1 & 2):165-186.  
1990 The Path and Problem of Site Recording Errors: An Iowa Example. *Journal of the Iowa Archeological Society* 37:40-45.  
1991 *The Iowa River Greenbelt: An Archaeological Landscape*. Special Publication. Office of the State Archaeologist. University of Iowa, Iowa City.  
1992 *A Phase I Archeological Survey of Primary Roads Project F-3-6(29)-20-09 AKA PIN 85-09020-1 Bremer County, Iowa*. Submitted to the Iowa Department of Transportation, Ames, IA, PCR 15(56):9-16.
- Collins, J. M., and W. Green  
1988 Archaeological Survey in the Turkey River Valley. In *Archaeological and Paleoenvironmental Studies in the Turkey River Valley, Northeastern Iowa*, edited by William Green, pp. 110-130. Research Papers 13(1). Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.
- Comfort, A. I.  
1978 Indian Mounds Near Ft. Wadsworth, Dakota Territory. *The Minnesota Archaeologist*, 37(1):3-15 (Originally published in 1873).
- Conrad, L. A.  
1981 *An Introduction to the Archaeology of Upland West Central Illinois: A Preliminary Archaeological Survey of the Canton to Quincy Corridor for the Proposed FAP-407 Highway Project*. Reports of Investigations 2. Archaeological Research Laboratory. Western Illinois University, Macomb.  
1986 The Late Archaic/Early Woodland Transition in the Interior of West-Central Illinois. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 301-325. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- Conrad, L. A., and A. D. Harn  
1972 The Spoon River Culture in the Central Illinois River Valley. Ms. on file, Dickson Mounds Branch of the Illinois State Museum, Lewistown.
- Conrad, Lawrence A., and Robert C. Koeppen  
1972 An Analysis of Charcoal from the Brewster Site (13CK15), Iowa. *Plains Anthropologist* 17(55):52-54.
- Cook, D.  
1975a *Archaeological Resources Management Plan: Known Archaeological Resources of the Chariton River Basin*. Division of Historic Preservation. Iowa State Historical Department, Iowa City.  
1975b *Archaeological Management Plan: Known Archaeological Resources of the Iowa-Cedar Rivers Basin*. Division of Historic Preservation. Iowa State Historical Department, Iowa City.
- Cook, D. C.  
1976 *Pathologic States and Disease Process in Illinois Woodland Populations: An Epidemiology Approach*. Unpublished Ph.D. dissertation, University of Chicago. Chicago, Illinois.
- Cook, T. G.  
1976 *Koster: An Artifact Analysis of Two Archaic Phases in Westcentral Illinois*. Prehistoric Records No. 1. Northwestern University Archeological Program, Evanston, Illinois.
- Cooper, D. J.  
1992 Wisconsin Underwater Archaeology: An Introduction. *The Wisconsin Archeologist* 73(1-2):1-6.

- Cooper, L. R.  
1933 The Red Cedar River Variant of the Wisconsin Hopewell Culture. Public Museum of the City of Milwaukee, *Bulletin* 16(2):47-108.  
1959 Indians Mounds Park, *Archaeological Site, Rice Lake, Wisconsin*. Science Bulletin No. 6, the Science Museum of St. Paul Institute, St. Paul, Minnesota.  
1964 A Preliminary Report on the Excavation of Two Late Middle Woodland Mounds in Northwest Wisconsin. *Journal of the Minnesota Academy of Science* 32(1):17-23.  
1965 *Preliminary Report: Archaeological Survey and Mille Lacs-Kathio State Park 1965*. Minnesota Outdoor and Resources Commission.  
1967 *Preliminary Report: Archaeological Survey and Excavation of the Stumne and Vach Sites, Pine County, MN*. 1966. Minnesota Historical Society, St. Paul.
- Cooper, L. R. and E. Johnson  
1964 Sandy Lake Ware and Its Distribution. *American Antiquity* 26(4):474-479.
- Corruccini, R. S.  
1984 An Epidemiologic Transition in Dental Occlusion in World Populations. *American Journal of Orthodontics* 84:419-426.
- Cordell, J., W. Green, and D. Marucci  
1991 The Paul Sagers Archaeological Collection. *Journal of the Iowa Archeological Society* 38: 5-10.
- Cork, K. P.  
1994 Reburial in Minnesota. Unpublished Senior Undergraduate Honor's thesis, Department of Anthropology, University of Minnesota, Minneapolis.
- Coues, E. (editor)  
1965 *The Manuscript Journals of Alexander Henry and David Thompson 1777-1814*. The Saskatchewan and Columbia Rivers Vol. II. Ross and Haines Inc., Minneapolis, MN. (Originally published in 1897).
- Crane, H. R., and J. B. Griffin  
1959 University of Michigan Radiocarbon Dates IV. *Radiocarbon* 1:177-178.  
1960 University of Michigan Radiocarbon Dates IV. *Radiocarbon* Supplement Vol. 2. New Haven, Connecticut.
- Crismon, S., and W. Green  
1992 Rediscovering Glenwood Earthlodges: The McDowell "Digs," 1938-1947. *Journal of the Iowa Archeological Society* 39:15-65.
- Cross, M. (editor)  
1938 *Father Louis Hennepin's Description of Louisiana: By Canoe to the Upper Mississippi in 1680*. University of Minnesota Press, Minneapolis.
- Crown Iron Works  
1978 *Crown Iron Works Centennial, 1878-1978*. Privately Printed, Minneapolis.
- Curtis, J. T.  
1971 *The Vegetation of Wisconsin*. University of Wisconsin Press, Madison.
- Dahlberg, R. N., and C. L. Dahlberg  
1880 *Composition of Pottery near the Mouth of Chequest Creek, at Pittsburgh, on the Des Moines River*. Annual Report of the Smithsonian Institution. pp. 349-350. Washington, D.C.
- Dallman, J. E.  
1983 *A Choice of Diet: Response to Climatic Change*. Report 16. Office of the State Archaeologist. University of Iowa, Iowa City.
- Daniels, R. B., and R. H. Jordan  
1966 *Physiographic History and the Soils, Entrenched Stream Systems and Gullies, Harrison County, Iowa*. Technical Bulletin 1348. USDA, Washington, D.C.
- Dankert, W. N., and L. T. Hanson  
1978 *Soil Survey of Lyon County, Iowa*. USDA Soil Conservation Service. Washington, D.C.
- Danzinger, E. G. Jr  
1978 *The Chippewa of Lake Superior*. University of Oklahoma Press, Norman.
- Davis, D. D., and P. R. Rowe  
1960 Further Notes on the Glenwood Culture: The Stille Site. *Journal of the Iowa Archeological Society* 9(3):13-17.
- Davis, M. B.  
1983 Holocene Vegetational History of the Eastern United States. In *Late Quaternary Environments of the United States, Vol. 2, The Holocene*, edited by H. E. Wright, Jr., pp. 166-181. University of Minnesota Press, Minneapolis.
- Dawson, K. C. A.  
1974 *The McCluskey Site*. National Museums of Canada, Archaeological Survey of Canada, Paper No. 25, Ottawa.  
1983 Prehistory of the Interior of Northern Ontario. In *Boreal Forest Adaptations: the Northern Algonkians*, edited by A. T. Steegmann, Jr. Plenum Press, New York.
- Dean, S.  
1883 *Antiquities of Mills County, Iowa*. Smithsonian Institution Annual Report, 1881. Washington, D.C.
- Deetz, J.  
1977 *In Small Things Forgotten*. Doubleday Publishers, New York.
- DeHart, J. N.  
1879 The Emblematic Mounds of Wisconsin. *American Antiquity* 1:195-209.
- Deller, D. B. and C. J. Ellis  
1988 Early Paleo-Indian Complexes in Southwestern Ontario. In *Late Pleistocene and Early Holocene Paleoecology and Archaeology of the Eastern Great Lakes Region*, edited by R. S. Laub, N. G. Miller, and D. W. Steadman, pp. 251-263. Bulletin of the Buffalo Society of Natural Sciences, Volume 33. Buffalo.
- Demski, E. A.  
1980 A Preliminary Report on Excavations at Jeremiah Curtin House 1978. *The Wisconsin Archeologist* 61(1):3-33.
- Densmore, F.  
1910 *Chippewa Music*. Bureau of American Ethnology, Bulletin 45. Smithsonian Institution, Washington D.C.  
1928 Uses of Plants by the Chippewa Indians. In *Bureau of American Ethnology, Annual Report* No. 44. pp. 275-397. Smithsonian Institution, Washington D.C.  
1979 *Chippewa Customs*. Reprint Edition, Minnesota Historical Society, St. Paul.
- Deuel, T.  
1958 *American Indian Ways of Life*. Story of Illinois Series 9. Illinois State Museum, Springfield, Illinois.
- De Vore, S. L.  
1984 *The Cribb's Crib Site (13WA105): The Archaeology and Ecology of an Oneota Village in the Central Des Moines River Valley*. Unpublished Master's thesis. Department of Sociology and Anthropology. Iowa State University, Ames.  
1990 The Cribb's Crib Site (13WA105): The Archaeology and Ecology of an Oneota Village in the Central Des Moines Valley. *Journal of the Iowa Archeological Society* 37:46-87.
- Dewdney, S. and K. E. Kidd  
1967 *Indian Rock Paintings of the Great Lakes*. 2nd ed, University of Toronto Press for the Quetico Foundation.
- Dickinson, D.  
1968 *The Vineland Bay Site*. Unpublished Master's thesis, University of Minnesota, Minneapolis.
- Dietz, E. F., D. A. Baerreis, R. Nero, and H. C. Cutler  
1956 A Report on the Dietz Site (Da 12), Dane County, Wisconsin. *The Wisconsin Archeologist* 37(1):1-19.
- Dirst, V.  
1982 The Oshkosh Swimming Pool Burial. *Wisconsin Archeologist* 63:53-63.  
1984 Recent Oshkosh Archaeological Fieldwork in East Central Wisconsin. Ms. on file, State Historical Society of Wisconsin, Madison.  
1985a The Paleo-Indians of East Central Wisconsin: A 1984 Survey and Testing Project. University of Wisconsin-Oshkosh. Ms. on file, State Historical Society of Wisconsin.  
1985b Three Classic Oneota Sites in East Central Wisconsin. University of Wisconsin-Oshkosh. Ms. on file, State Historical Society of Wisconsin.  
1987 *Archaeological Research at Whitefish Dunes State Park, Door County, Wisconsin*. Publication Number PR155(87). State of Wisconsin Department of Natural Resources, Bureau of Parks and Recreation.  
1989 *Phase II Archaeological Investigations at Three Sites on the East Shore of Green Bay*. Past Research, Sturgeon Bay, Wisconsin.  
1993 *The People of the Dunes*. Wisconsin Department of Natural Resources, Madison.



- 1994 *Second Report on the Leathem and Smith Quarry in Door County*. Wisconsin Department of Natural Resources, Bureau of Property Management, Madison.
- 1995a *Shanty Bay: A Great Place to Camp in Door County*. Wisconsin Department of Natural Resources, Madison.
- 1995b Thoughts on the Prehistory of Northeast Wisconsin. Paper presented at the Midwest Archaeological Conference, Beloit, WI.
- 1995c *Stockbridge Harbor: A Late Woodland Village on Lake Winnebago*. Wisconsin Department of Natural Resources, Bureau of Property Management, Madison.
- Dirst, V. and P. Kreisa  
1982 Human Remains from the Cowling Portion of the Karow Cemetery Site (47Wn-198). *The Wisconsin Archeologist* 63(4):405-426.
- Division of Historic Preservation  
1975 *Archaeological Resources in the Iowa-Cedar Rivers Basin*. Archaeological Resource Management Phase I Report. Division of Historic Preservation. Iowa State Historical Department, Iowa City.
- Doane, M.  
1994 *Bullet Heart: A Novel*. Alfred A. Knopf, New York.
- Dobbs, C. A.  
1976 *Cultural Resources of Section 2, Southwest Jefferson County, KY, Flood Control Project*. Report by Environment Consultants, Inc. for the U.S. Army Corps of Engineers, Louisville District, Louisville, KY.
- 1978 *Archaic Subsistence in Southwestern Minnesota: the View from Granite Falls*. Unpublished Master's thesis, Dept. of Anthropology, University of Minnesota, Mpls.
- 1982 Oneota Origins and Development: The Radiocarbon Evidence. In *Oneota Studies*, edited by G. Gibbon, pp. 91-106. Publications in Anthropology No. 1, University of Minnesota, Mpls.
- 1984 *Oneota Settlement Patterns in the Blue Earth River Valley, Southern Minnesota*. Unpublished Ph.D. dissertation, University of Minnesota, Mpls.
- 1984 Excavations at the Bryan Site: 1983-1984. *Minnesota Archaeologist* 43-2:49-58.
- 1985 *An Archaeological Survey of the City of Red Wing, Minnesota*. Reports of Investigations Number 2, The Institute for Minnesota Archaeology, Minneapolis.
- 1986 *Wisconsin Mounds Recorded by the Northwest Archaeological Survey and an Evaluation of the Adams Site (47P112)*. Reports of Investigations Number 7, The Institute for Minnesota Archaeology, Minneapolis.
- 1987a *A Phase One Archaeological Reconnaissance of a Proposed Dredged Material Disposal Site at Prairie Island, Minnesota*. Report of Investigations Number 17, The Institute for Minnesota Archaeology, Minneapolis.
- 1987b *Archaeological Excavations at the Bryan Site (21GD4), Goodhue County, Minnesota: 1983 and 1984*. Reports of Investigations Number 8, The Institute for Minnesota Archaeology, Minneapolis.
- 1988a *Outline of Historic Contexts for the Prehistoric Period (ca. 12,00 B.P.-A.D. 1700)*. Report of Investigations No. 37. Institute for Minnesota Archaeology, Minneapolis.
- 1988b *Historic Context Outlines: The Contact Period Contexts (ca. 1630 A.D.-1820 A.D.)*. Report of Investigations No. 39, Institute for Minnesota Archaeology, Minneapolis.
- 1991 *The Northwestern Archaeological Survey: an Appreciation and Guide to the Manuscripts. Cultural resources of Section 2, Southwest Jefferson County, KY, Flood Control Project*. Report by Environment Consultants, Inc. for the U.S. Army Corps of Engineers, Louisville District, Louisville, KY.
- Dobbs, C. A. and S. F. Anfinson  
1988 *Outline of Historic Contexts for the Prehistoric Period (ca. 12,00 B.P.-A.D. 1700)*. Report of Investigations No. 37. Institute for Minnesota Archaeology, Minneapolis.
- Dobbs, C. A. and K. C. Breakey  
1987 A Preliminary Report Investigations at the Energy Park Site (21GD158): A Silvernale Phase village at the Red Wing Locality. Paper presented at the 1987 Midwest Archaeological Conference, Milwaukee.
- Dobbs, C.A. and O. C. Shane III  
1982 Oneota settlement patterns in the Blue Earth River Valley, Minnesota. In *Oneota Studies*, edited by G. Gibbon, pp. 55-68, University of Minnesota Publications in Anthropology Number 135. Institute for Minnesota Archaeology, Minneapolis. Also published in *Northwestern Archaeological Survey, Field Notebooks and Related Volumes*. Microfilm edition, Minnesota Historical Society, St. Paul, MN.
- Dobbs, C. A. and K. C. Breakey  
1987 A Preliminary Report Investigations at the Energy Park Site (21GD158): A Silvernale Phase village at the Red Wing Locality. Paper presented at the 1987 Midwest Archaeological Conference, Milwaukee.
- Dobbs, C. A. and O. C. Shane III  
1982 Oneota settlement patterns in the Blue Earth River Valley, Minnesota. In *Oneota Studies*, edited by G. Gibbon, pp. 55-68, University of Minnesota Publications in Anthropology Number 1. University of Minnesota, Minneapolis.
- Donham, T. K.  
1982 Chronology of the Ceramic Period. In *The Cannon Reservoir Human Ecology Project An Archaeological Study of Cultural Adaptations in the Southern Prairie Peninsula*, edited by M. J. O'Brien, R. E. Warren, and D. E. Lewarch, pp. 117-130. Academic Press, New York.
- Dorothy, L. G.  
1980 The Ceramics of the Sand Point Site (20BG14), Baraga County, Michigan: A Preliminary Description. *Michigan Archaeologist* 26(3-4):39-71.
- Douglas, J. G.  
1976 *Collins: A Late Woodland Ceremonial Complex in the Woodfordian Northeast*. Unpublished Ph.D. Dissertation, Department of Anthropology, University of Illinois, Urbana.
- Dragoo, D. W.  
1976 Some Aspects of Eastern North American Prehistory: a Review 1975. *American Antiquity* 41:3-27.
- Droessler, J. B.  
1981 *Craniometry and Biological Distance: Biocultural Continuity and Change at the Late-Woodland - Mississippian Interface*. Center for American Archaeology. Northwestern University, Evanston, Illinois.
- Dudzik, M. J.  
1974 *Aboriginal Subsistence-Settlement Systems in the Upper Mississippi River Valley*. Unpublished Master's Paper. Department of Anthropology. University of Wisconsin-Milwaukee.
- 1993 The PaleoIndian Tradition in Northwestern Wisconsin: A Region 1 Culture Study Unit. Ms. on file, State Historical Society of Wisconsin.
- Dunnell, R.C.  
1984 The Ethics of Archaeological Significance Decisions. In *Ethics and Values in Archaeology*, edited by E. L. Green, pp. 62-74. The Free Press, New York.
- Eccles, W. J.  
1974 *The Canadian Frontier, 1534-1760*. University of New Mexico Press, Albuquerque, NM.
- Edmunds, R. D.  
1978 *The Potawatomis: Keepers of the Fire*. University of Oklahoma Press, Norman.
- Edwards, W. C.  
1993 Great Oasis Ceramics: Communication by Design. *Journal of the Iowa Archaeological Society* 40:20-49.
- Ehrhardt, K. L., and L. A. Conrad  
1994 Recent Investigations at Illinewek Village State Historic Site, Clark County, Missouri. Paper presented at the 39th Annual Midwest Archaeological Conference, Lexington, Kentucky.
- Eichenberger, J. A.  
1944 Investigations of the Marion-Ralls Archaeological Society in Northeast Missouri. *The Missouri Archaeologist* 19:2-69.
- Elliot, J. B. (editor)  
1975 Contest for Empire, 1500-1775. *Proceedings of an Indiana American Revolution Bicentennial Symposium*. Indiana Historical Society, Indianapolis.

- Ellis, C. J., and D. B. Deller  
1988 Some Distinctive Paleo-Indian Tool Types from the Lower Great Lakes Region. *Mid-Continental Journal of Archaeology* 13:111-158.
- El-Najjar, M.  
The Distribution of Human Skeletal Material in the Continental United States. *American Journal of Physical Anthropology* 46:507-512.
- Emerson, P. M., and H. R. Finney  
1984 *Archaeological and Geomorphological Data Recovery at Saylorville Lake, Polk County, Iowa, Vols. I-III*. Impact Services, Inc., Mankato, Minnesota.
- Emerson, P. M., H. R. Finney, F. W. Lange, and D. S. Radford  
1984 *The Cultural Resources and Geomorphology of Coralville Lake, Johnson County, Iowa*. Impact Services, Inc., Mankato, Minnesota.
- Emerson, P. M., H. R. Finney, W. A. Watson, and J. D. Irish  
1983 *Resurvey and Intensive Testing of Archaeological Sites at Saylorville Lake, Polk and Dallas Counties, Iowa*. Impact Services, Inc., Mankato, Minnesota.
- Emerson, T. E.  
1979 Prehistoric Seasonal Exploitation of White-Tailed Deer in the Driftless Area of Wisconsin: An Example from Brogley Rockshelter (47 Gt-156). *The Wisconsin Archeologist* 60(3):278-292.  
1986 A Retrospective Look at the Earliest Woodland Cultures in the American Heartland. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 621-633. Kampsville Seminars in Archeology, No. 2. Center for American Archeology Press, Kampsville, Illinois.  
1991a Some Perspectives on Cahokia and the Northern Mississippian Expansion. In *Cahokia and the Hinterlands: Middle Mississippian Cultures of the Midwest*, edited by T. E. Emerson and R. B. Lewis, pp. 221-238. University of Illinois Press, Urbana.  
1991b The Apple River Mississippian Culture in Northwestern Illinois. In *Cahokia and the Hinterlands: Middle Mississippian Cultures of the Midwest*, edited by T. E. Emerson and R. B. Lewis, pp. 164-182. University of Illinois Press, Urbana.
- Emerson, T. E. and R.B. Lewis (eds.)  
1991 *Cahokia and the Hinterlands*. University of Illinois Press, Urbana.
- Ennis, J. H.  
1951 Charles Reuben Keyes (Obituary). *Journal of the Iowa Archaeological Society*. 1(1):14-16.
- Esarey, D.  
1986 Red Ochre Mound Building and Marion Phase Associations: A Fulton County, Illinois Perspective. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 231-243. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- Evans, G. E.  
1960 Upper and Lower Rice Lakes. *Proceedings of the Minnesota Academy of Science* 28:93-95.  
1961a Ceramic Analysis of the Blackduck Ware and General Cultural Relationships. *Minnesota Academy of Science Proceedings* 29:33-54.  
1961b Prior Lake Effigy Mound Salvage. *Minnesota Archeologist Newsletter* No. 2.  
1961c *A Reappraisal of the Blackduck Focus or Headwaters Lakes Aspect*. Unpublished Master's thesis, Department of Anthropology, University of Minnesota, Minneapolis.  
1961d Prehistoric Blackduck-Historic Assiniboine: A Reassessment. *Plains Anthropologist* 6:271-275.
- Evans, S. B.  
1880 Notes on some of the Principal Mounds in the Des Moines Valley. *Annual Report of the Smithsonian Institution*. pp. 344-349. Washington, D.C.
- Evenson, E. B., W. R. Farrand, D. F. Eschman, D. M. Mickelson, and L. J. Maher  
1976 Greatlanean Substage: A Replacement for Valderan Substage in the Lake Michigan Basin. *Quaternary Research* 6:411-424.
- Ewen, C. R.  
1986 Fur Trade Archaeology: A Study of Frontier Hierarchies. *Midcontinental Journal of Archaeology* 20(1):15-28.
- Fagan, B. M.  
1991 *Ancient North America The Archaeology of a Continent*. Thames and Hudson, London.
- Farnsworth, K. B.  
1986 Black Sand Culture Origins and Distribution. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 634-641. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- Farnsworth, K. B., and D. L. Asch  
1986 Early Woodland Chronology, Artifact Styles, and Settlement Distribution in the Lower Illinois Valley Region. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 326-457. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- Farnsworth, K. B., and T. E. Emerson (editors)  
1986 *Early Woodland Archeology*. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- Farquharson, R. J.  
1875 Recent Explorations of Mounds near Davenport, Iowa. *Transactions of the American Association for the Advancement of Science* 18:297-315.  
1876 Recent Archaeological Discoveries at Davenport, Iowa of Copper Axes, Cloth, etc., Supposed to Have Come Down to Us from a Prehistoric People. *Proceedings of the Davenport Academy of Natural Sciences* 1:117-143.
- Farrand, W. R. and C. W. Drexler  
1985 Late Wisconsinan and Holocene History of the Lake Superior Basin. In *Quaternary Evolution of the Great Lakes*, edited by P. F. Karrow and P. E. Calkin, pp. 18-32. Geological Association of Canada Special Paper 30.
- Fay, R.  
1986a French Fur Control. In *Cultural Resource Management in Wisconsin: Vol. 1* by B. Wyatt, pp. 2-1 - 2-12. Historic Preservation Division. State Historical Society of Wisconsin, Madison.  
1986b British Fur Control. In *Cultural Resource Management in Wisconsin: Vol. 1* by B. Wyatt, pp. 3-1 - 3-10. Historic Preservation Division. State Historical Society of Wisconsin, Madison.  
1986c American Fur Control. In *Cultural Resource Management in Wisconsin: Vol. 1* by B. Wyatt, pp. 4-1 - 4-10. Historic Preservation Division. State Historical Society of Wisconsin, Madison.
- Federal Writers' Project  
1938 *Iowa: A Guide to the Hawkeye State*. Viking Press. New York.
- Fenneman, N. M.  
1938 *Physiography of the Eastern United States*. McGraw-Hill, New York.
- Fenton, T.W.  
1997 The Buhl Woman: A Paleoindian Skeleton from Southern Idaho. *American Journal of Physical Anthropology*, Supplement 24: 110.
- Field, H. P.  
1951 Ellison Orr-1857-1951 (Obituary). *Journal of the Iowa Archaeological Society* 1(1):11-13.
- Finley, R. W.  
1976 *Original Vegetation Cover of Wisconsin*. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station, St. Paul, Minnesota. (map)
- Finn, M. R.  
1982 *The Merrimac Mills Site (13JF92): a Study of Site Positioning and Mobile Strategy of an Upland Archaic Site in Southeast Iowa*. Unpublished Master's thesis. Department of Anthropology, University of Iowa, Iowa City.
- Finn, M. R., and M. J. Fokken  
1986 *Phase I and II Cultural Resource Investigations of the U.S. 61 Corridor (Weaver Bypass) Lee County, Iowa F-61-4(24) - 20-56*. The Cultural Resource Group. Louis Berger and Associates, Inc. East Orange, New Jersey.
- Finnegan, M.  
1976 Archaic Human Skeletal Material from the Draper Cave site 5CR1, Custer County, Colorado. *Southwestern Lore* 42: 24-32.  
1978 Human Skeletal Remains from Bradford House III, Site 5JF2, Jefferson County, Colorado. *Plains Anthropologist* 23: 221-234.
- Finney, F. A.  
1993 *Cahokia's Northern Hinterland as Viewed from the Fred Edwards Site in Southwestern Wisconsin: Intrasite and Regional Evidence for Production, Consumption, and Exchange*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin, Madison.

- Finney, F. A., S. B. Meyer, and K. E. Parker  
1992 *Phase III Archaeological Investigation of a Middle Archaic Raddatz Occupation at the Bobwhite Site (47 Ri-185), Richland County, Wisconsin*. Research Papers 17(2), Office of the State Archaeologist, University of Iowa. Iowa City.
- Finney, F. A. and J. B. Stoltman  
1991 The Fred Edwards Site: A Case of Stirling Phase Culture Contact in Southwestern Wisconsin. In *New Perspectives on Cabokia: Views from the Periphery*, edited by J. B. Stoltman, pp. 229-252. Monographs in World Archaeology No. 2. Prehistory Press, Madison.
- Fisher, A. K.  
1928 The Importance of Skeletal Remains in Wisconsin Archeology. *The Wisconsin Archeologist* (n.s.) 8:14-18.
- 1931 The Vertebral Pathology of Prehistoric Wisconsin Indians. *Wisconsin Archeologist* 10:105-110.
- 1935 Additional Paleopathological Evidence of Paget's Disease. *Annals of Medical History* 7:197-198.
- 1939 Problems in Physical Anthropology in Wisconsin. *The Wisconsin Archeologist*. (n.s.) 19:50-55.
- 1971 Human Bones from 13HB101. *Research Papers* 2(06): 9-12. Office of the State Archaeologist, Iowa City.
- 1976a Report of Examination of Skull Submitted by Sheriff of Dallas County, Iowa in October 1976. *Research Papers* 1(05): 1-2. Office of the State Archaeologist, Iowa City.
- 1976b Summary Report of Burial from 13AN43, Honey Creek State Park. *Research Papers* 1(01): 6-7. Office of the State Archaeologist, Iowa City.
- 1976c Physical Anthropology [Smith Site]. *Research Papers* 1(02): 6-7. Office of the State Archaeologist, Iowa City.
- 1977a Summary Report on Human Skeletal Material from 13MN9 [Skow Site]. *Research Papers* 2(02): 4. Office of the State Archaeologist, Iowa City.
- 1977b Human Skeletal Material from the Chan-ya-ta Site, 13BV1. *Research Papers* 2(04):15-24. Office of the State Archaeologist, Iowa City.
- 1977c Summary Report on Skeletal Material 13WB57. *Research Papers* 2(04): 31-33. Office of the State Archaeologist, Iowa City.
- 1977d Summary Report on Skeletal Material 13VB123. *Research Papers* 2(04): 38-39. Office of the State Archaeologist, Iowa City.
- 1977e Human Bones from 13JF52 [Hickenbottom Site]. *Research Papers* 2(05): 25-27. Office of the State Archaeologist, Iowa City.
- 1977f Bone Fragments from the Sioux City Sanitary Land Fill Site, 13WD27. *Research Papers* 2(06): 4-5. Office of the State Archaeologist, Iowa City.
- 1977g Human Bones from 13MAO (1,2). *Research Papers* 2(06): 14-15. Office of the State Archaeologist, Iowa City.
- 1977h Human Bones from the Hartz Brothers' Farm. 13IW115. *Research Papers* 2(06): 18-19. Office of the State Archaeologist, Iowa City.
- 1977i Human Bones from the Lane Farm Mound Group, 13AM104. *Research Papers* 2(06): 20-21. Office of the State Archaeologist, Iowa City.
- 1977j Human Bones from the School House Site, 13PM48. *Research Papers* 2(06): 24-26. Office of the State Archaeologist, Iowa City.
- 1977k Human Bones from the Smith Site, 13MN11. *Research Papers* 2(11): 4-6. Office of the State Archaeologist, Iowa City.
- 1977l Human Bones from the Diggins Site, 13HR401. *Research Papers* 2(11): 7-9. Office of the State Archaeologist, Iowa City.
- 1977m Human Bones from Cy Knapp Burial, 13PM27. *Research Papers* 2(11): 12. Office of the State Archaeologist, Iowa City.
- 1977n Human Bones from the Blue Diamond Burial No. 1, 13PM32. *Research Papers* 2(11): 13-14. Office of the State Archaeologist, Iowa City.
- 1977o Bella Vista Road Cut Skull, 13PM42. *Research Papers* 2(11): 15-16. Office of the State Archaeologist, Iowa City.
- 1977p Human Bones from the Birdie Site, 13WB114. *Research Papers* 2(12): 8-18. Office of the State Archaeologist, Iowa City.
- 1977q Human Bones from the Catlinite Amulet Site, 13CK64. *Research Papers* 2(12): 19-21. Office of the State Archaeologist, Iowa City.
- 1977r Human Calvarium from the Phipps Site, 13CK21. *Research Papers* 2(13): 1. Office of the State Archaeologist, Iowa City.
- 1977s Human Bones from the Hadfield's Cave Site, 13JN3. *Research Papers* 2(13): 2. Office of the State Archaeologist, Iowa City.
- 1977t Re-examination of Human Skeletal Material from the Rock Creek Ossuary, 13PM65. *Research Papers* 2(13): 3-9. Office of the State Archaeologist, Iowa City.
- 1977u Additional Human Remains from the Lane Farm Mound Group, 13AM104. *Research Papers* 2(13): 10-16. Office of the State Archaeologist, Iowa City.
- 1977v Human Remains from the Morgan Site, 13AM22. *Research Papers* 2(13): 26. Office of the State Archaeologist, Iowa City.
- 1977w Human Bones from 13HB101. *Research Papers* 2(06): 9-12. Office of the State Archaeologist, Iowa City.
- 1978a Paleopathology of an Archaic Ossuary at the Lewis Central School Site in Pottawattamie County, Iowa. *Proceedings of Iowa Academy of Science* 85(3): 88-90.
- 1978b Appendix A, Human Bones from the Keller Mound Group, 13AM69. *Research Papers* 3(03): 88-89. Office of the State Archaeologist, Iowa City.
- 1978c Appendix B, Human Bones from 13AM243. *Research Papers* 3(03): 90. Office of the State Archaeologist, Iowa City.
- 1978d Human Remains from the Wittrock Site, 13OB4. *Research Papers* 3(04): 1-4. Office of the State Archaeologist, Iowa City.
- 1978e Summary Report on Human Remains from the Brewster Site, 13CK15. *Research Papers* 3(04): 5. Office of the State Archaeologist, Iowa City.
- 1978f Human Calva from Cherokee County, 13CK0. *Research Papers* 3(04): 6. Office of the State Archaeologist, Iowa City.
- 1978g Skull Fragments from Harrison County, 13HR0. *Research Papers* 3(04): 7. Office of the State Archaeologist, Iowa City.
- 1978h Human Remains from the Sutton Coal Mine, 13JP12. *Research Papers* 3(04): 8-9. Office of the State Archaeologist, Iowa City.
- 1978i Human Remains from the Quandahl Rock Shelter, 13WH35. *Research Papers* 3(04): 10-12. Office of the State Archaeologist, Iowa City.
- 1978j Human Remains from the Sioux City Sand and Gravel Quarry, 13WD402. *Research Papers* 3(06): 48. Office of the State Archaeologist, Iowa City.
- 1978k A Human Cranial Fragment from Vicinity of the Blood Run Mound Group, 13L05. *Research Papers* 3(06): 49-50. Office of the State Archaeologist, Iowa City.
- 1979a Fragmentary Human Mandible from Central Plains House Site, 13ML128. *Research Papers* 4(03): 1. Office of the State Archaeologist, Iowa City.
- 1979b Report on the Skeleton from Cache K, 13ML 135, Institution Grounds, Glenwood Iowa. *Research Papers* 4(03): 2-3. Office of the State Archaeologist, Iowa City.
- 1979c Human Skeletal Remains from the Miner's Cabin Site, 13DB17. *Research Papers* 4(03): 4-7. Office of the State Archaeologist, Iowa City.
- 1979d Report of Examination of a Human Cranium Submitted by the Des Moines County Sheriff's Office. *Research Papers* 4(03): 8-10. Office of the State Archaeologist, Iowa City.
- 1979e Human Remains Found in a Gravel Pit on the Layton Farm Near Quimby, Iowa (13CK0) [actually 13CK73]. *Research Papers* 4(03): 11-12. Office of the State Archaeologist, Iowa City.
- 1979f Human Skeletal Remains from a Mound South of Stratford, Iowa (13WB0). *Research Papers* 4(03): 13-14. Office of the State Archaeologist, Iowa City.
- 1979g Examination of Human Remains from the U.S. Gypsum Company, Fort Dodge, Iowa. *Research Papers* 4(04): 9-13. Office of the State Archaeologist, Iowa City.
- 1980a Human Bone, Sioux City Sanitary Landfill (13WD27). *Research Papers* 5(01): 1-2. Office of the State Archaeologist, Iowa City.
- 1980b Human Bone, Siouxland Sand and Gravel Site (13WD402). *Research Papers* 5(01): 3-13. Office of the State Archaeologist, Iowa City.
- 1980c Osteological Report on the Council Bluffs Burial (13PM3) [actually 13PW3]. *Research Papers* 5(01): 24-25. Office of the State Archaeologist, Iowa City.
- 1980d Human Bone, Unknown Iowa Site. *Research Papers* 5(01): 61-62. Office of the State Archaeologist, Iowa City.
- 1981a Human Remains from the Pooler Site (13WB215). *Research Papers* 6(01): 1-4. Office of the State Archaeologist, Iowa City.
- 1981b Human Remains from the Hammer Farm Burial (13LE138). *Research Papers* 6(01): 8-9. Office of the State Archaeologist, Iowa City.
- 1981c Human Skeletal Remains from 13MN12. *Research Papers* 6(01): 26-27. Office of the State Archaeologist, Iowa City.

- 1981d Human Teeth from the "MAD" Site (13CF102). *Research Papers* 6(01): 53-55. Office of the State Archaeologist, Iowa City.
- 1981e Human Remains from Site 13DK30. *Research Papers* 6(01): 56-57. Office of the State Archaeologist, Iowa City.
- 1981f Analysis of Skeletal Material from the Keystone Site (13JK23). *Research Papers* 6(01):83-87. Office of the State Archaeologist, Iowa City.
- 1981g Report of Examination of Human Bones Recovered from the Dam Surface of Lake Meyer in Winneshiek County, Iowa (13WH30). *Research Papers* 6(04): 281-286. Office of the State Archaeologist, Iowa City.
- 1981h Human Bone Fragments from Mills County, Iowa (13ML30). *Research Papers* 6(04): 287-288. Office of the State Archaeologist, Iowa City.
- 1981i Human Bones Recovered Near the McBride Beach Area on Saylorville Lake Near Site 13PK111. *Research Papers* 6(04): 296-299. Office of the State Archaeologist, Iowa City.
- 1983 Human Remains from 13PM23 near Sioux City, Iowa. *Research Papers* 8(05): 275-283. Office of the State Archaeologist, Iowa City.
- 1984a Human Skeletal Found on Banks of Nodaway River in Page County, Iowa, at Site 13PA39. *Research Papers* 9(02): 74-82. Office of the State Archaeologist, Iowa City.
- 1984b Human Skeletal Remains from Jollyville Hill Site. *Research Papers* 9(2):81-82. Office of the State Archaeologist, Iowa City.
- 1984c Human Skull Found at Site 13L01 North of Rock Rapids near Kanarazi Creek. *Research Papers* 9(02): 83-87. Office of the State Archaeologist, Iowa City.
- 1984d Human Bones Recovered from the Vicinity of North Grove Cemetery in Indian Creek Township, Mills County, Iowa. *Research Papers* 9(02): 88-89. Office of the State Archaeologist, Iowa City.
- 1984e Human Skeleton Discovered at Anthon, Iowa, Site 13WD10. *Research Papers* 9(02):90-93. Office of the State Archaeologist, Iowa City.
- 1984f Human Skeleton Material from the Petersen Site (13PM81). *Research Papers* 9(02): 94. Office of the State Archaeologist, Iowa City.
- 1986a Human Skeletal Remains Found in the Attic of the Old Allamakee County Court House. *Research Papers* 11(01): 6-7. Office of the State Archaeologist, Iowa City.
- 1986b A Large Collection of Undocumented Human Skeletal Fragments Received from the State Museum of History and Archives in 1984. *Research Papers* 11(01): 8-13. Office of the State Archaeologist, Iowa City.
- 1986c Report of Examination of Human Skeletal Remains Recovered from River Bank Near Vinton, Iowa, on 9 June 1985. *Research Papers* 11(01): 14-18. Office of the State Archaeologist, Iowa City.
- 1986d Human Bone Fragments from a Vandalized Mound Near Guttenberg in Clayton County, Iowa, Site 13CT223. *Research Papers* 11(01): 19-20. Office of the State Archaeologist, Iowa City.
- 1986e Additional Human Skeletal Remains from the Rubel Site (13PM413). *Research Papers* 11(01): 21-25. Office of the State Archaeologist, Iowa City.
- 1986f Human Skeletal Remains from Exhibit at Camp Mitigwa Boy Scout Reservations (13BN0). *Research Papers* 11(01): 32-35. Office of the State Archaeologist, Iowa City.
- 1986g A Human Mandible from the State Historical Department. *Research Papers* 11(01): 38-39. Office of the State Archaeologist, Iowa City.
- 1986h Human Skeletal Material from the Boone Mound (13BN29). *Research Papers* 11(01): 40-47. Office of the State Archaeologist, Iowa City.
- 1986i Human Skull Received from the State Historical Department and Designated as Chesterfield, Allamakee County (13AM0) [actually Chesterfield Indian Agency, Polk County]. *Research Papers* 11(01): 48-52. Office of the State Archaeologist, Iowa City.
- 1986j Landrum Farm Human Skeletal Remains (13DM6). *Research Papers* 11(01): 53-54. Office of the State Archaeologist, Iowa City.
- 1986k Human Skeletal Remains from the DeCamp Farm and Designated as the Redfield Assemblage (13DA7) [actually 13DA64]. *Research Papers* 11(01): 55-58. Office of the State Archaeologist, Iowa City.
- 1986l Human Skeletal Remains from Pine Creek Mound Group (13MC44). *Research Papers* 11(01): 59-61. Office of the State Archaeologist, Iowa City.
- 1986m Incomplete Indian Skeleton Received from the Putnam Museum of Davenport, Iowa, (13-00-00). *Research Papers* 11(01): 62-64. Office of the State Archaeologist, Iowa City.
- 1986n Human Skeletal Remains Recovered from the Putnam Museum and Possibly Recovered from a Mill Creek Site (13-00-00). Burial Project #382. Unpublished report and file, Office of the State Archaeologist, Iowa City.
- 1987a Human Tooth from Site 13ML118. *Research Papers* 12(01): 4. Office of the State Archaeologist, Iowa City.
- 1987b Human Cranial Fragments from Site 13LA38. *Research Papers* 12(01): 5. Office of the State Archaeologist, Iowa City.
- 1987c Incomplete Artificially Deformed Human Skull of Possibly Hopewellian Affiliation from a Mound West of Davenport, Iowa (13ST00). *Research Papers* 12(01): 6-10. Office of the State Archaeologist, Iowa City.
- 1989 Infant Skeletal Remains from the Rosgaard Site, 13SX0. *Research Papers* 14(03): 1-2. Office of the State Archaeologist, Iowa City.
- Fisher, A. K. and J. L. Cordell  
1987 Human Skeletal Remains Recovered in Lewis, Iowa, 13CA5. *Research Papers* 12(01):1-3. Office of the State Archaeologist, Iowa City.
- Fisher, A. K., W. D. Frankforter, J. A. Tiffany, S. J. Schermer, and D. C. Anderson  
1985 Turin: A Middle Archaic Burial Site in Western Iowa. *Plains Anthropologist* 30(109):195-218.
- Fisher, A. K., H. W. Kuhm, and G. C. Adami  
1931 The Dental Pathology of the Prehistoric Indians of Wisconsin. *Bulletin of the Museum of the City of Milwaukee* 10(3):329-374.
- Fisher, A. K. and M. McKusick  
1980 A Historic Burial from Lee County (13LE136). *Research Papers* 5(01): 65-71. Office of the State Archaeologist, Iowa City.
- Fisher, A. K. and S. J. Schermer  
1987 The Analysis of Human Skeletal Remains from the Museum Collection at Effigy Mound National Monument. Contract Completion Report (CCR) 245, Office of the State Archaeologist, Iowa City.
- Fiske, T. and G. W. Hume  
1963 The Voight Site. *Minnesota Archaeological Newsletter*, 5:1-11.
- Fitting, J. E.  
1969 Settlement Analysis in the Great Lakes Region. *Southwestern Journal of Anthropology* 25:360-377.
- 1970 *The Archaeology of Michigan: A Guide to the Prehistory of the Great Lakes Region*. The Natural History Press, Garden City.
- 1978 Regional Cultural Development, 300 B.C. to A.D. 1000. In *Handbook of North American Indians: Northeast*, Volume 15 edited by B. Trigger, pp. 44-57. Smithsonian Institution, Washington.
- Fitting, J. E. and C. E. Cleland  
1969 Late Prehistoric Settlement Patterns in the Upper Great Lakes. *Ethnohistory* 16:289-316.
- Fitzhugh, W.  
1975 A Comparative Approach to Northern Maritime Adaptations. In *Maritime Adaptations of the Circumpolar Zone*, edited by W. Fitzhugh, pp. 339-386. Mouton, The Hague.
- Flanders, R. E.  
1960 A Re-examination of Mill Creek Ceramics: the Robinson Technique. *Journal of the Iowa Archeological Society* 10(2):1-35.
- 1977 The Soldow Site, 13HB1: An Archaic Component from North Central Iowa. *Journal of the Iowa Archeological Society* 24:125-147.
- Flanders, R. E. and R. Hansman  
1961 A Woodland Mound Complex in Webster County, Iowa. *Journal of the Iowa Archeological Society* 11(1): 1-12.
- Flannery, K. V. (editor)  
1976 *The Early Mesoamerican Village*. Academic Press, New York.
- Flaskard, G. A.  
1943 The A. H. Anderson Site. *The Minnesota Archaeologist*, 9(1):4-21.
- 1944 Additional Data on the A. H. Anderson Site. *The Minnesota Archaeologist*, 10(2):82-84.
- Flaskard, G. A. and R. H. Landon  
1945 The Long Lake Site. *The Minnesota Archaeologist*, 11(2):36-46.
- Fletcher, A. C., and F. LaFlesche  
1972 *The Omaha Tribe*. Originally published in 1911 as a paper accompanying the 27th Annual Report of the Bureau of American Ethnology. Smithsonian Institution. Washington, D.C. Reprinted in 1970 by Johnson Reprint Company. New York.

- Flick, G.  
1994 Produce a Late Archaic Study Unit. In *The Southeastern Wisconsin Archaeology Program: 1992-93*, edited by L. Goldstein, pp. 134-174. Report of Investigations No. 121. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Flick, G. and L. Goldstein  
1993 Produce an Early and Middle Archaic Study Unit. In *The Southeastern Wisconsin Archaeology Program: 1992-93*, edited by L. Goldstein, pp. 181-214. Report of Investigations No. 115. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Florin, F.  
1996 *Late Paleo-Indians of Minnesota and Vegetation Changes from 10,500 - 8,000 b.p.* Unpublished Master's thesis. University of Minnesota/Twin Cities.
- Fogel, I. L.  
1963 The Dispersal of Copper Artifacts in the Late Archaic Period of Prehistoric North America. *Wisconsin Archeologist*, new series, 44:129-180.
- Fokken, M. J.  
1979a Human Skeletal Remains from the McKinney Site, 13LA1. *Research Papers* 4(05): 1-3. Office of the State Archaeologist, Iowa City.  
1979b Report of Investigations at the Kindlespire Mound Group, 13CY4, Clay County, Iowa. *Research Papers* 4(05): 4-11. Office of the State Archaeologist, Iowa City.  
1981 Examination of Human Skeletal Material from Dallas County, Iowa (13DA11). *Research Papers* 6(01): 88-93
- Fokken, M. J., and M. R. Finn  
1984 *Iowa's Great River Road, Louisa County. Phase III Archaeological Mitigation at the Michael's Creek Segment of County Road X-61 GRS-8028(2) A Report of Archaeological Mitigation of Six Prehistoric Sites at the Michael's Creek Locality in Southeast Iowa.* The Cultural Resource Group. Louis Berger and Associates, Inc. East Orange, New Jersey.
- Folwell, W. W.  
1969 *A History of Minnesota, Volume III.* Revised Edition. Minnesota Historical Society Press, St. Paul (originally published in 1926).
- Ford, B. W.  
1982 Plum Creek Bridge Site (47 Pe-38): A Late Woodland Campsite in Pepin County, Wisconsin. *The Wisconsin Archeologist* 63(1):18-47.
- Ford, J. A., and G. R. Willey  
1941 An Interpretation of the Prehistory of the Eastern United States. *American Anthropologist* 43:325-363.
- Ford, R. I.  
1985 Patterns of Prehistoric Food Production in North America. In *Prehistoric Food Production in North America*, edited by R. I. Ford, editor. pp. 341-364. Anthropological Paper 75. Museum of Anthropology. University of Michigan, Ann Arbor.
- Forman, L.  
1992 *A Phase I Archaeological Survey of Primary Roads Project STPN-22-4(54)— 2J-70 a.k.a. PIN 90-70020-1 Muscatine County, Iowa.* Project Completion Report 15(69). Highway Archaeology Program. University of Iowa, Iowa City.
- Fortier, A. C.  
1983 Settlement and Subsistence at the Go-Kart North Site: A Late Archaic Titterington Occupation in the American Bottom, Illinois. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 243-260. New World Archaeological Record. Academic Press, New York.  
1984 The Go-Kart North Site. In *The Go-Kart North Site and the Dyroff and Levin Sites*, edited by C. J. Bareis and J. W. Porter, pp. 3-200. American Bottom Archaeology. FAI-270 Site Reports Vol. 9. University of Illinois Press, Urbana.
- Fowler, D.  
1982 Cultural Resource Management. In *Advances in Archaeological Method and Theory*, Volume 5, edited M. B. Schiffer, pp.1-50. Academic Press, New York.
- Fowler, M. L.  
1955 Ware Groupings and Decorations of Woodland Ceramics in Illinois. *American Antiquity* 20(3):213-225.  
1959a *Modoc Rock Shelter A Summary and Analysis of Four Seasons of Excavations.* Report of Investigations No. 8. Illinois State Museum. Springfield, Illinois.  
1959b The Early Woodland Period. In *Illinois Archaeology*, edited by E. A. Bluhm, pp. 17-20. Bulletin 1. Illinois Archaeological Survey.  
1975 A Pre-Columbian Urban Center on the Mississippi. *Scientific American* 233(2):92-101.  
1989 *The Cabokia Atlas A Historical Atlas of Cabokia Archaeology.* Studies in Illinois Archaeology No. 6. Illinois Historic Preservation Agency, Springfield.
- Fowler, M. L.  
1969 Middle Mississippian Agricultural Fields. *American Antiquity* 34(4):365-375.  
1975 A Pre-Columbian Urban Center on the Mississippi. *Scientific American* 233(2):92-101.
- Fowler, M. L. (editor)  
1973 *Explorations into Cabokia Archaeology.* Bulletin 7. Illinois Archaeological Survey, Urbana.
- Fowler, M. L. and R. L. Hall  
1972 *Archaeological Phases at Cabokia.* Illinois State Museum Papers in Anthropology, No. 1. Springfield.  
1978 Late Prehistory of the Illinois Area. In *Handbook of North American Indians: Northeast, Volume 15*, edited by B. G. Trigger, pp.560-568. Smithsonian Institution, Washington D.C.
- Frankforter, W. D.  
1955 Early Indian Skeletons at Turin Iowa. *Northwest Chapter of the Iowa Archaeological Society Newsletter* 3(5): 1-6.  
Frankforter, W. D. and G. Agogino  
1959 Archaic and Paleo-Indian Archaeological Discoveries in Western Iowa. *Texas Journal of Science* 11: 482-49.  
1969 Faunal Study of Large Ruminants from Mill Creek Culture Sites in Northwest Iowa. In *Climatic Change and the Mill Creek Culture of Iowa: Part II*, edited by D. R. Henning, pp. 286-301. Journal of the Iowa Archeological Society 15.
- Frankforter, W. D., and G. A. Agogino  
1959a Archaic and Paleo-Indian Archaeological Discoveries in Western Iowa. *Texas Journal of Science* 11(4):482-491.  
1959b Recent Pre-ceramic Archeological Developments in Western Iowa. *Journal of the Iowa Archeological Society* 9:13-19.  
1960 The Simonsen Site: Report for the Summer of 1959. *Plains Anthropologist* 5(10):65-70.
- Franzen, J. G.  
1986 *Prehistoric Settlement on the Hiawatha National Forest, Michigan: A Preliminary Locational Model.* Hiawatha National Forest Cultural Resource Management Report Number 4, Escanaba, Michigan.  
1987 *Test Excavations and Locational Analysis of Prehistoric Sites in the Hiawatha National Forest, Michigan: 1985 Season.* Hiawatha National Forest Cultural Resource Management Report Number 5, Escanaba, Michigan.
- Freeman, J. E.  
1956 An Analysis of the Point Sauble and Beaumier Farm Sites. Unpublished M. A. thesis, University of Wisconsin, Madison.  
1966 Price Site III, Ri-4, A Burial Ground in Richland County, Wisconsin. *The Wisconsin Archeologist* 47(2):33-74.  
1968 Hopewell Indians. *Wisconsin Academy Review* 15:5-7.  
1969 The Millville Site, A Middle Woodland Village in Grant County, Wisconsin. *The Wisconsin Archeologist* 50(2):37-123.  
1986 Aztalan: A Middle Mississippian Village. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 339-364. The Wisconsin Archeologist 67(3-4).
- Frison, G. C.  
1974 *The Casper Site.* Academic Press, New York.  
1978 *Prehistoric Hunters of the High Plains.* Academic Press, New York.  
Frison, G. C., and D. J. Stanford  
1982 *The Agate Basin Site.* Academic Press, New York.

- Fritz, H. C., G. R. Lofgren and G. A. Gordon  
1979 Variations in Climate since 1602 as Reconstructed From Tree Rings. *Quaternary Research* 12:18-46.
- Frye, J. C., H. B. Willman, and R. F. Black  
1965 Outline of Glacial Geology of Illinois and Wisconsin. In *The Quaternary of the United States*, edited by H. E. Wright and D. G. Frey, pp 43-62. Princeton University Press, Princeton, New Jersey.
- Fryxell, R., T. Bielicki, R. D. Daughtery, C.E. Gustafson, H.T. Irwin, and B.C. Keel  
1968 A Human Skeleton from Sediments of Mid-Pinedale Age in Southeastern Age in Southeastern Washington. *American Antiquity* 33: 511-514.
- Fugle, E.  
1954 A Fox Village Site. *Journal of the Iowa Archeological Society* 4(3):4-15.  
1957 *Introduction to the Artifact Assemblages of the Big Sioux and Little Sioux Foci*. Unpublished Master's thesis. Department of Sociology and Anthropology, State University of Iowa, Iowa City.  
1962 Mill Creek Culture and Technology. *Journal of the Iowa Archeological Society* 11(4):1-126.
- Fulmer, D., J. A. Hotopp, and A. K. Fisher  
1977 *The Lambert Site 13VB82 A Woodland Site on the Lower Des Moines River Van Buren County, Iowa*. Contract Completion Report 71. Office of the State Archaeologist. University of Iowa, Iowa City.
- Fulton, A. R.  
1888 *The Red Men of Iowa*. Mills and Company, Des Moines.
- Funk, R. E.  
1978 Post-Pleistocene Adaptations. In *Handbook of North American Indians*, Vol. 15: *The Northeast*. Smithsonian Institution Press, Washington, D.C.
- Gajewski, K.  
1988 Late Holocene Climate Changes in Eastern North America Estimated from Pollen Data. *Quaternary Research* 29:255-262.
- Gallagher, J. P.  
1989 Krause Site (47LC41). Unpublished notes on file, State Historical Society of Wisconsin, Burial Sites Office.  
1992 Prehistoric Field Systems in the Upper Midwest. In *Late Prehistoric Agriculture: Observations from the Midwest*, edited by W. I. Woods, pp. 95-135. Studies in Illinois Archaeology, No. 8. Illinois Historic Preservation Agency, Springfield.
- Gallagher, J. P. and A. M. Arzigian  
1991 A New Perspective on Late Prehistoric Agricultural Intensification in the Upper Mississippi River Valley. In *Native American Agriculture, the Origins, Development and Significance of Prehistoric Farming*, edited by W. Green. Report No. 19, Office of the State Archaeologist of Iowa, Iowa City, Iowa.
- Gallagher, J. P., R. F. Boszhardt, R. Sasso and K. Stevenson  
1985 Oneota Ridged Field Agriculture in Southwestern Wisconsin. *American Antiquity* 52(2):398-404.
- Gallagher, J. P., R. Rodell and K. Stevenson  
1982 *The 1980-1982 LaCrosse Area Archaeological Survey*. Reports of Investigations No.2, Mississippi Valley Archaeology Center, University of Wisconsin-La Crosse.
- Gallagher, J. P. and K. Stevenson  
1980 Preliminary Report on Excavations at the Valley View Site (47 Lc-34), An Oneota Site Near La Crosse, Wisconsin. *The Wisconsin Archeologist* 61(4):505-521.
- Gallagher, J. P., K. Stevenson, H. Fassler, C. Hill, M. Mills, T. Morrow, K. Motivans, S. Neff, T. Weeth, and R. Withrow  
1981 *The Overhead Site, 47-Lc-20*. Report Prepared for the State Historical Society of Wisconsin, Madison.
- Gardner-Sharp, A.  
1885 *History of the Spirit Lake Massacre and Captivity of Miss Abbie Gardner*. Iowa Printing Company, Des Moines.
- Gates, C. M.  
1965 *Five Fur Traders of the Northwest*. Minnesota Historical Society, St. Paul.
- Geier, C. R.  
1978 An Analysis of the Pottery Assemblage from the Hog Hollow Site: A Transitional Middle/Late Woodland Habitation in the Mississippi River Valley. *The Wisconsin Archeologist* 59(2):151-245.
- Geier, C. R. and M. K. Loftus  
1976 Preliminary Notes on Prehistoric Settlement Behavior in a Section of the Mississippi Valley in Southwest Wisconsin. *The Wisconsin Archeologist* 57(2):58-129.
- George, D.  
1979 St. Croix Stamped Series. In *A Handbook of Minnesota Prehistoric Ceramics*, edited by S. F. Anfinson, pp. 169-174. Occasional Publications in Minnesota Anthropology No. 5, Minnesota Archaeological Society, Ft. Snelling.
- Gibbon, G. E.  
n.d. Describing Material Remains and House Feature from Crescent Bay Hunt (Gun) Club (47 Je-244). Ms. on file, University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1971 The Bornick Site: A Grand River Phase Oneota Site in Marquette County. *The Wisconsin Archeologist* 52(3):85-137.  
1972a The Walker-Hooper Site: A Grand River Oneota Phase site in Green Lake County. *The Wisconsin Archeologist* 53(4):149-290.  
1972b Cultural Dynamics and the Development of the Oneota Life-Way in Wisconsin. *American Antiquity* 37:166-185.  
1973 *The Sheffield Site: An Oneota Site on the St. Croix River*. Minnesota Historical Society, St. Paul.  
1974 A Model of Mississippian Development and Its Implications for the Red Wing Area. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson. Minnesota Prehistoric Archaeology Series, No. 11. Minnesota Historical Society, St. Paul.  
1975 The Brower Site: A Middle Woodland Mound and Campsite on Lake Onamia. *The Minnesota Archaeologist*, 34(1 & 2):1-43.  
1975 The Crace Site. *The Minnesota Archaeologist* 34-3 & 4:49-70.  
1976 The Old Shakopee Bridge Site: A Late Woodland Ricing Site on Shakopee Lake, Mille Lacs County, Minnesota. *The Minnesota Archaeologist* 35(2):2-56.  
1978 A Simplified Algorithm Model for the Classification of Silvernale and Blue Earth Phase Ceramic Vessels. In *Some Studies of Minnesota Prehistoric Ceramics: Papers presented at the First Council for Minnesota Archaeology Symposium - 1976*, edited by A. R. Woolworth and M. A. Hall, pp. 3-11.  
1979 *The Mississippian Occupation of the Red Wing Area*. Minnesota Historical Society, St. Paul.  
1982 Oneota Origins Revisited. In *Oneota Studies*, edited by G. E. Gibbon, pp. 85-90. Publications in Anthropology No. 1. University of Minnesota, Minneapolis.  
1983 The Blue Earth Phase of Southern Minnesota. *Journal of the Iowa Archeological Society* 30:1-84.  
1986a The Mississippian Tradition: Oneota Culture. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 314-338. The Wisconsin Archeologist 67(3-4).  
1986b Does Minnesota Have an Early Woodland? In *Early Woodland Archaeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 84-91. Center for American Archeology, Kampsville Seminars in Archeology No.2.  
1991 The Middle Mississippian Presence in Minnesota. In *Cabokia and the Hinterlands: Middle Mississippian Cultures of the Midwest*, edited by T. E. Emerson and R. B. Lewis, pp. 207-220. University of Illinois Press, Urbana.  
1993 The Middle Missouri Tradition in Minnesota: A Review. *Plains Anthropologist* 38:169-187.  
1995 Oneota at the Periphery: Trade, Political Power, and Ethnicity in Northern Minnesota and on the Northeastern Plains in the Late Prehistoric Period. In *Oneota Archaeology: Past, Present, and Future*, edited by W. Green, pp. 175-199. Report 20. Office of the State Archaeologist, Iowa City.
- Gibbon, G. E. (editor)  
1982 *Oneota Studies*. Publications in Anthropology No. 1, University of Minnesota, Minneapolis.
- Gibbon, G. E. and C. A. H. Caine  
1976 The Middle Late Woodland Transition in Eastern Minnesota. Paper presented to the Annual Meeting of the Society for American Archaeology, St. Louis, Mo.  
1980 The Middle-Late Woodland transition in eastern Minnesota. *Midcontinental Journal of Archaeology* 5(1):57-72.



- Gibbon, G. E. and C. A. Dobbs  
1991 The Mississippian Presence in the Red Wing Area, Minnesota. In *New Perspectives on Cabokia: Views from the Periphery*, edited by J. B. Stoltman, pp. 281-305. Prehistory Press, Madison.
- Gibbons, A.  
1996 DNA Enters Dust Up Over Bones. *Science* 274: 172.
- Gibson, A. M.  
1963 *The Kickapoos: Lords of the Middle Border*. University of Oklahoma Press, Norman.
- Gilder, R. F.  
1926 *The Nebraska Culture Man*. Henry F. Kieser, Omaha.
- Gilman, C.  
1982 *Where Two Worlds Meet: The Great Lakes Fur Trade*. Minnesota Historical Society, St. Paul.
- Gilman, R. R.  
1970 Last Days of the Upper Mississippi Fur Trade. *Minnesota History*, 42:123-140 (Winter).  
1974 The Fur Trade in the Upper Mississippi Valley, 1630-1850. *Wisconsin Magazine of History* 58(1):3-18.
- Glenn, E. J.  
1971 *The Physical Affiliations of the Oneota Peoples*. Unpublished Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington.  
1974 *Physical Affiliations of the Oneota Peoples*. Report 7. Office of the State Archaeologist. University of Iowa, Iowa City.
- Gnabasik, V.  
1994 *A Phase I and II Cultural Resources Investigation of Various Farmstead Sites at Camp Ripley, Morrison County, Minnesota*. Draft report prepared for the Minnesota Department of Military Affairs, U.S. Army Corps of Engineers, St. Paul District.
- Goddard, I.  
1978 Mascouten. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 15, *Northeast*, edited by B. G. Trigger, pp. 668-672. Smithsonian Institution, Washington, D.C.
- Goetzinger, W. F. and E. Johnson  
1967 An Unusual Burial in Grant County (Site 21GR4). *Minnesota Archaeologist*, 29(2):48-51.
- Goldman-Finn, N. S., W. Green, and E. A. Bettis III  
1991 The Archaic-Woodland Transition in the Upper Mississippi Valley. Paper Presented at the 36th Annual Midwest Archaeological Conference, La Crosse, Wisconsin, October 18-20, 1991.
- Goldstein, L.  
1979 *An Archaeological Survey of Portions of the Crawfish and Rock River Drainages Near Their Confluence in Jefferson County, Wisconsin*. Report of Investigations No. 32. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1980 *Mississippian Mortuary Practices A Case Study of Two Cemeteries in the Lower Illinois Valley*. Scientific Papers No. 4. Northwestern University Archeological Program, Evanston, Illinois.  
1981 *A Continuing Survey of Portions of the Rock River Drainage in Jefferson County, Wisconsin*. Report of Investigations No. 52. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1982 *Archaeology in the Southeastern Wisconsin Glaciated Region: Phase I*. Report of Investigations No. 64. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1983 *The Southeastern Wisconsin Archaeology Project: 1982-83*. Report of Investigations No. 82. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1987a *The Southeastern Wisconsin Archaeology Project: 1986-87 & Project Summary*. Report of Investigations No. 88. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1987b The Context of the Hensler Petroglyphs and Its Implication. *The Wisconsin Archeologist* 68(4):412-418.  
1989 The Klug Island Site (47 Oz-67), Ozaukee County, Wisconsin. In *Southeastern Wisconsin Archaeology Project: 1988-89*, edited by L. Goldstein, E. D. Benchley, and J. L. Kolb. Report of Investigations No. 101. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- 1991a The Implications of Aztalan's Location. In *New Perspectives on Cabokia: Views from the Periphery*, edited by J. B. Stoltman, pp. 209-227. Monographs in World Archaeology No. 2. Prehistory Press, Madison.  
1991b Late Woodland Study Unit. In *The Southeastern Wisconsin Archaeology Program: 1990-91*, edited by L. Goldstein. Report of Investigations No. 107. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1992 *The Southeastern Wisconsin Archaeology Project: 1991-92*. Report of Investigations No. 112. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1994 *The Southeastern Wisconsin Archaeology Project: 1993-94*. Report of Investigations No. 121. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1995a *The Southeastern Wisconsin Archaeology Project: 1994-95*. Report of Investigations No. 125. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1995b Landscapes and Mortuary Practices: A Case for Regional Perspectives. In *Regional Approaches to Mortuary Analysis*, edited by L. A. Beck, pp. 101-121.
- Goldstein, L., E. D. Benchley, and J. L. Kolb  
1989 *Southeastern Wisconsin Archaeology Program: 1988-89*. Report of Investigations No. 101. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Goldstein, L., P. B. Bruhy, and J. G. Stark  
1983 Historic Occupation and Settlement. In *The Southeastern Wisconsin Archaeology Project: 1982-83*, edited by L. Goldstein, pp. 57-73. Report of Investigations No. 68. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Goldstein, L. and R. Kind  
1987 The Early Vegetation of the Region. In *The Southeastern Wisconsin Archaeology Program: 1986-87* edited by L. Goldstein, pp. 18-37. Report of Investigations No. 88. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Goldstein, L. G. and J. D. Richards  
1991 Ancient Aztalan: The Cultural and Ecological Context of a Late Prehistoric Site in the Midwest. In *Cabokia and the Hinterlands*, edited by T. E. Emerson and R. B. Lewis, pp. 193-206. University of Illinois Press, Urbana.
- Goldstein, L. and N. C. Sullivan  
1986 People as Food, Bone as Ritual: Rethinking Old Data. Paper presented at the Annual Meeting of the Society for American Archaeology, New Orleans, May.
- Gonsior, L., L. Schuster, and J. Myster  
1994 *A Study of Six Galena Chert Acquisition Sites in Fillmore County*. Report prepared for submission to the Minnesota Department of Transportation, SHPO Referral Number 92-1144. St. Paul.
- Goodman, A. H., G. J. Armelagos, and J. C. Rose  
1980 Enamel Hypoplasias as Indicators of Stress in Three Prehistoric Populations. *Human Biology* 52:515-528.
- Goodyear, A. C.  
1982 The Chronological Position of the Dalton Horizon in the Southeastern United States. *American Antiquity* 47:382-395.
- Gough, B. M. (editor)  
1988 *The Journal of Alexander Henry, The Younger 1799-1814*, 2 Volumes. The Champlain Society, Toronto.
- Gourley, K. E. M.  
1983a *The Southern Iowa Rivers Basin An Archaeological Overview*. Iowa River Basins Report Series, Vol. 1. Office of Historic Preservation. Iowa State Historical Department, Des Moines.  
1983b An Archaeological Survey of Central Iowa. Manuscript prepared for the Office of Historic Preservation, Iowa State Historical Department, Des Moines.  
1984 *The Skunk River Basin An Archaeological Overview*. Iowa River Basins Report Series, Volume 2. Office of Historic Preservation. Iowa State Historical Department, Des Moines.  
1990 *Locations of Sauk, Mesquakie, and Associated Euro-American Sites 1832 to 1845: and Ethnohistoric Approach*. Unpublished Master's thesis. Department of Sociology and Anthropology, Iowa State University, Ames.

- Gradwohl, D. M.  
 1967 A Preliminary Precip of the Moingona Phase, an Oneota Manifestation in Central Iowa. *Plains Anthropologist* 12(36):211-212.  
 1969 *Prehistoric Villages of Eastern Nebraska*. Publications in Anthropology No. 4. Nebraska State Historical Society, Lincoln.  
 1973 *Final Report on Investigation of Archaeological Sites in Red Rock Reservoir, Iowa*. Contracts 14-10-0232-920 and 14-10-0232-1164 between the National Park Service and Iowa State University. Research Report. Iowa State University Archaeological Laboratory, Ames.  
 1974 Archaeology of the Central Des Moines River Valley: A Preliminary Survey. In *Aspects of Upper Great Lakes Anthropology, Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 90-102. Minnesota Prehistoric Series 11. Minnesota Historical Society, St. Paul.  
 1975 *Final Report on the Investigation of Archaeological Sites in Saylorville Reservoir, Iowa, as Covered in Four Contracts between the National Park Service and Iowa State University*. Archaeological Laboratory. Iowa State University, Ames.  
 1982 Shelling Corn in the Prairie-Plains: Archeological Evidence and Ethnographic Parallels beyond the Pun. In *Plains Indian Studies A Collection of Essays in Honor of John C. Ewers and Waldo R. Wedel*, edited by D. H. Ubelaker and H. J. Viola, pp. 135-156. Smithsonian Contributions to Anthropology No. 30. Smithsonian Institution. Washington, D.C.
- Gradwohl, D. M., and N. M. Osborn  
 1973 *Site Seeking in Saylorville*. Research Report. Iowa State University Archaeological Laboratory, Ames, Iowa.  
 1974 *More Site Seeking in Saylorville*. Research Report. Iowa State University Archaeological Laboratory. Ames, Iowa.  
 1975 *Still More Site Seeking in Saylorville*. Research Report. Iowa State University Archaeological Laboratory, Ames.  
 1976 *Continued Site Seeking in Saylorville*. Research Report. Iowa State University Archaeological Laboratory, Ames.  
 1984 *Exploring Buried Buxton: Archaeology of an Abandoned Iowa Coal Mining Town with a Large Black Population*. Iowa State University Press, Ames.
- Graham, W. R. and J. I. Mead  
 1987 Environmental Fluctuations and the Evolution of Mammalian Faunas during the Last Deglaciation in North America. In *North America and Adjacent Oceans during the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 371-402. The Geology of North America, Vol. K-3.
- Grant, P  
 1960 The Santeux Indians About 1804. *Les Bourgeois De La Compagnie Du Nord-Quest* 2:303-366. L.R. Masson, editor. Reprint. Antiquarian Press, New York.
- Grantham, L.  
 n.d. Draft Preliminary Cultural Resources Management Plan for Rathbun Lake. Ms. on file, Kansas City District, U.S. Army Corps of Engineers.
- Grayson, D. K.  
 1977 Pleistocene Avifaunas and the Overkill Hypothesis. *Science* 189:691-692.
- Great Lakes Archeology Research Center  
 n.d. *Archaeological Survey of the Green Bay Coastal Corridor*. I. Survey Results, II. Appendices. Report of Investigations #87, Parts I and II, Milwaukee..
- Green, W.  
 1987 *Between Hopewell and Mississippian: Late Woodland in the Prairie Peninsula as Viewed from the Western Illinois Uplands*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin-Madison.  
 1991a The Paul Rowe Archaeological Collection: A Key to Central Plains Prehistory. *Plains Anthropologist* 36(133):79-85.  
 1991b *Alton K. Fisher 1905-1991*. Unpublished Obituary, Manuscript on File, Office of the State Archaeologist, Iowa City.  
 1992a The Weaver Ring-Midden Community at Gast Farm (13LA12): An Example of a Pan-Midwestern Early Late Woodland Village Organization Pattern. Paper Presented at the 57th Annual Meeting of the Society for American Archaeology. April 8-12, 1992. Pittsburgh, Pennsylvania.  
 1992b Charles Reuben Keyes and the History of Iowa Archaeology. *Journal of the Iowa Academy of Science* 99(4):80-85.  
 1993a *Mapping of the Toolesboro Mounds Historic Site (13LA29), Louisa County, Iowa*. Contract Completion Report 378. Office of the State Archaeologist. University of Iowa, Iowa City.  
 1993b Examining Protohistoric Depopulation in the Upper Midwest. *The Wisconsin Archeologist* 74:284-317.
- Green, W. (editor)  
 1990 *Glenwood Culture Paleoenvironment and Diet*. Research Papers 15(6). Office of the State Archaeologist. University of Iowa, Iowa City.  
 1992 Mills County Archaeology. The Paul Rowe Collection and Southwestern Iowa Prehistory. *Research Papers* 17(5). Office of the State Archaeologist, Iowa City.
- Green, W. and J. Behm  
 1980 Excavation of the DuPont Mound, Dane County, Wisconsin. *The Wisconsin Archeologist* 61(4):452-479.
- Green, W., J. L. Cordell, K. K. Hirst, and J. L. Theler  
 1990 Progress Report on Analysis of Avian, Reptile, Amphibian, and Pelecypod (Bivalve Mollusk) Remains from 13ML176. In *Glenwood Culture Paleoenvironment and Diet: Analysis of Plant and Animal Remains from the Wall Ridge Earthlodge (13ML176), Mills County, Iowa*, edited by William Green, pp. 29-32. Research Papers 15(6). Office of the State Archaeologist. University of Iowa, Iowa City.
- Green, W., C. E. Haury, and J. L. Cordell  
 1992 Documenting Southwestern Iowa Prehistory through the Paul Rowe Collection. *Journal of the Iowa Archeological Society* 39:1-14.
- Green, W., and C. A. Merry  
 1988 The Location of the Turkey River Winnebago Agency Complex. In *Archaeological and Paleoenvironmental Studies in the Turkey River Valley, Northeastern Iowa*, edited by William Green, pp. 228-231. Research Papers 13(1). Office of the State Archaeologist. The University of Iowa, Iowa City.
- Green, W. and R. L. Rodell  
 1994 The Mississippian Presence and Cahokia Interaction at Trempealeau, Wisconsin. *American Antiquity* 59(2): 334-358.
- Green, W., and S. J. Schermer  
 1988 The Turkey River Mound Group (13CT1). In *Archaeological and Paleoenvironmental Studies in the Turkey River Valley, Northeastern Iowa*, edited by W Green, pp. 131-198. Research Papers 13(1). Office of the State Archaeologist. The University of Iowa, Iowa City.
- Green, W., J. B. Stoltman, and A. B. Kehoe, eds.  
 1986 Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning. *The Wisconsin Archeologist* 67(3-4).
- Green, W., and R. Wallace  
 1991 Woodland Community Definition at the Gast Farm Site (13LA12), Louisa County, Iowa. Paper presented at the 36th Annual Midwest Archaeological Conference, October 8-10, 1991. La Crosse, Wisconsin.
- Greenman, E. F.  
 1951 *Old Birch Island Cemetery and the Early Historic Trade Route, Georgian Bay, Ontario*. Occasional Contributions from the Museum of Anthropology of the University of Michigan, No. 11, Ann Arbor.
- Gregg, M. L.  
 1974 Three Middle Woodland Sites from Henderson County, Illinois: An Apparent Congruity with Middle Woodland Subsistence-Settlement Systems in the Lower Illinois Valley. *Wisconsin Archeologist* 55(3):231-245.
- Grewal, M. S.  
 1962 The Rate of Genetic Divergence of Sublines in the C57BL Strain of Mice. *Genetical Research* 3:226-237.
- Griffin, J. B.  
 1937 The Archaeological Remains of the Chiwere Sioux. *American Antiquity* 2:180-181.  
 1946 Culture Change and Continuity in Eastern United States Archaeology. In *Man in Northeastern North America*, edited by F.S. Johnson. Papers of the Robert S. Peabody Foundation for Archaeology 3. Phillips Academy, Andover, Massachusetts.

- 1952 Culture Periods in Eastern United States Archaeology. In *Archaeology of the Eastern United States*, edited by J. B. Griffin. University of Chicago Press.
- 1960a A Hypothesis for the Prehistory of the Winnebago. In *Culture in History: Essays in Honor of Paul Radin*, edited by S. Diamond, pp. 809-868. Columbia University Press, New York.
- 1960b Climatic Change: A Contributory Cause of the Growth and Decline of Northern Hopewellian Culture. *Wisconsin Archeologist* 41:21-33.
- 1961 Some Correlation of Climatic and Cultural Change in Eastern North American Prehistory. *Annals of the New York Academy of Sciences* 95:710-717.
- 1964 The Northeast Woods Area. In *Prehistoric Man in the New World*, edited by J. D. Jennings and E. Norbeck, pp. 223-258. University of Chicago Press, Chicago.
- 1967 Eastern North American Archeology: A Summary. *Science* 156(3772):175-191.
- 1970 Introduction. In *The Burial Complexes of the Knight and Norton Mounds in Illinois and Michigan*, edited by J. B. Griffin, R. E. Flanders, and P. F. Titterington, pp. 1-10. University of Michigan Museum of Anthropology Memoir 2. Ann Arbor, Michigan.
- 1978 The Midlands and Northeastern United States. In *Ancient Native Americans*, edited by J. D. Jennings, pp. 221-280. W. H. Freeman and Company, San Francisco.
- 1979 An Overview of the Chillicothe Hopewell Conference. In *Hopewell Archaeology: The Chillicothe Conference*, edited by D. S. Brose and N. Greber, pp. 266-279. Kent State University Press, Kent, Ohio.
- 1986 Comments on the Kampsville Early Woodland Conference. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 609-620. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- Griffin, J. B. (editor)
- 1950 *Archaeology of the Eastern United States*. University of Chicago Press, Chicago.
- 1961 *Lake Superior Copper and the Indians: Miscellaneous Studies of Great Lakes Prehistory*. Museum of Anthropology, Anthropological Papers No. 17, University of Michigan, Ann Arbor.
- Griffin, K. L. and D. L. Lehman
- 1985 *Final Report on a 1994 Cultural Resources Survey of Lands on the Nicolet National Forest*. Report of Investigations No. 79. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Grimm, E. C.
- 1981 *An Ecological and Paleoecological Study of the Vegetation in the Big Woods Region of Minnesota*. Unpublished Ph.D. dissertation, University of Minnesota, Minneapolis.
- Grissel, L. A.
- 1946 *An Analysis of a Prehistoric Indian Site near Cedar Rapids, Iowa*. Unpublished Master's thesis. Department of History. University of Iowa. Iowa City, Iowa.
- Gummerman, G. J. and D. A. Phillips
- 1978 Archaeology beyond Anthropology. *American Antiquity* 43:184-191.
- Gunnerson, J. H.
- 1952 Some Nebraska Culture Pottery Types. *Plains Archeological Conference Newsletter* 5(3):39-49.
- Gussow, Z.
- 1974a An Anthropological Report on Indian Use and Occupancy of Royce Areas 69 and 120 which were ceded to the United States by the Sac, Fox, and Iowa Indians under the Treaty of August 4, 1824. In *Sac, Fox, and Iowa Indians*, edited by D. A. Horr, pp. 29-120. Three Volumes. American Indian Ethnohistory North Central and Northeastern Indians. Garland, New York.
- 1974b An Ethnological Report on the Historic Habitat of the Sauk, Fox, and Iowa Indians. In *Sac, Fox, and Iowa Indians*, edited by D. A. Horr, pp. 121-184. Three Volumes. American Indian Ethnohistory North Central and Northeastern Indians. Garland, New York.
- Haas, D. R.
- 1983 *Walker Gilmore: A Stratified Woodland Period Occupation in Eastern Nebraska*. Laboratory Notebook No. 6. Division of Archeological Research. University of Nebraska. Lincoln, Nebraska.
- Haas, J. R.
- 1993 Vertebral Pathology in the MCIG Population: A Preliminary Analysis. Paper presented at the Midwest Archaeological Conference, Milwaukee, Wisconsin.
- Hagan, W. T.
- 1958 *The Sac and Fox Indians*. University of Oklahoma Press, Norman.
- Hall, R. L.
- 1950 A Style Analysis of Wisconsin Woodland Pottery. *The Wisconsin Archeologist* 31(1):1-42.
- 1962a A Newly Designated Pottery Type from Northern Illinois. Type description of Starved Rock Collared mimeographed for distribution to participants in a symposium on Late Woodland Pottery at the Midwest Archaeological Conference, Springfield, Illinois.
- 1962b *The Archeology of Carcajou Point: With an Interpretation of the Development of Oneota Culture in Wisconsin*. Two Volumes. University of Wisconsin Press, Madison.
- 1967 The Mississippian Heartland and Its Plains Relationship. *Plains Anthropologist* 12:175-183.
- 1973 An Interpretation of the Two-Climax Model of Illinois Prehistory. Paper Presented at the IX International Congress of Anthropological and Ethnological Sciences. Chicago.
- 1976 Ghosts, Water Barriers, Corn and Sacred Enclosures in the Eastern Woodlands. *American Antiquity* 41:360-364.
- 1979 In Search of the Ideology of the Adena Hopewell Complex. In *Hopewell Archaeology: The Chillicothe Conference*. Edited by D.S. Brose and N. Greber. Kent State University Press, Kent, Ohio.
- 1980 An Interpretation of the Two-climax Model of Illinois Prehistory. In *Early Native Americans: Prehistoric Demography, Economy, and Technology*, edited by D. L. Browman, pp. 401-462. Mouton Publishers. The Hague, Belgium.
- 1986 Upper Mississippi and Middle Mississippi Relationships. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 365-369. The Wisconsin Archeologist 67(3-4).
- 1987 Type Description of Starved Rock Collared. *The Wisconsin Archeologist* 68(1):65-70.
- 1991 Cahokia Identity and Interaction Models of Cahokia Mississippian. In *Cahokia and the Hinterlands*, edited by T. E. Emerson and R. B. Lewis, pp. 3-34. University of Illinois Press, Urbana.
- 1993 Red Banks, Oneota, and the Winnebago: Views From a Distant Rock. *Wisconsin Archeologist* 74(1-4): 10-79
- Hallberg, G. R.
- 1980 *Pleistocene Stratigraphy in East-Central Iowa*. Technical Information Series No. 10. Iowa Geological Survey, Iowa City.
- 1986 Pre-Wisconsinan Glacial Stratigraphy of the Central Plains Region in Iowa, Kansas, and Missouri. In *Quaternary Glaciations in the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond, pp. 11-15. Quaternary Science Reviews 5.
- Hallberg, G. R., and J. D. Boellstorff
- 1978 Stratigraphic "Confusion" in the Region of the Type Areas of Kansan and Nebraskan Deposits. *Geological Society of America, Abstracts and Programs* 10(6):255.
- Halsey, J. R.
- 1972 The Molash Creek Red Ocher Burial. *The Wisconsin Archeologist* 53(1):1-14.
- 1974a The M.ee Site (47 Ve-195): An Early-Middle Archaic Campsite in the Kickapoo River Valley. *The Wisconsin Archeologist* 55(1):42-74.
- 1974b Gillen 9 (47 Ve-177): An Archaic-Woodland Campsite in the Kickapoo River Valley. *The Wisconsin Archeologist* 55(3):178-217.
- 1976 Bard Lawrence I Rockshelter (47 Ve-154). In *Report on the Archaeological Investigations in the LaFarge Lake Project Area, 1973 and 1974 Seasons*, edited by J. R. Halsey. Report submitted to the National Park Service. Ms. on file, State Historical Society of Wisconsin.
- Halsey, J. R. and P. H. Salkin
- 1974 *Earl II Site II (The Early Mound Group) 47 VE 50*. Report submitted to the National Park Service, on file at the Wisconsin State Historical Society.

- Hamilton, K.  
1988 Archaeological and Historical Survey of the Zerrenner Brickyard (47 Ou-101), Outagamie County, Wisconsin. Ms. on file, State Historical Society of Wisconsin.
- Hannus, L. Adrien  
1984 Evaluation of the Impact of Gravel Quarrying Activities at the Blood Run National Historic Landmark Site, Lyon County, Iowa. Ms. on file, Office of the State Archaeologist. University of Iowa, Iowa City.
- Hansel, A. K., D. M. Mickelson, A. F. Schneider, and C. E. Larsen  
1985 Late Wisconsinan and Holocene History of the Lake Michigan Basin. In *Quaternary Evolution of the Great Lakes*, edited by P. F. Karrow and P. E. Calkin, pp. 39-53. Geological Association of Canada Special Paper 30.
- Harlan, E. R.  
1908 Boone Mound Exploration. *Annals of Iowa, 3rd series* 8:467-469.  
1910 System in Mound Exploration. *Annals of Iowa, 3rd Series* 9(4):311-313.  
1914 Proposed Archaeological Survey of Iowa. *Annals of Iowa, 3rd Series* 11(5):382.  
1934 Indian Mounds of Southeastern Iowa. *Annals of Iowa* 19(5):387-394.
- Harn, A.  
1975 Cahokia and Mississippian Emergence in the Spoon River Area of Illinois. *Transactions of the Illinois Academy of Science* 68:414-434.  
1991 The Eveland Site: Inroad to Spoon River Mississippian Society. In *New Perspectives on Cahokia Views from the Periphery*, edited by J. B. Stoltman, pp. 129-153. Monographs in World Archaeology No. 2. Prehistory Press, Madison, Wisconsin.
- Harris, S.  
1993 Rare Light on Indian Lives at Time of European Arrival. *Wisconsin Archaeologist* 74:422-429.
- Harrison, C.  
1978 Report on an archaeological survey of Anoka and Isanti Counties. Ms. on file, Minnesota Historical Society, St. Paul.  
1985 *The Archaeology of Two Lakes in Minnesota*. Bureau of Land Management Cultural Resource Series No. 2. Bureau of Land Management Eastern States Office, Alexandria, VA.  
1990 The Terminal Woodland Period of Northwestern Wisconsin: A Study Unit. Ms. on file, State Historical Society of Wisconsin.  
1991 The Archaic Period of Northwestern Wisconsin: A Study Unit. Ms. on file, State Historical Society of Wisconsin.
- Harrison, C. E., and W. H. Pratt  
1893 Additional Explorations at Toolesboro. *Proceedings of the Davenport Academy of Natural Sciences* 5:43-44.
- Harrison, C. et. al. (Redepenning, Hill, Rapp, Aschenbrenner, Huber, Mulholland)  
1995 *The Paleo-Indian of Southern St. Louis County, Minnesota: The Reservoir Lakes Complex*. Archaeometry Laboratory, University of Minnesota/Duluth.  
1887b Quartz workers of Little Falls. *American Antiquarian*, March. 8. St. Paul.  
1990 Post-Archaic Rock Art in the Western Great Lakes. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Eldon Johnson*, edited by G. E. Gibbon, pp. 167-194, Publications in Anthropology No. 4, Dept. of Anthropology, University of Minnesota, Minneapolis.
- Hart, I. H.  
1956 An Amateur Archaeologist in Northern Minnesota. *Minnesota Archaeologist* 20(2):1-20.
- Harvey, A.  
1979 *Oneota Culture in Northwestern Iowa*. Report 12. Office of the State Archaeologist. University of Iowa, Iowa City.
- Harvey, H. M. W.  
1944 Some Caves and Pictographs Near the Harvey Rock Shelter. *Minnesota Archaeologist* 10:124-129.
- Hasse, B.  
1969 A Survey of Sites in Central Carver County, Minnesota. *Minnesota Archaeologist* 30(1):3-26.
- Hassen, H., and K. B. Farnsworth  
1987 *The Bullseye Site: A Floodplain Archaic Mortuary Site in the Lower Illinois River Valley*. Report of Investigations 42. Illinois State Museum, Springfield.
- Haury, C. E.  
1993 Theodore Hayes Lewis: The Northwestern Archaeological Survey in Iowa. *Journal of the Iowa Archeological Society* 40:82-87.
- Haywood, N.  
1991 A Phase II Archaeological Evaluation of the Bowling Lane Site, A Multicomponent Site in Douglas County, Wisconsin. Ms. on file, State Historical Society of Wisconsin.
- Heinselman, M. L.  
1974 *Interpretation of Francis J. Marschner's Map of the Original Vegetation of Minnesota*. U.S. Forest Service North Central Experiment Station, St. Paul.
- Hegmon, M.  
1992 Archaeological Research on Style. *Annual Review of Anthropology* 21:517-536.
- Helmen, V. R.  
1963 Salvage Archaeology at the Science Museum. *Museum Observer* 3:10-12 (No. 2). The Science Museum, St. Paul.  
1964 The Berscheid Site (21T01) Todd County, Minnesota. *The Minnesota Archaeologist* 26(3):44-69.
- Hennepin, L.  
1903 *A New Discovery of a Vast Country in America*, 2 Volumes, edited by R. G. Thwaites. A.C. McClurg, Chicago.  
1938 *Description of Louisiana, Newly Discovered to the Southwest of New France by Order of the King*. Translated by Marion E. Cross. University of Minnesota Press, Minneapolis.
- Henning, D. R.  
1961 *Oneota Ceramics in Iowa*. Journal of the Iowa Archeological Society 11(2)(whole volume).  
1967 Mississippian Influences on the Eastern Plains Border: An Evaluation. *Plains Anthropologist* 12:184-194.  
1970 *Development and Interrelationships of Oneota Culture in the Lower Missouri River Valley*. The Missouri Archaeologist 32.  
1971a Great Oasis Culture Distributions. In *Prehistoric Investigations*, edited by M. B. McKusick, pp. 125-133. Report 3. Office of the State Archaeologist. University of Iowa, Iowa City.  
1971b Origins of Mill Creek. *Journal of the Iowa Archeological Society* 18:6-13.  
1980 *A Prehistoric Cultural Resources Survey in the Proposed Perry Creek Reservoir*. Technical Report No. 80-10. Division of Archaeological Research, Department of Anthropology. University of Nebraska, Lincoln.  
1982a *Subsurface Testing Program: Proposed Perry Creek Dam and Reservoir Area, Plymouth County, Iowa*. Technical Report No. 82-05. Division of Archeological Research. Department of Anthropology. University of Nebraska, Lincoln.  
1982b *Evaluative Investigations of Three Landmark Sites in Northwestern Iowa*. Luther College Archaeological Research Center. Decorah, Iowa. Report prepared for the Division of Historic Preservation, Iowa State Historical Department, Des Moines.  
1983 The Oneota Cultural Tradition. In *Archaeology of the Northern Border Pipeline: Minnesota* Volume 1, edited by G. J. Hudak, pp. 4.66-4.79, Archaeological Field Services, Stillwater, Minnesota.  
1987 Future Requirements Blood Run Landmark Site Research and Development. Luther College Archeological Research Center. Decorah, Iowa. In *Preliminary Report on the 1986 Limited Survey at the Blood Run National Historic Landmark Site Lyon County, Iowa*, by S. J. Schermer, Appendix F, pp. 99-124. Contract Completion Report 248. Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.  
1989 Plains Village Tradition: Eastern Periphery. Ms. on file, Luther College, Decorah, Iowa.  
1991 Great Oasis and Emergent Mississippian: The Question of Trade. *Journal of the Iowa Archeological Society* 38:1-4.  
1992 *A Study of Pottery from the Blood Run Site (13L02), 1985 Excavations*. Luther College Archaeological Research Center. Decorah, Iowa. Report prepared for the Bureau of Historic Preservation. State Historical Society of Iowa, Des Moines.

- 1995a Managing Oneota. Paper presented at the 40th Annual Meeting of the Midwest Archaeological Conference, South Beloit, Illinois.
- 1995b Oneota Evolution and Interactions: A Perspective from the Wever Terrace, Southeast Iowa. In *Oneota Archaeology: Past, Present, and Future*, edited by W. Green, pp.65-90. Report 20. Office of the State Archaeologist, University of Iowa. Iowa City, Iowa.
- n.d. Plains Villagers: Eastern Periphery of the Plains. Ms. on file, Department of Anthropology, University of Nebraska.
- Henning, D. R. (editor)
- 1968/1969 *Climatic Change and the Mill Creek Culture of Iowa*. Journal of the Iowa Archeological Society 15 and 16, whole volumes.
- 1974 The Cherokee Sewer Site (13CK405): A Preliminary Report of a Stratified Paleo-Indian/Archaic Site in Northwestern Iowa. *Journal of Iowa Archeological Society* 21.
- Henning, D. R., and D. C. Anderson
- 1985 *The Blood Run Archaeological Site: A Landmark in Plains-Midwestern Prehistory*. An evaluative report submitted August 20, 1985. Luther College Archaeological Research Center, Decorah, Iowa, and the Office of the State Archaeologist, University of Iowa, Iowa City.
- Henning, D. R., and E. R. P. Henning
- 1978 Great Oasis Ceramics. In *Some Studies of Minnesota Prehistoric Ceramics: Papers Presented at the First Council for Minnesota Archeology Symposium- 1976*, edited by A. R. Woolworth and M. A. Hall, pp. 12-26. Occasional Publications in Minnesota Anthropology No. 2. Minnesota Historical Society, St. Paul.
- 1982 Mill Creek and Great Oasis Sites. In *Interrelations of Cultural and Fluvial Deposits in Northwest Iowa*, edited by E. A. Bettis III, and D. M. Thompson, pp. 15-27. Guidebook and Short Papers prepared for a Field Trip to Plymouth County, and the Spring Meeting of the Association of Iowa Archaeologists, April 3-4, 1982. University of South Dakota Archaeology Laboratory, Vermillion.
- Henning, D. R. and M. Q. Peterson
- 1965 Re-Articulated Burials from the Upper Iowa River Valley. *Journal of the Iowa Archeological Society* 13: 1-16.
- Henning, D. R., J. E. Saunders, T. K. Donham, and R. D. Mandel
- 1982 *Cultural Resources of the CBD Loop Arterial Project Area Phase I Investigations*. Brice Petrides and Associates. Waterloo, Iowa. Report prepared for the Iowa Department of Transportation, Ames.
- Henning, D. R., and S. J. Schermer
- 1985 Blood Run Excavations-1985. *Iowa Archeological Society Newsletter* 35(3):1- 2.
- Henning, E. R. P.
- 1981 Great Oasis and the Middle Missouri Tradition. In *The Future of South Dakota's Past*, edited by L. J. Zimmerman and L. C. Stewart, pp. 33-38. Special Publication of the South Dakota Archaeological Society Number 2. University of South Dakota Archaeology Laboratory, Vermillion.
- 1985 *Initiating the Resource Protection Planning Process in Iowa*. Office of Historic Preservation. Iowa State Historical Department, Des Moines.
- Henning, E. R. P., and D. R. Henning
- 1982 Great Oasis - Mill Creek Interrelationships. In *Interrelations of Cultural and Fluvial Deposits in Northwest Iowa*, edited by E. A. Bettis III, and D. M. Thompson, pp. 10-14. Guidebook and Short Papers prepared for a Field Trip to Plymouth County, and the Spring Meeting of the Association of Iowa Archaeologists. April 3-4, 1982. University of South Dakota Archaeology Laboratory, Vermillion.
- Henry, A.
- 1901 *Travels and Adventures in Canada and the Indian Territories Between the Years 1760 and 1776*. J. Bain, editor. Little Brown, Boston.
- 1969 *Travels and adventures in Canada and the Indian territories between the years 1760 and 1776*. J. Bain, editor. Ben Franklin, New York.
- Henshaw, H. W.
- 1883 *Animal Carvings from Mounds of the Mississippi Valley*. 2nd Annual Report:117- 166. United States Bureau of Ethnology. Washington, D.C.
- Hermann, R.
- 1906 Mound Builders of the Mississippi Valley. *Records of the Past* 5(8):236-239.
- 1907 Mound Builders of the Mississippi Valley. *Records of the Past* 6(2):79-82.
- 1908 A Probable Origin for the Custom of Mound Building. *Records of the Past* 7(4):188-190.
- Herold, E. B.
- 1971 *The Indian Mounds at Albany, Illinois*. Davenport Museum Anthropological Papers No. 1. Davenport, Iowa.
- Herold, E. B., P. J. O'Brien, and D. J. Wenner
- 1990 Hoxie Farm and Huber: Two Upper Mississippian Archaeological Sites in Cook County, Illinois. In *At the Edge of Prehistory: Huber Phase Archaeology in the Chicago Area*, edited by J. A. Brown and P. J. O'Brien, pp. 1-119. Illinois Department of Transportation, Springfield and Center for American Archaeology, Kampsville, Illinois.
- Hess, D.
- 1989 Minnesota Military Roads. National Register of Historic Places Multiple Property Documentation Form on file at the Minnesota Historical Society, St. Paul.
- Hewes, G. H.
- 1949 Burial Mounds in the Baldhill Area, North Dakota. *American Antiquity*, 14:322-328.
- Hickerson, H.
- 1962 *The Southwestern Chippewa: An Ethnohistorical Study*. American Anthropologist, Memoir 92.
- 1970 *The Chippewa and Their Neighbors: A Study in Ethnohistory*. Holt, Rinehart, and Winston, New York.
- 1974 An Anthropological Report on the Inian Occupancy of Area 289, which was Ceded to the United States by the Sisseton and Wahpeton Bands of Sioux Indians under the Treaty of July 23, 1851, and by the Mdewakanton and Wahpakoota Bands under the Treaty of August 5, 1851. In *Sioux Indians I: Mdewakanton Band of Sioux Indians*, pp. 255-300. Garland, New York.
- Higginbottom, D. K. and O. C. Shane II
- 1996 The Futed Point Traditions in Minnesota: An Overview with Suggestions for Future Research. Paper presented at the 54th Plains Anthropological Conference, Iowa City, Iowa.
- Hill, A. J.
- 1881 Proposal for a Survey of the Ancient Earthworks of Minnesota. November 30, 1881. Ms. in the Alfred J. Hill Papers. Minnesota Historical Society, St. Paul.
- 1964 *Diving into the Past: Theories, Techniques and Applications of Underwater Archaeology*. Minnesota Historical Society and Council of Underwater Archaeology, St. Paul.
- 1936 *Pleistocene Man in Minnesota: A Fossil Homo Sapiens*. University of Minnesota Press, Minneapolis.
- Hill, A. T., and P. Cooper
- 1937 The Archaeological Campaign of 1937. *Nebraska History Magazine* 18(4):243- 359.
- Hill, A. T., and W. R. Wedel
- 1936 Excavations at the Leary Indian Village and Burial Site, Richardson County, Nebraska. *Nebraska History Magazine* 17(1):2-73.
- Hill, M. G.
- 1994 Paleoindian Projectile Points for the Vicinity of Silver Mound (47 Ja-21), Jackson County, Wisconsin. *Midcontinental Journal of Archaeology* 19(2):223-259.
- Hirst, K. K.
- 1987 Fresh Water Mussel-Shell Tools Found at Glenwood Sites, Iowa. Paper Presented at the Plains Anthropological Conference, November 4-7. Columbia, Missouri.
- Hirt, D.
- 1977 The Erickson Farm Burials, 13HB101. *Research Papers* 2(06): 5-8. Office of the State Archaeologist, Iowa City.
- Hlady, W. M. (editor)
- 1950 Mound C, Fordville Mound Group, Walsh County, North Dakota: Its Excavation and Archaeology. *North Dakota History* 17:253-260.
- 1970 *Ten Thousand Years, Archaeology in Manitoba*. D.W. Friesen and Sons, Altona, Manitoba.

- Hodder, I.  
1986 *Reading the Past: Current Approaches to Interpretation in Archaeology*. Cambridge University Press, New York.
- Hodder, I. (editor)  
1978 *The Spatial Organization of Culture*. University of Pittsburgh Press, Pittsburgh.
- Hodder, I. and C. Orton  
1976 *Spatial Analysis in Archaeology*. Cambridge University Press, New York.
- Hodges, D. C.  
1989a Pine Creek Mounds (13MC44) Skeletal Remains. *Research Papers* 14(03): 15-51. Office of the State Archaeologist, Iowa City.  
1989b Report of Human Remains from Allamakee County, Iowa. *Research Papers* 14(03):52-57. Office of the State Archaeologist, Iowa City.  
1989c Cranial Fragment from the Lowry Farm Site, 13MC4. *Research Papers* 14(03): 58-59. Office of the State Archaeologist, Iowa City.  
1989d Human Cranium Donated by Maquoketa High School. *Research Papers* 14(03): 64-68. Office of the State Archaeologist, Iowa City.  
1989e Report of Human Calvaria from Butler County, 13BT0. *Research Papers* 14(03): 69-71. Office of the State Archaeologist, Iowa City.  
1990 Inventory and Description of Human Skeletal Remains from the DeCamp Site, 13DA64. *Research Papers* 15(05): 57-81. Office of the State Archaeologist, Iowa City.  
1993a Human Skeletal Remains from the Carter Denise Site, 13WD405, Woodbury County, Iowa. *Research Papers* 18(01): 35-42. Office of the State Archaeologist, Iowa City.  
1993b Human Skeletal Remains from the New Year Site, 13CK58, Cherokee County, Iowa. *Research Papers* 18(01): 43-60. Office of the State Archaeologist, Iowa City.  
1993c Human Skeletal Remains from the Indian Grave Site, 13DK401, Dickinson County, Iowa. *Research Papers* 18(01): 61-80. Office of the State Archaeologist, Iowa City.  
1994a Human Skeletal Remains from 13AM0i, Allamakee County, Iowa. *Research Papers* 19(01): 119-130. Office of the State Archaeologist, Iowa City.  
1994b Human Skeletal Remains from the Sanford Museum Collection, Cherokee, Iowa. *Research Papers* 19(01): 131-158. Office of the State Archaeologist, Iowa City.  
1994c A Human Mandible from 13WD6, The Correctionville Site, Woodbury County, Iowa. *Research Papers* 19(01): 159-164. Office of the State Archaeologist, Iowa City.  
1994d Human Skeletal Remains from the Dubuque County Historical Society, Ham House, Dubuque, Iowa. *Research Papers* 19(01): 165-212. Office of the State Archaeologist, Iowa City.
- Hodgson, N.  
1992 *Ancient Agriculture in Iowa: Paleoethnobotany of the Weaver Occupation at Gast Farm (13LA12), Louisa County, Iowa*. Unpublished Master's thesis. Department of Anthropology. University of Iowa, Iowa City.
- Hoffman, J. J.  
1965 *An Appraisal of the Archeological Resources of the Ratbun Reservoir, Iowa*. River Basin Surveys. Smithsonian Institution. Lincoln, Nebraska.
- Hoffman, R. S., and J. K. Jones, Jr.  
1970 Influence of Late-Glacial and Post-Glacial Events on the Distribution of Recent Mammals on the Northern Great Plains. In *Pleistocene and Recent Environments of the Central Great Plains*, edited by W. Dort, Jr., and J. K. Jones, Jr., pp 355-394. Special Publication 3. Department of Geology. University of Kansas, Lawrence.
- Holcomb, G. R.  
1952 *An Analysis of Human Remains from Aztalan*. Unpublished Master's thesis, Department of Anthropology, University of Wisconsin, Madison.
- Hole, F. D.  
1976 *Soils of Wisconsin*. University of Wisconsin Press, Madison.
- Holley, G. R.  
1989 The Archaeology of the Cahokia Mounds ICT-II: Ceramics. Illinois Historic Preservation Agency *Illinois Cultural Resources Study* No. 11. Springfield.
- Holliday, D. Y.  
1992 Analysis of Remains Recovered from the Island Village Site (47MN101/ BMN-102), Manitowoc County, Wisconsin. *Fox Valley Archeology* 19:1-9.
- Hollinger, R. E.  
1993 *Investigating Oneota Residence through Domestic Architecture*. Unpublished Master's thesis. Department of Anthropology. University of Missouri, Columbia.
- Hollinger, R. E. and J. A. Vradenburg  
1994 Report on Human Skeletal Remains from the Wever site (13LE110). Ms. on file in Burial Project File No. 645. Office of the State Archaeologist, University of Iowa, Iowa City.
- Hollow, R. C. and D. R. Parks  
1980 Studies in Plains Linguistics: A Review. In *Anthropology of the Great Plains*, edited by W. R. Wood and M. Liberty, pp. 68-97. University of Nebraska Press.
- Hotopp, J. A.  
1978a Settlement Patterns, Structures, and Temporal Placement of the Central Plains Tradition in Iowa. Unpublished Ph.D. dissertation. Department of Education. University of Iowa, Iowa City.  
1978b Glenwood: A Contemporary View. In *The Central Plains Tradition: Internal Developments and External Relationships*, edited by D. J. Blakeslee, pp. 109-133. Report 11. Office of the State Archaeologist. University of Iowa, Iowa City.  
1979 Test Excavations at the U.S. Gypsum Company, Fort Dodge, Iowa. *Research Papers* 4(04): 6-8. Office of the State Archaeologist, Iowa City.  
1980 Some Observations on the Central Plains Tradition in Iowa. In *Plains Indian Studies: A Collection of Essays in Honor of John C. Ewers and Waldo W. Wedel*. Smithsonian Contributions to Anthropology No. 30:173-192.  
1982 Some Observations on the Central Plains Tradition in Iowa. In *Plains Indian Studies: A Collection of Essays in Honor of John C. Ewers and Waldo W. Wedel*, pp. 173-192. Smithsonian Contributions to Anthropology No. 30.
- Hotopp, J. and A. K. Fisher  
1981 *13MN3 Burial Excavation Secondary Road L-20 Monona County*. Iowa Department of Transportation Project Completion Report 4(74): 1-14. Office of the State Archaeologist, Iowa City
- Hough, J. L.  
1963 The Prehistoric Great Lakes of North America. *American Scientist* 51:84-109.
- Howard, J.  
1965 *The Plains-Ojibwa or Bungi: Hunters and Warriors of the Northern Plains with Special Reference to the Turtle Mountain Band*. Anthropology Papers No. 1, South Dakota Museum, Vermillion.
- Howard, J. H.  
1960 The Cultural Position of the Dakota: A Reassessment. In *Essays in the Science of Culture in Honor of Leslie A. White*, edited by G. E. Dole and R. L. Carniero, pp. 249-268. T.Y. Crowell, New York.  
1966 *The Dakota or Sioux Indians*. Dakota Museum, University of South Dakota, Vermillion.  
1976 *Yanktonai Ethnohistory and the John D. Bear Winter Count*. Plains Anthropologist, Memoir 11.
- Hoyer, B. E.  
1980 The Geology of the Cherokee Sewer Site. In *The Cherokee Excavations: Holocene Ecology and Human Adaptations in Northwestern Iowa*, edited by D. C. Anderson and H. A. Semken, Jr., pp. 21-66. Academic Press, New York.
- Hrdlicka, A.  
1937 The Minnesota 'Man'. *American Journal of Physical Anthropology* 22(2):175-199.
- Hruby, T. H.  
1977 *Lithic Analysis of the Anderson Site (21AN8)*. Plan B Masters paper, Center for Ancient Studies, University of Minnesota, Minneapolis.
- Hruska, R.  
1967 The Riverside Site: A Late Archaic Manifestation in Michigan. *The Wisconsin Archeologist* 48(3):145-260.



- Hsu, T.  
1970 *An Analysis of the Reigh Site Old Copper Human Remains*. Unpublished Master's thesis, Department of Anthropology, University of Wisconsin, Madison.
- Huber, J. K. and G. Rapp, Jr.  
1992 Results of a Pollen Study from Southeast Kenosha County, Wisconsin. In *Archaeological Studies on the Southeast Wisconsin Uplands*, edited by D. F. Overstreet, pp. 73-94. Case Studies in Great Lakes Archaeology, No. 1. Great Lakes Archaeological Press, Milwaukee.
- Hudak, G. J.  
1976 *Woodland Ceramics from the Pedersen Site*. Scientific Publications of the Science Museum of Minnesota. New Series 3(2).  
1977 *The Pedersen Site (21LN2), Lincoln County, Minnesota*. Unpublished Master's thesis, Department of Anthropology, University of Nebraska, Lincoln.  
1978 A Description of the Early Middle Woodland Ceramics from the Pedersen site in Southwestern Minnesota. In *Some studies of Minnesota Prehistoric Ceramics: Papers presented at the First Council for Minnesota Archaeology Symposium 1976*, edited by A. Woolworth, and M. Hall, pp. 27-34.
- Hudak, G. J. and E. Johnson  
1975 *An Early Woodland Pottery Vessel from Minnesota*. Scientific Publications of the Science Museum of Minnesota New Series 2-4.
- Hudson, L.  
1974 *The Wolff Mound*. Sioux Archaeological Society, Worthington, MN.  
1991 The Coppers Creek Site: A Late Woodland Occupation on the Des Moines River. *Journal of the Iowa Archeological Society* 38:56-61.
- Hull, J. W., and P. Bargloff  
1966 Gillett Grove Revisited. *Iowa Archeological Society Newsletter* 40:9.
- Hume, I. N.  
1968 *Historical Archaeology*. Alfred Knopf, New York.
- Hurley, W. M.  
1965a Codification of Wisconsin's Archaeological Sites. *The Wisconsin Archeologist* 45(2):148-156.  
1965b Archeological Research in the Projected Kickapoo Reservoir, Vernon County, Wisconsin. *The Wisconsin Archeologist* 46(1):1-113.  
1966 *The Silver Creek Sites (47-MO-1 to MO-5): A Complex of Five Woodland Site Locations in Monroe County, Wisconsin*. Unpublished Master's thesis, University of Wisconsin, Madison.  
1974 *Silver Creek Woodland Sites, Southwestern Wisconsin*. Report 6, Office of the State Archaeologist, University of Iowa, Iowa City.  
1975 *An Analysis of Effigy Mound Complexes in Wisconsin*. Anthropological Papers No. 59. Museum of Anthropology, University of Michigan, Ann Arbor.  
1977 Aztalan Revisited. *The Wisconsin Archeologist* 58(4):256-294.  
1978 The Armstrong Site: A Silvernale Phase Oneota Village in Wisconsin. *The Wisconsin Archeologist* 59(1):1-145.  
1986 The Late Woodland Stage: Effigy Mound Culture. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 283-301. The Wisconsin Archeologist 67(3-4).
- Hurt, W. R., Jr.  
1952 *Report of the Investigation of the Scalp Creek Site 39GR1 and the Ellis Creek Site 39GR2, Gregory County, South Dakota*. Archaeological Studies Circular No. 4. South Dakota Archaeological Commission, Pierre.  
1954 Pottery Types of the Over Focus, South Dakota. In *Prehistoric Pottery of the Eastern United States*, edited by J.B. Griffin. Museum of Anthropology. University of Michigan, Ann Arbor.
- Hybbs, R. and J. A. Hess  
1990 Overland Staging Industry in Minnesota, 1849 - 1880. National Register of Historic Places Multiple Property Documentation Form on file at the Minnesota Historical Society, St. Paul.
- Hyde, S. C.  
1873 *Historical Sketch of Lyon County, Iowa, and a Description of the County and its Resources; Giving Information with Regard to the Inducements which it Offers to Immigrants and Others Desiring to Settle in the Northwest*. Perkins Brothers, Sioux City, Iowa.
- Innis, H. A.  
1973 *The Fur Trade in Canada. An introduction to Canadian Economic History*. Rec. ed., University of Toronto Press.
- Ives, J. C.  
1955 Glenwood Ceramics. *Journal of the Iowa Archeological Society* 4(3-4).  
1962 Mill Creek Pottery. *Journal of the Iowa Archeological Society* 11(3):1-59.
- Ives, J. C. (editor)  
1955 Turin Man. *Iowa Archeological Society Newsletter* 16:3-5.
- Jacobs, L. H., and C. A. Merry  
1986 An Outline of the Culture History of Southeastern Iowa. In *Archaeological Investigations along the F-518 Corridor: Phase III Mitigation at 13WS61, 13WS65, 13WS122, 13WS126*, edited by S. C. Lensink, pp. 246-253. Iowa Quaternary Studies Contribution 9. Iowa Quaternary Studies Group. University of Iowa, Iowa City.
- Jacobson, G. L., T. Webb III, and E. C. Grimm  
1987 Patterns and Rates of Vegetation Change during the Deglaciation of Eastern North America. In *North America and Adjacent Oceans during the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 277-288. The Geology of North America, Vol. K-3.
- Jaehrig, M. E. W.  
1975 *The Prehistoric Cultural Ecology of Eastern Iowa as Seen from Two Woodland Rockshelters*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin-Madison.
- James, G.  
1981 *Final Report to the State Historical Society of Wisconsin for Archaeological Investigations in Milwaukee County, Wisconsin, 1980-1981*. Report of Investigations No. 55. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- James, G. and E. D. Benchley  
1980 *Final Report to the State Historical Society of Wisconsin for Archaeological Investigations in Milwaukee County, Wisconsin, 1979-1980*. Report of Investigations No. 44. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- James, W. R., and H. Nichols  
1969 Pollen Analysis of Materials from the Phipps, Kimball, and Wittrock Sites in Iowa. In *Climatic Change and the Mill Creek Culture of Iowa: Part II*, edited by D. R. Henning, pp. 302-317. *Journal of the Iowa Archeological Society* 15.
- Janzen, D. R.  
1968 *The Naomikong Point Site and the Dimensions of Laurel in the Lake Superior Region*. University of Michigan Museum of Anthropology Anthropological Papers No. 59. Ann Arbor.
- Jenks, A. E.  
1900 The Wild Rice Gatherers of the Upper Lakes: A Study in American Primitive Economics. *19th Annual Report of the Bureau of American Ethnology for the Years 1897-1898*, pp. 1013-1137. Washington, D.C.  
1932a The Problem of the Culture from the Arvilla Gravel Pit. *American Anthropologist*, Vol 34, No. 3.  
1932b Unpublished field notes on file at the University of Minnesota, Minneapolis.  
1935 Recent Discoveries in Minnesota Prehistory. *Minnesota History*, 16:1-21.  
1936 *Pleistocene Man in Minnesota: A Fossil Homo sapiens*. Minneapolis: University of Minnesota Press.  
1937 *Minnesota's Browns Valley Man and Associated Burial Artifacts*. American Anthropological Association Memoirs No. 49.
- Jenks, A. E. and L. A. Wilford  
1938 Sauk Valley Skeleton. *Texas Archeological and Paleontological Society, Bulletin* 10:136-168.  
1974 Lloyd A. Wilford and Minnesota Archaeology. In *Aspects of Upper Great Lakes Anthropology*, edited by E. Johnson, pp 1 - 7. Minnesota Prehistoric Archaeology Series No. 11, Minnesota Historical Society, St. Paul.  
1990 Minnesota Anthropology to 1948. In *Culture and the Anthropological Tradition: Essays in honor of Robert F. Spencer*, edited by R. H. Winthrop, pp. 15-22. University Press of America, New York.

- Jenkins, N. J., D. H. Dye, and J. A. Walthall  
1986 Early Ceramic Development in the Gulf Coastal Plain. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 546-563. Kampsville Seminars in Archeology, Vol. 2. Center for American Archeology, Kampsville, Illinois.
- Jennings, J. D.  
1974 *Prehistory of North America*. McGraw-Hill, New York.
- Jenson, P. S.  
1959 *The Bremer Village and Mound Site*. Unpublished Master's thesis, Department of Anthropology, University of Minnesota, Minneapolis.
- Jensen, P. and W. Anderson  
1960 Rooney Burial Mound. *Minnesota Journal of Science* 3:21-28 (No. 4). Reprinted in St. Paul Institute, Science Museum, Science Bulletin, No. 7.
- Jeske, J. A.  
1927 The Grand River Mound Group and Camp Site. *Bulletin of the Public Museum of the City of Milwaukee* 3(2):139-214.
- Jeske, R. J.  
1990 Langford Tradition Subsistence, Settlement, and Technology. *Midcontinental Journal of Archaeology* 15(2):221-249.
- Johnson, A. E.  
In Press Plains Woodland. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 12, *Plains*. Smithsonian Institution Press, Washington, D.C.
- Johnson, A. E., and W. R. Wood  
1980 Prehistoric Studies on the Plains. In *Anthropology on the Great Plains*, edited by W. R. Wood and M. Liberty, pp. 35-51. University of Nebraska Press. Lincoln, Nebraska.
- Johnson, C.  
1974 House Four at the Broken Kettle West Site (13PM25). Ms. on file, Department of Anthropology, University of Nebraska.
- Johnson, E.  
1959 Spring Lake Archaeology: The Sorg Site. *Science Bulletin* 3-3, St. Paul Science Museum.  
1961 Cambria Burial Mounds in Big Stone County. *Minnesota Archaeologist* 23:53-81.  
1962a The Prehistory of the Red River Valley. *Minnesota History* 31(4):151-164.  
1962b An "Archaic" Burial Site in Minnesota, Site 21PO3. *Minnesota Archaeologist*, 23:52-81 (No. 3).  
1964a Twenty New Radiocarbon Dates From Minnesota. *The Minnesota Archaeologist* 26(2):5.  
1964b Copper Artifacts and Glacial Lake Agassiz Beaches. *Minnesota Archaeologist*, 26:5-22 (No. 1).  
1969a *Prehistoric Peoples of Minnesota*. Revised 1988, Minnesota Historical Society Press, St. Paul.  
1969b Personal Communication. In *The Archaeology of Petaga Point: The Pre-ceramic Component*, by P. Bleed. Minnesota Prehistoric Archaeology Series No. 2, Minnesota Historical Society.  
1969 Decorative Motifs on Great Oasis Pottery. *Plains Anthropologist* 14:272-276.  
1969d Archaeological Evidence for Wild Rice Use. *Science* 163:276-277.  
1969e Preliminary Notes on the Prehistoric Use of Wild Rice. *The Minnesota Archaeologist* 30:31-43.  
1971a Excavations at the Gull Lake Dam (21CA27). *The Minnesota Archaeologist* 31(2):44-69.  
1971b The Northern Margin of the Prairie Peninsula. *Journal of the Iowa Archaeological Society* 18:13-21.  
1973 *The Arvilla Complex*. Minnesota Prehistoric Archaeology Series No. 9, Minnesota Historical Society, St. Paul.  
1974 Lloyd A. Wilford and Minnesota Archaeology. In *Aspects of Upper Great Lakes Anthropology*, edited by E. Johnson, pp 1-7. Minnesota Prehistoric Archaeology Series No. 11, Minnesota Historical Society, St. Paul, MN.  
1979 *Cultural Resources Investigation of the Reservoir Shorelines: Gull Lake, Leech Lake, Pine River and Lake Pokegama*, Volume 1. Submitted to U.S. Army Corps of Engineers, St. Paul District.
- 1985 The 17th Century Mdewakanton Dakota Subsistence Mode. In *Archaeology, Ecology and Ethnohistory of the Prairie-Forest Border Zone of Minnesota and Manitoba*, edited by J. Spector and E. Johnson. Reprints in Anthropology, Vol. 31, J&L Reprint Company, Lincoln, Nebraska.
- 1986 Cambria and Cahokia's Northwestern Periphery. Paper presented at the 51st Society for American Archaeology Conference, New Orleans.
- 1988 *Prehistoric Peoples of Minnesota*, rev. ed. Minnesota Historical Society, St. Paul.
- 1991 Cambria and Cahokia's Northwestern Periphery. In *New Perspectives on Cahokia: Views from the Periphery*, edited by J. B. Stoltman, pp. 307-317. Prehistory Press, Madison, Wisconsin.
- n.d. Sandy Lake Attribute List. Unpublished manuscript, Department of Anthropology, University of Minnesota, Minneapolis.
- Johnson, E. (editor)  
1974 *Aspects of Upper Great Lakes Anthropology*. Minnesota Prehistoric Archaeology Series No. 11, Minnesota Historical Society, St. Paul.
- Johnson, E., M. Q. Peterson and J. Strieff  
1968 Birch Lake Burial Mound Group. *Journal of the Minnesota Academy of Science* 36(1):3-8.
- Johnson, E. and T. Ready  
1992 Ceramic Funerary Masks from McKinstry Mound 2. *MidContinental Journal of Archaeology* 17(1):16-45.
- Johnson, E. and J. Schaaf  
1978 *Cultural Resources Investigation at the Lake Winnibigoshish Dam Site (21IC4)*. Report prepared for the U.S. Army Corps of Engineers, St. Paul District.
- Johnson, E. and P. S. Taylor  
1956 *Spring Lake Archaeology: The Lee Mill Cave*. Science Bulletin, St. Paul Institute, Science Museum, No. 3, Part 2.
- Johnston, R. B.  
1967 *The Mitchell Site*. Publications in Salvage Archeology No. 3. Smithsonian Institution River Basin Surveys. Lincoln, Nebraska.  
1968 *The Archaeology of the Serpent Mounds Site*. Occasional Paper 10, Royal Ontario Museum, Art and Archaeology Division, Toronto.
- Joyes, D. C.  
1969 *Blackduck in the West: The Distribution and Stylistic Changes of Blackduck Ware on the Prairies*. Canadian Archaeological Association, Bulletin No. 1, English Edition.
- Kadlec, E. and L. Paasch  
n.d. Overton Meadow Site, Summer 1971, Analysis of Human Bones. Ms. on file, Department of Anthropology, University of Wisconsin-Oshkosh.
- Kaestle, A.  
1997 Molecular Archaeology: An Analysis of Ancient Native American DNA from Western Nevada. Paper presented at The American Association of Physical Anthropologists Annual Meeting, St. Louis.
- Kane, L. M.  
1987 *The Falls of St. Anthony: The Waterfall That Built Minneapolis*. Minnesota Historical Society Press, St. Paul.
- Karamanski, T. J.  
1984 *Historic Records Study: Logging and Pioneer Homesteading, Cultural Resources on the Hiawatha National Forest, Michigan*. Mid-American Research Center, Loyola University of Chicago.  
1989 *Northwoods Frontier: A History of Logging in Northern Michigan*. Wayne State Press, Detroit.
- Kaufman, T. S.  
1980 *Early Prehistory of the Clear Lake Area, Lake County, California*. Unpublished Ph.D. dissertation, University of California, Los Angeles.
- Kay, M.  
1979 On the Periphery: Hopewell Settlement of Central Missouri. In *Hopewell Archaeology the Chillicothe Conference*, edited by D. S. Brose and N. Greber, pp. 94-99. Kent State University Press, Kent, Ohio.
- Kay, M., and A. E. Johnson  
1977 Havana Tradition Chronology of Central Missouri. *Mid-Continental Journal of Archaeology* 2(2):195-217.
- Keaveny, B., S. T. Myster, A. M. Kakaliouras, and B. H. O'Connell  
1993 Intentional Tapping of Human Long Bones from Three Blackduck Sites in Minnesota. Paper presented at the Midwest Archaeological Conference, Madison, Wisconsin.

- Kehoe, A. B.  
1986 The History of Archaeology in Wisconsin. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 174-180. *The Wisconsin Archeologist* 67(3-4).
- Kehoe, T. F.  
1975 Two More Dates from the Hilgen Spring Park Mound Group. *The Wisconsin Archeologist* 56:346-347.
- Kellogg, L. P.  
1908 The Fox Indians during the French Regime. *Proceedings of the State Historical Society of Wisconsin*, pp. 142-188. State Historical Society of Wisconsin, Madison.  
1925 *The French Regime in Wisconsin and the Northwest*. State Historical Society of Wisconsin, Madison.  
1935 *The British Regime in Wisconsin and the Northwest*. State Historical Society of Wisconsin, Madison.  
1953 *Early Narratives of the Northwest 1634-1699*. Barnes and Noble, New York.
- Kelly, E., R. Amundson, B. Marino, and M. Marino  
1991 Stable Isotope Ratios of Carbon in Phytoliths as a Quantitative Method of Monitoring Vegetation and Climate Change. *Quaternary Research* 35:222-233.
- Kelly, J. E.  
1991 Cahokia and its Role as a Gateway Center in Interregional Exchange. In *Cahokia and the Hinterlands: Middle Mississippian Cultures of the Midwest*, edited by T. E. Emerson and R. B. Lewis, pp. 61-80. University of Illinois Press, Urbana.
- Kelly, J. E., J. R. Linder, and T. J. Cartmell  
1979 *The Archaeological Intensive Survey of the Proposed I-270 Alignment in the American Bottom Region of Southern Illinois*. Illinois Transportation Archaeology Scientific Reports 1. Illinois Department of Transportation, Springfield.
- Kennedy, M. S.  
1961 *The Assiniboines from the Accounts of the Old Ones Told to First Boy (James Larpenteur Long)*. University of Oklahoma Press, Norman.
- Kenyon, W. A.  
1960 Rainy River Project—1959. *Ontario History* 52:73-74.  
1961 The Swan Lake Site. *Royal Ontario Museum, Art and Archaeology Division, Occasional Paper* 3:1-37, Toronto.  
1970 *The Armstrong Mound on Rainy River, Ontario*. Canadian Historic Sites, Occasional Papers in Archaeology and History No. 3, pp. 66-84, Ottawa.  
1973 Notes on Rainy River Mounds. Ms. on file, Royal Ontario Museum, Toronto.
- Keslin, R. O.  
1958 A Preliminary Report on the Hahn (Dg-1 and Dg-2) and Horicon (Dg-5) Sites, Dodge County, Wisconsin. *The Wisconsin Archeologist* 39(4):191-273.
- Kuehl, R. J.  
1982 *Soil Survey of Clayton County, Iowa*. USDA Soil Conservation Service, Washington, D.C.
- Key, P. J.  
1983 *Craniometric Relationships Among Plains Indians*. Report of Investigation No. 34, Department of Anthropology, University of Tennessee, Knoxville.
- Keyes, C. R.  
n.d. Undated Field Notes on Horsethief Cave Excavations. Jones County File. Keyes Document Collection. State Historical Society of Iowa. Iowa City, Iowa.  
1920 Some Materials for the Study of Iowa Archaeology. *Iowa Journal of History and Politics* 18(3):357-370.  
1925 Progress of the Archaeological Survey of Iowa. *Iowa Journal of History and Politics* 23(3):339-352.  
1927 Prehistoric Man in Iowa. *The Palimpsest* 8(6):185-229.  
1928a Prehistoric Red Men. *The Palimpsest* 9:33-37.  
1928b The Hill-Lewis Archeological Survey. *Minnesota History* 9:96-108.  
1932 Some Prehistoric Monuments in Iowa: a List of Important Archaeological Sites in Iowa Recommended for Permanent Preservation to the Iowa State Board of Conservation. Ms. on file, Charles R. Keyes collection. State Historical Society of Iowa, Iowa City.  
1933 Shall Iowa have National Monuments? *Iowa Journal of History and Politics* 31(1):31-46.  
1934 Antiquities of the Upper Iowa. *The Palimpsest* 15:321-354.  
1939 Letter dated June 24, 1939 to George I. Quimby, concerning Iowa archaeology. Copy on file in the Keyes Collection. State Historical Society of Iowa, Iowa City.  
1941 An Outline of Iowa Archaeology. *Proceedings of the Iowa Academy of Science* 48:91-98.  
1942 An Outline of Iowa Archaeology. *The Minnesota Archeologist* 8:5-7.  
1943 Minott's Rock Shelter. *The Palimpsest* 24(1).  
1949 Four Iowa Archaeologies with Plains Affiliations. *Proceedings of the Fifth Plains Conference for Archaeology. Notebook* 1:96-97. Laboratory of Anthropology. University of Nebraska, Lincoln.  
1951 Iowa Prehistoric Cultures. *The Palimpsest* 32:323-344.
- Keyser, R. and C. Norquist  
1967 The Orwell Site 21 OT 7. Ms, Department of Anthropology, University of Minnesota, Minneapolis.
- Kim, H. K.  
1986 *Late Glacial and Holocene Environment in Central Iowa: A Comparative Study on Pollen Data from Four Sites*. Unpublished Ph.D. dissertation. Department of Geology. University of Iowa, Iowa City.
- Kimmerle, E.  
1997 Documentation of the Human Skeletal Remains from the Syl Sand Site (21SN11) in Minnesota. Ms. on file, Osteology Laboratory, Hamline University.
- King, J. E.  
1981 Late Quaternary Vegetational History of Illinois. *Ecological Monographs* 51(1):43-62.
- King, S.  
1982 Exotic (non-local) Shell Artifacts. In *Subsurface Testing Program: Proposed Perry Creek Dam and Reservoir Area, Plymouth County, Iowa*, edited by D. R. Henning, pp. 200-250. Technical Report No. 82-05. Division of Archeological Research. Department of Anthropology. University of Nebraska, Lincoln.
- King, T. F. and M. M. Lyneis  
1978 Preservation: A Developing Focus of American Archaeology. *American Anthropologist* 80:873-893.
- Kinietz, W.V.  
1965 *The Indians of the Western Great Lakes 1615-1760*. Ann Arbor Paperback edition, University of Michigan Press, Ann Arbor.
- Kivett, M. F.  
1949 A Woodland Pottery Type from Nebraska. *Proceedings of the 5th Plains Conference of Archaeology. Notebook* 1:67-69. Laboratory for Anthropology. University of Nebraska, Lincoln.  
1952 *Woodland Sites in Nebraska*. Publications in Anthropology 1. Nebraska State Historical Society, Lincoln.
- Knauth, O.  
1963 The Mystery of the Crosses. *Annals of Iowa* 37(2):81-91.
- Knox, J. C.  
1983 Responses of River Systems to Holocene Climates. In *Late Quaternary Environments of the United States, Vol. 2, The Holocene*, edited by H. E. Wright, Jr., pp. 26-42. University of Minnesota Press, Minneapolis.
- Knudson, R. A.  
1967 Cambria Village Ceramics. *Plains Anthropologist* 12:247-299.
- Kolb, J. L.  
1988 *The Archaeological Resources of Northwestern Wisconsin: Region 1 Archaeology Program 1987-1988*. Burnett County Historical Society. Siren, Wisconsin.
- Kolb, J. L., E. D. Benchley, and M. F. Kolb  
1989 *Mitigation of the Manogue Site (47 Ro-249), An Archaic Period Site in Rock County, Wisconsin*. Report of Investigations No. 99. University of Wisconsin-Milwaukee Archaeological Research Laboratory.

- Kolb, M., L. Sundstrom, and G. G. Fredlund  
1993 *Sucker Creek Assessment Project: Archaeology and Geomorphology of a Southern Lake Michigan Coastal Environment*. Soils and Physical Geography Laboratory, Department of Geography, Univ. of Wisconsin-Milwaukee for State Historical Society of Wisconsin.
- Kohl, J. G.  
1985 *Kitchi-gami: Life among the Lake Superior Ojibway*. Minnesota Historical Society Press, St. Paul. Originally published by Chapman and Hall, London.
- Kohlepp, H.  
1941 The Centerville Monograph. *The Minnesota Archaeologist* 7(1).
- Krause, R. A.  
1969 Correlation of Phases in Central Plains Prehistory. *Plains Anthropologist* 14(44), *Memoir* 6:82-96.  
1970 Aspects of Adaptation among Upper Republican Subsistence Cultivators. In *Pleistocene and Recent Environments of the Central Great Plains*, edited by W. Dort and J. K. Jones, pp. 103-116. Special Publication 3. Department of Geology. University of Kansas. Lawrence, Kansas.  
1985 Trends and Trajectories in American Archaeology: Some Questions about the Mississippian Period in Southeastern Prehistory. In *Alabama and the Borderlands: From Prehistory to Statehood*, edited by R. Badger and L. Clayton, pp. 17-39. University of Alabama Press, University.
- Kreisa, P. P.  
1986 The Furman Site (47 Wn-216), a Lake Winnebago Phase Burial Area near Oshkosh, Wisconsin. *The Wisconsin Archeologist* 67(2):71-96.  
1993 Oneota Burial Patterns in Eastern Wisconsin. *Midcontinental Journal of Archaeology* 18(1):33-60.
- Krieger, A.  
1956 Notes and News: Early Man. *American Antiquity* 21:449-450.
- Kroeber, A. L.  
1936 *Cultural and Natural Areas of Native North America*. University of California Press, Berkeley.  
1962 The Rancho La Brea Skull. *American Antiquity* 27: 416-419.
- Kurtz, R. D.  
1979 Iowa Archaeology: A Social History 1867-1920. *Journal of the Iowa Archeological Society* 26:1-28.
- Kutzbach, J. E.  
1987 Model Simulations of the Climatic Patterns during the Deglaciation of North America. In *North America and Adjacent Oceans during the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 425-446. Geological Society of America, Boulder, Colorado.
- Kvamme, K. L.  
1988 A Simple Graphic Approach and Poor Man's Clustering Technique for Investigating Surface Lithic Scatter Types. *Plains Anthropologist* 33(121):385-394
- Lahren, L., and R. Bonnichsen  
1974 Bone Foreshafts from a Clovis Burial in Southwestern Montana. *Science* 186:147-150.
- Landes, R.  
1968 *The Mystic Lake Sioux*. University of Wisconsin Press, Madison.
- Lane, R. B.  
1974 An Archaeological Reconnaissance of the Sherberne Nation Wildlife Refuge, Minnesota, August 1969. On file, Minnesota Historical Society, St. Paul, Minnesota.
- Lange, F.  
1969 The Bigelow Site (47 Pt-29), Portage County, Wisconsin. *The Wisconsin Archeologist* 50(4):215-255.
- Lanum, P. D.  
1981 Field Examination of Human Skeletal Remains Discovered in Kennebec Township, Monona County, Iowa. *Research Papers* 6(01): 22-25. Office of the State Archaeologist, Iowa City.
- Lanum, P. D. and J. Apley  
1981 Field Examination of the Single Hill Burial Site (13PM49). *Research Papers* 6(04):255-257. Office of the State Archaeologist, Iowa City.  
Lapham, Increase A.  
1855 *Antiquities of Wisconsin*. Smithsonian Contributions to Knowledge, Vol. 7. Washington D.C.
- Larsen, C. E.  
1985a Lake Level, Uplift, and Outlet Incision: the Nipissing and Algoma Great Lakes. In *Quaternary Evolution of the Great Lakes*, edited by P. F. Karrow and P. E. Calkin. Geological Association of Canada Special Paper 30.  
1985b *A Stratigraphic Study of Beach Features on the Southwestern Shore of Lake Michigan: New Evidence of Holocene Lake Level Fluctuations*. Illinois State Geological Survey, Environmental Geology Notes 112. Champaign.  
1985c Geological Interpretations of Great Lakes Coastal Environments. In *Archaeological Sediments in Context: Peopling of the Americas*, edited by J. K. Stein and W. R. Farrand, pp. 99-110. University of Maine Institute for Quaternary Studies, Orono.  
1987 Geological History of Glacial Lake Algonquin and the Upper Great Lakes. *U.S. Geological Survey Bulletin* 1801.
- Larson, P. L.  
1961 The Erickson Mound Group. *Wisconsin Archeologist* 42:88-90.
- Lass, B.  
1978 The Woodland Mounds and Their Cultural Significance. *Journal of the Iowa Archeological Society* 25: 100-113.
- Lass, W. E.  
1980 *Minnesota' Boundary with Canada*. Minnesota Historical Society, St. Paul.
- Lee, L. P.  
1967 *History of the Spirit Lake Massacre*. Ye Galleon Press. Fairfield, Washington. Reprint of Lee's 1857 private publication: History of the Spirit Lake Massacre! 8 March, 1857, and of Miss Abigail Gardiner's Three Month's Captivity Among the Indians. According to her own Account, as given to L. P. Lee. New Britain, Connecticut.
- Lehmer, D. J.  
1954a *Archaeological Investigations in the Oahe Dam Area, South Dakota, 1950-1951*. River Basin Survey Papers No. 7. Bureau of American Ethnology Bulletin 158, Smithsonian Institution, Washington, D.C.  
1954b The Sedentary Horizon of the Northern Plains. *Southwestern Journal of Anthropology* 10:139-159.  
1971 *Introduction to Middle Missouri Archeology*. Anthropological Papers 1. National Park Service, Washington, D.C.
- Lensink, Stephen C.  
1986 Investigations at 13WS61, The Sweeting Site. In *Archaeological Investigations along the F-518 Corridor*, edited by S. C. Lensink, pp. 61-114. Iowa Quaternary Studies Group Contribution No. 9. The University of Iowa, Iowa City.  
1993 Episodic Climatic Events and Mill Creek Culture Change: An Alternative Explanation. In *Prehistory and Human Ecology of the Western Prairies and Northern Plains: Papers in Honor of Robert A. Alex (1941-1988)*. Memoir 27. Plains Anthropological Society.
- Leverett, F.  
1932 *Quaternary Geology of Minnesota and Parts of Adjacent States*. United States Geological Survey Professional Paper 161.
- Lewis, R.  
1979 *Archaeological Reconnaissance Survey: Proposed Sewage Lagoon, Dam Site Recreation Area, Coralville Lake, Iowa River, Iowa*. Rock Island District. U.S. Army Corps of Engineers. Rock Island, Illinois.
- Lewis, T. H.  
1887a Incised Boulders in the Upper Minnesota Valley. *American Naturalist* 21:639-642.  
1887b Quartz Workers of Little Falls. *American Antiquarian*, March.  
1890 Cave Drawings. *Appletons' Annual Cyclopaedia and Register of Important Events*, 1889, new series 14:117-122.  
1890 Effigy Mounds in the Valley of the Big Sioux River, Iowa. *Science* 15:275.  
1898 *The Northwestern Archaeological Survey*. St. Paul: published by author.
- Life  
1955 Bones Found in Iowa Sandpit may be Oldest American Skeleton. *Life* 39(12):59-60.
- Lillie, R. M.  
1990a Analysis of Articulated Human Skeletal Material from Eddyville School, Eddyville, Iowa. *Research Papers* 15(05): 1-15. Office of the State Archaeologist, Iowa City.

- 1990b Analysis of Human Skeletal Remains from Dubuque Senior High School, Dubuque, Iowa. *Research Papers* 15(05): 16-22. Office of the State Archaeologist, Iowa City.
- 1990c Analysis of Human Skeletal Remains from the Historical Society of Marshall County, Marshalltown, Iowa. *Research Papers* 15(05): 23-33. Office of the State Archaeologist, Iowa City.
- 1990d Analysis of Human Skeletal Remains from the Phipps Site, 13CK21, Cherokee County, Iowa. *Research Papers* 15(05): 34-36. Office of the State Archaeologist, Iowa City.
- 1990e Analysis of Human Skeletal Remains from Broken Kettle West Site, 13PM25, Plymouth County, Iowa. *Research Papers* 15(05): 37-39. Office of the State Archaeologist, Iowa City.
- 1990f Analysis of Human Skeletal Remains from the Bultman Site, 13BV2, Buena Vista County, Iowa. *Research Papers* 15(05): 40-42. Office of the State Archaeologist, Iowa City.
- 1990g Analysis of Human Skeletal Remains from 13ML126, Mills County, Iowa. *Research Papers* 15(05): 43-44. Office of the State Archaeologist, Iowa City.
- 1990h Analysis of Human Skeletal Remains from 13PK201, Polk County, Iowa. *Research Papers* 15(05): 45-56. Office of the State Archaeologist, Iowa City.
- 1990i Analysis of Additional Human Skeletal Remains from 13LE12, the Jollyville Hill Site in Lee County Iowa. *Research Papers* 15(5): 82-83. Office of the State Archaeologist.
- 1990j Analysis of Human Skeletal Remains from 13DM3, Kingston Oneota Site Des Moines County, Iowa. *Research Papers* 15(05): 84-85. Office of the State Archaeologist, Iowa City.
- 1990k Analysis of Human Skeletal Remains from 13WD8, Dixon Site, Woodbury County, Iowa. *Research Papers* 15(05): 86-94. Office of the State Archaeologist, Iowa City.
- 1990l Analysis of Human Crania from the Iowa Masonic Library Collection, Cedar Rapids, Iowa. *Research Papers* 15(05): 95-102. Office of the State Archaeologist, Iowa City.
- 1990m Analysis of Human Skeletal Remains from 13WD82, Woodbury County, Iowa. *Research Papers* 15(05): 103-105. Office of the State Archaeologist, Iowa City.
- 1990n Analysis of Human Skeletal Remains from 13WD55, Woodbury County, Iowa. *Research Papers* 15(05): 106-107. Office of the State Archaeologist, Iowa City.
- 1990o Analysis of Human Skeletal Remains from 13DM4, Des Moines County, Iowa. *Research Papers* 15(05): 108-111. Office of the State Archaeologist, Iowa City.
- 1990p Analysis of Human Skeletal Remains from 13AM310, Allamakee County, Iowa. *Research Papers* 15(05): 126-133. Office of the State Archaeologist, Iowa City.
- 1992a Human Skeletal Remains from the Paul Rowe Collection, Mills County, Iowa. *Journal of Iowa Archeological Society* 39:99-105
- 1992b Human Skeletal Remains from Lansing, Allamakee County, Iowa, 13AM0e. *Research Papers* 17(01): 1-12. Office of the State Archaeologist, Iowa City.
- 1992c Human Skeletal Remains from 13IA5, Battle Hill Site, Ida County, Iowa. *Research Papers* 17(01): 13-22. Office of the State Archaeologist, Iowa City.
- 1992d Analysis of Human Skeletal Remains from 13ML349, Mills County, Iowa. *Research Papers* 17(01): 35-42. Office of the State Archaeologist, Iowa City.
- 1992e Analysis of Human Skeletal Remains from Ottumwa High School, 13WP0, Wapello County, Iowa. *Research Papers* 17(01): 43-46. Office of the State Archaeologist, Iowa City.
- 1992f Analysis of Human Skeletal Remains from the Conger House Museum in Washington, Iowa, 399-00-00. *Research Papers* 17(01): 47-60. Office of the State Archaeologist, Iowa City.
- 1992g Analysis of a Human Cranium, AP 115, from the Putnam Museum, Davenport, Iowa. *Research Papers* 17(01): 61-68. Office of the State Archaeologist, Iowa City.
- 1992h Human Maxillary First Molar from 13MC120, Muscatine County, Iowa. *Research Papers* 17(01): 69-72. Office of the State Archaeologist, Iowa City.
- 1992i Human Skeletal Remains from 13AM0f, Allamakee County, Iowa. *Research Papers* 17(01): 73-88. Office of the State Archaeologist, Iowa City.
- 1992j Analysis of Human Skeletal Remains from 13ML387, Mills County, Iowa. *Research Papers* 17(01): 107-120. Office of the State Archaeologist, Iowa City.
- 1992k Possible Human Bone Fragment from 13ML332, Mills County, Iowa. *Research Papers* 17(01): 121-122. Office of the State Archaeologist, Iowa City.
- 1992l Analysis of a Human Cranial Fragment from Pony Creek, 13ML0b, Mills County, Iowa. *Research Papers* 17(01): 123-124. Office of the State Archaeologist, Iowa City.
- 1992m Teeth from the Bar Site, 13ML360, Mills County, Iowa. *Research Papers* 17(01): 125-128. Office of the State Archaeologist, Iowa City.
- 1992n Subadult Skeletal Remains from 13ML461, Mills County, Iowa. *Research Papers* 17(01): 129-132. Office of the State Archaeologist, Iowa City.
- 1992o Human Skeletal Remains from the Rowe Collection, Mills County, Iowa. *Research Papers* 17(05): 157-170. Office of the State Archaeologist, Iowa City.
- 1993a Human Skeletal Remains from 13CD10, Rock Run Shelter, Cedar County, Iowa. *Research Papers* 18(01): 1-4. Office of the State Archaeologist, Iowa City.
- 1993b A Human Femur Found on a Maple River Sandbar, 13MN-4 Findspot, Monona County, Iowa. *Research Papers* 18(01): 5-6. Office of the State Archaeologist, Iowa City.
- 1993c A Human Mandible from the Maple River, 13IA-1 Findspot, Ida County, Iowa. *Research Papers* 18(01): 7-10. Office of the State Archaeologist, Iowa City.
- 1993d Analysis of a Human Skull from 13PW82, Big Lake Cemetery, Pottawattamie County, Iowa. *Research Papers* 18(01): 11-20. Office of the State Archaeologist, Iowa City.
- 1993e Analysis of a Cranium from the Conger House Museum, 13WS0a, Washington, Iowa. *Research Papers* 18(01): 21-28. Office of the State Archaeologist, Iowa City.
- 1993f A Partial Human Mandible from the Maple River, 13IA-2 Findspot, Ida County, Iowa. *Research Papers* 18(01): 29-32. Office of the State Archaeologist, Iowa City.
- 1993g Analysis of Fragmented Human Skeletal Remains from Unknown Provenience, 13LA0a, Louisa County, Iowa. *Research Papers* 18(01): 33-34. Office of the State Archaeologist, Iowa City.
- 1993h Analysis of Human Skeletal Remains from 13DB5, Adams Mounds, Dubuque County, Iowa. *Research Papers* 18(01): 81-114. Office of the State Archaeologist, Iowa City.
- 1993i Human Skeletal Remains of Unknown Provenience from the Putnam Museum, Davenport, Iowa. *Research Papers* 18(01): 115-152. Office of the State Archaeologist, Iowa City.
- 1993j Analysis of Human Skeletal Remains Recovered from the Glen Oaks Site, 13PK63, Polk County, Iowa. *Research Papers* 18(01): 153-172. Office of the State Archaeologist, Iowa City.
- 1993k Humans Skeletal Remains from Nobis Farm Mounds, 13ST108, Scott County, Iowa. *Research Papers* 18(01): 173-180. Office of the State Archaeologist, Iowa City.
- 1993l Analysis of Human Vertebrae and Teeth from Allen Farm Mounds, 13ST0c, Putnam Museum Collection. *Research Papers* 18(01): 181-186. Office of the State Archaeologist, Iowa City.
- 1993m Human Skull of Possible Oneota Affiliation, 13AM0j, Allamakee County, Iowa. *Research Papers* 18(01): 187-194. Office of the State Archaeologist, Iowa City.
- 1994a Aboriginal Canadian Skeletal Remains from the University of Iowa Museum of Natural History Collections. *Research Papers* 19(01): 1-60. Office of the State Archaeologist, Iowa City.
- 1994b Nonhuman Remains Surface Collected from 13HR36, Harrison County, Iowa. *Research Papers* 19(01): 69-70. Office of the State Archaeologist, Iowa City.
- 1994c Human Skeletal Remains from a Tree Fall, 13CT254, at Turkey River Mounds State Preserve, Clayton County, Iowa. *Research Papers* 19(01): 71-72. Office of the State Archaeologist, Iowa City.
- 1994d Analysis of Human Skeletal Material from 13WD78, Woodbury County, Iowa. *Research Papers* 19(01): 73-76. Office of the State Archaeologist, Iowa City.
- 1994e A Human radius of Unknown Provenience, 13-00-00. *Research Papers* 19(01): 77-78. Office of the State Archaeologist, Iowa City.

- 1994f Analysis of Human Skeletal Remains from 13CY26, Clay County, Iowa. *Research Papers* 19(01): 79-82. Office of the State Archaeologist, Iowa City.
- 1994g Possible Human Bone Fragments from 13HR27, Murray Hill Site, Harrison County, Iowa. *Research Papers* 19(01): 83-84.
- 1994h Analysis of Human Skeletal remains from 13ML428, Mills County, Iowa. *Research Papers* 19(01): 85-90. Office of the State Archaeologist, Iowa City.
- 1994i Analysis of Cranium from Findspot 13ML-10, Mills County, Iowa. *Research Papers* 19(01): 73-76. Office of the State Archaeologist, Iowa City.
- 1994j Analysis of Cranial Remains of Unknown Provenience, 13ST0d from the Putnam Museum, Davenport, Iowa. *Research Papers* 19(01): 95-104. Office of the State Archaeologist, Iowa City.
- 1994k Analysis of Human Cranium from Mound No. 3,, Cook Form Mounds, 13SR82, Scott County, Iowa, Putnam Museum Collection. *Research Papers* 19(01): 105-114. Office of the State Archaeologist, Iowa City.
- 1994l Analysis of Human Skeletal Fragments of Possible Onetoo Affiliation from 13LE183, Lee County, Iowa. *Research Papers* 19(01): 115-118. Office of the State Archaeologist, Iowa City.
- 1995a Human Skeletal Remains from a Flood-damaged Burial, 13WD91, Woodbury County, Iowa. *Research Papers* 20(01): 1-4. Office of the State Archaeologist, Iowa City.
- 1995b Human Skeletal Remains from 13ML0h and 13ML0i, Mills County, Iowa. *Research Papers* 20(01): 13-18. Office of the State Archaeologist, Iowa City.
- 1995c Human Skeletal Remains from Tipton Mound, 13ML193, Mills County, Iowa. *Research Papers* 20(01): 19-24. Office of the State Archaeologist, Iowa City.
- 1995d Analysis of Human Skeletal Remains of Unknown Provenience, Burial Project No. 771. *Research Papers* 20(01): 25-26. Office of the State Archaeologist, Iowa City.
- 1995e Analysis of Human Skeletal Remains from the Gast Farm Site, 13LA12, Louise County, Iowa. *Research Papers* 20(01): 27-42. Office of the State Archaeologist, Iowa City.
- 1995f Human Cranial Remains from 13FM63, Fremont County, Iowa. *Research Papers* 20(01): 43-46. Office of the State Archaeologist, Iowa City.
- 1995g Analysis of Human Remains from 13MN0a, Monona County, Iowa. *Research Papers* 20(01): 47-48. Office of the State Archaeologist, Iowa City.
- 1995h A Partial Human mandible from 13FM0a, Fremont County Iowa. *Research Papers* 20(01): 49-50. Office of the State Archaeologist, Iowa City.
- 1995i A Human Mandible Found Near Emmetsburg, 13PL0a, Palo Alto County, Iowa. *Research Papers* 20(01): 51-54. Office of the State Archaeologist, Iowa City.
- 1995j A Partial Cranium Possibly from the Upper Village Site, 13BH68, Black Hawk County, Iowa. *Research Papers* 20(01): 55-58. Office of the State Archaeologist, Iowa City.
- 1995k Analysis of Subadult Human Skeleton from the Clarkson Site, 13WA2, Warrenb County, Iowa. *Research Papers* 20(01): 59-68. Office of the State Archaeologist, Iowa City.
- 1995l Human Skeletal Remains from the Swiggert and Springdale Collections of the Sioux City Public Museum, Sioux City, Iowa. *Research Papers* 20(01): 69-92. Office of the State Archaeologist, Iowa City.
- 1995m Human Skeletal Remains from 21BE0, Blue Earth County, Minnesota. *Research Papers* 20(01): 93-106. Office of the State Archaeologist, Iowa City.
- 1995n A Subadult Phalanx from Lane Farm Enclosure, 13AM200, Allamakee County, Iowa. *Research Papers* 20(01): 107-108. Office of the State Archaeologist, Iowa City.
- 1995o Human Skeletal Remains from the Paul Cota Collection, 13AM0g, Allamakee County, Iowa. *Research Papers* 20(01): 109-122. Office of the State Archaeologist, Iowa City.
- 1995p Human Skeletal Remains from Near Harpers Ferry, 13AM0h, Allamakee County, Iowa. *Research Papers* 20(01): 123-144. Office of the State Archaeologist, Iowa City.
- 1995q Human Skeletal Remains Possibly from the New Galena Mound Group, 13AM108, Allamakee County, Iowa. *Research Papers* 20(01): 145-150. Office of the State Archaeologist, Iowa City.
- 1995r A Subadult Mandible from 13PA-2 Findspot, Page County, Iowa. *Research Papers* 20(01): 151-154. Office of the State Archaeologist, Iowa City.
- 1995s Human Teeth from the State Historical Museum Collections, 13LE0b, Lee County Iowa. *Research Papers* 20(01): 155-158. Office of the State Archaeologist, Iowa City.
- 1996a A Human Skull Possibly from the State of Wyoming, Burial Project No. 755. *Research Papers* 21(01): 1-8.
- 1996b Human Skeletal Remains from Northeast Iowa on the Henry P. Field Collection of Luther College. *Research Papers* 21(01): 9-32.
- 1996c Human Skeletal Remains from Unknown Provenience, Burial Project No. 835. *Research Papers* 21(01): 33-40.
- 1996d Analysis of Human Skeletal Remains Probably from 13ML283, Mills County, Iowa. *Research Papers* 21(01): 41-54.
- 1996e Human Teeth Probably from 13DM31, Des Moines County, Iowa. *Research Papers* 21(01): 55-60.
- 1996f Analysis of Human Skeletal Remains from Hunter's Home Rockshelter, 13JK98, Jackson County, Iowa. *Research Papers* 21(01): 61-68.
- 1996g Analysis of Human Skeletal Remains Recovered from a Streambed, Findspot 13JP-7, Jasper County, Iowa. *Research Papers* 21(01): 69-72.
- 1996h A Deciduous Maxillary Molar from the Gast Spring Site, 13LA152, Louisa County, Iowa. *Research Papers* 21(01): 73-76.
- 1996i A Deciduous Tooth from the Sharp's Site, 13ML42, Mills County, Iowa. *Research Papers* 21(01): 77-80.
- 1996j Unprovenienced Human Skeletal Remains, 13LO0a, Lyon County, Iowa. *Research Papers* 21(01): 81-84.
- 1996k Three Human Teeth Possibly from 13WD27, Woodbury County, Iowa. *Research Papers* 21(01): 85-88.
- 1996l Human Skeletal Remains from the Gengler Site, 13AM269, Allamakee County, Iowa. *Research Papers* 21(01): 89-98.
- 1996m Human Skeletal Remains from the Marrion Boots Collection, State Historical Museum, State Historical Society of Iowa. *Research Papers* 21(01): 99-122.
- 1996n A Human Maxillary Molar from 13BN168, Boone County, Iowa. *Research Papers* 21(01): 123-126.
- 1996o An Isolated Human Cranial Fragment from 13PK132, Polk County, Iowa. *Research Papers* 21(01): 127-128.
- 1996p A Human Femur Fragment from 13PK197, Polk County, Iowa. *Research Papers* 21(01): 129-130.
- 1996q Human Skeletal Remains from the Charles D. Johnson Mound, 13PK33, Polk County, Iowa. *Research Papers* 21(01): 131-134.
- 1996r A Human Talus from the Logansport Site, 13BN103, Boone County, Iowa. *Research Papers* 21(01): 135-138.
- 1996s Osteological Analysis of Human Remains from Cribb's Crib Site, 13WA105, Warren County, Iowa. *Research Papers* 21(01): 139-144.
- 1996t Additional Human Skeletal Remains from Flatiron Terrace, 13AM1, Allamakee County, Iowa. *Research Papers* 21(01): 145-148.
- 1996u Two Human Teeth from Burke's Bridge South, 13AM16, Allamakee County, Iowa. *Research Papers* 21(01): 149-152.
- 1996v Preliminary Report on Human Skeletal Fragments Recovered from the McKinney Site, 13LA1, Louisa County, Iowa. *Research Papers* 21(01): 153-158.
- 1996w Human Skeletal Remains from the North Hill Area of Burlington, 13DM0a, Des Moines County, Iowa. *Research Papers* 21(01): 159-168.
- 1996x Human Skeletal Remains from the Howard Goodhue Site, 13PK1, Polk County, Iowa. *Research Papers* 21(01): 169-224.
- 1996y A Mill Creek Burial from Western Iowa, 13PM172, Plymouth County, Iowa. *Research Papers* 21(01): 271-286.
- Lillie, R. M. and R. E. Hollinger  
n.d. Unpublished Draft Report on Culturally Modified Human Cranial Remains from 13DM101, the Schmeister Site. Ms. on file, Burial Project File No. 781. Office of the State Archaeologist, University of Iowa, Iowa City.
- Lillie, R. M. and S. J. Schermer  
1990 Analysis of Human Skeletal Remains from 13WD402, Siouxland Sand and Gravel Site, Woodbury County, Iowa. *Research Papers* 15(05): 112-125. Office of the State Archaeologist, Iowa City.
- 1992a Report on Human Skeletal Remains from 13PW75, Pottawattamie County, Iowa. *Research Papers* 17(01): 23-34. Office of the State Archaeologist, Iowa City.



- 1992b Analysis of Two Early Historic Burials and Artifactual Materials Recovered from a Vandalized Site in Chickasaw County, 13CW21. *Research Papers* 17(01): 89-106. Office of the State Archaeologist, Iowa City.
- Lilly, D. and R. Banks  
1965a A Preliminary Description of a Mill Creek Cemetery Near the Broken Kettle Midden Mound. *Northwest Chapter of the Iowa Archaeological Society Newsletter* 13(1): 2-6.  
1965b A Preliminary Description of a Mill Creek Cemetery Near the Broken Kettle Midden Mound. *Iowa Archaeological Society Newsletter* 57: 2-6.
- Limp, W. F.  
1989 *Guidelines for Historic Properties Management, Southwestern Division Management Plan*. Arkansas Archeological Survey Special Publication 1.
- Lindeman, C. G.  
1967 The Vach Sites (1 & 4E): A Comprehensive Analysis. *Minnesota Archaeologist*, 29(4):83-98.
- Link, A.  
1984 Bone Fishhooks from the Bryan Site: 1983-1984. *Minnesota Archaeologist* 43(2):59-62.
- Lippold, L. K.  
1973a Animal Resource Utilization at the Cooper's Shore Site (47 Ro-2), Rock County, Wisconsin. *The Wisconsin Archeologist* 54(1):36-62.  
1973b Animal Resource Utilization at Wisconsin Effigy Mound Sites. *The Wisconsin Archeologist* 54(3):135-152.
- Little, B.  
1985 Early Mdewakanton Dakota Culture and Interpretations for Archaeology: A Re-evaluation, 1640-1780. In *Archaeology, Ecology, and Ethnohistory of the Prairie-Forest Border Zone of Minnesota and Manitoba*, edited by J. Spector and E. Johnson, pp. 146-153. J&L Reprint Company, 410 Wedgewood Drive, Lincoln, Nebraska.
- Lockridge, L. D.  
1979 *Soil Survey of Lee County, Iowa*. USDA Soil Conservation Service, Washington, D.C.
- Lofstrom, E.  
1981 A Possible Altithermal Habitation Site in Faribault County. Paper presented at the 6th Annual Council for Minnesota Archaeology, Spring Symposium, St. Paul.
- Lofstrom, T.  
1987 The Rise of Wild Rice Exploitation and its Implications for Population Size and Social Organization in Minnesota Woodland Period Populations. *The Minnesota Archaeologist* 46(2):3-15.
- Logan, B.  
1988 The Plains Village Frontier in the Kansas City Locality. *The Missouri Archaeologist* 49:3-25.
- Logan, W. D.  
1951 Past Iowa Archeological Research and Future Trends. *Journal of the Iowa Archeological Society* 1(1):3-13.  
1953 Archaeological Investigation of Spike Hollow Rockshelter, Allamakee County, Iowa. *Journal of the Iowa Archeological Society* 2(2):4-30.  
1959 *Analysis of Woodland Complexes in Northeastern Iowa*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Michigan, Ann Arbor.  
1971 Final Investigation of Mound 33, Effigy Mounds National Monument. *Journal of the Iowa Archeological Society* 18:30-45.  
1976 *Woodland Complexes in Northeastern Iowa*. Publications in Archaeology, 15, National Park Service, Washington D.C.
- Lopinot, N. H.  
1994 A New Crop of Data on the Cahokian Polity. In *Agricultural Origins and Development in the Midcontinent*, edited by W. Green. University of Iowa Office of the State Archaeologist, Report 19. Iowa City.
- Lothson, G. A.  
1967 The Distribution of Burial Mounds in Minnesota. *Minnesota Archaeologist* 29(2):29-47.  
1972 *Burial Mounds of the Mille Lacs Lake Area*. Unpublished Master's thesis, Department of Anthropology, University of Minnesota, Minneapolis.  
1976 *The Jeffers Petroglyphs Site: A Survey and Analysis of the Carvings*. Minnesota Prehistoric Archaeology Series No. 12, Minnesota Historical Society.
- 1983 *The Alton Anderson Site (21WW4), Watonwan County, Minnesota*. Occasional Publications in Minnesota Anthropology No. 4, Minnesota Archaeological Society, St. Paul.
- Lovejoy, C. O., A. H. Burstein and K. G. Heiple  
1976 The Biomechanical Analysis of Bone Strength; A Method and its Application to Platycnemia. *American Journal of Physical Anthropology* 44:489-506.
- Lovejoy, C. O., R. S. Meindl, T. R. Pryzbeck and R. P. Mensforth  
1985 Chronological Metamorphosis of the Auricular Surface of the Ilium: A New Method for the Determination of Adult Skeletal Age at Death. *American Journal of Physical Anthropology* 68:15-28.
- Lovis, W. A.  
1990 Site Formation Processes and the Organization of Space at the Stratified Late Woodland O'Neil Site. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson*, edited by G. E. Gibbon. Publications in Anthropology, Number 4. University of Minnesota, Minneapolis.
- Lovis, W. A. and J. A. R. Markson  
1989 Rethinking the Archaic Chronology of the Saginaw Valley, Michigan. *Midcontinental Journal of Archaeology* 14(2):226-260.
- Lowe, D.  
1987 Rock Art Survey of the Blue Mounds Creek and Mill Creek Drainages in Iowa and Dane Counties, Wisconsin. In *Wisconsin Rock Art*, edited by R. A. Birmingham and W. Green, pp. 341-375. The Wisconsin Archeologist 68(4).
- Lowie, R. H.  
1909 *The Assiniboine*. Anthropological Papers No. 4. American Museum of Natural History, New York.
- Loy, J. D.  
1968 A Comparative Style Analysis of Havana Series Pottery from Two Illinois Valley Sites. *Bulletin of the Illinois Archaeological Survey* 6:129-200.
- Luchterhand, K.  
1970 Early Archaic Projectile Points and Hunting Patterns in the Lower Illinois Valley. Illinois Archaeological Survey *Monograph* No. 2. Urbana.
- Luckenbach, A., E. Dugan, R. Levy, D. Pollack, and C. Niquette  
1988 *Archaeological Investigations at Rathbun Lake, Iowa*. Environmental Consultants, Inc. Dallas, Texas.
- Ludwickson, J., D. Blakeslee, and J. O'Shea  
1981 *Missouri National Recreational River: Native American Cultural Resources*. Nebraska State Historical Society, Lincoln.
- Luecke, S. K.  
1996 Coffins and Gravestones as Indications of Ethnicity in an Historic Finnish Cemetery. Senior Honors thesis, Department of Anthropology, Hamline University.
- Lufkin, J. M. (editor)  
1966 The Jeffers Petroglyphs. *Minnesota Archaeologist* 28:110-141.
- Lugenbeal, E.  
1973 The 1972 Excavations at the Smith Village Site: A Descriptive and Analytical Report. Doctoral Dissertation Preliminary Report, University of Wisconsin, Madison.  
1976 *The Archaeology of the Smith Site: A study of the ceramics and culture history of Minnesota Laurel and Blackduck*. Unpublished Ph.D. dissertation (2 Vols), University of Wisconsin, Madison.  
1978a Brainerd Ware Occurrence and Chronological Relationships. In *Some Studies of Minnesota Prehistoric Ceramics*, pp. 47-55. Occasional Publications in Minnesota Anthropology No. 2, Minnesota Historical Society, Fort Snelling.  
1978b The Blackduck Ceramics of the Smith Site (21KC3) and their Implications for the History of Blackduck Ceramics and Culture in Northern Minnesota. *Midcontinental Journal of Archaeology* 3(1):45-68.  
1979 Blackduck Ware. In *A Handbook of Minnesota Prehistoric Ceramics*, edited by S. F. Anfinson, pp. 23-37. Occasional Publications in Minnesota Anthropology No. 5, Minnesota Historical Society, Fort Snelling.
- Lukens, P. W. Jr.  
1963 *Some Ethnozoological Implications of Mammalian Faunas from Minnesota Archaeological Sites*. Unpublished Ph.D. dissertation, University of Minnesota, Minneapolis.

- 1973 The Vertebrate Fauna from Pike Bay Mound, Smith Mound 4, and McKinstry Mound 1. In *The Laurel Culture in Minnesota*, James B. Stoltman, pp. 37-45. Minnesota Historical Society, St. Paul.
- Lurie, N. O.  
1960 Winnebago Protohistory. In *Culture in History*, edited by S. Diamond, pp. 790-808. Columbia University Press, New York.
- 1978 Winnebago. In *Handbook of North American Indians*, edited by W. C. Sturtevant, Volume 15, *Northeast*, edited by B. G. Trigger, pp. 690-707. Smithsonian Institution, Washington, D.C.
- 1983 *A Special Style: The Milwaukee Public Museum 1882-1982*. Milwaukee Public Museum, Milwaukee.
- Lynch, E. P., H. C. Fulton, C. E. Harrison, and C. H. Preston  
1893 Mound Explorations at Toolesboro, Louisa County, Iowa. *Proceedings of the Davenport Academy of Natural Sciences* 5:37-423.
- Lynott, M. J. and L. A. Perry  
1984 Thermoluminescence Dating and Chronology Building in the Western Great Lakes Region. *The Wisconsin Archeologist* 65(2):116-130.
- Lynott, M. J., J. J. Richner, and M. Thompson  
1986 *Archaeological Investigations at Voyageurs National Park: 1979 and 1980*. Midwest Archaeological Center Occasional Studies in Anthropology No. 16. Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.
- MacNeish, R. S.  
1954 The Stott Mound and Village near Brandon, Manitoba. *National Museum of Canada Bulletin* 132:20-53.  
1958 *An Introduction to the Archaeology of Southeast Manitoba*. Bulletin No. 157. National Museum of Canada.  
1976 Early Man in the New World. *American Scientist* 63(3):316-327. Maher, R. F.  
1958 The Excavation and Reconstruction of the Southwest Pyramidal Mound at Aztalan. *The Wisconsin Archeologist* 39(1):77-100.
- Mallam, R. C.  
1976a *The Iowa Effigy Mound Manifestation: An Interpretive Model*. Report 9. Office of the State Archaeologist. University of Iowa, Iowa City.  
1976b The Mound Builders: an American Myth. *Journal of the Iowa Archeological Society* 23:145-175.  
1979 A Cut and Perforated Human Mandible from the Quandahl Rockshelter, Winneshiek County, Iowa. *Journal of the Iowa Archeological Society* 26:30-36.
- Malik, R. and K. Bakken  
1991 The Bradbury Brook Site: 21ML42. *Institute for Minnesota Archaeology Newsletter* July:4-5.  
1993 *Archaeological Data Recovery at the Bradbury Brook Site, 21ML42, Mille Lacs County, Minnesota*. Report submitted to the Minnesota Department of Transportation by the Archaeology Department, Minnesota Historical Society. Minnesota SHPO Reference File 90-0999. St. Paul.
- Mallam, R. C. and E. A. Bettis, III  
1979 Mound Investigations in Granaville Township, Clayton County, Iowa. *Research Papers* 4(02): 1-51. Office of the State Archaeologist, Iowa City.
- Marcucci, D. J.  
1977 Poison Ivy Obsidian. *The Keystone* 2(1):4-6. Newsletter of the Charles R. Keyes Chapter of the Iowa Archeological Society.
- Marcucci, D. J., F. W. Nelson, and R. V. Sidrys  
1978 Poison Ivy Obsidian Source Identification. *Journal of the Iowa Archeological Society* 25:93-99.
- Marcucci, D. J., J. Cordell, and W. Green  
1991 The Paul Sagers Archaeological Collection. Paper presented at the 36th Annual Midwest Archaeological Conference, La Crosse, Wisconsin. October 18-20, 1991.
- Markman, C. W.  
1988 *Putney Landing: Archaeological Investigations at a Havana-Hopewell Settlement on the Mississippi River, West-Central Illinois*. Archaeological Research Series No. 2. Northern Illinois University, DeKalb.
- Marschner, F. J.  
1974 *Map of the Original Vegetation of Minnesota*. U.S. Forest Service, North Central Experiment Station. St. Paul, MN.
- Martin, L.  
1965 *The Physical Geography of Wisconsin*. University of Wisconsin Press, Madison. (originally published 1932).
- Martin, P. S., and R. G. Klein (editors)  
1984 *Pleistocene Extinctions*. University of Arizona Press, Phoenix.
- Mason, C. I.  
1964 An Early Woodland Vessel from Wisconsin. *The Wisconsin Archeologist* 45(4):158-159.  
1970 The Oneota Component at the Porte des Morts Site, Door County, Wisconsin. *The Wisconsin Archeologist* 51(4):191-227.  
1976 Historic Identification and Lake Winnebago Focus Oneota. In *Cultural Change and Continuity: Essays in Honor of James B. Griffin*, edited by C. E. Cleland, pp. 335-348. Academic Press, New York.  
1981 Excavations on the Little Eau Pleine: Site 6. *The Wisconsin Archeologist* 62(1):84-111.  
1983 The Grignon House Collection of Late Historic Trade Material from Kaukana, Wisconsin. *The Wisconsin Archeologist* 64(3-4):239-260.  
1986 The Historic Period in Wisconsin Archaeology. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 370-392. The Wisconsin Archeologist 67(3-4).  
1988 *Introduction to Wisconsin Indians: Prehistory to Statehood*. Sheffield Publishing Company, Salem, Wisconsin.
- 1990 Indians, Maple Sugaring, and the Spread of Market Economies. In *The Woodland Tradition in the Western Great Lakes: Papers presented to Elden Johnson*, edited by G. E. Gibbon, pp. 37-43. University of Minnesota Publications in Anthropology, Number 4. Minneapolis.
- Mason, C. I. and R. J. Mason  
1961 The Age of the Old Copper Culture. *The Wisconsin Archeologist* 42(4):143-154.
- Mason, C. I.  
1994a The Relationship of Historical Archaeology to Historic Documents: Three Case Studies. Master's Paper, Department of Anthropology, University of Wisconsin-Milwaukee.  
1994b *The 1993 Fur Trade Era Survey of the Fox River Corridor in Northeast Wisconsin*. University of Wisconsin-Oshkosh Archaeology Laboratory Reports of Investigations No. 5, Oshkosh.
- Mason, R. J.  
1962 The Paleo-Indian Tradition in Eastern North America. *Current Anthropology* 3:227-283.  
1963 Two Late Paleo-Indian Complexes in Wisconsin. *The Wisconsin Archeologist* 44(4):199-211.  
1966 *Two Stratified Sites on the Door Peninsula of Wisconsin*. Anthropological Papers, No. 26, Museum of Anthropology, University of Michigan, Ann Arbor.  
1967 The North Bay Component at the Porte des Morts Site, Door County, Wisconsin. *The Wisconsin Archeologist* 48(4):267-345.  
1968 Fox Valley Archaeology 1: James Island Site. *The Wisconsin Archeologist* 49(2):57-75.  
1969 Laurel and North Bay: Diffusional Networks in the Upper Great Lakes. *American Antiquity* 34:295-302.  
1970 Hopewell, Middle Woodland and the Laurel Culture: A Problem in Archaeological Classification. *American Anthropologist* 72:805-815.  
1974 Huron Island and the Island of the Poutouatamis. In *Aspects of Upper Great Lakes Anthropology*, edited by E. Johnson, pp. 149-156. Minnesota Prehistoric Archaeology Series No. 11. Minnesota Historical Society, St. Paul.
- 1981 *Great Lakes Archaeology*. Academic Press, New York.  
1986a The Paleo Indian Tradition. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 181-206. The Wisconsin Archeologist 67(3-4).  
1986b *Rock Island: Historical Indian Archaeology in the Northern Lake Michigan Basin*. MCJA Special Paper No. 6. Kent State University Press. Kent, Ohio.

- 1990a The Lawton Site and the Havana Shadow in Northeastern Wisconsin. In *The Woodland Tradition in the Western Great Lakes: Papers presented to Elden Johnson*, edited by G. E. Gibbon, pp. 19-30. University of Minnesota Publications in Anthropology, Number 4. Minneapolis.
- 1990b Late Woodland and Oneota Occupations on Rock Island, Wisconsin. *The Wisconsin Archeologist* 71(3-4): 115-136.
- 1991 Rock Island and the Laurel Cultural Frontier in Northern Lake Michigan. *Midcontinental Journal of Archaeology* 16(1):118-155.
- 1992 Compilation of Door Peninsula Radiocarbon Dates. *The Wisconsin Archeologist* 73(3-4):111-117.
- 1993 Oneota and Winnebago Ethnogenesis: An Overview. *The Wisconsin Archeologist* 74(1-4):400-421.
- Mason, R. J. and C. Irwin  
1960 An Eden-Scottsbluff Burial in Northeastern Wisconsin. *American Antiquity* 26:43-57.
- Mason, R. P.  
1988 Preliminary Report on the Fluted Point Component at the Aebischer Site (47 Ct 30) in Calumet County, Wisconsin. *The Wisconsin Archeologist* 69(4):211-226.
- Mason, R. P. and C. L. Mason  
1991 Test Excavations at the Blair's Spring Site (47 Wn-428), Winnebago County, Wisconsin. *The Wisconsin Archeologist* 72(1-2):28-56.  
1993 The Dory Island Village Site (47 Wn-30), Winnebago County, Wisconsin. *The Wisconsin Archeologist* 74(1-4):197-257.
- Matsch, C. L. and Schneider, A. F.  
1986 Stratigraphy and Correlation of the Glacial Deposits of the Glacial Lobe Complex in Minnesota and Northwestern Wisconsin. *Quaternary Science Reviews* 5: 59-64.
- Matsch, C.L. and Wright, H.E. Jr.  
1967 The Southern Outlet of Lake Agassiz. In *Life, Land, and Water, Conference On Environmental Studies of the Glacial Lake Agassiz Region (1966)*, edited by W.J. Mayer-Oakes. Proceedings, University of Manitoba Press.
- Maxwell, M. S.  
1950 A Change in the Interpretation of Wisconsin's History. *Wisconsin Magazine of History* 33(4):427-443.
- Mayer, M. T.  
1962 Effigy Mound Burial and Big Bend, Waukesha. *The Wisconsin Archeologist* 43(2):42-43
- McAlister, P. A.  
1972 The Larson Site: Great Oasis, Mill Creek, or Both? *Northwest Chapter of the Iowa Archeological Society Newsletter* 20(5):3-8.
- McCarthy, John P.  
1996 An Approach to the Archaeology of Rural Society and Economy. Paper presented at the Second Historical Archaeology Conference of the Upper Midwest, Red Wing, MN.
- McCarthy, J. P., and J. A. Ward  
1995 The Archaeology of Farmsteads in the Upper Midwest: A Consideration of What and Why. Paper presented at the Midwest Archaeological Conference, Beloit, WI.  
1996 *Archaeological Investigations at the Bridgehead Site, Minneapolis Minnesota, The 1994 Season, Volume 2: Site Area B: Residential and Commercial Occupations in the Vicinity of 1st Street North: Working Life in an Emerging Industrial District*. Institute for Minnesota Archaeology Reports of Investigation Number 367, prepared for the Federal Reserve Bank of Minneapolis. IMA Consulting, Inc., Minneapolis.
- McCarthy, J. P., J. A. Ward, C. A. Dobbs, and J. F. Rust  
1996a *Archaeological Investigations at the Bridgehead Site, Minneapolis Minnesota, The 1994 Season, Volume 1: Site Areas E and F: The North Star Iron Works and the Pacific Saw Mill*. Institute for Minnesota Archaeology Reports of Investigation Number 363, prepared for the Federal Reserve Bank of Minneapolis. IMA Consulting, Inc., Minneapolis.
- McCarthy, J. P., J. A. Ward, and K. W. Hagglund  
1996b *An Archaeological Evaluation and Data Recovery Investigation at the New Federal Building/United States Courthouse, Minneapolis, Minnesota: Material Insights into Working Class Life in the Late 19th Century*. Institute for Minnesota Archaeology Reports of Investigation Number 369, draft report prepared for the Leonard Parker Associates and the General Services Administration. IMA Consulting, Inc., Minneapolis.
- McConaghy, L.  
1996 *A Biomechanical Analyses on the Effect of Locomotor and Activity Patterns on the Human Skeleton*. Bachelor of Arts Honors thesis, Department of Anthropology, Hamline University, St. Paul.
- McElrath, D. L., T. E. Emerson, A. C. Fortier, and J. L. Phillips  
1984 Late Archaic Period. In *American Bottom Archaeology A Summary of the FAI-270 Project Contribution to the Culture History of the Mississippi River Valley*, edited by C. J. Bareis and J. W. Porter, pp. 34-58. University of Illinois Press, Urbana.
- McKern, W. C.  
1928 *The Neale and McClaughry Mound Groups*. Public Museum of the City of Milwaukee Bulletin 3(3).  
1929 A Hopewell Type of Culture in Wisconsin. *American Anthropologist* 31:562-564.  
1930 *The Kletzein and Nitschke Mound Groups*. Public Museum of the City of Milwaukee Bulletin 3(4).  
1931 *A Wisconsin Variant of the Hopewell Culture*. Public Museum of the City of Milwaukee Bulletin 10(2).  
1939 The Midwest Taxonomic Method as an Aid to Archaeological Culture Study. *American Antiquity* 4(4):301-313.  
1941 Recent Side-Lights on Aztlan. *The Wisconsin Archeologist* 22: 79-83.  
1942 The First Settlers of Wisconsin. *Wisconsin Magazine of History* 25:153-169.
- 1945 *Preliminary Report on the Upper Mississippi Phase in Wisconsin*. Public Museum of the City of Milwaukee Bulletin 16(3).  
1963 *The Clam River Focus*. Milwaukee Public Museum Publications in Anthropology, Number 9.
- McKusick, M. B.  
1963 Evaluation and Index. In *Iowa Archaeological Reports, 1934-1939. Archives of Archaeology*, edited by D. Baerreis. Microcard Series 20, Society for American Archaeology, University of Wisconsin Press, Madison.  
1964a *Men of Ancient Iowa As Revealed by Archeological Discoveries*. Iowa State University Press, Ames.  
1964b Prehistoric Man in Northeastern Iowa. *The Palimpsest* 45:465-496.  
1964c Discovering the Hartley Fort. *The Palimpsest* 45(12):487-494.  
1970 *The Davenport Conspiracy*. Report 1. Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.  
1971 Oneota Longhouses. In *Prehistoric Investigations*, edited by M. B. McKusick, pp. 86-94. Report 3. Office of the State Archaeologist. University of Iowa, Iowa City.  
1973 *The Grand Oneota Village*. Report 4. Office of the State Archaeologist. University of Iowa, Iowa City.  
1975a Fort Des Moines (1834-1837): An Archaeological Test. *Annals of Iowa* 42:513-522.  
1975b *The Iowa Northern Border Brigade*. Report 8. Office of the State Archaeologist. University of Iowa, Iowa City.  
1975c A Perspective of Iowa Prehistory 1841-1928. *The Wisconsin Archeologist* 56(1):16-54.  
1979 Documenting Iowa Prehistory: 1928-1964. *The Wisconsin Archeologist* 60(1):3-25.  
1991 The Davenport Conspiracy Revisited. Iowa State University Press, Ames.  
n.d. *The Bartron Village Site*. Unpublished Master's thesis. University of Minnesota.
- McKusick, M. B., and D. Archie  
1966 A Tale of Two Forts: Fort Madison and Fort Atkinson. *Iowan Magazine* 15:10-15, 50-51.
- McKusick, M. B., and J. Ries  
1962a *Archaeological Resources of the Rathbun Reservoir Drainage, Iowa*. State University of Iowa, Iowa City.

- 1962b *Archeological Survey of Red Rock Reservoir, Iowa*. State University of Iowa, Iowa City.
- McNerney, M. J.  
1987 The Effigy Complex of the Nebraska Phase and the Problem of Nebraska Phase-Mississippian Relationships. *Journal of the Iowa Archeological Society* 34:22-50.
- McPherron, A.  
1967 *The Juntunen Site and the Late Woodland Prehistory of the Upper Great Lakes Area*. University of Michigan, Museum of Anthropology, Anthropological Papers No. 30, Ann Arbor.
- McTaggart, F.  
1976 *Wolf that I Am*. Houghton Mifflin, Boston.
- McWilliams, R. G. (editor)  
1953 Fleur de Lys and Calumet. In *Being the Penicaut Narrative of French Adventure in Louisiana*. Louisiana State University Press, Baton Rouge.
- Mead, B.  
1979 The Rehbein I Site (47 Ri-81): A Multicomponent Site in Southwestern Wisconsin. *The Wisconsin Archeologist* 60(3):91-182.  
1981 Seed Analysis of the Meehan-Schell Site (13BN110), a Great Oasis Site in Central Iowa. *Journal of the Iowa Archeological Society* 28:15-90.
- Mead, B. and D. E. Berwick  
1977 The Blake Site (47 Ri-49): A Late Paleo Indian Site in Richland County, Wisconsin. *The Wisconsin Archeologist* 58(1):24-32.
- Meer, R. M.  
1990 Stoltz Site (47OZ?). Report on file, state Historical Society of Wisconsin, Burial Sites Office.
- Meer, R. M. and D. Y. Holliday  
1990 Report of Investigation of Skeletal Remains Recovered from the Pioneer's Rest Cemetery, Manitowoc County, Wisconsin. Report on file at Wisconsin Historical Society, Burial Sites Office.
- Meer, R. M. and R. Riggs  
1989 Report of Investigation of Skeletal Remains Recovered from Nob Hill. Report on file at Wisconsin State Historical Society, Burial Sites Office.
- Meier, R. J.  
1969 Description of Human Skeletal Material From the Millville Site. *Wisconsin Archeologist* 50:109-123.
- Meinholz, N.  
1993 The Statz Site (47 Da-642): A Late Woodland Community and Archaic Workshop in Dane County, Wisconsin, State Highway 19 (Draft Report). Prepared for Wisconsin Department of Transportation by Museum Archaeology Program, State Historical Society of Wisconsin.
- Meinholz, N. and S. R. Kuehn  
1996 *The Deadman's Slough Site: Late Paleoindian/Early Archaic and Woodland Occupations along the Flambeau River, Price County, Wisconsin*. Archaeology Research Series Number 4, Museum Archaeology Program, State Historical Society of Wisconsin, Madison.
- Melbye, F. J.  
1969 *An Analysis of a Late Woodland Population in the Upper Great Lakes*. Unpublished Ph.D. thesis, University of Toronto.
- Meltzer, D.  
1988 Late Pleistocene Human Adaptations in Eastern North America. *Journal of World Prehistory* 2(1):1-52.
- Merbs, C. F.  
1963 Skeletal Material From the Bell Site, Wn9, Wisconsin. *Wisconsin Archeologist* 44:72-77.  
1966 Effigy Mounds and the Burton Site—A Study in Human Biology. *Wisconsin Archeologist* 47(3):131-150.
- Merry, C. A.  
1987 Letter of July 8, 1987 to Randall Faber, Historic Preservation Specialist, Office of Project Planning, Iowa Department of Transportation, Ames, Iowa. Copy on File at the Office of the State Archaeologist. University of Iowa, Iowa City.  
1992 *A Phase I Archeological Survey of Local Systems Project Site #1 a.k.a. FHWA 736390 Mahaska County, Iowa*. Project Completion Report 15(53). Highway Archaeology Program. University of Iowa, Iowa City.
- Merry, C. A., and W. Green  
1989 Sources for Winnebago History in Northeastern Iowa, 1837-1848. *Journal of the Iowa Archeological Society* 36:1-8.
- Meyer, G. N., and Hobbs, H. C.  
1989 *Surficial Geology of Hennepin County, Minnesota*. Geologic Atlas Hennepin County, Minnesota, Atlas C-4, Minnesota Geological Survey.
- Meyer, G. N., Baker, R. W., and Patterson, C. J.  
1990 *Surficial Geology of Washington County, Minnesota*. Geologic Atlas Washington County, Minnesota, Atlas C-5. St. Paul, Minnesota Geological Survey.
- Meyer, Roy W.  
1967 *History of the Santee Sioux: United States Indian Policy on Trial*. University of Nebraska Press, Lincoln.
- Michlovic, M. G.  
1979 *The Dead River Site (21OT51)*. Minnesota Archaeological Society, St. Paul.  
1982 Report on the Red River archaeological survey in Norman County, Minnesota. *Minnesota Archaeologist* 41(2):53-69.  
1983 The Red River Valley in the prehistory of the Northern Plains. *Plains Anthropologist* 28(99):23-31.  
1985a *The Archaeology of the Mooney Site (21NR29) on the Red River in Minnesota*. U.S. Corps of Engineers, St. Paul.  
1985b The Problem of Teton Migration. In *Archaeology, Ecology and Ethnohistory of the Prairie-forest Border Zone of Minnesota and Manitoba*, edited by J. Spector and E. Johnson, pp. 131-145. J&L Reprint Company, Lincoln, Nebraska.
- 1986 The Archaeology of the Canning Site. *Minnesota Archaeologist* 45(1):3-36.  
1987a The Archaeology of the Mooney Site (21NR29). *Minnesota Archaeologist* 46(2):39-66.  
1987b *Archeological Survey and Test Excavations in Cass County, N.D.* Report submitted to the State Historical Society of North Dakota. Moorhead State University, Moorhead.
- Michlovic, M., J. Batura, T. Connelloy and F. Wicak  
1977 Is North Arvilla Ancestral Cheyenne? *Minnesota Archaeologist* 36(4):155-160.
- Mickelson, D. M., J. C. Knox, and L. Clayton  
1982 Glaciation of the Driftless Area: An Evaluation of the Evidence. In *Quaternary History of the Driftless Area*, pp. 155-169. Field Trip Guide Book, No. 5. Geological and Natural History Survey, University of Wisconsin-Extension, Madison.
- Mier, L., M. F. Kolb, and J. D. Richards  
1996 *Archeological Investigations at the West Prairie Mound Group (47 Mo-7), Fort McCoy, Wisconsin*. Reports of Investigations No. 378. Great Lakes Archaeological Research Center, Milwaukee.
- Miller, D.  
1995 A Closer Look at the Human Remains from the Bryan Site (21GD4) Goodhue County, Minnesota. Senior Honors thesis, Department of Anthropology, Hamline University, St. Paul.
- Milner, G. R.  
1986 Mississippian Period Population Density in a Segment of the Central Mississippi River Valley. *American Antiquity* 51:468-488.  
1990 The Late Prehistoric Cahokia Cultural System of the Mississippi River Valley: Foundations, Fluorescence, and Fragmentation. *Journal of World Prehistory* 4(1):1-43.  
1991 American Bottom Mississippian Culture: Internal Developments and External Relations. In *New Perspectives on Cahokia: Views from the Periphery*, edited by J. B. Stoltman, pp. 29-47. Monographs in World Archaeology, No. 2. Prehistory Press, Madison, Wisconsin.
- Minnesota Historical Society  
1981 *Minnesota Statewide Archeological Survey Summary 1977-1980*. Minnesota Historical Society, St. Paul.  
1990 Biography of Elden Johnson. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson*, edited by G. E. Gibbon. New Issues Press, Western Michigan University, Kalamazoo.

- Minnesota State Historic Preservation Office (MN SHPO)  
1990 *Urban Centers (1870-1940)*. State Preservation Plan Historic Context. Minnesota State Historic Preservation Office, St. Paul.
- Mittlestadt, S., D. Holliday, and R. Riggs  
1987 Investigation of the Nicolet Grave Burial Site (#BBR001) Brown County, Wisconsin. Unpublished Ms. on file at the Wisconsin State Historical Society, Burial Sites Office.
- Moffat, Charles R.  
1979 Some Observations on the Distribution and Significance of the Garden Beds in Wisconsin. *The Wisconsin Archeologist* 60(3):222-248.
- Moffat, C. R., C. M. Arzigian, and J. L. Theler  
1993 *Further Archaeological Investigations in the Wisconsin River Headwaters: The Results of the 1992 Field Season*. Reports of Investigations No. 159. Mississippi Valley Archaeology Center, La Crosse.
- Moffat, C. R., C. M. Arzigian, J. L. Theler, and J. M. Speth  
1992 *Archaeological Site Evaluations at Rice and Willow Reservoirs, Lincoln and Oneida Counties, Wisconsin*. Reports of Investigations No. 141. Mississippi Valley Archaeology Center, La Crosse.
- Moffat, C. R., W. Cremin, and L. S. Kelly  
1988 Faunal and Floral Remains. In *Archaeological Data Recovery at the Cormorant Site (13MA387): A Multicomponent Woodland and Oneota Site at Lake Red Rock, Iowa*, edited by C. R. Moffat, B. Koldehoff, and M. R. McCorvie, pp. 183-194. Cultural Resources Management Report No. 128. American Resources Group, Ltd. Carbondale, Illinois.
- Moffat, C. R., B. Koldehoff, and M. R. McCorvie  
1988 *Archaeological Data Recovery at the Cormorant Site (13MA387): A Multicomponent Woodland and Oneota Site at Lake Red Rock, Iowa*. Cultural Resources Management Report No. 128. American Resources Group, Ltd., Carbondale, Illinois.
- Moffat, C. R., B. Koldehoff, K. E. Parker, L. S. Kelly, M. R. McCorvie, and J. Craig  
1990 *Archaeological Data Recovery at Five Prehistoric Sites, Lake Red Rock, Marion County, Iowa*. Cultural Resources Management Report No. 133. American Resources Group, Ltd. Carbondale, Illinois.
- Moffat, C. R., J. M. Speth, C. Arzigian, and J. L. Theler  
1991 *Archaeological Site Evaluations at Eight Lakes in the Wisconsin River Headwaters*. Reports of Investigations No. 118. Mississippi Valley Archaeology Center, La Crosse.
- Monse, D.  
1978 *Ancient Disease in the Midwest*. 2nd Revised Edition. Illinois State Museum Reports of Investigation 15. Springfield, Illinois.
- Montet-White, A.  
1968 *The Lithic Industries of the Illinois Valley in the Early and Middle Woodland Period*. Anthropological Papers 35. Museum of Anthropology. University of Michigan, Ann Arbor.
- Mooers, H. D.  
1988 Quaternary History and Ice Dynamics of the St. Croix Phase of Late Wisconsin Glaciation, Central Minnesota [Unpublished Ph.D. thesis]: University of Minnesota.
- Mooers, H. D., Lehr, J. D., and Matsch, C. L.  
1996 *A Terrestrial Record of Ice Sheet Recession and Shifting Divides in Phase with Heinrich Events*, (in press).
- Moore, C. T.  
1972 *Man and Fire in the central North American Grassland 1535-1890: A Documentary Historical Geography*. Unpublished Ph.D. dissertation, University of California, Los Angeles.  
1894-1904 *Memoirs of Exploration in the Basin of the Mississippi*. Eight volumes. H.L. Collins Co., St. Paul, Mn.  
1991 *The Northwestern Archaeological Survey: An Appreciation and Guide to the Manuscripts*. Institute for Minnesota Archaeology Reports of Investigations No. 135, Minneapolis. Microfilm edition, Minnesota Historical Society, St. Paul.
- Moreau, M. S.  
1950 A Change in the Interpretation of Wisconsin's Prehistory. *Wisconsin Magazine of History* 33:427-433.
- Morgan, D. T.  
1979 Hickory Hills Survey. *Research Papers* 4(04): 1-5. Office of the State Archaeologist, Iowa City.
- 1981a Analysis of Human Skeletal Remains from Site 13MN13. *Research Papers* 6(04): 247-254. Office of the State Archaeologist, Iowa City.  
1981b Analysis of Skeletal Material Recovered from the Spencer Burial (13CY9). *Research Papers* 6(04): 261-268. Office of the State Archaeologist, Iowa City.  
1981c Analysis of Skeletal Material Recovered from Jim Rooks, Dubuque, Iowa. *Research Papers* 6(04): 269-277. Office of the State Archaeologist, Iowa City.  
1981d Analysis of Human Remains from Site 13BN123. *Research Papers* 6(04): 278-280. Office of the State Archaeologist, Iowa City.  
1981e Analysis of Human Remains Recovered from Site 13AM46. *Research Papers* 6(04):289-295. Office of the State Archaeologist, Iowa City.  
1981f Analysis of Human Remains from the Nelson Site (13WR1). *Research Papers* 6(04):300-307. Office of the State Archaeologist, Iowa City.  
1985 Late Woodland Ceramics from the Fall Creek Locality, Adams County, Illinois. *The Wisconsin Archeologist* 66(3):265-281.
- Morrow, T.  
1984 *Iowa Projectile Points*. Special Publication. Office of the State Archaeologist. University of Iowa, Iowa City.
- Morrow, T. A. and J. A. Behm  
1986 Descriptions of Common Lithic Raw Materials Encountered on Wisconsin Archaeological Sites. Ms. on file, University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Morse, D.  
1969 *Ancient Disease in the Midwest*. Reports of Investigations, No. 15. Illinois State Museum, Springfield.
- Mott, M.  
1938a The Relation of Historic Indian Tribes to Archaeological Manifestations in Iowa. *Iowa Journal of History and Politics* 36(3):227-314. Iowa City.  
1938a *The Relation of Historic Indian Tribes to Archaeological Manifestations in Iowa*. Unpublished Master's thesis. Department of Anthropology, University of Chicago.
- Mulholland, S. C. et. al., in press  
1997 Paleo-Indian Occupations in Northeastern Minnesota: How Early? *North American Archaeologist*.
- Munson, P. J.  
1966 The Sheets Site: A Late Archaic-Early Woodland Occupation in West-Central Illinois. *Michigan Archeologist* 12(3):111-120.  
1982 Marion, Black Sand, Morton, and Havana Relationship: An Illinois Valley Perspective. *The Wisconsin Archeologist* 63(1):1-17.  
1986 Black Sand and Havana Tradition Ceramic Assemblages and Culture History in the Central Illinois River Valley. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 280-300. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- Musgrove, J.  
n.d. Unpublished Field Notes from De Camp Site Excavation. On file, Library of the State Historical Society, Des Moines, Iowa.
- Musil, J. L.  
1982 The Effigy Mound Tradition in Wisconsin. M.S. Paper, Department of Anthropology, University of Wisconsin-Milwaukee.  
1986 Where are the Late Woodland Sites? 1985 Survey Results in the Lake Koshkonong Region. In *The Southeastern Wisconsin Archaeology Program: 1985-86*, edited by L. Goldstein, pp. 56-73. Report of Investigations No. 85. University of Wisconsin-Milwaukee Archaeological Research Laboratory.  
1987 The Lake Koshkonong Region: Survey and Effigy Mound Research. In *The Southeastern Wisconsin Archaeology Program: 1986-87*, edited by L. Goldstein, pp. 120-181. Report of Investigations No. 88. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Myster, S. T.  
n.d. *A Bioarchaeological Investigation of Population Relationships and Extant Tribal Affiliations of Ancient Upper Midwestern and Southern Ontario and Manitoba Peoples: The Evidence from Cranial Morphology and Mortuary Practices*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Tennessee, Knoxville. (Anticipated date of completion - December, 1997).

- Myster, S. M. T. and E. H. Kimmerle  
1995 A Bioarchaeological Investigation of the Hypothesized Relationship Between the Effigy Mound Culture of Wisconsin and the Cultures of the Mille Lacs Aspect of Minnesota. Paper presented at the 60th Annual Meeting of the Society For American Archaeology, Minneapolis, Minnesota.
- Myster, S. M. T. and R. M. Lillie  
1994 Three Cranial Fragments from 13PK496, Pol County, Iowa. *Research Papers* 19(01): 67-67-68. Office of the State Archaeologist, Iowa City
- Nansel, B. H.  
1989 *Report on the 1989 Archaeological Field School and Teacher Workshop in Monona and Woodbury Counties, Iowa*. Research Papers 14(2). Office of the State Archaeologist. University of Iowa, Iowa City.
- Nash, P.  
1933 The Excavation of the Ross Mound Group I. Public Museum of the City of Milwaukee *Bulletin* 16(1).
- National Register Bulletin  
1986 *Guidelines for Completing National Register of Historic Places Forms*. National Register Bulletin Number 16. Interagency Resources Division, National Park Service, U.S. Dept. of the Interior, Washington, D.C.  
n.d. *Traditional Cultural Properties: Guidelines for Evaluation*. National Register Bulletin Number 38. Interagency Resources Division, National Park Service, U.S. Dept. of the Interior, Washington, D.C.
- Neiburger, E. J.  
1977 Torsoversion Molar Analysis—Measuring Genetic Relationships. *Wisconsin Archeologist* 58:205-222  
1978 Trephination: Two Probable Cases in Prehistoric Wisconsin Indians. *Wisconsin Archeologist* 59(2):253-265.  
1982 Prehistoric Scalping: A Case in Wisconsin. *Rediscovery: Journal of Archaeology* 2:26-30.
- Nelson, G. C.  
1992 Maxillary Canine/Third Premolar Transposition in a Prehistoric Population from Santa Cruz Island, California. *American Journal of Physical Anthropology* 88(2):135-144.
- Neumann, G. K.  
1937 Preliminary notes on the crania from Fulton County, Illinois. In *Rediscovering Illinois*. University of Chicago Press, Chicago.  
1952 Archaeology and Race in the American Indian. In *Archaeology of Eastern United States*, edited by J. B. Griffin, pp. 13-34. University of Chicago Press, Chicago.  
1960 Origins of the Indians of the Middle Mississippi Area. *Proceedings of the Indiana Academy of Science for 1959* 69:66-68.
- Neumann, T. W.  
1978 Classification of Net Impressed Pottery from Central Minnesota. In *Some Studies of Minnesota Prehistoric Ceramics*, pp. 56-65. Occasional Publications in Minnesota Anthropology No 2.
- Neumann, T. and E. Johnson  
1979 Patrow Site Lithic Analysis. *Midcontinental Journal of Archaeology* 4:79-111.
- Newhall, J. B.  
1841 *Sketches of Iowa, or the Emigrant's Guide*. J. H. Colton, New York.
- Newman, R. W.  
1967 Radiocarbon Dated Archaeological Remains on the Northern and Central Great Plains. *American Antiquity* 32:471-486.
- Nickerson, W. B.  
1912 The Burial Mounds at Albany. *Records of the Past* 11(2):69-81.  
1913 Field Notes from Jones Village excavation, 1913. Unpublished manuscript, Minnesota Historical Society, St. Paul.  
1916 Field Notes from Jones Village excavation, 1916. Unpublished manuscript, Minnesota Historical Society, St. Paul.  
1917 Archaeological Evidences in Minnesota; Exploration of the Minnesota Historical Society in 1913 and 1916 in the Valley of the Minnesota River. Unpublished manuscript, Minnesota Historical Society, St. Paul.
- Niehoff, A.  
1956 The Prawatschke Mound Group, A Woodland Burial Complex. *Wisconsin Archeologist* 37:87-94.
- Nolan, D. J. and R. N. Hickson  
1993 Buried Upland Sites: Some Practical Considerations for Archaeologists and Cultural Resource Managers. *Illinois Antiquity* 28(4):4-10.
- Norquist, C. L.  
1967a An Historic Indian Burial in Southwestern Renville County (21RN14). *Minnesota Archaeologist* 29(1):18-19.  
1967b Albert Lea Lake Salvage Project. Ms. on file at the University of Minnesota, Minneapolis.  
1967c Salvage Excavation: Steele Mound Group, Shakopee, Minn. Ms. on file Department of Anthropology UM.
- Nute, G. L.  
1930 Posts in the Minnesota Fur-Trading Area, 1660-1855. *Minnesota History* 11:353-385 (December).  
1941 *The Voyageur*. D. Appleton, New York and London.  
1941 *The Voyageur's Highway - Minnesota's Border Country*. Minnesota Historical Society, St. Paul.  
1960 By Minnesota Waters. In *Minnesota Heritage*, edited by L. M. Brings, pp. 89-119. T.S. Denison, Minneapolis.
- Nutty, C. L.  
1984 Cemetery Symbolism of Prairie Pioneers: Gravestone Art and Social Change in Story County, Iowa. *Journal of the Iowa Archaeological Society* 31:1-136.
- Nystuen, D. W.  
1971 *The Minnesota Trunk Highway Archaeological Reconnaissance Survey: Annual Report 1970*. Minnesota Department of Highways and the Minnesota Historical Society, St. Paul.
- Nystuen, D. W. and L. D. Peterson  
1972 *The Archaeological Salvage of the Greenbush "Borrow Pit Site"*. Minnesota Dept. of Highways and Minnesota Historical Society, St. Paul.
- Obey, W. A.  
1974 The Arvilla People. *The Minnesota Archaeologist* 33(3 & 4):1.
- O'Brien, M. J.  
1987 Sedentism, Population Growth, and Resource Selection in the Woodland Midwest: A Review of Coevolutionary Developments. *Current Anthropology* 28:177-197.
- O'Brien, M. J. and D. E. Lewarch  
1981 *Plowzone Archaeology: Contributions to Theory and Technique*. Vanderbilt University Publications in Anthropology No. 27. Nashville, Tennessee.
- O'Brien, M. J., and R. E. Warren  
1983 An Archaic Projectile Point Sequence from the Southern Prairie Peninsula: The Pigeon Roost Creek Site. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 71-98. New World Archaeological Record. Academic Press, New York.
- O'Brien, P. J.  
1972 Urbanism, Cahokia, and Middle Mississippian. *Archaeology* 25:189-197.  
1989 Cahokia: The Political Capital of the "Ramey" State? *North American Archaeologist* 10(4):275-292.
- O'Brien, P. J. and K. Hart  
1972 The Utlaut Site (32SA162W): An Oneota-Historic Missouri Burial Site. *The Missouri Archaeologist* 34:48-66.
- O'Connell, B. H.  
1981 Human Osteological Analysis of the Altern Site. In *St. Croix Area Archaeological Survey Burnett County, Wisconsin Phase*, by A. H. Caine, C. K. C. Wedding, and P. R. Stern.  
1991 *Subsistence Economy of the Blackduck Culture in Northern Minnesota*. Report submitted to the Minnesota Private College Research Foundation, Blandin Faculty Fellowship Program.
- O'Connell, B. H., P. B. Brown and M. H. Regan  
1990 *Osteological Analysis of Human Skeletal Material: Science Museum of Minnesota Collections*. Report submitted to the Science Museum of Minnesota, on file, Hamline University and Science Museum of Minnesota.
- O'Connell, B. H. and S. T. Myster  
1995 *Osteological Analysis of the Cremation Feature at the Hannaford Site (21KC25)*. Submitted to Archeometry Laboratory, University of Minnesota, Duluth. Pursuant to MNDOT subcontract agreement No. 70974.



- 1996 Paleoindian and Early Archaic Human Remains in Minnesota. Paper presented at the Plains Anthropological Conference, Iowa City.
- O'Connell, B. H., M. K. Whelan and R. Withrow  
 1989 The Black Dog Burial Site (21DK26): Evidence for Culture Change at a Historic Dakota Indian Cemetery. Paper presented at the American Association of Physical Anthropologist Annual meeting, San Diego.
- Oerichbauer, E. S. (editor)  
 n.d. Stray Bands and Dream Dancers: Indian Farms and Potawatomi Settlement in Central Wisconsin during the Late 19th and Early 20th Century. Ms. on file, Burnett County Historic Society.  
 1982 Archaeological Excavations at the Site of a North West and XY Company Wintering Post. *The Wisconsin Archeologist* 58(2):8144-164.  
 1988 *Two Worlds Meeting on the Ouisconsin Frontier: Fort Folle Avoine Historic Park*. Burnett County Historical Society.
- O'Gorman, J. A.  
 1991 The Tremaine, OT, Filler, and Firesign Site Excavations: Late Prehistoric Sites in the La Crosse Locality. Paper presented at the 36th Annual Midwest Archaeological Conference, October 18-20, 1991. La Crosse, Wisconsin.  
 1993 *The OT Site (47 Lc-262)*. Archaeology Research Series Number 1, Museum Archaeology Program, State Historical Society of Wisconsin, Madison.  
 1994 *The Filler Site (47 Lc-149)*. Archaeology Research Series Number 2, Museum Archaeology Program, State Historical Society of Wisconsin, Madison.  
 1995 *The Tremaine Site (47 Lc-95)*. Archaeology Research Series Number 3, Museum Archaeology Program, State Historical Society of Wisconsin, Madison.
- Ohlhausen, M.  
 1995 *Historic Documentation, Cartherine & Martin Schultz Barn, Blue Earth County, Minnesota*. S.P. No. 0712-31. Report submitted to Minnesota Department of Transportation Agreement 70973, W.O. # 11.
- Olsen, S. L. and P. Shipman  
 1994 Cutmarks and Perimortem Treatment of Skeletal Remains on the Northern Plains. In *Skeletal Biology in the Great Plains*, edited by D. W. Owsley and R. L. Jantz, pp. 377-387. Smithsonian Institution Press, Washington D.C.
- Ojakangas, R. W., and Matsch, C. L.  
 1982 *Minnesota's Geology*. University of Minnesota Press.
- Othoudt, J. W.  
 1991a The Hanson Site Burial, Koochiching County, Minnesota. *Minnesota Archaeologist* 50(1):7-18.  
 1991b The Becker County "Red Ocher Burial" Revisited: Human Osteology and Comments. *Minnesota Archaeologist* 50(2):47-52.
- Orr, E.  
 1913 Mounds and Mound Explorations in Northeastern Iowa. *Proceedings of the Iowa Academy of Science* 20:257-260.  
 1914 Indian pottery of the Oneota or Upper Iowa River Valley in Northeastern Iowa. *Iowa Academy of Science Proceedings* 21:231-239.  
 1917a Notable Mound Groups in and Near the Proposed Government Park at McGregor, Iowa. *Proceedings of the Iowa Academy of Science* 24:43-46.  
 1917b Preserving the Indian Mounds Along the Mississippi River. *Iowa Conservation* 1(3):45-46.  
 1935 *Report of a State Wide Reconnaissance [sic] Survey of Indian Mound Groups, and Excavation of Camp Sites, Under Project 1047 of the Iowa Planning Board*. Ellison Orr Manuscripts, Vol. 2. On file at Effigy Mounds National Monument, Harpers Ferry, Iowa. Published on microfiche, 1963, Archives of Archaeology, Vol. 20. Society for American Archaeology.  
 1963 *Iowa Archaeological Reports, 1934-1939*. Volumes 2, 4, and 8. In Ten Volume Series, edited by M. B. McKusick. Archives of Archaeology 20. Society for American Archaeology. Madison, Wisconsin.
- Orr, P. C.  
 1956 Pleistocene Man in Fishbone Cave, Pershing County, Nevada. *Nevada State Museum Bulletin* 2: 1-20.  
 1962 The Arlington Springs Site, Santa Rosa Island. *American Antiquity* 27: 417-419.  
 1974 Notes on the Archaeology of the Winnemucca Lake Caves, 1952-1958. *Nevada State Museum Anthropological Papers* 16:47-59.
- Osborn, A.  
 1981 Amazing Paste, How Sweet the Taste! Mississippian Influences, Maize Horticulture, and Shell Tempered Ceramics in the Eastern Plains. Paper presented at the 39th Annual Meetings of the Plains Anthropological Conference, Bismark, North Dakota.
- Osborn, N. M.  
 1976 *The Clarkson Site (13WA2): An Oneota Manifestation in the Central Des Moines River Valley*. Unpublished Master's thesis. Department of Sociology and Anthropology. Iowa State University, Ames.  
 1982 The Clarkson Site (13WA2), An Oneota Manifestation in the Central Des Moines River Valley. *Journal of the Iowa Archeological Society* 29:1-108.
- Osborn, N. M., and D. M. Gradwohl  
 1980 Emergency Archaeological Investigations at 13PK154 (The DeArmond/Barrier Dam Site), Saylorville Reservoir, Iowa. *Journal of the Iowa Archeological Society* 27:61-96.  
 1981 *Saylorville Stage 2 Contract Completion Report*. Research Report. Iowa State University Archaeological Laboratory. Ames.  
 1982 *Saylorville Stage 3 Contract Completion Report*. Research Report. Iowa State University Archaeological Laboratory. Ames.
- Osborn, N. M., D. M. Gradwohl, and R. M. Thies  
 1978 *Emergency Archaeological Investigations at the Saylorville Site (13PK165), a Late Woodland Manifestation within the Saylorville Reservoir, Iowa*. Report submitted to the U. S. Heritage Conservation and Recreation Service, Interagency Archeological Services, Denver, Colorado.  
 1989 The Archaeology of the Saylorville Site (13PK165): A Late Woodland Manifestation on the Des Moines River. *Journal of the Iowa Archeological Society* 36:9-38.
- Ossenberg, N. S.  
 1969 Skeletal Remains from Hungry Hall Mound 2. Ms. on file, Royal Ontario Museum, Toronto.  
 1974 Origins and Relationships of Woodland Peoples: The Evidence of Cranial Morphology. In *Aspects of Upper Great Lakes Archaeology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson. Minnesota Historical Society, St. Paul.
- Overstreet, D. F.  
 1976 *The Grand River, Lake Koskonong, Green Bay, and Lake Winnebago Phases- Eight Hundred Years of Oneota Prehistory in Eastern Wisconsin*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin- Milwaukee.  
 1977 Wisconsin Binomial Pottery Types and Oneota Prehistory. *The Wisconsin Archeologist* 58(2):8144-164.  
 1978 Oneota Settlement Patterns in Eastern Wisconsin: Some Considerations of Time and Space. In *Mississippian Settlement Patterns*, edited by B. D. Smith, pp. 21-52. Studies in Archeology. Academic Press, New York.  
 1980 The Convent Knoll Site (47 WK-327): A Red Ocher Cemetery in Waukesha County, Wisconsin. *The Wisconsin Archeologist*. 61(1): 34-90.  
 1981 Investigations at the Pipe Site (47 Fd-10) and Some Perspectives on Eastern Wisconsin Oneota Prehistory. *The Wisconsin Archeologist* 62(4): 365-525.  
 1981 Review of Oneota Culture in Northwestern Iowa. *Plains Anthropologist* 26(91):87-89.  
 1982 Identification and Evaluation of Logging Industry-Related Cultural Resources, Nicolet National Forest. Great Lakes Archaeological Research Center, Wauwatosa, Wisconsin.  
 1984 *Archaeological Reconnaissance Survey of Pool 10, Upper Mississippi River, Grant and Crawford Counties, Wisconsin, and Allamakee and Clayton Counties, Iowa*. Reports of Investigations No. 139.  
 1984 *Archaeological Reconnaissance Survey of Pool 10, Upper Mississippi River, Grant and Crawford Counties, Wisconsin, and Allamakee and Clayton Counties, Iowa*. Reports of Investigations No. 139. Great Lakes Archaeological Research Center, Wauwatosa, Wisconsin.  
 1985 *Archaeological Investigations, Navigation Pool 11, Upper Mississippi River Basin*. Reports of Investigations No. 151. Great Lakes Archaeological Research Center, Inc. Wauwatosa, Wisconsin.  
 1986 *The Archaeology of Coralville Lake, Iowa Vol. I: Cultural Resources Management Plan and Overview*. Reports of Investigation No. 167. Great Lakes Archaeological Research Center, Inc. Wauwatosa, Wisconsin.

- 1987 *Cultural Resources Management Plan: Coralville Lake, Iowa*. Reports of Investigations No. 187. Great Lakes Archaeological Research Center, Milwaukee, Wisconsin.
- 1987 *Sub-Surface Evaluation of 47 Kn 40 and 47 Kn 56/134, Kenosha County, Wisconsin*. Reports of Investigations No. 199. Great Lakes Archaeological Research Center, Milwaukee.
- 1988 Osceola Revisited: Archaeological Investigations on the Potosi Terrace, Grant County, Wisconsin. *The Wisconsin Archeologist* 69(1-2):1-61.
- 1989a *Oneota Tradition and Culture History: New Data from the Old Spring Site (47 Wn-350)*. Draft Reports of Investigations No. 219. Great Lakes Archaeological Research Center, Milwaukee.
- 1989b *Survey and Testing, South Adams Street Redevelopment Project, Green Bay, Wisconsin*. Reports of Investigations No. 211. Great Lakes Archaeological Research Center, Milwaukee.
- 1991 Survey and Testing, South Adams Street Redevelopment Project, Green Bay, Wisconsin. Report on file at the State Historical Society of Wisconsin.
- 1992 *Archaeological Studies on the Southeast Wisconsin Uplands*. Case Studies in Great Lakes Archaeology, No. 1. Great Lakes Archaeological Press, Milwaukee.
- 1993a Paleoindian Traditions on Southeastern Wisconsin—An Overview. In *FY 1992 Historic Preservation Survey and Planning Grant: Early Holocene Megafauna Exploitation, Kenosha County, Wisconsin*, edited by D. F. Overstreet. Reports of Investigations No. 325. Great Lakes Archaeological Research Center, Milwaukee.
- 1993b *Chesrow: A Paleoindian Complex in the Southern Lake Michigan Basin*. Case Studies in Great Lakes Archaeology, No. 2. Great Lakes Archaeological Press, Milwaukee.
- 1993c Updated Paleoindian Study Unit for Region 7. In *Archaeological Investigations in the Sheboygan River Watershed, 1990-1993*, edited by J. D. Richards, D. F. Overstreet, and P. B. Richards, pp. 61-100. Reports of Investigations No. 327. Great Lakes Archaeological Research Center, Milwaukee.
- 1993d Early Woodland Study Unit for Region 7. In *Archaeological Investigations in the Sheboygan River Watershed, 1990-1993*, edited by J. D. Richards, D. F. Overstreet, and P. B. Richards, pp. 101-153. Reports of Investigations No. 327. Great Lakes Archaeological Research Center, Milwaukee.
- 1993e McCauley, Astor, and Hanson—Candidates for a Provisional Dandy Phase. *The Wisconsin Archeologist* 74(1-4):120-196.
- 1995 The Eastern Wisconsin Oneota Regional Continuity. In *Oneota Archaeology: Past, Present, and Future*, edited by W. Green, pp. 33-64. The University of Iowa Office of the State Archaeologist, Report 20. Iowa City.
- n.d. Cultural Dynamics of the Late Prehistoric Period in Southern Wisconsin. Manuscript submitted to Illinois State Museum, in press.
- Overstreet, D. F. and P. Bruhy  
1979 *Archaeological Studies at the Mile Long Site (47 Wl-110): A Planning and Preservation Report*. Reports of Investigations No. 70. Great Lakes Archaeological Research Center, Milwaukee.
- Overstreet, D. F., P. L. Lurenz, Jr., and C. Rosen  
1986 *Evaluation of the Archaeological Data Base, Coralville Lake, Iowa*. Reports of Investigation No. 186. Great Lakes Archaeological Research Center, Milwaukee, Wisconsin.
- Overstreet, D. F. and P. B. Richards (editors)  
1992 *Archaeology at Lac du Puans: The Lake Winnebago Phase, A Classic Horizon Expression of the Oneota Tradition in East Central Wisconsin*. Reports of Investigations No. 280. Great Lakes Archaeological Research Center, Milwaukee.
- Overstreet, D. F., and J. G. Stark  
1985a *Archaeological Investigations at Coralville Lake, Iowa. Results of Phases 0-1 of a Cultural Resources Management Plan*. Reports of Investigations No. 167. Great Lakes Archaeological Research Center, Wauwatosa, Wisconsin.
- 1985b *The Archaeology of Coralville Lake, Iowa, Volume IV: Recreation Area Survey (Interim Report II)*. Reports of Investigations No. 167. Great Lakes Archaeological Research Center, Wauwatosa, Wisconsin.
- Overstreet, D. F., J. G. Stark, and J. D. Anderson  
1985 *Archaeological Investigations at Coralville Lake, Iowa: Results of Management Phase 0-1*. Reports of Investigations No. 156. Great Lakes Archaeological Research Center, Milwaukee, Wisconsin.
- Owsley, D. W., R. W. Mann, and T. G. Baugh  
1994 Culturally Modified Human Bones from the Edwards I Site. In *Skeletal Biology in the Great Plains*, edited by D. W. Owsley and R. L. Jantz, pp. 363-375. Smithsonian Institution Press, Washington D.C.
- Owsley, D. W., D. F. Morey, and W. B. Turner  
1981 Inferring History from Crania: Biological Distance Comparisons of Mill Creek and Early Middle Missouri Tradition Crania with Mandan and Arikara Population Samples. *Plains Anthropologist* 26(94): 301-310.
- Owsley, D. W. and J. C. Rose (editors)  
1997 *The Bioarcheology of the North Central United States*. Arkansas Archeological Survey Research Series No. 49.
- Ozker, D. B.  
1982 *An Early Woodland Community at the Schultz Site 20SA2 in the Saginaw Valley and the Nature of the Early Woodland Adaptation in the Great Lakes Region*. Anthropological Papers 70. Museum of Anthropology, University of Michigan, Ann Arbor.
- Page, W. C.  
1983 Historical Assessment: An Intensive Cultural Resource Survey for the Bank Stabilization Project. In *An Intensive Cultural Resource Survey for the Bank Stabilization Project NCROD-S-070-0x6-1-103490 Rip-Rap Construction Bonaparte, Iowa*, by A. Till, pp. 121-138. Report Prepared for the Rock Island District, US Army Corps of Engineers. Rock Island, Illinois.
- Palmer, H. A.  
1954 A Review of the Interstate Park, Wisconsin Bison Find. *Proceedings of the Iowa Academy of Science* 61:313-319. Des Moines.
- Palmer, H. A. and J. B. Stoltman  
1976 The Boaz Mastodon: A Possible Association of Man and Mastodon in Wisconsin. *Mid-Continental Journal of Archaeology* 1(2):163-177.
- Parker, J.  
1976 *The Journals of Jonathan Carver and Related Documents 1766-1770*. Minnesota Historical Society Press, St. Paul.
- Parmalee, P. W.  
1959a Animal Remains from the Raddatz Rockshelter, Sk5, Wisconsin. *The Wisconsin Archeologist* 40(2):83-90.
- 1959b Use of Mammalian Skull and Mandibles by Prehistoric Indians in Illinois. *Transactions, Illinois Academy of Science* 52 (3-4): 85-95.
- 1960 Animal Remains from the Aztalan Site, Jefferson County, Wisconsin. *Wisconsin Archeologist* 41:1-10.
- Parson, L. A.  
1960 Another Indian Burial from Milwaukee. *Wisconsin Archeologist* 41:71-73.
- Patterson, C. J.  
1992 *Surficial Geology of Ramsay County, Minnesota*. Geologic Atlas Ramsay County, Minnesota, Atlas C-7, Minnesota Geological Survey.
- Paull, R. K., and R. A. Paull  
1977 *Geology of Wisconsin and Upper Michigan*. Kendall/Hunt Publishing Company, Dubuque, Iowa.
- 1980 *Wisconsin and Upper Michigan*. Geology Field Guide Series, Kendall/Hunt Publishing Company. Dubuque, Iowa.
- Peet, S. D.  
1892 *The Mound Builders: Their Works and Relics*. Office of the American Antiquarian, Chicago.
- Penman, J. T.  
1978 Archaeology of a Late Nineteenth Century Shoemaker's Shop, Mineral Point, Wisconsin. *The Wisconsin Archeologist* 59(3): 310-342.
- 1981 The Archaeology of the Bluff Siding Site (47 Bf-45), Buffalo County, Wisconsin. *The Wisconsin Archeologist* 62(1): 1-52.
- 1984 *Archaeology of the Great River Road: Summary Report*. Wisconsin Department of Transportation Archaeological Report No. 10, Madison.
- 1984b *Transportation Archaeology in Wisconsin-The 1983 Field Season*. Wisconsin Department of Transportation, Madison.

- 1985 Late Woodland Sites in Southwestern Grant County, Wisconsin. *Journal of the Iowa Archeological Society* 32:1-36.
- 1988 Neo-Boreal Climatic Influences on the Late Prehistoric Agricultural Groups in the Upper Mississippi Valley. *Geoarchaeology* 3:139-145.
- Penman, J. T. and K. Hamilton  
1990 *Prehistoric Sites in La Crosse County*. Wisconsin Department of Transportation Archaeology Report No.17, Madison.
- Penny, D. M., T. K. Larson, and W. J. Kinney  
1994 *Results of a Level I Cultural Resource Inventory of Streambank Areas, Fort McCoy, Wisconsin*. Final Report submitted to U.S. Army Corps of Engineers, Omaha District by Gulf Engineers & Consultants, Inc. and Larson-Tibesar Associates, Inc.
- Penrose, L. S.  
1954 Distance, Size, and Shape. *Annals of Eugenics* 18:337-343.
- Perry, M. J.  
1981 *BROS-9056(1), Des Moines/Lee Counties, Phase II Investigation of 13DM40, Secondary Roads*. Project Completion Report 4(44). Highway Archaeology Program. University of Iowa, Iowa City.  
1982 *Phase II Investigation Louisa County*. Project Completion Report 5(41). Highway Archaeology Program. University of Iowa, Iowa City.  
1984a *Test Excavations at Sites 13MC23, 13MC32, 13MC33, and 13MC88*. Project Completion Report 7(363). Highway Archaeology Program. University of Iowa, Iowa City.  
1984b *Phase II Investigation at 13HN48, BROS-9044(2), Henry County, Local Roads*. Project Completion Report 7(193). Highway Archaeology Program. University of Iowa, Iowa City.  
1984c *Phase II Investigation at 13HN40, LG-7789FM, Henry County, Local Roads*. Project Completion Report 7(194). Highway Archaeology Program. University of Iowa, Iowa City.  
1985 *FM-56(9) a.k.a. FHWA 219360 and BROS-9056(3), Lee County, Local Roads*. Project Completion Report 8(250). Highway Archaeology Program. University of Iowa, Iowa City.  
1987 Late Woodland Ceramics in Southeastern Iowa: A Perspective from the Lower Skunk Valley. *Journal of the Iowa Archeological Society* 34:57-62.  
1991 Middle Woodland Field Camps in the Cedar Valley. *Journal of the Iowa Academy of Science* 98(3):109-117.  
1992 *Phase II Test Excavations in the Central Des Moines River Valley Primary Roads Project F-500-1(5 and 20)—20-77 a.k.a. PIN 777-77290-1 and 3 Polk County, Iowa*. Project Completion Report 15(25). Highway Archaeology Program. University of Iowa, Iowa City.  
1993 13IW216: An Apparent Keyes Phase Component in the Amana Locality, Eastern Iowa. Paper Presented at the 38th Annual Midwest Archaeological Conference. October 22-24, 1993. Milwaukee, Wisconsin.
- Peske, G. R.  
1966 Oneota Settlement Patterns and Agricultural Patterns in Winnebago County. *The Wisconsin Archeologist* 47(4):188-195.  
1971 Winnebago Cultural Adaptation to the Fox River Waterway. *Wisconsin Archeologist* 52(2):62-70.
- Peske, G. R. and G. R. Peters  
1976 Microscopic Analysis and Age Determination of Prehistoric Human Bone. *The Wisconsin Archeologist* 57(2):130-137.
- Peske, G. R., and N. C. Tappen  
1970 Microscopic Examination of Human Femurs Buried at Washington Island, Wisconsin. *American Antiquity* 35:463-465.
- Peters, G. R.  
1976 A Reevaluation of Aztalan: Some Temporal and Causal Factors. *The Wisconsin Archeologist* 57(1):1-11.  
1988 Blackduck Culture. In *Historical Dictionary of North American Archaeology*, edited by E.B. Jelks and J.C. Jelks, pp. 44. Greenwood Press, New York, NY.
- Peters, G. R. (editor)  
1990 *Cultural Resource Management on the Superior National Forest: 1989 Annual Report*. Cultural Resource Report 7, Superior National Forest. USDA Forest Service, Duluth.  
1992 *Cultural Resource Management on the Superior National Forest: 1990-91 Annual Report*. Cultural Resource Report 8, Superior National Forest. USDA Forest Service, Duluth.
- Petersen, R. W.  
1984 A Survey of the Destruction of Effigy Mounds in Wisconsin and Iowa—A Perspective. *The Wisconsin Archeologist* 65(1): 1-31.  
1986 The Strange Case of the Harpers Ferry "Great Group". *Iowa Archeological Society Newsletter* 36(2):3-4.
- Peterson, L., W. Yourd and L. Gonsior  
1988 *Minnesota Trunk Highway Archaeological Reconnaissance Survey Annual Report - 1987*. Minnesota Historical Society, St. Paul.
- Peterson, L. D.  
1977a Investigation of the Black Dog Village and Burial Site, January and February, 1977. Ms. on file, Minnesota Historical Society.  
1977b Amendment to Report on Investigations at Black Dog. Ms. on file, Minnesota Historical Society.  
1977c Memo detailing burials and artifact catalogue for 21DK25, Black Dog Burials. Office Memorandum, Minnesota Historical Society.  
1978 The Minnesota Trunk Highway Archaeological Reconnaissance Survey, In *Annual Report-1977*, pp. 98-105. Minnesota Historical Society.
- Peterson, M. Q.  
1964 *The Estimation of the Relationship and Biological Distance Between Selected Minnesota Prehistoric Groups*. Unpublished Master's thesis, University of Minnesota, Minneapolis.  
Peterson, M. Q., and R. M. Schact  
1966 An Analysis of the Skeletal Remains of Price Site III, Ri 4. *Wisconsin Archeologist* 47:76-84.
- Petsche, J. E.  
1974 *The Steamboat Bertrand: History, Excavation, and Architecture*. Publications in Archeology 11. National Park Service, Washington, D.C.
- Pettigrew, F. W.  
1901 *A Prehistoric Indian Village*. Bulletin of the Minnesota Academy of Natural Science.
- Pfeiffer, S.  
1977 *The Skeletal Biology of Archaic Populations of the Great Lakes Region*. National Museum of Man, Mercury Series No. 64.  
1979 Archaic Populations as Determined by Analysis of Cranial Morphology. *Ontario Archaeology* 32:35-41.  
1988 Summary of Osceola Site Skeletal Remains. *The Wisconsin Archeologist* 69(1-2):62-63.
- Phillips, J. L., and J. A. Brown  
1983 *Archaic Hunters and Gatherers in the American Midwest*. New World Archaeological Record. Academic Press, New York.
- Pillaert, E. E.  
1969 Faunal Remains from the Millville Site (47 Gt-53), Grant County, Wisconsin. *The Wisconsin Archeologist* 50(2):93-108.
- Platcek, E. P.  
1965 A Preliminary Survey of a Fowl Lakes Site. *Minnesota Archaeologist*, 27:51-92 (No. 2).
- Pond, S. W.  
1986 *The Dakota or Sioux in Minnesota as They Were in 1834*. Minnesota Historical Society, St. Paul.
- Popham, R. E. and J. N. Emerson  
1954 Manifestations of the Old Copper Industry in Ontario. *Pennsylvania Archaeologist* 24(1):3-9.
- Porter, J. W.  
1961 Hixton Silicified Sandstone: A Unique Lithic Material Used by Prehistoric Cultures. *The Wisconsin Archeologist* 62(1):1-33.
- Porubcan, P. J. and E. D. Benchley  
1995 *The Warren Hause Site (47 Da-910): Final Report of Phase III Archaeological Data Recovery at a Mid-19th Century Homestead in Verona Township, Dane County, Wisconsin*. Report of Investigations No. 124. University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Powell, J. F. and D. G. Steele  
1994 A Multivariate Craniometric Analysis of North American Paleoindian Remains. *Current Research in the Pleistocene* 9:59-62.
- Powers, H. C.  
1910 Opening of an Indian Mound near Sioux City, Iowa. *Records of the Past* 9(6):309-311.

- Pratt, D. R.  
 1994a *A Carbon and Nitrogen Isotope Analysis of Sixty-Three Burials from the Upper Mississippi River Valley*. M.S. on file, Interdisciplinary Ancient Studies Department, University of Minnesota, Minneapolis, Minnesota.  
 1994b *A Carbon Isotope Analysis of Fifty-Nine Burials from the Upper Mississippi River Valley*. Unpublished Master's thesis. Department of Anthropology, University of Minnesota, Minneapolis.
- Pratt, W. H.  
 1876 Report of Explorations of the Ancient Mounds at Toolesboro, Louisa County, Iowa. *Proceedings of the Davenport Academy of Natural Sciences* 1:106-111.
- Price, T. D.  
 1985 Late Archaic Subsistence in the Midwestern United States. *Journal of Human Evolution* 14:449-459.
- Price, T. D., M. Connor, J. D. Parsen  
 1985 Bone Chemistry and the Reconstruction of Diet: Strontium Discrimination in White-Tailed Deer. *Journal of Archaeological Science* 12:419-442.
- Price, T. D. and M. Kavanagh  
 1982 Bone Composition and the Reconstruction of Diet: Examples from the Midwestern United States. *Midcontinental Journal of Archaeology* 17:61-79.
- Prior, J. C.  
 1976 *A Regional Guide to Iowa Landforms*. Educational Series 3. Iowa Geological Survey, Iowa City.  
 1991 *Landforms of Iowa*. University of Iowa Press, Iowa City.
- Proudfit, S. V.  
 1881 Antiquities of the Missouri Bluffs. *American Antiquarian* 3:271-280.  
 1886 The Lodge Dweller. *American Antiquarian* 8:222-228.
- Purcell, L. E.  
 1978 The Unknown Past: Sources for History Education and the Indians of Iowa. In *The Worlds Between Two Rivers: Perspectives on American Indians in Iowa*, edited by G. M. Bataille, D. M. Gradwohl, and C. L. P. Silet, pp. 16-25. Iowa State University Press, Ames.
- Pyle, K. B.  
 1980 The Cherokee Large Mammal Fauna. In *The Cherokee Excavations: Holocene Ecology and Human Adaptation in Northwestern Iowa*, edited by D. C. Anderson and H. A. Semken, Jr., pp. 171-196. Academic Press, New York.
- Quimby, G. I.  
 1960 *Indian Life in the Upper Great Lakes*. University of Chicago Press, Chicago.  
 1963 Late Period Copper Artifacts in the Upper Great Lakes region. *Wisconsin Archeologist* 44:193-198.  
 1966 *Indian Culture and European Trade Goods: The Archaeology of the Historic Period in the Western Great Lakes*. The University of Wisconsin Press, Madison.
- Raab, L. M. and T. C. Klinger  
 1977 A Critical Appraisal of "Significance" in Contract Archaeology. *American Antiquity* 42:629-634.  
 1979 A Reply to Sharrock and Grayson on Archaeological Significance. *American Antiquity* 44:328-329.
- Radin, P.  
 1916 *The Winnebago Tribe*. Bureau of American Ethnology, 37th Annual Report. Washington, D.C.
- Rajnovich, G.  
 1984 A Study of Possible Prehistoric Wild Rice Gathering on Lake of the Woods, Ontario. *North American Archaeologist* 5(3):197-215.
- Rajnovich, M. G. N. and C.S. Reid  
 1978 Selkirk and Clearwater Ceramics on Lake of the Woods: An Overview. *Manitoba Archaeological Quarterly* 2(1-2):43-48, Winnipeg.
- Ray, A. J.  
 1974 *Indians in the Fur Trade: The Role as Hunters, and Trappers and Middlemen in the Lands Southwest of Hudson Bay 1660-1870*. University of Toronto Press, Toronto.
- Ready, T.  
 1974 Onamia Ceramics. Ms. on file, Wilford Laboratory of Archaeology, University of Minnesota, Minneapolis.
- 1979a Onamia Series. In *A Handbook of Minnesota Prehistoric Ceramics*, edited by S. F. Anfinson, pp. 149-155. Occasional Publications in Minnesota Anthropology, Minnesota Archaeological Society, Ft. Snelling.  
 1979b Cambria Phase. In *A Handbook of Minnesota Prehistoric Ceramics*, edited by S. F. Anfinson, pp. 51-65, Minnesota Archaeological Society, St. Paul.
- Reid, C. S. and G. Rajnovich  
 1980 Ash Rapids Corded: Newly Defined Late Woodland Ceramics from Northwestern Ontario. *Ontario Archaeology* 34:69-86.  
 1991 Laurel: a Re-evaluation of the Spatial, Social and Temporal Paradigms. *Canadian Journal of Archaeology* 15:193-234.
- Reid, K. C.  
 1983 The Nebo Hill Phase: Late Archaic Prehistory in the Lower Missouri Valley. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 11-39. New World Archaeological Record. Academic Press, New York.
- Reynolds, J. D.  
 1967 Historic Archaeology in the Red Rock Reservoir, Iowa, 1966. *Plains Anthropologist* 12:208-209.  
 1969 Report on Excavation at Site 13MA103 (The Coalport Kiln). *Plains Anthropologist* 14:316.  
 1970 *Coalport and its Relationship to the Early Historic Pottery Industry in the Des Moines River Valley*. Unpublished Master's thesis. Department of Sociology and Anthropology. Iowa State University, Ames.
- Rhodes, J. W.  
 1973 *Upper Rice Lake Site (2ICE4)*. Unpublished Master's thesis, Department of Anthropology, University of Minnesota, Minneapolis.
- Richards, J. D.  
 1992 *Ceramics and Culture at Aztalan, A Late Prehistoric Village in Southeast Wisconsin*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin-Milwaukee.  
 1993 Preliminary Analysis of Ceramics from the Henschel Site (47 Sb-29). In *Archaeological Investigations in the Sheboygan River Watershed, 1990-1993*, edited by J. D. Richards, D. F. Overstreet, and P. B. Richards, pp.154-224. Reports of Investigation No. 327. Great Lakes Archaeological Research Center, Milwaukee.
- Richards, P. B.  
 1993a Winnebago Subsistence—Change and Continuity. In *Exploring the Oneota-Winnebago Direct Historic Connection.*, edited by D. F. Overstreet. *The Wisconsin Archeologist* 74(1-4):272-290.  
 1993b Excavations at the Milwaukee County Institution Grounds Almshouse Cemetery. Paper presented at the Midwest Archaeological Conference, Milwaukee, Wisconsin.
- Richardson, D. B., J. D. Anderson, and M. L. Anderson  
 1989 *Geomorphological and Archaeological Survey of Selected Lands to be Impacted by the Coralville Lake Pool Raise Phase I, II Johnson County, Iowa*. Donahue and Associates, Inc., Sheboygan, Wisconsin.
- Richards, P. B. and M. W. Kastell  
 1993 *Unpublished reports, Archaeological Excavation at the Almshouse Burial Ground, Milwaukee County Poorhouse, Wauwatosa, Wisconsin*. Report of Investigations Number 333, Great Lakes Archaeological Research Center, Milwaukee.
- Richner, J. J.  
 1987 *Archaeological Investigations at Apostle Islands National Lakeshore, 1979-1980*. Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.  
 1989 *1984 Excavations at Site 47 As-47, A Fishing Camp on Manitou Island, Wisconsin*. Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.  
 1991 *Archaeological Excavations at the Manitou Fish Camp, Apostle Islands National Lakeshore, 1983*. Midwest Archaeological Center Technical Report No. 4, Lincoln, Nebraska
- Riggle, S.  
 1981 The Late Woodland Transition in the Central Mississippi Valley: A.D. 700-1100. *South Dakota Archaeology* 5:5-18.
- Riggs, R. E.  
 1981 Human Skeletal Remains from Bluff Siding (47-BF-45), Buffalo County, Wisconsin. *Wisconsin Archeologist* 62:45-48.

- 1985 Human Skeletal Remains from the Poor Man's Farrah (47 Gt-366) and the Bade (47 Gt-365) Sites in Southwestern Wisconsin. *Journal of the Iowa Archeological Society* 32:37-73.
- Ritchie, W. A.  
1965 *The Archaeology of New York State*. The Natural History Press, Garden City.
- Ritzenthaler, R. E.  
1946 The Osceola Site—An "Old Copper" Site near Potosi, Wisconsin. *The Wisconsin Archeologist* 27(3):53-70.  
1953 *Prehistoric Indians of Wisconsin*. Popular Science Handbook Series No. 4. Public Museum of the City of Milwaukee.  
1958 Some Carbon 14 Dates for the Wisconsin Old Copper Culture. *The Wisconsin Archeologist* 39(3):173-174.  
1964 The Riddle of the Spencer Lake Horse Skull. *The Wisconsin Archeologist* 45:115.  
1966a The Kouba Site: Paleo-Indians in Wisconsin. *The Wisconsin Archeologist* 47(4):171-187.  
1966b Radiocarbon Dates for the Clam River Focus. *The Wisconsin Archeologist* 47(4):219-220.  
1967a A Probable Paleo-Indian Site in Wisconsin. *American Antiquity* 32:227-229.  
1967b A Cache of Paleo-Indian Gravers from the Kouba Site. *The Wisconsin Archeologist* 48(3):261-262.  
1970a Clovis and Sandia-Like Points from Dane County, Wisconsin. *The Wisconsin Archeologist* 51(1):35-36.  
1970b Another Radiocarbon Date for the Oconto Site. *The Wisconsin Archeologist* 51(2):77.  
1972 The Pope Site: A Scottsbluff Cremation? in Waupaca County. *The Wisconsin Archeologist* 53:15-19.
- Ritzenthaler, R. E. (editor)  
1957 The Old Copper Culture of Wisconsin. *Wisconsin Archaeologist*, new series, 38:186-329.  
1978 Southwestern Chippewa. In *Handbook of North American Indians*, Volume 15, pp. 743-759. Smithsonian Institution, Washington D.C.  
1985 *Prehistoric Indians of Wisconsin*. Milwaukee Public Museum (third edition), Milwaukee, Wisconsin.
- Ritzenhaler, R. and A. Niehoff  
1958 A Red Ochre Burial in Ozaukee County. *The Wisconsin Archeologist* 39:115-120.
- Ritzenthaler, R. E., N. Ostberg, K. Whaley, M. Greenwald, P. Foust, E. Shug, W. Wittry, H. Meyer, and E. Lunsted  
1957 Reigh Site Report - Number 3. *The Wisconsin Archeologist* 38(4):278-310.
- Ritzenthaler, R. E. and G. I. Quimby  
1962 The Red Ocher Culture of the Upper Great Lakes and Adjacent Areas. *Fieldiana Anthropology* 36(11):243-275. Chicago.
- Ritzenthaler, R. E. and W. L. Wittry  
1952 The Oconto Site—An Old Copper Manifestation. *The Wisconsin Archeologist* 33(4):199-223.
- Roberts, F. H. H.  
1945 A Deep Burial on the Clear Fork of the Brazos River. *Bulletin of the Texas Archeological and Paleontological Society* 16:9-30.
- Robinson, E. B.  
1966 *History of North Dakota*. University of Nebraska Press, Lincoln.
- Robinson, D.  
1967 *The History of the Dakota or Sioux Indians*. Ross & Haines, Inc., Minneapolis.
- Rodell, R. L.  
1983 *The Late Prehistory of Eastern Wisconsin: A Survey of the Archaeological Research and Interpretations Pertaining to Oneota Settlement and Subsistence*. Unpublished Masters Paper, Department of Anthropology, University of Wisconsin-Milwaukee.  
1986 Archaeology of the Diamond Bluff Complex. Paper presented at the Midwest Archaeological Conference, Milwaukee, October 1987.
- 1991 The Diamond Bluff Complex and Cahokia Influence in the Red Wing Locality. In *New Perspectives on Cahokia: Views from the Periphery*, edited by J. B. Stoltman. Monographs in World Archaeology No. 2. Prehistory Press, Madison.
- Rodnick, D.  
1937 Political Structure and Status among the Assiniboine Indians. *American Anthropologist* n.s. 41:408-416.
- Roefer, F., M. English and G. Lothson  
1973 *The Jeffers Petroglyphs: A Cultural-Ecological Study*. Minnesota Historical Society, St. Paul.
- Roetzel, K. A., and R. A. Strachan  
1980 *An Archaeological Investigation of the Proposed Lagoon Site, Dam Site Recreation Area, Coralville Lake, Iowa*. Impact Services, Inc. Mankato, Minnesota.
- Rogers, Leah D., and Brad Koldehoff  
1987 *Archaeological Site Testing, Lake Red Rock, Iowa: Pool Raise Project, 1986 Season*. Cultural Resources Management Report No. 125. American Resources Group, Ltd., Carbondale, Illinois.
- Romano, A. D. and E. Johnson  
1990 A Northern Minnesota Gunflint Silica Clovis Point. *Wisconsin Archaeologist* 71(3/4):204-215.
- Roper, D. C.  
1976 A Trend-Surface Analysis of Central Plains Radiocarbon Dates. *American Antiquity* 16(4):181-188.  
1986 *Archaeological Survey and Testing at Lake Red Rock, Iowa: The 1984 and 1985 Seasons*. R-2821. Gilbert/Commonwealth, Inc., Jackson, Michigan.  
1992 *Phase 3 Investigations at 13LC17: A Randolph Phase Winter Camp in the White Breast Creek Valley, Lucas County, Iowa*. Manhattan, Kansas. Report Prepared for the Iowa Department of Transportation, Ames.  
1994 A Randolph Phase Winter Camp in the White Breast Creek Valley. *Journal of the Iowa Archeological Society* 41:76-107.
- Rose, J. C. (editor)  
1991 *Paleopathology Association Skeletal Database Committee Recommendations*. Paleopathology Newsletter Supplement.
- Rose, J. C., B. A. Burnett, M. S. Nassaney, and M. W. Blauer  
1984 Paleopathology and the Origins of Maize Agriculture in the Lower Mississippi Valley and Caddoan Culture Areas. In *Paleopathology at the Origins of Agriculture*, edited by M. N. Cohen and G. T. Armelagos, pp. 293-424. Academic Press, Orlando, FL.
- Rowe, C. W.  
1953 Preliminary Report on the Heller Mounds Group. *Wisconsin Archeologist* 34:144-148.  
1956 The Effigy Mound Culture of Wisconsin. Milwaukee Public Museum *Publications in Anthropology*, Number 3.  
1958 A Crematorium at Aztalan. *The Wisconsin Archeologist* 39(1):101-110.
- Rowe, P. R.  
1922 Decorative Markings on Some Fragments of Indian Pottery from Mills County, Iowa. *Proceedings of the Iowa Academy of Science* 29:53-59.  
1951 Notes on Early Man and Archaic Sites in the Glenwood Area. *Iowa Archeological Society Newsletter* 3-4:4-6.  
1952a Early Horizons of Mills County, Iowa, Part I, Evidences of Early Man. *Journal of the Iowa Archeological Society* 1(3):6-13.  
1952b Early Horizons of Mills County, Iowa, Part II, Pre-pottery Sites. *Journal of the Iowa Archeological Society* 2(1).
- Ruddiman, W. F. and H. E. Wright, Jr.  
1987a Introduction. In *North America and Adjacent Oceans During the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 1-12. The Geology of North America, Vol. K-3. The Geological Society of North America. Boulder, Colorado.  
1987b *North America and Adjacent Oceans During the Last Deglaciation*. The Geology of North America, Vol. K-3. The Geological Society of North America. Boulder, Colorado.
- Ruhe, R. V.  
1969 *Quaternary Landscapes in Iowa*. Iowa State University Press, Ames.

- Ruppé, R. J.  
 1954a An Archaic Site at Olin, Iowa. *Journal of the Iowa Archeological Society* 3(4):12-15.  
 1954b Archeological Chats. *Journal of the Iowa Archeological Society* 3(4):1-5.  
 1956 Archeological Investigations of the Mill Creek Culture of Northwestern Iowa. *American Philosophical Society Yearbook* 1955:335-339.  
 1957a University Summer Session Excavation. *Iowa Archeological Society Newsletter* 21:2.  
 1957b Unpublished Field Notes on File. Office of the State Archaeologist, Iowa City.  
 1960a Archeological Chats. *Journal of the Iowa Archeological Society* 9(4):2-5.  
 1960b The Westwood Site: A Middle Woodland Burial Mound. *Journal of the Iowa Archeological Society* 9(3): 20-23.
- Rusch, L. A.  
 1985 The Springview Site: A Possible Late-Seventeenth Century Mascouten Village. *The Wisconsin Archeologist* 66(2):157-175.  
 1988 The Early and Late Woodland Occupations at the Bachmann Site in East Central Wisconsin. Ms. on file, State Historical Society of Wisconsin.
- Rusch, L. A. and J. T. Penman  
 1982 *Historic Sites along the Great River Road*. Wisconsin Department of Transportation Archaeological Report 7. Madison.  
 1984 *Transportation Archaeology in Wisconsin: The 1983 Field Season*. Wisconsin Department of Transportation Archaeological Report 9. Madison.
- Sage, L. L.  
 1974 *A History of Iowa*. Iowa State University Press, Ames.
- Salkin, P. A.  
 1979 47MQ66: A Report on A Late Woodland Site in Marquette County, Wisconsin. *The Wisconsin Archeologist* 60:330-349
- Salkin, P. H.  
 1986 The Lakes Farm Phase: The Early Woodland Stage in South-Central Wisconsin as Seen from the Lake Farms Archeological District. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 92-120. Center for American Archeology, Kampsville Seminars in Archeology, No. 2. Center for American Archeology Press, Kampsville, Illinois.  
 1987 A Reevaluation of the Late Woodland Stage in Southeastern Wisconsin. *Wisconsin Academy Review* 33(2):75-79.  
 1989 *Archaeological Mitigation Excavations at Fox Lake, Dodge County, Wisconsin*. Archaeological Consulting and Services Reports of Investigations, Report Number 500. Verona, WI.  
 1990 *Mitigation Excavation at the Brower Site, A 19th Century Wholesale Drug Concern in the City of Prairie du Chien, Wisconsin*. Archaeological Consulting and Services Reports of Investigations, Report Number 491. Madison, WI.  
 1993 *Mitigation Excavations in the Kekoskee Archeological District in Dodge County, Wisconsin*. Archaeological Consulting and Services Reports of Investigations, Report Number 700. Verona, WI.  
 1994a *The Cultural Resources of the Fort McCoy Installation: A Literature and Records Search, Cultural Overview, and Management Plan for the Environmental Impact Statement for the Master Plan at Fort McCoy, Wisconsin*. Archaeological Consulting and Services, Reports of Investigations No. 742. Verona, Wisconsin.  
 1994b The Kekoskee and Horicon Phases: Support for the Model. Paper presented at the Spring Meeting of the Wisconsin Archeological Survey, Madison, March.  
 1994c *Archaeological Mitigation Excavations at the Airport Village Site (47 Da-2) in Dane County, Wisconsin*. Archaeological Consulting and Services, Reports of Investigations No. 870. Verona, Wisconsin.
- Salzer, R. J.  
 1966 Field Notes on the Maine Site. On File at the University of Wisconsin, Milwaukee.  
 1969 *An Introduction to the Archaeology of Northern Wisconsin*. Unpublished Ph.D. dissertation, Southern Illinois University, Carbondale.  
 1974 The Wisconsin Northern Lakes Project: A Preliminary Report. In *Aspects of Upper Great Lakes Anthropology*, edited by E. Johnson, pp. 40-54. Minnesota Prehistoric Archaeology Series No. 11. Minnesota Historical Society, St. Paul.  
 1981 The Kutz Site (47 Je-243), Jefferson County, Wisconsin. *The Wisconsin Archeologist* 62(1):53-83.  
 1986a The Middle Woodland Stage. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 263-282. *The Wisconsin Archeologist* 67(3-4).  
 1986b Other Late Woodland Developments. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 303-313. *The Wisconsin Archeologist* 67(3-4).  
 1987a Preliminary Report on the Gotschall Site (47 Ia-80). In *Wisconsin Rock Art*, edited by R. A. Birmingham and W. Green, pp. 419-472. *The Wisconsin Archeologist* 68(4).  
 1987b Introduction to Wisconsin Rock Art. *The Wisconsin Archeologist* 68(4):277-286.  
 1996 Post-Hopewell Rockshelter Rituals in Southwestern Wisconsin. Paper presented at the Annual Meeting of the Society for American Anthropology, New Orleans.  
 n.d. The Waukesha Focus: Hopewell in Southeastern Wisconsin. Ms. on file, University of Wisconsin-Milwaukee Archaeological Research Laboratory.
- Salzer, R. J. and D. F. Overstreet  
 1974 *Summary Report: Archaeological Survey of Madeline Island*. Report submitted to the State Historical Society of Wisconsin, Madison.
- Santure, S. K.  
 1990 Bold Counselor Phase Oneota Habitation Component. In *Archaeological Investigations at the Morton Village and Norris Farms 36 Cemetery*. Illinois State Museum Reports of Investigations, No. 45, Springfield.
- Santure, S. K., A. D. Harn, and D. Esary  
 1990 *Archaeological Investigations at the Morton Village and Norris Farms 36 Cemetery*. Illinois State Museum Reports of Investigations, No. 45, Springfield.
- Sasso, R. et. al.  
 1985 *Prehistoric Ridged Field Agriculture in the Upper Mississippi Valley*. Reports of Investigations Number 38, Mississippi Valley Archaeology Center, University of Wisconsin/La Crosse.
- Sasso, R. F.  
 1993 La Crosse Region Oneota Adaptations: Changing Late Prehistoric Subsistence and Settlement Patterns in the Upper Mississippi Valley. *The Wisconsin Archeologist* 74(1-4):324-369.
- Sather, D. A.  
 1986 Index to the Minnesota Archaeologist. *The Minnesota Archaeologist* 45(2):23-57.
- Saxe, A. A.  
 1970 *Social Dimensions of Mortuary Practices*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Michigan, Ann Arbor.
- Schermer, S. J.  
 1981a Analysis of Human Remains Recovered from Site 13MK98. *Research Papers* 6(4): 312-313. Office of the State Archaeologist. University of Iowa, Iowa City.  
 1981b Analysis of Human Remains Recovered from Site 13MK99. *Research Papers* 6(4):314-315. Office of the State Archaeologist. University of Iowa, Iowa City.  
 1982a Human Remains from Site 13ML126. *Research Papers* 7(02): 320-321. Office of the State Archaeologist, Iowa City.  
 1982b Human Remains from Site 13ML130. *Research Papers* 7(02): 322-323. Office of the State Archaeologist, Iowa City.  
 1982c Human Remains from Site 13ML138. *Research Papers* 7(02): 324-325. Office of the State Archaeologist, Iowa City.  
 1982d Human Remains from Site 13ML139. *Research Papers* 7(02): 326-327. Office of the State Archaeologist, Iowa City.  
 1982e Human Remains from Site 13ML140. *Research Papers* 7(02): 328-329. Office of the State Archaeologist, Iowa City.



- 1982f Human Remains from Site 13ML155. *Research Papers* 7(02): 330-331. Office of the State Archaeologist, Iowa City.
- 1982g Human Remains from along the Maquoketa River (13JK0). *Research Papers* 7(02): 332-338. Office of the State Archaeologist, Iowa City.
- 1982h Human Remains from Site 13WD48. *Research Papers* 7(02): 339-340. Office of the State Archaeologist, Iowa City.
- 1983a Human Remains from 13MN20. *Research Papers* 8(05): 237-240. Office of the State Archaeologist, Iowa City.
- 1983b Human Remains from 13MN21. *Research Papers* 8(05): 241-242. Office of the State Archaeologist, Iowa City.
- 1983c Human Remains from 13MN22. *Research Papers* 8(05): 243-245. Office of the State Archaeologist, Iowa City.
- 1983d Human Remains from the Adamson Site (13WD7). *Research Papers* 8(05): 246-253. Office of the State Archaeologist, Iowa City.
- 1983e Field Examination of Human Remains from 13MN25. *Research Papers* 8(05): 254-259. Office of the State Archaeologist, Iowa City.
- 1983f Human Remains from the Rubel Site (13PM413). *Research Papers* 8(05): 260-267. Office of the State Archaeologist, Iowa City.
- 1983g Human Remains from 13JK80. *Research Papers* 8(05): 268-275. Office of the State Archaeologist, Iowa City.
- 1983h *Coralville Reservoir Shoreline Survey*. *Research Papers* 8(2). Office of the State Archaeologist. University of Iowa, Iowa City.
- 1984a Human Skeletal Remains from Site 13ST78. *Research Papers* 9(02): 54-58. Office of the State Archaeologist, Iowa City.
- 1984b Human Skeletal Remains from the Sioux City Water Tower Site (13WD51). *Research Papers* 9(02): 59-64. Office of the State Archaeologist, Iowa City.
- 1984c Human Skeletal Remains from the Palmer Collection. *Research Papers* 9(02): 65-73. Office of the State Archaeologist, Iowa City.
- 1984d Human Skeleton Remains from Site 13DB9. *Research Papers* 9(02): 95-97. Office of the State Archaeologist, Iowa City.
- 1986a Human Skeletal Remains from Site 13BN54. *Research Papers* 11(01): 1-5. Office of the State Archaeologist, Iowa City.
- 1986b Human Skeletal Remains from Site 13HR33. *Research Papers* 11(01): 26-29. Office of the State Archaeologist, Iowa City.
- 1986c Human Skeletal Remains from Camp Arrowhead, Sites 13WP287 and 13WP288. *Research Papers* 11(01): 30-31. Office of the State Archaeologist, Iowa City.
- 1986d Human Skeletal Remains from the Pitman Collection (13HB0). *Research Papers* 11(01): 36-37. Office of the State Archaeologist, Iowa City.
- 1987a Human Skeletal Remains from 13L02, the Blood Run National Historic Landmark Site 1984-1986. *Research Papers* 12(01): 61-81. Office of the State Archaeologist, Iowa City.
- 1987b *Preliminary Report on the 1986 Limited Survey at the Blood Run National Historic Landmark Site Lyon County, Iowa*. Contract Completion Report 248. Office of the State Archaeologist. University of Iowa, Iowa City.
- 1989a Human Skeletal Remains from 13WD10, Anthon, Iowa. *Research Papers* 14(03): 3-8. Office of the State Archaeologist, Iowa City.
- 1989b Human Skeletal Remains from the Buchanan Site, 13SR153. *Research Papers* 14(03): 9-10. Office of the State Archaeologist, Iowa City.
- 1989c Human Skeletal Remains Found Near Waucoma, Findspot 13FT-5, Fayette County, Iowa. *Research Papers* 14(03): 11-14. Office of the State Archaeologist, Iowa City.
- 1989d Human Skeletal Remains Confiscated at Kirkwood Community College [possibly 11RI29]. *Research Papers* 14(03): 60-63. Office of the State Archaeologist, Iowa City.
- 1991 Archaeological Investigations and Osteological Analyses at 13SR18 and 13SR19, Northridge Subdivision, Ames, Story County. *Research Papers* 16(02): 1-19. Office of the State Archaeologist, Iowa City.
- 1993 Analysis of Human Remains from the Council Bluffs Ossuary, 13PW1, Pottawatomie County, Iowa. *Research Papers* 18(01): 195-220. Office of the State Archaeologist, Iowa City.
- 1994 Osteological Analysis of a Cranium from the Iowa Department of Criminal Investigation, Burial Project No. 589. *Research Papers* 19(01): 61-66.
- 1995 Osteological Analysis of a Cranium Found at Mount Clavary Cemetery, Dubuque, Iowa. *Research Papers* 20(01): 5-12. Office of the State Archaeologist, Iowa City.
- Schermer, S. J., A. K. Fisher and D. C. Hodges  
1994 Endemic Treponematosis in Prehistoric Western Iowa. In *Skeletal Biology in the Great Plains*, edited by D. W. Owsley and R. L. Jantz, pp. 109-121. Smithsonian Institution Press, Washington D.C.
- Schermer, S. J. and D. C. Hodges  
1989 A Prehistoric Burial Near Iowa Falls, 13HA182. *Research Papers* 14(03): 72-89. Office of the State Archaeologist, Iowa City.
- Schermer, S. J. and D. W. Owsley  
1987 Analysis of Human Skeletal Material from the Hanging Valley Site (13HR28). *Research Papers* 12(01): 13-53. Office of the State Archaeologist, Iowa City.
- Schermer, S. J. and V. R. Perez  
1995 Human Remains from Mohler-Miller Mound Group, 13MA20, Marion County, Iowa. *Research Papers* 20(01): 159-180.
- 1996 Analysis of Human Remains from 13BN125, Boone County, Iowa. *Research Papers* 21(01): 287-316. Office of the State Archaeologist, Iowa City.
- Schlundt, Z. L. and B. Mead  
1979 Skeletal Remains From the Rehbein I Mound Group, 47-RI-81. *Wisconsin Archeologist* 60:183-214
- Schneider, A. F.  
1983 Wisconsinan Stratigraphy and Glacial Sequence in Southeastern Wisconsin. In *Late Pleistocene History in Southeastern Wisconsin*, edited by D. M. Mickelson and L. Clayton. Geoscience Wisconsin Vol. 7. University of Wisconsin-Extension, Madison.
- Schneider, F. E.  
1982 A Model of Prehistoric Cultural Development in the James River Valley of North Dakota. *Journal of the North Dakota Archaeological Association* 1:113-134.
- 1979 The Price Site (21BE25): Preliminary Notes on a Previously Unidentified Site of the Cambria Focus. Paper presented to the Northern Plains/Midwest Conference, Grand Forks, ND, April.
- Schoolcraft, H. R.  
1851 *Historical and Statistical Information Respecting the History, Condition, and Prospects of the Indian Tribes of the United States*. 6 vols. Lippincott, Philadelphia.
- Schroeder, A.  
1974 *The Stoneware Industry at Moingona, Iowa: Archaeological and Historical Study of Moingona Pottery Works (13BN120) and Flint Stone Pottery (13BN132)*. Unpublished Master's thesis. Department of Sociology and Anthropology. Iowa State University, Ames.
- Schroeter, E.  
1996 Bones: One State Government Paid Attention. *News From Indian Country: The Nations Native Journal*, late June 1996, p. 7A.
- Schulte, B.  
1974 *The Nineteenth Century Ceramic Industry at Coal Valley: Archaeology of 13BN111 (Noah Creek Kiln)*. Unpublished Master's thesis. Department of Sociology and Anthropology. Iowa State University, Ames.
- Schultz, G.  
1986 *Wisconsin's Foundations: A Review of the State's Geology and Its Influence on Geography and Human Activity*. University of Wisconsin Extension & Kendall/Hunt.
- Schumacher, J. P.  
1918 Indian Remains in Door County. *The Wisconsin Archeologist* 16(1) (old series):25-45.
- Schumacher, J. P. and W.A. Titus  
1913 Aboriginal Remains of the Upper Wisconsin Valley. *The Wisconsin Archeologist* 12(3) (old series):75-86.
- Schurr, M. R.  
1992 Isotopic and Mortuary Variability in a Middle Mississippian Population. *American Antiquity* 57:300-320.
- Scott, D. H.  
1979 Analysis of Avifauna from Five Sites in Northwest Iowa. *Journal of the Iowa Archeological Society* 26:43-79.
- Scott, G. T. and L. L. Loendorf  
1976 *Karlstad Ossuary 21MA10*. University of North Dakota, Grand Forks.

- Scullin, M.  
n.d. Minnesota's First Farmers? Late Woodland Ceramics and Maize on the Blue Earth River (The Nelson Site: 21BE24). Ms. on file, Dept. of Anthropology, Mankato State University, Mankato, MN.
- Secretary of the Interior  
1983 Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines. *Federal Register* 48(190):44716-44742, Sept. 29, 1983. Washington, D.C.
- Seeman, M. F.  
1986 Adena 'Houses' and their Implications for Early Woodland Settlement Models in the Ohio Valley. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 564-580. Kampsville Seminars in Archeology No. 2. Center for American Archeology. Kampsville, Illinois.
- Senken, H. A., Jr.  
1982 Mammalian Remains. In *A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa*, edited by J. A. Tiffany, pp. 119-132. Research Papers 7(1). Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.
- Seurer, D. M. and A. Faulkner  
1976 The Nile Roeder Site: A Salvage Project on Winnebago County. *Wisconsin Archeologist* 57(1):29-51.
- Shane, O. C., III  
1978 A Survey of Fluted Points from Minnesota. *Minnesota Archeologist* 37(4):150.  
1978b *The Vertebrate Fauna of the Mountain Lake Site, Cottonwood County, Minnesota*. Scientific Publications of the Science Museum of Minnesota, New Series 4-2.  
1981 Radiocarbon Chronology for the Late-Prehistoric Period in Southern Minnesota. *American Philosophical Yearbook*.  
1982 Fox Lake Subsistence and Settlement: New Evidence from Southwestern Minnesota. *The Minnesota Archaeologist* 41(1):45-52.  
1989 *Ice Age Hunters in Minnesota*. Institute for Minnesota Archaeology Newsletter Volume 4(3).  
1991 Final Report to the Minnesota Historical Society for Contract 90-C2443: Radiocarbon Assays of Bone from the Browns Valley Skeleton. Ms. on file, Science Museum of Minnesota, St. Paul, MN.
- Sharrock, F. W. and D. K. Grayson  
1974 Crees, Cree-Assiniboines, and Assiniboines: Interethnic Social Organization of the Far Northern Plains. *Ethnohistory* 21:95-122.  
1979 "Significance" in Contract Archaeology. *American Antiquity* 44:327-328.
- Shaw, J.  
1877 The Mound-Builders in the Rock River Valley, Illinois. *Smithsonian Institution Annual Report for 1877*:253-260. Smithsonian Institution, Washington, D.C.
- Shay, C. T.  
1966 *Cambria Village Ceramics*. Unpublished Master's thesis, University of Minnesota.  
1971 *The Itasca Bison Kill Site: An Ecological Analysis*. Minnesota Historical Society, St. Paul.  
1978 Late Prehistoric Bison and Deer Use in the Eastern Prairie-Forest Border. *Plains Anthropologist* 23:194-212.
- Shea, J. G.  
1861 *Early Voyages Up and Down the Mississippi, by Cavalier, St. Cogne, Le Sueur, Gravier, and Guignes*. Joel Munsell, Albany.
- Sigstad, J. S.  
1970 *A Report of Archeological Investigations, Pipestone National Monument 1956 and 1966*. Journal of the Iowa Archeological Society 17.
- Silverberg, R.  
1968 *Mound Builders of Ancient America: The Archaeology of a Myth*. New York Graphic Society, Greenwich, CT.
- Skinner, A.  
1926 Ethnology of the Ioway Indians. *Bulletin of the Public Museum of the City of Milwaukee* 5(4):181-354.
- Slattery, R. G., E. A. Bettis, III, A. K. Fisher, and J. A. Tiffany  
1977 Report on Investigations at the Little Maquoketa Mound Group, 13DB36 & 13DB37, Dubuque, Iowa. *Research Papers* 2(16): 1-14. Office of the State Archaeologist, Iowa City.
- Slattery, R. G., G. A. Horton, and M. E. Ruppert  
1975 The McKinney Village Site: An Oneota Site in Southeastern Iowa. *Journal of the Iowa Archeological Society* 22:35-61.
- Smith, B. D.  
1987 The Independent Domestication of Indigenous Seed-Bearing Plants in Eastern North America. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by W. F. Keegan, pp. 3-48. Occasional Paper No. 7. Center for Archaeological Investigations. Southern Illinois University, Carbondale, Illinois.  
1992 *Rivers of Change: Essays on Early Agriculture in Eastern North America*. Smithsonian Institution Press, Washington, D.C.
- Smith, B. D. (editor)  
1978 *Mississippian Settlement Patterns*. Academic Press, New York.
- Smith, F.  
1976 The Skeletal Remains of the Earliest Americans: A Survey. *Tennessee Anthropologist* 1:226-247.
- Smith, H. G.  
1948 Wilson's Studies of the Hidatsa. *Minnesota Archaeologist* 14(1):33-34.
- Snortland-Coles, S.  
1983 A Reassessment of Northern Plains Burial Complexes. Paper presented at the 41st Annual Plains Conference, Rapid City, South Dakota.
- Snow, C. E.  
1941 *Anthropological Studies at Moundville, Part 1*. Museum Paper 15, Alabama Museum of Natural History.
- Snow, C. E. and M. T. Newman  
1942 *Skeletal Material from Pickwick Basin*. Bulletin 129, Smithsonian Institution, Bureau of American Ethnology.
- Snow, D. R.  
1962 Petroglyphs of Southern Minnesota. *Minnesota Archaeologist* 24:103-128.
- Spargo, L.  
1984 The Milford Site (13DK1): An Oneota Component in Dickinson County, Iowa. Ms. on file, Office of the State Archaeologist. University of Iowa, Iowa City.
- Spector, J.  
1985 Ethnoarchaeology and Little Rapids: A New Approach to 19th Century Eastern Dakota Sites. In *Archeology, Ecology, and Ethnohistory of the Prairie-Forest Border Zone of Minnesota and Manitoba*, edited by J. Spector and E. Johnson, pp. 167-203. J&L Reprint Company, 410 Wedgewood Drive, Lincoln, Nebraska.
- Spector, J. D.  
1974 *Winnebago Indians, 1634-1829: An Archaeological and Ethnohistoric Investigation*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin, Madison.  
1975 Crabapple Point (Je93): An Historic Winnebago Indian Site in Jefferson County, Wisconsin. *The Wisconsin Archeologist* 56(4):270-345.
- Spencer, H. L.  
1996 *Archaeological and Documentary Investigation of Fort McCoy's Japanese Prisoner of War Camp, South Post, Fort McCoy*. U.S. Army Fort Mc Coy Archaeological Resource Management Series Reports of Investigations, Number 5.
- Sprietersbach, M., R. J. Slattery, and J. M. Zalesky  
1981 Further Investigations at the Mud Lake Mound Group. *Research Papers* 6(01): 32-46. Office of the State Archaeologist, Iowa City.
- Springer, J. W. and S. R. Witkowski  
1982 Souian Historical Linguistics and Oneota Archaeology. In *Oneota Studies*, edited by G. E. Gibbon, pp. 69-83. University of Minnesota Publications in Anthropology, Number 1, Minneapolis.
- Squier, G. H.  
1905 Certain Archaeological Features of Western Wisconsin. *The Wisconsin Archeologist* (o.s.) 4:24-38.  
1914 Archaeological Resources of Western Wisconsin. *The Wisconsin Archeologist* (o.s.) 13:121-150.
- Staeck, J. P.  
1993 Chef's Daughters, Marriage Patterns, and the Construction of Past Identities: Some Suggestions on Alternative Methods for Modeling the Past. *Wisconsin Archeologist* 74:370-399.

- Stafford, T. W., Jr.  
1988 Accelerator <sup>14</sup>C Dating of Late Pleistocene Megafauna. *Current Research in the Pleistocene*, 5:41-43.
- Stafford, T. W., Jr., P. E. Hare, L. Currie, A. J. T. Jull and D. Donahue  
1990 Accuracy of North American Human Skeleton Dates. *Quaternary Research* 34:111-120.
- 1991 Accelerator Radiocarbon Dating at the Molecular Level. *Journal of Archaeological Science* 18:35-72.
- Stafford, T. W., J. R., A. J. T. Hull, K. Brendel, R. C. Duhamel, and D. Donahue  
1987 Study of Bone Radiocarbon Dating Accuracy at the University of Arizona NSF Accelerator Facility for Radioisotope Analysis. *Radiocarbon* 29: 24-44.
- Stafford, T. W., O. C. Shane III and B. H. O'Connell  
n.d. Radiocarbon Dating of Minnesota Paleoindians. Unpublished manuscript.
- Stafford, W. T.  
1906 Result of the Investigations of the Indian Mound at Broken Kettle Creek. *Proceedings of the Academy of Science and Letters of Sioux City, Iowa* 2:85-102.
- Stains, D. J.  
1972 *Seed Analysis: Brewster Site (13CK15) Western Iowa*. Unpublished Master's thesis. Department of Anthropology. University of Wisconsin-Madison.
- Stanley, D. G., and A. Hoppin.  
1987 Lithic Analysis. In *Archaeology in the Mississippi River Floodplain at Sand Run Slough, Iowa*, edited by D. W. Benn, pp. 101-187. CAR-690. Center for Archaeological Research. Southwest Missouri State University, Springfield.
- Stanley, D. G., J. D. Anderson, and L. D. Rogers  
1988 *Archaeological Site Testing, Lake Red Rock, Iowa: Pool Raise Project, 1987 Season*. 5 Volumes. Cultural Resources Management Report No. 127. American Resources Group, Ltd., Carbondale, Illinois.
- Stanley, D. G., and L. D. Rogers  
1988 *Archaeological Site Testing, Lake Red Rock, Iowa: Pool Raise Project, 1987 Season*, Vol. 4, Synthesis of Historic and Prehistoric Sites Analysis: Summary and Recommendations. Cultural Resources Management Report No. 127. American Resources Group, Ltd., Carbondale, Illinois.
- Starr, F.  
1887a Mounds and Lodge Circles in Iowa. *American Antiquarian* 9(6):361-363.  
1887b Shell Heap at Cedar Rapids, Iowa. *American Antiquarian* 9(5):303.  
1888 Mound Explorations in North-western Iowa. *Proceedings of the Davenport Academy of Natural Sciences* 5:110-112.  
1892 Bibliography of Iowa Antiquities. *Proceedings of the Davenport Academy of Natural Sciences* 6:1-24.  
1897 Summary of the Archaeology of Iowa. *Proceedings of the Davenport Academy of Natural Sciences* 6:53-124.  
1897a Circular of Suggestions Regarding Work in Archaeology. *Proceedings of the Davenport Academy of Natural Sciences* 6:340-343.
- State Historical Society of Wisconsin  
n.d. Unpublished notes on file, State Historical Society of Wisconsin, Burial Sites Office.
- Steele, D. G.  
1989 Recently Recovered Paleoindian Skeletal Remains from Texas and the Southwest. *American Journal of Physical Anthropology* 78: 307.
- Steele, D. G. and J. Powell  
1992 Peopling of the Americas: Paleobiological Evidence. *Human Biology* 64:303-336.  
1997 Biological Affinities of the Oldest Recorded North Americans: The Spirit Cave and Pyramid Lakes Data. *American Journal of Physical Anthropology, Supplement* 24: 218.
- Steinbring, J.  
1970 Evidences of Old Copper in a Northern Transitional Zone. In *Ten Thousand Years*, edited by W. M. Hlady, pp:47-75. Manitoba Archaeological Society.  
1971 The Little Fork Burial: New Light on Old Copper. *Journal of the Minnesota Academy of Science* 37:8-15 (No. 1).
- 1974 The Preceramic Archaeology of Northern Minnesota. In *Aspects of Upper Great Lakes Anthropology, Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 40-54. Minnesota Prehistoric Series 11. Minnesota Historical Society. St. Paul, Minnesota.
- 1990 Post-Archaic Rock Art in the Western Great Lakes. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson*, edited by G. E. Gibbon, pp. 167-194, University of Minnesota Publications in Anthropology No. 4, Dept. of Anthropology University of Minnesota, Minneapolis.
- Steinbring, J. and F. Farvour  
1987 The Hensler Petroglyph Site, Dodge County, Wisconsin. *The Wisconsin Archeologist* 68(4):396-411.
- Steinbring, J. and J. B. Whelan  
1971 Test Excavations at the Fish Lake Dam Site, Minnesota. *Minnesota Archeologist*, 31(1):3-40.
- Sterns, F. H.  
1915a *The Archaeology of Eastern Nebraska with Special Reference to the Culture of the Rectangular Earth Lodges*. Unpublished Ph.D. dissertation. Harvard University, Cambridge, Massachusetts.  
1915b Stratification of Cultures in Eastern Nebraska. *American Anthropologist* 17:121-127.
- Stevens, J. S.  
1980 Survey Results. In *Southeast Iowa Lake Calvin Area Paleo-Indian Survey*, edited by R. Shutler, Jr., and T. H. Charlton. Department of Anthropology. University of Iowa, Iowa City.
- Stevens, W. E.  
1923 The Fur Trade in Minnesota during the British Regime. *Minnesota History Bulletin* 5(1):3-13. Minnesota Historical Society, St. Paul.  
1938 *The Northwest Fur Trade, 1763-1781*. University of Illinois Press, Urbana.
- Stevenson, K.  
1985 *Oneota Subsistence-Related Behavior in the Driftless Area: A Study of the Valley View Site Near La Crosse, Wisconsin*. University Microfilms International, Ann Arbor, MI.  
1994 Chronological and Settlement Aspects of the Valley View Site (47 Lc-34). *The Wisconsin Archeologist* 75(3-4):237-294.
- Stevenson, K. e and R. F. Boszhardt  
1993 *The Current Status of Oneota Sites and Research in Western Wisconsin: The Oneota Study Unit in Region 6, 1993 Update*. Reports of Investigations No. 163. Mississippi Valley Archaeology Center, La Crosse.
- Stevenson, R. L. and J. E. Kutzbach  
1987 University of Wisconsin Radiocarbon Dates XXIV. *Radiocarbon* 29(3):397-415.)
- Stewart, T. D.  
1943 Skeletal remains from Platte and Clay Counties, Missouri. In *Archaeological Investigations in Platte and Clay Counties, Missouri*, by W. R. Wedel. Bulletin 183, U.S.N.M.  
1946 A Reexamination of the Fossil Human Skeletal Remains from Melbourne, Florida. *Smithsonian Miscellaneous Collections* 106: 1-28.  
1953 The Age Incidence of Neural-Arch Defects in Alaskan Natives, considered from the Standpoint of Etiology. *Journal of Bone and Joint Surgery*, 35-A, No.4.  
1956 Examination of the Possibility that Certain Skeletal Characters Predispose to Defects in the Lumbar Neural Arches. *Clinical Orthopaedics* 8:44-60.
- Stiles, C. M.  
1994 The Historic Logging Industry in State Region 2 and Nicolet National Forest. Nicolet National Forest, State Region 2 Archaeology Center, *Report of Investigations* No. 3, USDA Forest Service, Rhinelander, WI.
- Stiles-Hanson, C.  
1987 Petroglyphs and Pictographs of the Coulee Region. In *Wisconsin Rock Art*, edited by R. A. Birmingham and W. Green, pp. 287-340. The Wisconsin Archeologist 68(4).
- Stoltman, J. B.  
1962 *A Proposed Method of Systematizing the Modal Analysis of Pottery and Its Application to the Laurel Focus*. Unpublished Master's thesis, University of Minnesota, Minneapolis.  
1973a *The Laurel Culture in Minnesota*. Minnesota Prehistoric Archaeology Series No. 7, Minnesota Historical Society, St. Paul.

- 1973b The Overhead Site (47 Lc-20): An Orr Phase Site near La Crosse, Wisconsin. *The Wisconsin Archeologist* 54(1):2-55.
- 1974 An Examination of Within-Laurel Cultural Variability in Northern Minnesota. In *Aspects of Upper Great Lakes Anthropology, Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson. Minnesota Prehistoric Archaeology Series No. 11, Minnesota Historical Society, St. Paul.
- 1976 Two New Late Woodland Radiocarbon dates from the Rosenbaum Rockshelter (47 Da-411) and their Implications for Interpretations of Wisconsin Prehistory. *The Wisconsin Archeologist* 57(1):12-28.
- 1978 Temporal Models in Prehistory: an Example from Eastern North America. *Current Anthropology* 19:703-746.
- 1979 Middle Woodland Stage Communities of Southwestern Wisconsin. In *Hopewell Archaeology: The Chillicothe Conference*, edited by D. S. Brose and N. Greber, pp. 122-139. Kent State University Press, Ohio.
- 1985 The Appearance of the Mississippian Cultural Tradition in the Upper Mississippi Valley. In *Prehistoric Mound Builders of the Mississippi Valley*, edited by J. B. Stoltman, pp. 26-34. The Putnam Museum, Davenport, Iowa.
- 1986a The Archaic Tradition. In *Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning*, edited by W. Green, J. B. Stoltman, and A. B. Kehoe, pp. 207-238. *The Wisconsin Archeologist* 67(3-4).
- 1986b The Prairie Phase: An Early Woodland Manifestation in the Upper Mississippi Valley. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 121-136. Center for American Archeology, Kampsville Seminars in Archeology, No. 2. Center for American Archeology Press, Kampsville, Illinois.
- 1986c The Appearance of the Mississippian Cultural Tradition in the Upper Mississippi Valley. In *Prehistoric Mound Builders of the Upper Mississippi Valley*, edited by J. B. Stoltman. The Putnam Museum, Davenport, Iowa.
- 1986 The Archaic Tradition. *Wisconsin Archeologist* 67:207-238
- 1990 The Woodland Tradition in the Prairie du Chien Locality. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson*, edited by G. E. Gibbon, pp. 239-259. Publications in Anthropology, Number 4. University of Minnesota, Minneapolis.
- 1991a Cahokia as Seen from the Peripheries. In *New Perspectives on Cahokia: Views from the Periphery*, edited by J. B. Stoltman, pp. 349-354. Monographs in World Archaeology No. 2. Prehistory Press, Madison.
- 1991b Ceramic Petrography as a Technique for Documenting Cultural Interaction: An Example from the Upper Mississippi Valley. *American Antiquity* 56(1):103-120.
- 1992a Paleoindian Study Unit, Introductory Overview: A Reconsideration of Fluted Point Diversity in Wisconsin. Region 8 Annual Report. Ms. on file, State Historical Society of Wisconsin.
- 1992b Regional Overview: Overview of the Prehistory of Archaeological Region 8, State of Wisconsin. Region 8 Annual Report. Ms. on file, State Historical Society of Wisconsin.
- Stoltman, J. B. (editor)
- 1991 *New Perspectives on Cahokia Views from the Periphery*. Monographs in World Archaeology No. 2. Prehistory Press, Madison, Wisconsin.
- Stoltman, J. B., J. A. Behm, and H. A. Palmer
- 1984 The Bass Site: A Hardin Quarry/Workshop in Southwestern Wisconsin. In *Prehistoric Chert Exploitation: Studies from the Mid-Continent*, edited by B. M. Butler and E. E. May. Occasional Paper 2. Southern Illinois University Center for Archaeological Investigations, Carbondale.
- Stoltman, J. B. and K. Workman
- 1969 A Preliminary Study of Wisconsin Fluted Points. *The Wisconsin Archeologist* 50:189-214.
- Stone, L. M.
- 1974 *Fort Michilimackinac, 1715-1781. An Archaeological Perspective on the Revolutionary Frontier*. Publications of the Museum, Michigan State University. East Lansing.
- Storck, P. L.
- 1972 *The Archaeology of Mayland Cave*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin, Madison.
- 1974 Some Aspects of Effigy Mound Subsistence and Settlement Patterns during the Late Woodland Period in Wisconsin. *Arctic Anthropology* 11:272-279.
- 1988 The Late Wisconsinan Ice Margin and Early Paleo-Indian Occupation in the Mid-Continent Region. *Mid-Continental Journal of Archaeology* 13:259-272.
- Storck, P. L. and A. E. Spiess
- 1994 The Significance of New Faunal Identifications Attributed to An Early Paleoindian (Gainey Complex) Occupation at the Udora Site, Ontario, Canada. *American Antiquity* 59(1):121-142.
- Stortroen, C. E.
- 1957 The Bryan Site: A Prehistoric Village in Southern Minnesota. *The Minnesota Archaeologist* 43(2):37-48, 1984.
- Stout, D.
- 1953 Plans for an Archaeological Program at the State University of Iowa. *Journal of the Iowa Archeological Society* 3(1):8-12.
- Straffin, D. F.
- 1971a Wolfe Havana Hopewell Site. In *Prehistoric Investigations*, edited by M. B. McKusick, pp. 53-65. Report 3. Office of the State Archaeologist. University of Iowa, Iowa City.
- 1971b *The Kingston Oneota Site*. Report 2. Office of the State Archaeologist. University of Iowa, Iowa City.
- 1972 *Unraveling the Oneota Mystery*. The College pp. 3-8. Parsons College, Fairfield, Iowa.
- Streiff, J. E.
- 1972 *Roster of Excavated Prehistoric Sites in Minnesota to 1972*. Minnesota Prehistoric Archaeology Series No. 7, Minnesota Historical Society, St. Paul.
- 1990 Biography of Elden Johnson. In *The Woodland Tradition in the western Great Lakes: Papers Presented to Elden Johnson*, edited by G. E. Gibbon, Dept. of Anthropology, University of Minnesota, Minneapolis.
- 1997 Cooper Mound No. 2 (21ML16). In Health Demography and Archaeology of Mille Lacs Native American Mortuary Populations. *Plains Anthropologist* 39(149):313-315, Memoir 28.
- Strong, W. D.
- 1935 *An Introduction to Nebraska Archaeology*. Smithsonian Institution Miscellaneous Collections 93(10).
- Struever, S.
- 1964a The Hopewell Interaction Sphere in Riverine-Great Lakes Culture History. In *Hopewellian Studies*, edited by J. R. Caldwell and R. L. Hall, pp. 94-100. Scientific Papers Vol. 12. Illinois State Museum, Springfield.
- 1964b Analysis of the Hopewell Interaction Sphere. In *Social Exchange and Interaction*, edited by E. Wilmsen, pp. 47-49. University of Michigan Anthropological Papers No. 46. Museum of Anthropology. University of Michigan. Ann Arbor, Michigan.
- 1965 Middle Woodland Culture History in the Great Lakes Riverine Area. *American Antiquity* 31:211-223.
- 1968 Woodland Subsistence-Settlement Systems in the Lower Illinois Valley. In *New Perspectives in Archaeology*, edited by S. R. Binford and L. R. Binford, pp. 285-312. Aldine Publishing Company, Chicago.
- Struever, S., and F. A. Holton
- 1979 *Koster: Americans in Search of their Past*. Anchor Press/Doubleday, Garden City, New York.
- Struever, S., and G. L. Houart
- 1972 An Analysis of the Hopewell Interaction Sphere. In *Social Exchange and Interaction*, edited by E. Wilmsen, pp. 47-79. University of Michigan Anthropological Papers No. 46. Museum of Anthropology. University of Michigan. Ann Arbor, Michigan.
- Styles, B. W.
- 1981 *Faunal Exploitation and Resource Selection: Early Late Woodland Subsistence in the Lower Illinois Valley*. Northwestern University Archaeological Program. Scientific Papers No. 3. Evanston, Illinois.
- Styles, B. W., S. R. Ahler, and M. L. Fowler
- 1983 Modoc Rockshelter Revisited. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. A. Phillips and J. A. Brown, pp. 261-298. Academic Press, New York.
- Sullivan, A. E., B. B. Granfield, and R. G. Baker
- 1982 Plant Remains. In *A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa*, edited by J. A. Tiffany, pp. 139-142. Research Paper 7(1). Office of the State Archaeologist. University of Iowa, Iowa City.

- Sullivan, N. C.  
 1985 Tuberculosis in a Late Woodland Effigy Mound Population. *Wisconsin Archeologist* 66(1):71-76.  
 1986 Enamel Hypoplasia as an Indicator of Biological Stress in Two Wisconsin Populations. *Wisconsin Archeologist* 67:97-103.  
 1988 Enamel Hypoplasia in the Dental Remains of the Osceola Site Inhabitants. *Wisconsin Archeologist* 69:64-68.  
 1990a The Biological Consequences of the Mississippian Expansion into the Western Great Lakes Region: A Study of Prehistoric Culture Contact. In *Powers of Observation: Alternative Views in Archaeology*, edited by S. M. Nelson and A. B. Kehoe.  
 1990b Oneota Subsistence: Inferences from Dental and Skeletal Pathology. In *The Woodland Tradition in the Western Great Lakes*. Papers presented to E. Johnson, G. E. Gibbon, editors. University of Minnesota, Publication in Anthropology, pp. 11-17.  
 The Human Remains Associated with the OT Village Site, LaCrosse County, Wisconsin. Manuscript on file, Museum Division, State Historical Society of Wisconsin.
- Sullivan, N. C., and D. F. Overstreet  
 1991 Notes on the Child Burial from the Blood Mound Group, Wauhesta County. *Wisconsin Archeologist* 72:127-132.
- Sullivan, N. C. and J. T. Penman  
 1990 The Human Remains Associated with OT Village Site, LaCrosse County, Wisconsin. Ms. on file, State Historical Society of Wisconsin.
- Swanholm, M.  
 1978 *Lumbering in the Last of the White-Pine States*. Historic Sites Pamphlet Series No. 17. Minnesota Historical Society, St. Paul.
- Swedlund, A. and L. Goodman  
 1966 The Witkin Burial Site. *Southwestern Lore* 32:70-74.
- Switzer, R. R.  
 1974 *The Bertrand Bottles: A Study of 19th-Century Glass and Ceramic Containers*. Publications in Archeology 12. National Park Service, Washington, D.C.
- Syms, E. L.  
 1979 The Snyder Dam Site (DhMg-37), Southwestern Manitoba: Two New Ceramic Components. *Canadian Journal of Archaeology* 3:41-67.
- Tainter, J. A.  
 1983 Woodland Social Change in the Central Midwest: A Review and Evaluation of Interpretive Trends. *North American Archaeologist* 4(2):141-161.
- Tainter, J. A. and G. J. Lucas  
 1983 Epistemology of the Significance Concept. *American Antiquity* 48:707-719.
- Tallo, J., G. T. Armelagos and J. C. Rose  
 1978 Paleoepidemiology of Infectious Disease in the Dickson Mounds Population. *Medical College of Virginia Quarterly* 14:17-23.
- Tandarich, J. P.  
 1977 Appendix A: A History of the Potters in Dahlonga, Iowa. In *Final Report of Archaeological Investigations at the Site of the Ottumwa Generating Station, Chillicothe, Iowa*, by J. P. Tandarich. Contract Completion Report 73. Office of the State Archaeologist. University of Iowa, Iowa City.
- Tandarich, J. P., and L. N. Horton  
 1976 A Memorial Bibliography of Charles R. Keyes and Ellison J. Orr. *Journal of the Iowa Archeological Society* 23:45-144.
- Tanner, J.  
 1956 *A Narrative of the Captivity and Adventures of John Tanner*. Reprint Edition, Ross & Haines, Inc., Minneapolis.
- Tatum, L. S.  
 1980 A Seasonal Subsistence Model for Holocene Bison Hunters on the Eastern Plains of North America. In *The Cherokee Excavations*, edited by D. Anderson and H. Semken, pp.149-170, Academic Press, New York.
- Taylor, D. C.  
 1969 The Wilsall Excavations: An Exercise in Frustration. *Proceedings from the Montana Academy of Science* 29: 147-150.
- Taylor, P. S.  
 1955 The Identification of Bone Fragments from the Lee Mill Cave Site. *Proceedings, Minnesota Academy of Science*, 21:29-34.
- Taylor, R. E., L. A. Payen, C. A. Prior, P. J. Slota, Jr., R. Gillespie, J. A. Gowlett, R. M. C. Hedges, A. J. T. Jull, T. H. Zabel, D. J. Donahue, and R. Berger  
 1985 Major Revisions in the Pleistocene Age Assignments for North American Humans Skeletons by C-14 Accelerator Mass Spectrometry: None Older than 11,000 C-14 Years B.P. *American Antiquity* 50: 136-140.
- Teller, J. T.  
 1987 Proglacial lakes and the Southern Margin of the Laurentide Ice Sheet. In *North America and Adjacent Oceans During the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 39-69. Geological Society of America. Boulder, Colorado.
- Teller, J. T., and L. Clayton  
 1983 *Glacial Lake Agassiz*. University of Toronto, Ontario.
- Thayer, B. W.  
 1941 Some Examples of Potsherds from Centerville. *Minnesota Archaeologist*, 7-1.
- Theiler, J. L.  
 1981 An Archaeological Survey of Mill Coulee and the Adjacent Uplands of Crawford County, Wisconsin—1979. *The Wisconsin Archeologist* 62(2):168-206.  
 1986 The Early Woodland Component at the Mill Pond Site, Wisconsin. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 92-120. Center for American Archeology, Kampsville Seminars in Archeology, No. 2. Center for American Archeology Press, Kampsville, Illinois.  
 1987 *Woodland Tradition Economic Strategies: Animal Resource Utilization in Southwestern Wisconsin and Northeastern Iowa*. University of Iowa, Office of the State Archaeologist Report 17. Iowa City.  
 1991 Faunal Remains. In *Archaeological Site Evaluations at Eight Lakes in the Wisconsin River Headwaters*, edited by C. R. Moffat et al., pp. 344-349. Reports of Investigations No. 118. Mississippi Valley Archaeology Center, La Crosse.  
 1992 Faunal Remains. In *Archaeological Site Evaluations at Rice and Willow Reservoirs, Lincoln and Oneida Counties, Wisconsin*, edited by C. R. Moffat et al. Reports of Investigations No. 141. Mississippi Valley Archaeology Center, La Crosse.  
 1993 Faunal Remains. In *Further Archaeological Investigations in the Wisconsin River Headwaters: The Results of the 1992 Field Season*, edited by C. R. Moffat et al., pp. 344-349. Reports of Investigations No. 159. Mississippi Valley Archaeology Center, La Crosse.
- Theiler, J. L. and E. Elizabeth Pillaert  
 1983 Additional Seasonality Data for the Millville Site (47 Gt-53): Evidence from White-Tailed Deer Mandibles Aged by Dental Eruption. *The Wisconsin Archeologist* 64(3-4):305-312.
- Thies, R. M.  
 1989 The Brassica Bench Site (13PK251): its Archaeology and Ecology. *Journal of the Iowa Archeological Society* 36:39-65.
- Thomas, C.  
 1887 *Burial Mounds of the Northern Sections of the United States*. Annual Report 5. Bureau of American Ethnology. Smithsonian Institution, Washington, D.C.  
 1891 *Catalogue of Prehistoric Works East of the Rocky Mountains*. Smithsonian Institution, Washington, D.C.  
 1894 Report on Mound Explorations of the Bureau of Ethnology. *Bureau of American Ethnology 12th Annual Report (1890-1891)*. Washington D.C.
- Thompson, D.  
 1977a The Hickenbottom Site (13JF52): Salvage Excavation of a Boone Focus Burial from Jefferson County, S.E. Iowa. *Research Papers* 2(05): 1-24. Office of the State Archaeologist, Iowa City.  
 1977b The Birdie Mound, 13WB114. *Research Papers* 2(12): 1-7. Office of the State Archaeologist, Iowa City.
- Thompson, D. M., and E. A. Bettis III  
 1980 Archeology and Holocene Landscape Evolution in the Missouri Drainage of Iowa. *Journal of the Iowa Archeological Society* 27:1-60.

- 1981 Out of Site, Out of Planning: Assessing and Protecting Cultural Resources in Evolving Landscapes. *Contract Abstracts and CRM Archaeology* 2(3):16-22.
- Thompson, D. M., and A. K. Fisher  
1977 *The Hickenbottom Site (13JF52)*. Research Papers 2(5). Office of the State Archaeologist. University of Iowa, Iowa City.
- Thompson, E. N.  
1969 *Grand Portage: A History of the Sites, Peoples, and Fur Trade*. National Park Service. Washington D.C.
- Thompson, R. G.  
1985 The Natwick, Warner, and Slinger Habitations: Their Relationship with the Arvilla Complex and the Late Woodland Period on the Northeastern Plains. *Minnesota Archaeologist* 44(1):18-28.
- Thurston, S. M.  
1987 A Preliminary Report on the Excavation of the Hamalainen Cemetery Site (21IC106) in North Central Minnesota. *Tennessee Anthropological Association Newsletter* 12(4):2-13.
- Thurston-(Myster), S. and B. H. O'Connell  
1984 Report on Human Skeletal Material Goodhue County, Bryan Site (21GD04). Ms. on file, Hamline University, St. Paul.  
1985 Report on Human Skeletal Material Cottonwood County-Talcot Lake, SouthBrook Township. Ms. on file at Hamline University, St. Paul.
- Thwaites, R. G. (editor)  
1896-1901 *The Jesuit Relations and Allied Documents: Travels and Explorations of the Jesuit Missionaries in New France, 1610-1791*. 73 vols., Burrows Brothers, Cleveland.  
1902 *The French Regime in Wisconsin - I*. Collections of the State Historical Society of Wisconsin Vol. 26, Madison, WI.
- Tieszen, L. L.  
1994 Stable Isotopes in the Great Plains: Vegetation Analyses and Diet Determinations. In *Skeletal Biology in the Great Plains: A Multidisciplinary View*, edited by D. W. Owsley and R. L. Jantz. Smithsonian Institution, Washington, D.C.
- Tiffany, J. A.  
1974 An Application of Eigenvector Techniques to the Seed Analysis of the Brogley Rockshelter (47 Gt-156). *The Wisconsin Archeologist* 55(1):2-41.  
1977a Investigation at the Chan-Ya-Ta Site, 13BV1. *Research Papers* 2(4):1-14.  
1977b Introduction and Artifact Analysis 13BW57. *Research Papers* 2(4):25-30. Office of the State Archaeologist, Iowa City.  
1977c Introduction and Site Summary 13VB23. *Research Papers* 2(4):34-37. Office of the State Archaeologist, Iowa City.  
1977d Marion County Finds 13MAO (1,2). *Research Papers* 2(06): 13. Office of the State Archaeologist, Iowa City.  
1977e The Hartz Brothers' Site, 131W115. *Research Papers* 2(06): 16-17. Office of the State Archaeologist, Iowa City.  
1977f The School House Site, 14PM48. *Research Papers* 2(06): 22-23. Office of the State Archaeologist, Iowa City.  
1977g Artifacts from the Sharp's Site: A Sterns Creek Component in Southwestern Iowa. *Journal of the Iowa Archeological Society* 24:84-124.  
1978a Middle Woodland Pottery Typology from Southwest Iowa. *Plains Anthropologist* 23(81):169-182.  
1978b *A Model of Changing Subsistence Patterns for the Mill Creek Culture of Northwest Iowa: An Analysis from the Chan-ya-ta Site (13BV1), Buena Vista County, Iowa*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin-Madison.  
1979 An Overview of Oneota Sites in Southeastern Iowa: A Perspective from the Ceramic Analysis of the Schmeiser Site, 13DM101, Des Moines County, Iowa. *Proceedings of the Iowa Academy of Science* 86(3):89-101.  
1981a The Williams Site (13HN10) Ceramics. *South Dakota Archaeology* 5:85-96.  
1981b A Compendium of Radiocarbon Dates for Iowa Archaeological Sites. *Plains Anthropologist* 26:55-73.  
1982a *A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa*. Research Papers 7(1). Office of the State Archaeologist. University of Iowa, Iowa City.  
1982b Hartley Fort Ceramics. *Proceedings of the Iowa Academy of Science* 89(4):133-150.
- 1982c Site Catchment Analysis of Southeast Iowa Oneota Sites. In *Oneota Studies*, edited by G. E. Gibbon, pp. 1-13. Publications in Anthropology No. 1. University of Minnesota, Minneapolis.
- 1982d *Chan-Ya-Ta: A Mill Creek Village*. Report 15. Office of the State Archaeologist. University of Iowa, Iowa City.
- 1983 An Overview of the Middle Missouri Tradition. In *Prairie Archaeology: Papers in Honor of David A. Baerreis*, edited by Guy E. Gibbon, pp. 87-108. Publications in Anthropology No. 3. University of Minnesota, Minneapolis, Minnesota.
- 1986a The Early Woodland Period in Iowa. In *Early Woodland Archeology*, edited by K. B. Farnsworth and T. E. Emerson, pp. 159-170. Kampsville Seminars in Archeology No. 2. Center for American Archeology, Kampsville, Illinois.
- 1986b Ceramics from the F-518 Project. In *Archaeological Investigations along the F-518 Corridor: Phase III Mitigation at 13WS61, 13WS65, 13WS122, 13WS126*, edited by S. C. Lensink, pp. 227-245. Iowa Quaternary Studies Contribution 9. Iowa Quaternary Studies Group. University of Iowa, Iowa City.
- 1986c Curating the Charles R. Keyes Archaeological Collection. *Council for Museum Anthropology Newsletter* 10(2):15-22.
- 1987 *Modeling Mill Creek-Mississippian Interaction*. Iowa Quaternary Studies Contribution No. 12. Iowa Quaternary Studies Group. University of Iowa, Iowa City.
- 1988 Preliminary Report on Excavations at the McKinney Oneota Village Site (13LA1), Louisa County, Iowa. *The Wisconsin Archeologist* 69(4):227-312.
- 1991a Models of Mississippian Culture History in the Western Prairie Peninsula: A Perspective from Iowa. In *Cabokia and the Hinterlands Middle Mississippian Cultures of the Midwest*, edited by T. E. Emerson and R. B. Lewis, pp. 183-192. University of Illinois Press, Urbana, Illinois.
- 1991b Modeling Mill Creek-Mississippian Interaction. In *New Perspectives on Cabokia: Views from the Periphery*, edited by J. B. Stoltman, pp. 319-347. Monographs in World Archaeology No. 2. Prehistory Press. Madison, Wisconsin.
- Tiffany, J. A. (editor)  
1982 *A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa*. Research Papers 7(1). Office of the State Archaeologist, University of Iowa, Iowa City.
- Tiffany, J. A. (compiler)  
1981 *The Keyes Archaeological Collection: a Finder's Guide*. Iowa State Historical Department, Division of the State Historical Society, Iowa City.
- Tiffany, J. A., and D. C. Anderson  
1993 The Milford Site (13DK1): A Postcontact Oneota Site in Northwest Iowa. In *Prehistory and Human Ecology of the Western Prairies and Northern Plains Papers in Honor of Robert A. Alex*, edited by J. A. Tiffany, pp. 283-306. Memoir 27. Plains Anthropological Society. Plains Anthropologist 38(145).
- Tiffany, J. A. and A. K. Fisher  
1976 Report on the Smith Sites 13OB404, O'Brien County, Iowa. *Research Papers* 1(2):1-7. Office of the State Archaeologist, Iowa.
- Tiffany, J. A., S. J. Schermer, and D. Z. Baker  
1990 Documenting Archaeological Sites in the Charles R. Keyes Collection. *Journal of the Iowa Archeological Society* 37:88-92.
- Tiffany, J. A., S. J. Schermer, J. L. Theler, D. W. Owsley, D. C. Anderson, E. A. Bettis III, and D. M. Thompson.  
1988 The Hanging Valley Site (13HR28): A Stratified Woodland Burial Locale in Western Iowa. *Plains Anthropologist* 33(120):141-259.  
1989 Reply to Benn's Comments on the Hanging Valley Site (13HR28). *Plains Anthropologist* 34:271-272.
- Tiffany, J. A., S. J. Schermer, and D. Ziegowski Baker  
1990 Documenting Archaeological Sites in the Charles R. Keyes Collection. *Journal of the Iowa Archeological Society* 37:88-92.
- Tiling, C. E.  
1970 Preliminary Report on the Sand Mound. Ms. on file at the Minnesota Historical Society, St. Paul.
- Till, A.  
1976 *Preliminary Archaeological Investigations of the Des Moines and Skunk River Basins*. Report Submitted to Division of Historic Preservation, Iowa State Historical Department, Iowa City.



- 1983 *An Intensive Cultural Resource Survey for the Bank Stabilization Project NCROD-S-070-0X6-1-103490 Rip-Rap Construction Bonaparte, Iowa.* Manuscript prepared for the Rock Island District, U.S. Army Corps of Engineers. Rock Island, Illinois.
- Till, Anton, and Blane H. Nansel
- 1981a *Van Buren County Archaeology.* Manuscript Submitted to the Division of Historic Preservation, Iowa State Historical Department, Iowa City.
- 1981b *Jefferson County Archaeology.* Manuscript Submitted to the Division of Historic Preservation, Iowa State Historical Department, Iowa City.
- 1983 *Mabaska County Archaeology.* Manuscript Submitted to the Office of Historic Preservation, Iowa State Historical Department, Des Moines.
- 1984a *Keokuk County Archaeology.* Manuscript Submitted to the Office of Historic Preservation, Iowa State Historical Department, Des Moines.
- 1984b *Wapello County Archaeology.* Manuscript Submitted to the Office of Historic Preservation, Iowa State Historical Department, Des Moines.
- 1984c *Lucas and Wayne Counties Archaeology.* Manuscript Submitted to the Office of Historic Preservation, Iowa State Historical Department, Des Moines.
- Titus, S., J. K. Johnston, C. R. McGimsey, and J. D. Anderson
- 1991 *Phase II Archaeological Investigations within the Northern Border Pipeline Expansion/Extension Project Corridor: Harper, Iowa, to the Mississippi River.* Cultural Resources Management Report No. 168. American Resources Group, Ltd. Carbondale, Illinois.
- Torbenson, M., A. Aufderheide, and E. Johnson
- 1992 Punctured Human Bones of the Laurel Culture from Smith Mound Four, Minnesota. *American Antiquity* 57(3):506-514.
- Torbenson, M., O. Langsjoen, and A. Aufderheide
- 1994 Laurel Culture Human Remains from Smith Mounds Three and Four. *Plains Anthropologist* 39(150):429-444.
- 1996 Human Remains from McKinstry Mound Two. *Plains Anthropologist* 41(155):71-92.
- Tresyen, L. L.
- 1994 Stable Isotopes in The Great Plains: Vegetation Analysis and Dirt Determination. In *Skeletal Biology in The Great Plains: A Multidisciplinary View*, edited by D. W. Owsley and R. L. Jantz, pp 261-282. Smithsonian Institution Press, Washington D.C.
- Trigger, B. G.
- 1968 The Determinants of Settlement Patterns. In *Settlement Archaeology*, edited by K.C. Chang. National Press Books, Palo Alto, CA.
- Trow, T.
- 1979 The Prehistory of Brown and Redwood Counties: An Archaeological Survey of the Cottonwood River. Ms. on file, Minnesota Historical Society, St. Paul.
- 1982 Surveying the Route of the Root: An Archaeological Reconnaissance in Southeastern Minnesota. In *Current Directions in Midwestern Archaeology: Selected Papers from the Mankato Conference*, edited by S. F. Anfinson. Occasional Publications in Minnesota Anthropology No. 9, Minnesota Archaeological Society, St. Paul.
- Trdan, J.
- 1997 Paleodemography and Mortuary Variability in the Late Woodland Period in Minnesota: Round Mound (21TR01) and Osufsen Mound (21IC02). Unpublished B.A. Honors Thesis, Department of Anthropology, Hamline University.
- Tuck, J. A.
- 1978 Regional Cultural Development, 3000 to 300 B.C. In *Handbook of North American Indians*, Volume 15, *The Northeast*. Smithsonian Institution, Washington, D.C.
- Turner, C. G.
- 1971 Three-rooted Mandibular First Permanent Molars and the Question of American Indian Origins. *American Journal of Physical Anthropology* 34:229-242.
- 1979 Dental Anthropological Indications of Agriculture Among the Jomon People of Central Japan. *American Journal of Physical Anthropology* 51:619-636.
- 1981 Appendix I: Description of Human Skeletal Material from the Little Eau Plaine Site 6. *Wisconsin Archeologist* 62:108-111.
- Turner, F. J.
- 1977 The Character and Influence of the Indian Trade in Wisconsin. In *A Study of the Trading Post as an Institution*, edited by D. H. Miller and W. W. Savage, Jr. University of Oklahoma Press, Norman.
- University of Minnesota Correspondence File
- n.d. General correspondence files for Aitkin, Clearwater, Traverse and Wilkin Counties. University of Minnesota, Minneapolis.
- U.S. Army Corps of Engineers
- 1985 *Cultural Resources Reconnaissance at Prehistoric Sites 13LA30 and 13LA38 Mississippi River Sand Run Slough, Louisa County, Iowa.* Rock Island District. U.S. Army Corps of Engineers. Rock Island, Illinois.
- Valentine, J. H.
- 1969 An Archaic Burial and Workshop Site Near New Ulm, Minnesota. *Minnesota Archaeologist*, 30(3):72-75.
- Vander Leest, B. J. and D. B. Halmo
- 1980 Conservation Archaeology in Southeastern Wisconsin: The Barnes Creek Site. Applied Urban Field School, Monograph Number 1. University of Wisconsin-Parkside, Kenosha.
- Van Dyke, A. P.
- 1985 Archaeological Investigations at the Bagley Rapids Quartz Outcrop and Quartz Reduction Site in Northern Wisconsin. *The Wisconsin Archeologist* 66(4):299-326.
- 1987 *Cultural Resource Assessment, Six Prehistoric Sites, East Bay, Fay Lake, Nicolet National Forest.* Archaeological Services Division, Berg Zimmer & Associates, West Allis, WI.
- Van Dyke, A. P., and E. S. Oerichbauer
- 1988 The Clam River Focus Revisited: Excavations at 47-Bt-36, Burnett County, Wisconsin. *Wisconsin Archeologist* 69(3):139-162.
- Van Dyke, A. P., D. F. Overstreet, and J. L. Theler
- 1980 Archaeological Recovery at 11-RI-337, an Early Middle Woodland Shell Midden in East Moline, Illinois. *The Wisconsin Archeologist* 61(2):125-265.
- Van Hying, Thompson
- 1910a The Boone Mound. *Records of the Past* 9(pt. III):157-162.
- 1910b The Boone Mound. *Archaeological Bulletin* 1:92-94.
- Van Langen, H., and T. F. Kehoe
- 1971 Hilgen Spring Park Mound Group. *The Wisconsin Archeologist* 52(1):1-19.
- Van Zant, K.
- 1979 Late Glacial and Postglacial Pollen and Plant Macrofossils from Lake West Okoboji, Northwestern Iowa. *Quaternary Research* 12:358-380.
- Vennum, T. Jr.
- 1988 *Wild Rice and the Ojibway People.* Minnesota Historical Society Press, St. Paul.
- Vickers, C.
- 1951 The Assiniboines of Manitoba. Papers read before the Historical and Scientific Society of Manitoba. *Series III* (8):40-46.
- Vickers, C.
- 1947 Burial Traits of the Headwaters Lake Aspect in Manitoba. *American Antiquity* 11:88-94.
- Vickers, C. and R. Bird
- 1949 A Copper Trade Object from the Headwaters Lakes Aspect in Minnesota. *American Antiquity* 15:157-160.
- Vis, R. B., and D. R. Henning
- 1969 A Local Sequence for Mill Creek Sites in the Little Sioux River Valley. *Plains Anthropologist* 14(46):253-271.
- Vogel, J. A.
- 1980 *Folk Technology: A History of the Round Lake Logging Dam.* Report submitted to the Chequamegon National Forest, Park Falls, Wisconsin.
- 1983 The Round Lake Logging Dam: A Survivor of Wisconsin's Log Driving Days. *The Wisconsin Magazine of History* 66(3):171-191.
- Vogel, R. C.
- 1988 Archival Research. In *Archaeology and Geomorphology in Pools 17 & 18 Upper Mississippi River*, edited by D. W. Benn, pp. 228-315. CAR-714. Center for Archaeological Research. Southwest Missouri State University, Springfield.
- 1989 Archival Research. In *Archaeology, Geomorphology and Historic Surveys in Pools 13-14, Upper Mississippi River.* CAR-752, edited by D. W. Benn, pp. 56-137. Center for Archaeological Research. Southwest Missouri State University. Springfield, Missouri.

- Vondracek, B., and K. W. Gobalet  
1982 Fish Remains. In *A Preliminary Report on the Arthur Site, East Okoboji Lake, Iowa*, edited by J. A. Tiffany, pp. 133-138. Research Papers 7(1). Office of the State Archaeologist. University of Iowa. Iowa City, Iowa.
- Vradenburg, J. A.  
1991a Skeletal Analysis of Materials from the Tremaine Site, La Crosse County, Wisconsin. Ms. on file, State Historical Society of Wisconsin, Madison.  
1991b Skeletal Analysis of a Late Prehistoric Oneota Population: La Crosse County, Wisconsin. Paper presented in the symposium "Oneota in the La Crosse Locality", 36th Annual Midwest Archaeological Conference, La Crosse, Wisconsin.  
1991c Skeletal Analysis of a Late Prehistoric Oneota Population: La Crosse County, Wisconsin. Paper presented at the 36th Annual Midwest Archaeological Conference, October 18-20. La Crosse, Wisconsin.  
1993 Chapter 9: Analysis of Human Skeletal Remains. In Volume 1: *The OT Site (47LC262)*, by J. O'Gorman with contributions by R. E. Hollinger, B. W. Styles and K. White, A. A. Hunter and C. M. Berg, and J. Vradenburg. Archaeology Research Series Number 1, Museum Archaeology Program, State Historical Society of Wisconsin, Madison.  
1994a Skeletal Remains from 13WH1, Sampson Farm, Winneshiek County, Iowa. *Research Papers* 19(01): 213-216. Office of the State Archaeologist, Iowa City.  
1994b Analysis of Human Skeletal Remains from 13AM0m, Allamakee County, Iowa. *Research Papers* 19(01): 217-220. Office of the State Archaeologist, Iowa City.  
1994c Analysis of Human Skeletal Remains from 13AM60, Malone Cemetery, Allamakee County, Iowa. *Research Papers* 19(01): 221-240. Office of the State Archaeologist, Iowa City.  
1994d Analysis of Human Skeletal Remains from 13AM1, Flatiron Terrace, Allamakee County, Iowa. *Research Papers* 19(01): 241-256. Office of the State Archaeologist, Iowa City.  
1994e Analysis of Human Skeletal Remains from 13AM0n, Fisherman's Point Cave, Allamakee County, Iowa. *Research Papers* 19(01): 257-264. Office of the State Archaeologist, Iowa City.
- Vradenburg, J. A. and R. E. Hollinger  
1992 Analysis of a Contact Period Oneota Cemetery from North-East Iowa. Paper presented at the 37th Annual Midwest Archaeological Conference, October 16-18. Grand Rapids, Michigan.
- Wackman, J. F.  
1990 Cinko Kirchner Site (Jackson House Hotel). *The Wisconsin Archeologist* 71(1-2):1-114.  
1991 Report on the DuBay Collection at the Milwaukee Public Museum. Archaeological Rescue, Milwaukee
- Wade, S. J.  
1988 Osteological Analysis of Some Nineteenth Century German-American Burials from the Altenburg Cemetery, Ozaukee County, Wisconsin. Report on file at the Wisconsin State Historical Society, Burial Sites Office.
- Walker, E. G.  
1983 Evidence for Prehistoric Cardiovascular Disease of Syphilitic Origin on the Northern Plains. *American Journal of Physical Anthropology* 60: 499-503.
- Wallace, D. C. and A. Torroni  
1992 American Indian Prehistory as Written in the Mitochondrial DNA: A Review. *Human Biology* 64(3):403-416.
- Walthall, J. A.  
1980 Galena and Aboriginal Trade on Eastern North America. Illinois State Museum *Scientific Papers* 27. Springfield.
- Ward, D. J. H.  
1903a Historico-Anthropological Possibilities in Iowa. *Iowa Journal of History and Politics* 1(1):47-76.  
1903b Anthropological Instruction in Iowa. *Iowa Journal of History and Politics* 1(3):312-328.  
1904a First Yearly Meeting of the Iowa Anthropological Association. *Iowa Journal of History and Politics* 2(3):342-368.  
1904b Some Iowa Mounds, an Anthropological Survey. *Iowa Journal of History and Politics* 2(1):312-328.  
1905 Second Yearly Meeting of the Iowa Anthropological Association. *Iowa Journal of History and Politics* 3(3):442-458.
- 1906a Meskwaki. *Iowa Journal of History and Politics* 4(2):179-189.  
1906b Muskewaki People of To-day. *Iowa Journal of History and Politics* 4(2):190-219.
- Warren, R. E., and M. J. O'Brien  
1982 Conclusions. In *The Cannon Reservoir Human Ecology Project*, edited by M. J. O'Brien, R. E. Warren, and D. E. Lewarch, pp. 391-394. Academic Press, New York.
- Warren, W. W. (editor)  
1957 *History of the Ojibway Nation*. Ross and Haines, Inc., Minneapolis.  
1984 *History of the Ojibway Nation*. Borealis Paperback edition, Minnesota Historical Society Press, St. Paul. New introductions by Roger Buffalohead. First published in 1885.
- Waseskuk, B.  
1978 Mesquakie History—As We Know It. In *The Worlds Between Two Rivers: Perspectives on American Indians in Iowa*, edited by G. M. Bataille, D. M. Gradwohl, and C. L. P. Silet, pp. 54-61. Iowa State University Press, Ames.
- Waters, M. R.  
1986 Sulphur Springs Woman: An Early Human Skeleton from South-Eastern Arizona. *American Antiquity* 51: 361-365.
- Watrall, C.  
1968a *An Analysis of the Bone, Stone, and Shell Materials from the Cambria Focus*. Unpublished Master's thesis, University of Minnesota.  
1968b Analysis of Unmodified Stone Materials from the Cambria Site. *Minnesota Academy of Science Journal* 35:4-8.  
1974 Subsistence Pattern Change at the Cambria Site: A Review and Hypothesis. In *Aspects of Upper Great Lakes, Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, Minnesota Prehistoric Series No. 11, Minnesota Historical Society, St. Paul.
- Weaver, J. E. and F. E. Clements  
1979 *Plant Ecology*. New York: McGraw-Hill.
- Webb, T. III, P. J. Bartlein, and J. E. Kutzbach  
1987 Climatic Change in Eastern North America During the Past 18,000 Years; Comparisons of Pollen Data with Model Results. In *North America and Adjacent Oceans during the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright, Jr., pp. 447-462. *The Geology of North America*, Vol. K-3.
- Webb, T. III and R. A. Bryson  
1972 Late and Postglacial Change in the Northern Midwest, U.S.A., Quantitative Estimates Derived from Fossil Pollen Spectra by Multivariate Statistical Analysis. *Quaternary Research* 2:70-115.
- Webb, T. III, E. J. Cushing, and H. E. Wright, Jr.  
1983 Holocene Changes in the Vegetation of the Midwest. In *Late Quaternary Environments of the United States, Vol. 2, The Holocene*, edited by H. E. Wright Jr., pp. 142-165. University of Minnesota Press, Minneapolis.
- Webb, T. III, and H. E. Wright Jr.  
1972 Quaternary History of Minnesota. In *Geology of Minnesota: A Centennial Volume*, edited by P. K. Sims, and G. B. Morey, pp. 515-547, Minnesota Geological Survey, Minneapolis, Minnesota.
- Webster, C. L.  
1887a Indian Graves in Floyd and Chickasaw Counties, Iowa. *Annual Report of the Smithsonian Institution*, 1889:590-592.  
1887b Mounds of the Western Prairies. *Annual Report of the Smithsonian Institution*, 1889:603-604. Washington, D.C.  
1889a Aboriginal Remains Near Old Chickasaw, Iowa. *American Naturalist* 23:650-655.  
1889b Ancient Mounds at Floyd, Iowa. *American Naturalist* 23:185-188.  
1891 Ancient Mounds at Floyd, Iowa. *Nature* 43(1105):213-214.
- Webster, D.  
1973 Nonceramic Artifacts from Laurel Culture Sites Excavated Prior to 1961. In *The Laurel Culture in Minnesota*, edited by J. B. Stoltman, pp. 94-111. Minnesota Historical Society, St. Paul.
- Wedel, M. M.  
1938 The Relation of Historic Indian Tribes to Archaeological Manifestations in Iowa. *Iowa Journal of History and Politics* 30(3): 227-314.  
1959 Oneota Sites on the Upper Iowa River. *Missouri Archaeologist* 21(2-4).  
1961 Indian Villages on the Upper Iowa River. *The Palimpsest* 42(1):561-592.

- 1963a Review of "The Archeology of Carcajou Point: With an Interpretation of the Development of Oneota Culture in Wisconsin." By Robert L. Hall. *The Wisconsin Archeologist* 44(2):112-117.
- 1963 Notes on Oneota Classification. *The Wisconsin Archeologist* 44:118-122.
- 1974 Le Sueur and the Dakota Sioux. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 157-172. Minnesota Prehistoric Archaeology Series No. 11. Minnesota Historical Society. St. Paul, Minnesota.
- 1976 Ethnohistory: Its Payoffs and Pitfalls for Iowa Archeologists. *Journal of the Iowa Archeological Society* 23:1-44.
- 1978 A Synonymy of Names for the Ioway Indians. *Journal of the Iowa Archeological Society* 25:49-77.
- 1981 The Ioway, Oto, and Omaha Indians in 1700. *Journal of the Iowa Archeological Society* 28:1-14.
- 1986 Peering at the Ioway Indians Through the Mist of Time: 1650-Circa 1700. *Journal of the Iowa Archeological Society* 33:1-74.
- 1988 The 1804 "Old Ioway Village" of Lewis and Clark. *Journal of the Iowa Archeological Society* 35:70-71.
- Wedel, W. R.
- 1959 *An Introduction to Kansas Archaeology*. Bureau of American Ethnology Bulletin 174. Smithsonian Institution. Washington, D.C.
- 1961 *Prehistoric Man on the Great Plains*. University of Oklahoma Press, Norman.
- 1978 The Prehistoric Plains. In *Ancient Native Americans*, edited by J. D. Jennings, pp. 183-220. W. H. Freeman and Company, San Francisco.
- Weichman, M. S.
- 1975 *The Johnson County - Coralville Reservoir Road Improvement Project*. Research Report 20. Environmental Research Center, Iowa City, Iowa.
- 1976a *A Preliminary Archaeological, Architectural, and Historical Reconnaissance within the Upper Chariton River Valley: Appanoose County, Iowa, and Putnam County, Missouri*. Environmental Research Center, Iowa City, Iowa.
- 1976b *An Intensive Survey of the Archaeological, Architectural, and Historical Resources within the Proposed Lodge Complex Project, Lake Rathbun, Iowa*. Report 25. Environmental Research Center, Iowa City, Iowa.
- Weichman, M. S., and S. Hedin
- 1974 *Chelsea Levee Project: An Intensive Survey of Cultural Resources*. Research Report 4. Environmental Research Center, Iowa City, Iowa.
- Weichman, M. S., and J. P. Tandarich
- 1974 *Iowa River Overview*. Research Report 10. Environmental Research Center, Iowa City, Iowa.
- Weir, F. A.
- 1985 An Early Holocene Burial at the Wilson-Leonard Site in Central Texas. *Mammoth Trumpet* 2: 1-3.
- Weiss,
- 1973 *Demographic Models for Anthropology*. Memoirs of the Society for American Archaeology, No. 27.
- Weitzel, T. S.
- 1992 *A Ceramic Analysis of the Weaver Community at Gast Farm (13LA12) Southeastern Iowa*. Unpublished Master's thesis. Department of Anthropology. University of Iowa, Iowa City.
- Weitzel, T. S., and W. Green
- 1994 *Journal of the Iowa Archeological Society* 41:
- Wendland, W. M.
- 1982 Geomorphic Responses to Climatic Forcing during the Holocene. In *Space and Time in Geomorphology*, edited by Colin E. Thorn, pp:355-371. George Allen and Unwin, Boston.
- Wendland, W. M. and R. A. Bryson
- 1974 Dating Climatic Episodes of the Holocene. *Quaternary Research* 4(1):9-24.
- Wendt, D.
- 1985 Paleo-Indian Site Distribution in the Yahara River Basin of Wisconsin. *The Wisconsin Archeologist* 66(3):243-264.
- 1986 *An Analysis of Endsrapers from the Bryan Site*. Reports of Investigations No. 9, Institute for Minnesota Archaeology, Minneapolis.
- 1987a *Initial Investigations of a Multi-component Woodland Site (21AN20) in Anoka County, Minnesota*. Report of Investigations Number 30, The Institute for Minnesota Archaeology, Minneapolis.
- 1987b *The Destruction of Two Multi-component Sites in Anoka County, Minnesota*. Reports of Investigations Number 31, The Institute for Minnesota Archaeology, Minneapolis.
- 1988 21AN42: A Special Activity Site in Anoka County from the Middle and Late Woodland Periods. *The Minnesota Archeologist*, in press.
- Wendt, D. and C. A. Dobbs
- 1989 A Reevaluation of the Mero (Diamond Bluff) Site Complex. *The Wisconsin Archeologist* 70(3):281-308.
- West, G. A.
- 1905 The Aboriginal Pipes of Wisconsin. *The Wisconsin Archeologist* (old series) 4:47-171.
- 1907 The Indian Authorship of Wisconsin Antiquities. *The Wisconsin Archeologist* (old series) 6(4):169-256.
- 1929 Copper: Its Mining and Use by the Aborigines of the Lake Superior Region. *Milwaukee Public Museum Bulletin* 10:1-184.
- 1934 Tobacco, Pipes and Smoking Customs of the American Indians. *Milwaukee Public Museum Bulletin* 17.
- Wheeler, C. J.
- 1977 The Historic Assiniboine: A Territorial Dispute in the Ethnohistoric Literature. In *Papers of the Eighth Algonquian Conference*, edited by W. Cowan, pp. 115-123. Carleton University, Ottawa, Canada.
- Wheeler, R. C. et. al.
- 1975 *Voices from the Rapids: An Underwater Search for Fur Trade Artifacts 1960 - 1973*. Minnesota Historical Society, St. Paul, Mn.
- 1954 Archaeological Method in the Eastern United States. In *Method and Perspective in Anthropology*, edited by R. H. Spencer, pp. 171 - 191. University of Minnesota Press, Minneapolis, Mn.
- 1985 *A Toast to the Fur Trade: A Picture Essay and Its Material Culture*. Wheeler Productions, St. Paul.
- Wheeler, R. P.
- 1949a *Preliminary Appraisal of the Archeological Resources of the Rathbun Reservoir, Chariton River Basin, Iowa*. River Basin Surveys. Smithsonian Institution, Lincoln, Nebraska.
- 1949b *Appraisal of the Archeological Resources of the Coralville Reservoir, Iowa River, Iowa*. River Basin Surveys. Smithsonian Institution, Lincoln, Nebraska.
- 1949c *Appraisal of the Archeological Resources of the Red Rock Reservoir*. River Basin Surveys. Smithsonian Institution, Lincoln, Nebraska.
- Whelan, M. K.
- 1990 Late Woodland Subsistence System and Settlement Size in the Mille Lacs Area. In *The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson*, edited by G. Gibbon, pp 55-75. University of Minnesota Publications in Anthropology No. 4, Minneapolis.
- Whelan, M. K., M. S. Neverett, and K. D. Sobolik
- 1992 The Gast Farm Site (13LA12) Faunal Remains: Early-Late Woodland Subsistence Patterns in Southeastern Iowa. Paper Presented at the 57th Annual Meeting of the Society for American Archaeology. April 8-12, 1992. Pittsburgh, Pennsylvania.
- Whelan, M. K., R. Withrow and B. H. O'Connell
- 1989a The Black Dog Burial Site 21DK26: Evidence for Culture Change at a 19th Century Dakota Indian Cemetery. Paper presented at the Society for American Archaeology Annual Meetings, Atlanta.
- 1989b An Archaeological Study of the Black Dog Burial, 21DK26. Paper presented at the World Archaeological Congress Inter-Congress on Archaeological Ethics and Treatment of the Dead, Vermillion South Dakota.
- White, B. M.
- 1977 *The Fur Trade in Minnesota: An Introductory Guide to Manuscript Sources*. Minnesota Historical Society, St. Paul.
- White, J. K.
- 1985 Ceramics. In *Deer Track: A Late Woodland Village in the Mississippi Valley*, edited by C. R. McGimsey and M. D. Conner, pp. 27-43. Technical Report No. 1. Center for American Archeology. Kampsville Archeological Center, Kampsville, Illinois.

- Whiteford, A. H.  
1949 A Report on the Outlet Site on Lake Monona. *The Wisconsin Archeologist* 30(1):22-35.
- Whitman, W.  
1937 *The Oto*. Columbia University Press, New York.
- Wiant, M. D., E. R. Hajic, and T. R. Styles  
1983 Napoleon Hollow and Koster Site Stratigraphy: Implications for Holocene Landscape Evolution and Studies of the Archaic Period Settlement Patterns in the Lower Illinois River Valley. In *Archaic Hunters and Gatherers in the American Midwest*, edited by J. L. Phillips and J. A. Brown, pp. 147-164. Academic Press, New York.
- Wilford, L. A.  
n.d. Smith Mound 3. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
n.d. McKinstry Mound 2. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1933 Smith Mound 4. Unpublished site report on file, Wilford Archaeology Laboratory, Department of Anthropology, University of Minnesota, Minneapolis.  
1937a *Minnesota Archaeology with Special Reference to the Mound Area*. Unpublished Ph.D. dissertation, Harvard University.  
1937b The Shocker Village Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1938 Cambria Village. Ms. on file at the University of Minnesota, Minneapolis.  
1940 The Prehistoric Peoples of Minnesota: The Mille Lacs Aspect. *Minnesota History* 26(4):312-329.  
1941a Report on Cambria Village Excavation, 1941. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1941b A Tentative Classification of the Prehistoric Cultures of Minnesota. *American Antiquity* 6-3.  
1942a Judson Mounds. Ms. on file at the University of Minnesota, Minneapolis.  
1942b The Morrison Mounds. Ms. on file at the University of Minnesota, Minneapolis.  
1942c The Peterson Mound Group. Ms. on file at the University of Minnesota, Minneapolis.  
1943a The Hanel Mounds. Ms. on file at the University of Minnesota, Minneapolis.  
1943b The Osufsen Mounds. Ms. on file at the University of Minnesota, Minneapolis.  
1943c A Tentative Classification of the Prehistoric Cultures of Minnesota. *Minnesota Archaeologist* 9(4):91-92.  
1944 The Prehistoric Indians of Minnesota: The Mille Lacs Aspect. *Minnesota History* 25:329-341.  
1945a The Prehistoric Indians of Minnesota: The Headwaters Lake Aspect. *Minnesota History*, 26:312-329.  
1945b Three Villages of the Mississippian Pattern in Minnesota. *American Antiquity* 11:32-40.  
1945c The Cambria Village Site-1938. Ms. on file, Department of Anthropology, University of Minnesota.  
1945d Humphrey Village Site. Ms. on file, Wilford Laboratory of Archaeology, University of Minnesota, Minneapolis.  
1945e Huber Mound. Ms. on file at the University of Minnesota, Minneapolis.
- 1946 Owen D. Johns Village Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1947a The Farley Village Site. Ms. on file, Wilford Laboratory of Archaeology, University of Minnesota, Minneapolis.  
1947b Gladly Mound. Unpublished ms. on file, Wilford Laboratory of Archaeology, University of Minnesota, Minneapolis.  
1949 Great Oasis Village Site, 1941. Ms. on file, Wilford Laboratory of Archaeology, University of Minnesota.  
1950 The Prehistoric Indians of Minnesota: Some Mounds of the Rainy River Aspect. *Minnesota History*, 31:163-167.  
1951 The Gillingham Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1952a The McKinstry Mounds of the Rainy River Aspect. *The Minnesota Archaeologist*, 18(2):10-14.  
1952b The Prehistoric Indians of Minnesota: Some Mounds of the Rainy River Aspect. *The Minnesota Archaeologist*, 18(1):4-9.  
1952c The Silvernale Village and Mounds Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1952d The Vosburg Site. Ms. on file, Wilford Archaeology Laboratory, University of Minnesota, Minneapolis.  
1952e The Wilsey Burial. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1954 Archaeological method in the eastern United States. In *Method and perspective in Anthropology*, edited by R. H. Spencer, pp. 171-191. University of Minnesota Press, Minneapolis.  
1954a Mille Lacs Lake Survey. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1954b Mitchell Dam Ricing Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1954c The LaMoille Rock Shelter. *The Minnesota Archaeologist* 19(2):17-21.  
1955a A Revised Classification of the Prehistoric Cultures of Minnesota. *American Antiquity* 21-2:130-142.  
1955b The Howard Lake Mounds. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1955c The Eggleston Mounds. Ms. on file at the University of Minnesota, Minneapolis.  
1955d Unpublished field notes on file at the University of Minnesota, Minneapolis.
- 1956 The Bryan Site. Unpublished manuscript, Department of Anthropology, University of Minnesota.  
1957 The Bryan Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis. Published in *Minnesota Archaeologist* 43(2):21-36.  
1958 The Hogback Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1959 White Oak Mounds and Village. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1960a The First Minnesotans. In *Minnesota Heritage*, edited by L.M. Brings, pp. 40-79. T.S. Denison and Co., Minneapolis.  
1960b Brostrom Mounds. Ms. on file at the University of Minnesota, Minneapolis.  
1961a The Washish Habitation Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1961b The Fox Lake Village Site, Ms. on file, Department of Anthropology, University of Minnesota.  
1962 Mountain Lake Village Site. Ms. on file, Department of Anthropology, University of Minnesota, Minneapolis.  
1964 Eck Mound and Burial Area. *Minnesota Archaeology News* 6.  
1970 *Burial Mounds of the Red River Headwaters*. Minnesota Historical Society, St. Paul.  
1984 The Ralph Bryan Site, 1951-1952. *Minnesota Archaeologist* 43(2):21-36.
- Wilford, L.A. and J. Brink  
1974 The Hogback Site. *Minnesota Archaeologist* 33 (1 and 2).
- Wilford, L. A., E. Johnson and J. Vicinus  
1969 *Burial Mounds of Central Minnesota*. Minnesota Prehistoric Series No. 1, Minnesota Historical Society.
- Willey, G. R. and P. Phillips  
1958 *Method and Theory in American Archaeology*. University of Chicago Press, Chicago.
- Willey, G. R., and J. A. Sabloff  
1980 *A History of American Archaeology* (Second Edition). W.H. Freeman and Company, New York.
- Williams, P.  
1975 The Williams Site (13PM50): A Great Oasis Component in Northwestern Iowa. *Journal of the Iowa Archaeological Society* 22.
- Williams, W.  
1880 Ancient Fortifications and Mounds in Webster County, Iowa. *Annals of Iowa* 7:339.

- Wilmeth, R. H.  
1972 *The Woodland Sequence in the Central Plains*. Unpublished Ph.D. dissertation. Department of Anthropology. University of Michigan. Ann Arbor, Michigan.
- Wilson, H. C.  
1963 An Inquiry into the Nature of Plains Indians Cultural Development. *American Anthropologist* 65:355-369.
- Wilson, W. H.  
1966 Appendix I: Anomalies and Pathologies. *Wisconsin Archeologist* 47:84-87.
- Winchell, N. H.  
1911 *The Aborigines of Minnesota*. The Minnesota Historical Society, St. Paul.
- Winkler, M. G., A. M. Swain, and J. E. Kutzbach  
1986 Middle Holocene Dry Period in the Northern Midwestern United States: Lake Levels and Pollen Stratigraphy. *Quaternary Research* 25:235-250.
- Wiseman, J. R.  
1980 Archaeology in the Future: An Evolving Discipline. *American Journal of Archaeology* 84:279-285.
- Wissler, C.  
1914 The Influence of the Horse in the Development of Plains Culture. *American Anthropologist* 16:1-25.  
1923 *State and Local Archaeological Surveys: Suggestions in Method and Technique*. Bulletin of Information Series No. 11. State Historical Society of Iowa, Iowa City.
- Withrow, R. M., J. P. Gallagher, and R. Rodell  
1991 Oneota Orr Phase and the Seventeenth Century Ioway. Paper presented at the 56th Annual Meeting of the Society for American Archaeology, New Orleans.
- Withrow, R. M., E. Johnson and M. Whelan  
1987 *The Schilling Site (21WA1), Cottage Grove, MN*. Cottage Grove Cultural Resource Survey: Archaeological Field Survey and Documentation Project. Final Report Volume 2.
- Withrow, R. M. and R. L. Rodell  
1984 *Archaeological Investigations in Southeastern Minnesota: The 1984 Root River Survey*. Reports of Investigations Number 29, Mississippi Valley Archaeology Center, University of Wisconsin/La Crosse.
- Wittry, W. L.  
1955 Salvage Operations at the Kolterman Mound Group. *The Wisconsin Archeologist* 36: 3-12.  
1957 A Preliminary Study of the Old Copper Complex. *The Wisconsin Archeologist* 32(1):1-18.  
1959a The Raddatz Rockshelter, Sk 5, Wisconsin. *The Wisconsin Archeologist* 40(2):33-69.  
1959b Archaeological Studies of Four Wisconsin Rockshelters. *The Wisconsin Archeologist* 40(4):137-267.  
1959c The Wakanda Park Mound Group, Dn1, Menomonie, Wisconsin. *The Wisconsin Archeologist* 40(3):95-115.  
1963 The Bell Site, WN-9, an Early Historic Fox Village. *The Wisconsin Archeologist* 44(1):1-57.
- Wittry, W. L. and D. A. Baerreis  
1958 Domestic Houses at Aztalan. *The Wisconsin Archeologist* 39(1):62-76.
- Wittry, W. L. and R. E. Ritzenthaler  
1956 The Old Copper Complex: An Archaic Manifestation in Wisconsin. *American Antiquity* 22(1).
- Witty, T. A., Jr.  
1967 The Pomona Focus. *Kansas Anthropological Association Newsletter* 12(9):1-5.  
1981 The Pomona Focus, Known and Unknown. *The Missouri Archeologist* 42:77-84.
- Wood, E. F.  
1936 A Central Basin Manifestation in Eastern Wisconsin. *American Antiquity* 1:215-219.
- Wood, W. R.  
1960 The Boundary Mound Group (32SI-1): An Eastern Woodland Complex in North Dakota. *Plains Anthropologist*, 5:71-78.  
1974 Northern Plains Village Cultures: Internal Stability and External Relationships. *Journal of Anthropological Research* 30:1-18.  
1993 Some Views on Great Plains Prehistory. *The Review of Archaeology* 14(1):21-24
- Wood, W. R., M. J. O'Brien, K. A. Murray, and J. C. Rose  
1995 *Holocene Human Adaptations in the Missouri Prairie-Timberlands*. Research Series No. 45. Arkansas Archeological Survey, Fayetteville, Arkansas.
- Wood, W. R., and R. B. McMillan (editors)  
1976 *Prehistoric Man and His Environments: a Case Study in the Ozark Highland*. Academic Press, New York.
- Woodbury, N. F. S. (editor)  
1962 "Notes and News." *American Antiquity*, 28:120.
- Woods, W. I.  
1987 Maize Agriculture and the Late Prehistoric: A Characterization of Settlement Location Strategies. In *Emergent Horticultural Economies of the Eastern Woodlands*, edited by W. F. Keegan, pp. 275-294. Center for Archaeological Investigations Occasional Paper No. 7, Southern Illinois University, Carbondale.
- Woods, W. I. and G. R. Holley  
1991 Upland Mississippian Settlement in the American Bottom Region. In *Cabokia and the Hinterlands: Middle Mississippian Cultures of the Midwest*, edited by T. E. Emerson and R. B. Lewis, pp. 207-220. University of Illinois Press, Urbana.
- Woolworth, A. R.  
1968 Archaeological Excavations at Grand Portage National Monument. Ms. on file, Minnesota Historical Society.
- Woolworth, A. R. (editor)  
1983 The Red Pipestone Quarry of Minnesota: Archaeological and Historical Reports. *Minnesota Archaeologist* 42(1 and 2), Minnesota Archaeological Society.
- Wormington, H. M.  
1957 *Ancient Man in North America*. Popular Series 4. Denver Museum of Natural History. Denver, Colorado.
- Wright, H. E., Jr.  
1972 Quaternary History of Minnesota. In *Geology of Minnesota: A Centennial Volume*, edited by P. K. Sims and G. B. Morey, pp. 515-547, Minnesota Geological Survey, Minneapolis, Minnesota.  
1974 The Environment of Early Man in the Great Lakes Region. In *Aspects of Upper Great Lakes Anthropology. Papers in Honor of Lloyd A. Wilford*, edited by E. Johnson, pp. 8-14. Minnesota Historical Society, St. Paul.  
1976 The Dynamic Nature of Holocene Vegetation: A Problem in Paleoclimatology, Biogeography, and Stratigraphic Nomenclature. *Quaternary Research* 6:581-596.  
1987 Synthesis; The Land South of the Ice Sheets. In *North America and Adjacent Oceans during the Last Deglaciation*, edited by W. R. Ruddiman and H. E. Wright, Jr. The Geology of North America, Vol. K-3.  
1992 Patterns of Holocene Climatic Change in the Midwestern United States. *Quaternary Research* 38:129-134.
- Wright, J. V.  
1965 A Regional Examination of Ojibwa Culture History. *Anthropologica* 7(2):198-227.  
1967 *The Laurel Tradition and the Middle Woodland Period*. National Museum of Canada, Bulletin No. 217, Ottawa.  
1972 Shield Archaic. In *Ontario Prehistory: An Eleven-Thousand Year Archaeological Outline*. Ottawa: National Museums of Canada.
- Wyatt, B.  
1986 *Cultural Resource Management in Wisconsin: A Manual for Historic Properties*. 3 volumes. State Historical Society of Wisconsin, Madison.
- Wyckoff, L.M.  
1978 Post-Mortem Human Bone Deformation. *The Wisconsin Archeologist* 59(4):345-357.
- Yellen, J. E.  
1977 *Archaeological Approaches to the Present*. Academic Press, New York.
- Yerkes, R. W.  
1987 *Prehistoric Life on the Mississippi Floodplain: Stone Tool Use, Settlement Organization, and Subsistence Practices at the Labras Lake Site, Illinois*. University of Chicago Press, Chicago, IL.

- Young, D.  
 1986 The Paleoindian Skeletal Material from Horn Shelter, Number 2 in Central Texas: An Analysis and Perspective. Unpublished Master's thesis, Department of Anthropology, Texas A&M University, College Station, Texas.  
 1988 The Double Burial at Horn Shelter: An Osteological Analysis. *Central Texas Archaeologist* 11:11-115.
- Young, M. A.  
 1980a Human Bone from Mud Lake Mound 1 (13DB30). *Research Papers* 5(01): 41. Office of the State Archaeologist, Iowa City.  
 1980b Human Bone, Dolliver Memorial Park Gravel Pit (13WB150). *Research Papers* 5(01): 63-64. Office of the State Archaeologist, Iowa City.  
 1981a Human Remains from the 1979 Excavation of the McKinney Oneota Village Site (13LA1). *Research Papers* 6(01): 10-14. Office of the State Archaeologist, Iowa City.  
 1981b Human Remains from the Lane Enclosure (13AM200). *Research Papers* 6(01): 15-17. Office of the State Archaeologist, Iowa City.  
 1981c Human Remains from the Sterns Creek Burial Site (13ML7). *Research Papers* 6(01):18-21. Office of the State Archaeologist, Iowa City.  
 1981d Human Remains from Site 13MN16. *Research Papers* 6(01): 28-31. Office of the State Archaeologist, Iowa City.  
 1981e Additional Human Skeletal Remains from the Mud Lake Mounds 1 & 2 (13DB30,31). *Research Papers* 6(01): 47-48. Office of the State Archaeologist, Iowa City.  
 1981f Human Maxillary Fragment from the Rock Run Shelter (13CD10). *Research Papers* 6(01): 49-50. Office of the State Archaeologist, Iowa City.  
 1981g Human Skeletal Remains from the Milford Site (13DK1). *Research Papers* 6(01): 51-52. Office of the State Archaeologist, Iowa City.  
 1981h Analysis of Human Skeletal Remains from the Pooler Site, 13WB215. *Research Papers* 6(03): 190-. Office of the State Archaeologist, Iowa City.  
 1981i Cranial Remains from the Single Hill Burial Site (13PM49). *Research Papers* 6(04):258-260. Office of the State Archaeologist, Iowa City.  
 1981j Analysis of Human Skeletal Remains from the 1980 Excavation of the McKinney Site (13LA1). *Research Papers* 6(04): 308-311. Office of the State Archaeologist, Iowa City.  
 1982 Human Remains [Arthur Site Report]. *Research Papers* 7(01): 118. Office of the State Archaeologist, Iowa City.
- Yourd, W. J.  
 1984 Going...Going...Gone? Archaeological Observations Amidst the Destruction of the Bryan Site-Complex 1854-1980. *Minnesota Archaeologist* 43(20):7-20.  
 1985 *An Archaeological Assessment Study of Proposed MnDOT Project S.P. 3604-44, T.H. 11: Reconnaissance and Evaluation Phase Excavation at the McKinstry Site, Koochiching County, Minnesota.* Minnesota Trunk Highway Archaeological Reconnaissance Survey, St. Paul.  
 1988 *Archaeological Testing at the McKinstry Site Complex Koochiching County, Minnesota: 1982 - 1984.* Plan B Unpublished Master's thesis, Center For Ancient Studies, University of Minnesota, Minneapolis.
- Zalesky, J. M.  
 1977 A Collection of Surface Finds from East Central Iowa. Ms. on File, Iowa State University Archaeological Laboratory. Ames, Iowa.  
 1981 The Hammer Farm Burial (13LE138). *Research Papers* 6(01): 5-7. Office of the State Archaeologist, Iowa City.
- Zalucha, A.  
 1994 Wood Charcoal from the Valley View Site. *The Wisconsin Archeologist* 75(3-4):295-342.
- Zalucha, L. A.  
 1982 *Methodology in Paleoethnobotany: A Study in Vegetational Reconstruction Dealing with the Mill Creek Culture of Northwestern Iowa.* Unpublished Ph.D. dissertation. Department of Anthropology. University of Wisconsin-Madison.
- Zieglowsky, D., and J. Zalesky  
 1981 *The Coralville Reservoir: A Status Report, 1980.* *Research Papers* 6(4). Office of the State Archaeologist. University of Iowa, Iowa City.
- Zimmerman, L. J.  
 1971a Skadeland Mill Creek Culture Site. In *Prehistoric Investigations*, edited by M. B. McKusick, pp. 114-124. Report 3. Office of the State Archaeologist. University of Iowa, Iowa City.
- 1971b *The Glenwood Taxonomic Problem.* Unpublished Master's thesis. Department of Anthropology. University of Iowa, Iowa City.  
 1977a The Glenwood Local Sequence: A Re-Examination. *Journal of the Iowa Archeological Society* 24:62-83.  
 1977b *Prehistoric Locational Behavior: A Computer Simulation.* Report 10. Office of the State Archaeologist. University of Iowa, Iowa City.  
 1977c Field Examination of 13WD27. *Research Papers* 2(06): 1-3. Office of the State Archaeologist, Iowa City.



## Index

- Adams Mound 225  
Aicher Mound Group 136  
Airport Village site 109, 120  
Albany site 93  
Allamakee phase 90, 95, 96, 222, 227  
Allis Village site 143  
Altern site 116, 255  
Alton Anderson site 281, 282  
"Amana Havana complex" 96  
American Fur Company  
    181, 183, 184, 186, 197, 211  
Anderson site 125  
Armstrong site 163  
Arrowhead Beach site 166  
Arthur site 47, 61, 76, 91, 130  
Arvilla complex 132-133  
Astor site 160, 166, 195  
Aztalan site 48, 49, 120, 121, 155-156, 269,  
    270, 271, 272
- B. Lawrence I site 79  
Bachmann site 109  
Baer I site 160, 161  
Bailey Farm site 147  
Barnes Creek site 113  
Barton site 55  
Bartron site 172  
Baskins Grave site 244  
Bass site 78  
Bastian site 143, 147, 149  
Battle of Kathio 204  
Beach site 108, 109  
beads  
    shell 74, 88, 90, 107, 108, 110, 111, 136,  
    copper 75, 80, 81, 107, 134, 138, 160, 164  
    glass 150, 151  
Bearskin Point site 66  
Beaumier Farm site 166  
Bell site 194, 195, 274  
Berscheid site 288  
Big Slough site 174  
Big Stone phase 176-177  
Bigelow site 196  
Birdie Mound 226  
bison hunting 72-86 passim, 142-184 passim,  
    232-242 passim, 281, 294, 295  
Black Dog Burial site 298, 299  
Black Sand culture 89-90  
Blackduck culture 126, 134-135, 177-178, 282, 284-  
    294, 301  
Blood Run National Landmark site  
    40, 143, 147, 150, 150-151, 242  
Blosser site 232  
Blue Earth phase (Oneota) 163, 168, 172-173  
Bluff Siding site 253  
Boaz Mastodon site 63  
Bobwhite site 79  
bone tools 74, 76, 79, 81, 86,  
    150, 159, 160, 161, 163, 176  
Boone Mound 41, 97  
Bornick site 160  
bow and arrow 96, 100, 101, 116,  
    118, 119, 127, 129, 130  
Bowling Lane site 65
- Bradbury Brook site 68-69  
Brainerd ceramic series 130-131  
Brainerd site 264  
Brassica Bench site 105  
Bremer Village site 55, 129  
Brewster site 46, 140, 236  
Brice Prairie phase 164  
Bridgehead site 214  
British 180-212 passim  
Brogley Rockshelter 79, 118  
Broken Kettle site 41, 138, 140, 233  
Brower, Jacob V. 52-53  
Brower site 282  
Browns Valley skeleton site 69, 70, 176, 278  
Bryan site 158, 296  
Bultman site 236  
Burk site 147  
Burke site 153  
Burlington phase 147  
Burnt Rollways phase 83  
Butternut Lake site 123  
Buxton townsite 190
- Caldwell phase 93  
Cambria complex 174-176,  
    286, 293, 295, 296, 302  
Cambria site 175  
Cambrian age 4, 5, 15, 16, 20, 25  
Camp Ripley farm sites 213  
Canning site 86  
Canoe site 109  
Carcajou Point site 156, 160, 196, 263  
Cardy site 63  
Carlisle Railroad Swing site 147  
Catlinite Amulet site 236  
Chan-Ya-Ta site 43, 46, 141, 235  
Cherokee fort site 189  
Cherokee phase 72  
Cherokee Sewer site 46, 47, 61, 70, 72, 73,  
    85, 218  
Chesrow complex 63  
Chief Keokuk 243  
Chippewa-Dakota wars 206  
Christenson Mound site 55, 148  
Clam Lake site 123  
Clarkson site 147, 241  
Classic horizon 160-161  
clay masks 290  
Clitherall burials 279  
Clovis culture 60, 66  
Cochran site 89  
Cody complex 64  
Conference on the Woodland Pattern 42  
Convent Knoll site 108  
Cook Farm Mounds site 39, 40  
Cooper Village site 56, 297  
Cooper's Shores site 109, 113  
copper tools 75-86 passim, 107-117 passim,  
    151-179 passim  
Coppers Creek site 102  
Cormorant site 98  
Correctionville focus, site 142, 147, 149, 189  
Council Bluffs Ossuary 231, 234  
Crabapple Point site 160, 196
- Crabtown Rockshelter site 89, 90, 102  
Crawford phase 91  
Crescent Bay Hunt Club site 160  
Cribb's Crib site 147  
Crookston Mound 293
- Dalton complex 61, 66  
Dalton culture 61  
Darr-es-Shalom site 105  
Dawson site 148  
Dead River site 125  
Deadman's Slough site 65, 78  
DeArmond/Barrier Dam site 105  
DeCamp site 232  
deer 72, 76, 77, 79, 82, 85, 86  
Devonian 6, 7, 8, 12, 17  
Diamond Bluff Mound Group 119, 123, 158, 163  
Dietz site 120  
Dixon site 45, 147, 149  
Dogtown site 196  
Doty Island Village site 161, 195  
Double Ditch site 48  
Douglas phase 142  
DuBay site 198  
Dubuque, Julien (bones) 243  
Dubuque town site 39  
Durst phase 75  
Durst Rockshelter 82, 111, 112, 118
- East Terrace site 68  
Eastern Archaic tradition 86  
Eastman phase 118  
Effigy Mound tradition 96, 102-128 passim, 222, 258  
Effigy Mounds National Monument 43, 45  
Elephant site 89, 90, 152, 221  
elk 77, 81, 82, 85  
Elmwood Island site 120  
epidemics 299  
Eveland site 141
- Fay Lake sites 123  
Fickle site 167  
figurines, ritually broken 99  
Finnish immigrants 296  
Fischer's Island site 123  
Fish Farm Mound/Village site 40, 218, 220  
Flambeau phase 64  
Floyd phase 99  
Flynn Cemetery site 153, 239  
Folsom culture 60, 66  
Fort Beauharnois site 209  
Fort Bluemounds site 198  
Fort Dodge site 187, 188, 189, 190, 191  
Fort Dodge Stoneware Company 190  
Fort McCoy site 50, 200  
Fort Renville site 57  
Fort Snelling site 57, 211  
Fort St. Antoine site 209  
Fox Lake phase 91, 129-130  
Franz site 55  
Frazier phase 94  
Fred Edwards site 120, 156, 156-157  
French 180-211 passim  
French Town Mound Group 88, 220

- FTD site 89, 104  
 Fulton phase 93  
 Furman site 264
- Gainey complex 63  
 Galaz site 53  
 Gardner site 68  
 Gast Farm site 48, 89, 95, 136  
 Gast Spring site 48, 73, 89  
 Gates Cemetery site 244  
 Ghost Shirt Island V site 123  
 Gibbs Farm site 213  
 Gibson Rockshelter site 122  
 Gideon site 100  
 Gillen 9 site 79  
 Gillett Grove site 152  
 Gillingham site 55, 175  
 Gilman Lake site 66  
 Gingerstairs Rock Shelters 102  
 glacial lakes 10-35 passim  
 Glen Oaks site 232  
 Glenwood culture 141-143,  
 231, 233, 234, 235, 245  
 Gorto site 64  
 Gothier site 149  
 Gotschall site 112, 118, 119, 157, 163  
 Governor Dodge site 79, 118  
 Gracie Paulson site 97  
 Graham Lake Mound site 125  
 Grand Portage National Monument 57  
 Grand River phase 160, 165  
 Grant site 152, 153  
 Great Oasis culture 105, 137-139, 174, 221-245  
 passim, 286, 295  
 Green Bay phase 165, 166m  
 Greenfield Lime Industry District 199  
 Gull Lake Dam site 125, 131  
 Gundersen site 164  
 Gypsum Quarry site 174, 220, 226, 233
- Hadfield's Cave 136  
 Hahn site 68, 109, 120, 251  
 Hamilton Brooks site 156  
 Hamm site 55  
 Hanging Valley site 99, 222, 227  
 Hanson site 273  
 Hartford Beach site 176  
 Hartley Fort site 44, 104, 136, 141  
 Hartley phase 104  
 Hartz Brothers' Farm site 226  
 Harvey's Island Mound Group 90  
 Havana tradition 92-93  
 Heins Creek complex 122  
 Heins Creek site 114  
 Held Creek 98, 99, 100  
 Hemphill phase 74  
 Henry Schnoor Rockshelter site 102  
 Henschel site 109  
 Hensler Petroglyph site 120  
 Hickenbottom site 95  
 Highsmith site 109, 113  
 Hilgen Spring Park site 108, 251  
 Hill site 45, 72  
 Hill-Lewis Survey 48, 51  
 Hitchell site 138  
 Hogback site 294  
 Holocene climate, vegetation 10-38 passim
- Hopewell Interaction Sphere 75, 92, 97,  
 98, 110, 111, 125  
 Horicon phase, site 119-120  
 Horseshoe Bay site 299  
 Horsethief Cave 96  
 Houlihan Mound site 88, 220  
 Howard Goodhue site 147, 241  
 Howard Lake focus 131-133  
 Howard Lake Mounds 283  
 Huber site 287  
 Hudson's Bay Company 197, 205, 207, 208, 211  
 Humphrey site 132
- Indian Isle phase 108  
 Indian Prairie site 156  
 Indian tribes  
 Arikara 237  
 Assiniboin 167, 179, 207, 285, 291, 293, 296  
 Chippewa 153, 192, 195, 206, 211, 212,  
 213, 272, 296-299 passim  
 Dakota 180, 181, 182, 193, 202-213 passim  
 Eastern Dakota 179, 203-205  
 Fox 166,  
 180, 182, 183, 192, 193, 194, 195, 196, 208, 212  
 Hidatsa 140  
 Ioway 42, 143, 152, 161, 164, 180-183  
 passim, 192, 202, 203, 205  
 Kickapoo 180, 182, 193  
 Mandan 140, 141, 237, 243  
 Mascouten 181, 182, 192, 193, 194, 203  
 Menomini 166, 180, 192, 193, 194, 196, 198  
 Mesquakie 41, 181-186 passim, 194, 195  
 Ojibway 180, 192, 194-197, 201, 202, 204-  
 207, 208, 211  
 Omaha 151, 181, 202, 203  
 Oto 143, 152, 180, 181, 182, 202, 203  
 Ottawa 204  
 Ponca 181, 202  
 Potawatomi 166, 180, 182, 184,  
 192, 193, 194, 195, 196, 206  
 Sac 182, 183  
 Santee 167, 180-184  
 passim, 192, 193, 194, 202, 203, 205  
 Sauk 180-186 passim, 192-196 passim,  
 208, 212, 217, 228, 243, 268 passim  
 Sioux 203, 205, 207, 208, 209, 212, 213  
 Teton 205  
 Winnebago (Ho Chunk) 117, 143, 161-163,  
 180-183, 192-197, 202-206, 212  
 Yankton  
 180, 181, 182, 184, 202, 203, 205, 207
- Iowa Coal Lands survey 47  
 Island Village site 122, 274  
 Itasca Bison Kill site 86
- Jackson House site 199  
 James Island site 122  
 Jesuit rings 151  
 Jim Braun site 164  
 Johnson, Elden 55-56  
 Johnson Farm site 143  
 Jollyville Hill site 102, 228, 229
- Karow site 161, 263, 264  
 Kathio phase 133-135, 178  
 Keg Creek complex 74, 142  
 Kekoskee phase 120  
 Keller Mound site 228
- Kelley phase, site 147  
 Keyes phase 103  
 Keystone Rockshelter site 62, 73, 102, 226  
 kiln sites 187, 190, 199  
 Kimball site 140, 236  
 Kindem site 68  
 King Coulee site 125, 128  
 Kingston site 146, 240  
 Kletzien Mound Group 260  
 Klug Island site 156  
 Klunk site 220  
 Knoop Rockshelter 119  
 Kouba site 63  
 Kratz Creek site 260  
 Kullbom phase 142  
 Kullbom Village site 142, 143  
 Kutz site 109
- La Moille Rockshelter 128  
 Lake Agassiz 18, 25, 30, 31, 33, 37, 38  
 Lake Benton phase 98, 130  
 Lake Brontson site 125  
 Lake Koshkonong phase 160, 161  
 Lake Winnebago phase 161, 165, 166  
 Lake-forest complex 84-85  
 Lakes phase 123  
 Lambert site 95  
 Lamine phase 100  
 Lane Enclosure site 146, 147, 228, 239  
 Larson site 139  
 Lasley's Point site 160, 161  
 Laurel culture 115, 125, 134-135  
 Layton Farm site 221  
 Leech Lake Chippewa Reservation 58  
 Levens Rockshelter site 43, 89, 90  
 Lewis and Clark expedition 180, 182, 211  
 Lewis Central School site 74, 76, 218, 221  
 Liebmann site 122  
 Linden site 66  
 Lindenmeier site 60  
 Little Bluff Platform Mound Complex 157  
 Little Ice Age 14, 20, 34, 37  
 Little Red River site 166  
 Little Rock River site 166  
 Liverpool phase 89  
 Logan Creek complex 72, 74  
 Long Nosed God 136, 157, 170  
 Lost Creek site 147  
 Luedke site 120  
 Lungren site 46, 74
- MacCauley site 161  
 MacDonald site 263  
 McKee Terrace site 221  
 MAD site 47, 91, 98  
 maize 96-120 passim, 293-302 passim  
 Malmo culture 125, 131, 280-287, 292, 297, 301  
 Malmo Mound Group 283  
 malnutrition 233, 245, 265, 299  
 Malone Cemetery site 240  
 Marina site 195  
 Marion culture 88, 89  
 Markee site 79  
 Mayland Cave 118, 119  
 McGregor phase 95, 98  
 McKinney site 39, 147, 241

- McKinstry site 55, 125, 288, 289  
 Meehan-Schell site 138  
 Mellen site 209  
 Mellor phase 100  
 Mero complex, site 114, 165, 166  
 Merrimac Mills site 73  
 Metzsig Garden site 64  
 Middle Mississippian tradition 154-159  
 Middle Missouri tradition 231-  
     232, 235, 237, 286, 295, 301  
 Midway Village site 146, 164  
 Midwest Taxonomic Method 42, 49, 54, 55, 145  
 Mile Long site 78  
 Milford, or Big Bend site 151-152  
 Mill Cave site 55  
 Mill Coulee Shell Heap 118  
 Mill Creek culture 139-141, 221-245 passim, 295  
 Mill phase 117  
 Mill Pond site 118  
 Miller Mound site 176  
 mills  
     lumber 186, 190, 213  
     wheat 185, 186, 190, 213  
 Millville phase, site 110, 111, 112, 253  
 Milwaukee Road Shops sites 199  
 mining 181-200 passim  
 Minnesota Woman (Man) 54, 276, 277, 278, 301  
 Minocqua phase 64  
 Minott's Rockshelter site 96, 102  
 Mississippianization 136, 139, 231  
 Mohler Farm site 147  
 Mohler-Miller Mound Group 229  
 Moingona phase 147, 147-148  
 Mooney site 86  
 Morrison Mound Group 125, 131, 282  
 Morse site 220  
 mortality rate 265, 282, 300  
 Morton phase 93  
 Morty site 167  
 Moundbuilder Myth 39, 48  
 Mountain Lake phase, site 76, 130  
 Mouse Hollow Rockshelter site 43, 89, 90, 104, 136
- Nebo Hill phase 76  
 Nebraska phase 142, 233, 234  
 Nelson site 125, 126, 129, 230  
 Nett Lake site 55, 135  
 New Galena Mound Group 152  
 Nicholls Mound Group 111  
 Nokomis phase 110, 115  
 Norman Dille site 148  
 North Bay culture 109, 111, 114  
 North Star Iron Works site 214  
 North West Company 210, 211, 212  
 Northridge Subdivision site 230
- Oconto site 79, 81, 246  
 Ogden phase 93, 94  
 Old Catholic Cemetery site 244  
 Old Copper complex 75, 80, 83  
 Old Spring site 160, 161, 162  
 Olin site 75  
 Olson/North Shore site 164  
 Oneota culture 42, 143-154, 159-167  
 O'Regan cemetery and village site 152  
 ornament 132, 133, 135  
 Orr focus 152-155, 173-174, 238-244  
     passim, 293, 294, 296
- Osceola site 75, 78, 80-81, 247  
 Osufsen Mound site 177, 288  
 OT site 165, 267  
 Outlet site 109, 112, 113, 254  
 Overhead site 111, 164  
 Overton Meadow site 161
- P-Flat site 195  
 Pacific Saw Mill site 214  
 Pammel Creek phase 164  
 Pedersen site 86, 130, 133  
 Pedretti III site 112, 118  
 Pelican Lake burial 279  
 Perry phase 107  
 Petaga site 56  
 Phipps Mill Creek Village site 44, 45, 140, 236  
 Pike site 180, 182, 211  
 Pike Bay Mound 284  
 Pine Creek Mounds 225  
 Pine River Mounds 288  
 pipe 150, 151, 175  
 Pipe site 159, 160, 262  
 PK Co Sheriff site 220  
 Plano complex 64, 66  
 Pleistocene 9-27 passim  
 Pleistocene megafauna 60, 62, 72  
 Poehler Mound 282  
 Point Sauble site 114, 120, 121, 122, 123, 166  
 Poison Ivy site 146  
 Polk City phase 90, 97  
 Pony Creek phase 142  
 Pooler site 218, 220  
 Poor Man's Farrah site 118, 261  
 Pope site 64  
 Porte des Morts site 114  
 Potawatomi Indian Farms site 196  
 Potosi (skull) 243  
 pottery types  
     Allamakee Trailed 150, 151, 164  
     Arthur Cord-Roughened 98  
     Aztalan Collared 122, 155  
     Baehr 94  
     Bauer Branch Shoulder Punctated 102  
     Beach Incised 108  
     Black Sand Incised 92  
     Blackduck 124  
     Brainerd Net Impressed 125  
     Bremer Triangular Punctate 129  
     Brice Prairie Trailed 164  
     Cahokia Red Filmed 157  
     Chamberlain 140  
     Chariton Plain 100  
     Correctionville Shell Tempered 149  
     Crawford ware 91  
     Dane Incised 108  
     Deer Creek Incised 108  
     Denzer Stamped 111  
     Fettie Incised 93  
     Foreman 141  
     Glenwood Trailed 92  
     Great Oasis High Rim 138, 174  
     Great Oasis Wedge Lip 138, 174  
     Havana Zoned 93  
     Judson Composite 175  
     Kimball Modified Lip 140  
     Koshkonong Bold 164  
     La Moille Thick 124, 128  
     Lake Benton 106
- Lake Benton Cordwrapped Stick Impressed 130  
 Lake Benton Vertical Cordmarked 130  
 Lane Farm Cord Impressed 88, 96  
 Lane Farm Stamped 96  
 Levsen Punctated 90  
 Levsen Stamped 90  
 Linden Everted Rim 175  
 Loseke ware 102, 105, 106, 107  
 Madison ware 102-123 passim  
 Madrid ware 97, 98, 100  
 Mankato Incised 175  
 Marion Thick 88-93 passim  
 McBride 91  
 Mero Trailed 165  
 Mill Creek, bowl, high rim 140, 141  
 Mitchell Modified Lip 140  
 Morton 93  
 Naples Dentate Stamped 95  
 Naples Stamped 93  
 Neteler Stamped 93  
 Nininger Cordwrapped Stick Impressed 129  
 Pammel Creek Trailed 164  
 Perrot Punctate 164  
 Point Sable 119  
 Powell Plain 157, 175  
 Prairie Incised 90, 108  
 Ramey Broad Trailed 175  
 Ramey Incised 157  
 Sandy Lake Corded 178  
 Sandy Lake Smooth 178  
 Sanford Plain 140  
 Sister Creeks Punctated 93  
 Spring Hollow Cordmarked 90  
 Spring Hollow Incised 88, 89  
 Spring Hollow Plain 90  
 St. Croix 133  
 Starved Rock Collared 155  
 Valley View Trailed 164  
 Waubesa Incised 108  
 Weaver ware 94, 98, 99, 106, 113, 114
- Prairie complex 85  
 Prairie du Chien sites 180-183, 194-199, 205-214  
     passim  
 Prairie phase 90  
 Pre-Clovis 59, 62, 65  
 Precambrian age 4, 15, 20-28 passim  
 Preston Rockshelter site 82, 118  
 Price sites 79, 82, 175, 249  
 projectile points  
     Agate Basin 61, 62, 64, 67, 90  
     Alberta 67, 68  
     Chesrow 63  
     Clovis 62, 66  
     Conrad 75  
     Dalton 62  
     Dovetail 77  
     Durst 75, 82  
     Eden 64, 67  
     Etley/Atalissa 74  
     Fayette 62  
     Folsom 62, 66  
     Fort Dodge 75  
     Godar 73, 74  
     Hardin 72  
     Hardin Barbed 77  
     Hell Gap 61  
     Hi-Lo 68  
     Karnak 74

- Kramer 88  
 Little Sioux 72, 73  
 Madison 78, 90  
 Mankar 111  
 Matanzas 73, 74  
 Merom 75  
 Monona 108, 111  
 Nebo Hill 74  
 Osceola 73, 78  
 Plainview 64  
 Raddatz 73, 78, 79  
 Robbins 75  
 Scottsbluff 62, 64, 67  
 Sedalia 74  
 Snyder's 93, 111, 146  
 Springly 75  
 Steuben Expanding 94, 100  
 Table Rock 75  
 Tama 73  
 Thebes 77  
 Thebes/Grundy 72  
 Tipton 75  
 Turkey Tail 75  
 Wadlow 74  
 Putney Landing site 93, 94  
 Quandahl Rockshelter site 229  
 Queen Anne's War 208  
 Raddatz Rockshelter site 78, 79  
 railroads 187-213 passim  
 Rainbow site 47, 98, 99  
 Ralls phase 107  
 Randolph phase 100, 107  
 Red Cedar focus 113  
 Red Ocher complex, site 75, 81, 87-93  
     passim, 107, 108, 218-251 passim, 274  
 red ocher 74, 75, 81, 88, 89, 93, 107, 108  
 Red River site 166  
 Rehbein site 253  
 Reigh site 79, 81-82, 248  
 Renelius site 55  
 Renier site 64  
 rice, wild 98, 110-133 passim, 159-179 passim  
 Riverbend phase 97  
 Riverside Cemetery site 109  
 Robert Battery Rockshelter site 61, 102  
 Robinson site 65, 115, 123, 257  
 rock art 23, 119, 120, 157  
 Rock Creek Ossuary site 236  
 Rock Island II site 114, 165, 193, 194  
 Rock Island site 274  
 Rock Run site 89, 102  
 Rogers site 89, 90  
 Roseau River site 55  
 Rosenbaum Rockshelter site 119  
 Rosencrants Mound 100  
 Round Mound site 286  
 Rubel site 221  
 Rummels-Maske site 60  
 Ryan focus, site 88-89, 174  
 Sand Point site 159  
 Sand Run Slough site 74  
 Sand Run West site 73, 89, 218  
 Sandy Beach site 96, 102  
 Sandy Lake culture 178-179  
 Sauk Valley skeleton 278  
 Sawmill site 56  
 Sayers Post 57  
 Saylor site 105, 138  
 Scalp Creek site 138  
 scalping 222, 227, 241, 250, 258, 260, 274  
 Schilling site 55, 128  
 Schmeiser site 147  
 Schoen Mound #1 site 176  
 Schwert Mound Group 111  
 Scott site 135  
 Sedalia phase 74, 75  
 Shady Dell site 176  
 Shakopee 4 site 287  
 Shanty Bay site 110, 114, 122, 166  
 Sheffield site 172  
 shell ornaments 74, 75, 76, 77, 81, 86  
 Shield Archaic complex 84  
 Shocker site 134, 135, 177, 288  
 Shrake Mound Group 111  
 Shrake-Gillies site 164  
 Sid's site 89  
 Silurian 6, 8, 12, 13, 16, 21  
 Silver Creek sites 109, 112  
 Silver Lake site 163  
 Silver Mound site 63  
 Silvernale phase 158, 163  
 Simonson or Quimby site 45, 68, 72  
 Siouland Sand and Gravel site 237  
 Sixteen Rock Shelter 141  
 Skadeland site 140  
 Slilinger Mound Group 125  
 Smith site 89, 135, 177, 229, 284, 285  
 Sny-Magill Mound Group site 88, 220  
 Soldow site 61, 72, 74  
 Sorg phase, site 55, 128  
 Southeastern Ceremonial Complex 143  
 Spanish 180-211 passim  
 Spencer Lake Mound site 123, 258  
 Spike Hollow Rock Shelter site 44  
 Spring Creek site 147  
 Spring Hollow Rockshelters 90, 96, 102  
 Squier Garden site 157  
 Squirrel Dam site 64, 65, 115  
 Squirrel River phase 83  
 State Road Coulee site 164, 267  
 Statz site 120, 121  
 steamboats 184, 185, 186, 190  
 Sterns Creek phase 106  
 Stockbridge Harbor site 120, 122  
 Stricker Pond site 120  
 Stull site 157  
 Sweeting site 102, 104, 136  
 Tessum/Lunde site 68  
 Tieskotter/Stevens site 68  
 Titterington phase 74  
 tobacco 100, 143, 148, 157, 159, 164, 167, 174  
 Toolesboro Mounds 39, 97  
 Tremaine site 164  
 Trempealeau phase, site 111, 252  
 trophy taking 219, 235, 271, 275  
 Turin site 45, 74, 218, 219  
 Turkey River Mound Group 88, 90, 218, 219, 223  
 Utz site 147  
 Vach Mound site 280  
 Valley View phase, site 164  
 Van Hynning phase 97  
 Vineland Bay or Kathio School site 298  
 Vosburg site 172  
 Wakanda Park site 159, 167  
 Wakanda phase 100  
 Walker Gilmore site 106  
 Walker-Hooper site 160, 262  
 Walters site 96, 102  
 Wanikan culture  
     see Sandy Lake culture 178  
 Warren Hause House site 199  
 Watasa Lake Swamp site 156, 167  
 Waterville Rockshelter site 136, 141  
 Waukesha phase 113  
 weaning, childhood 233, 245, 265, 299  
 Weaver phase 94  
 Weisner III site 120-121  
 West Des Moines site 174, 232  
 West Prairie Mound Group 119  
 Westwood site 226  
 White Mound Group 111  
 Whitefish Bay View site 114, 122, 165  
 Wildcat Creek site 147, 148  
 Wilford site 56  
 Williams site 95  
 Winston-Cadotte site 193, 196  
 Wittrock site 140, 236  
 Wolfe site 89  
 Woolstrom Cemetery site 153  
 XY Company site 197  
 Young site 94, 96  
 Zarling Lake site 167