

BA-BE Effects Narrative

2/03/05

Kirtland's Warbler

Background Information

Kirtland's warblers are present on the Hiawatha National Forest (HNF), breeding and foraging in stands of young jack pine. The HNF provides important breeding habitat for the Kirtland's warbler (KW) in Michigan. The Kirtland's warbler was first listed as federally endangered on March 11, 1967 (DOI 1967). No critical habitat has been designated for this species. However, approximately 150,000 acres of essential habitat has been identified on public land in the northern Lower Peninsula of Michigan. Essential habitat is defined as *"that land identified as biologically appropriate and necessary for the development of nesting habitat for the Kirtland's warbler"* (Huber et. al. 2001). No essential habitat has been identified for management on the HNF.

On the HNFs, Kirtland's warbler conservation and management is conducted in consultation with the U.S. Fish and Wildlife Service (USFWS) and the KW Recovery Team and is guided by two documents:

The Kirtland's Warbler Recovery Plan (KWRP) (Byelich et al. 1985). The *Kirtland's Warbler Recovery Plan* was completed in 1976 (Byelich et al.) and revised in 1985 (Byelich et al.).

Strategy for Kirtland's Warbler Habitat Management (Strategy) (Huber et. al. 2001). The *Strategy for Kirtland's Warbler Habitat Management* replaced the *Kirtland's Warbler Management Plan for Habitat in Michigan* (Management Plan) (USFS & MDNR 1981). The Strategy provides specific direction for land managers in the USDA Forest Service (USFS), Michigan Department of Natural Resources (MDNR), and USDI Fish and Wildlife Service (USFWS) on how to manage summer range for the Kirtland's warbler, and protecting individuals and their nesting habitat.

These documents are not referenced in the current Hiawatha Forest Plan and the Plan does not address specific standards and guidelines relative to KW. In addition to the above guidance, Section 7 (a)(1) of the ESA directs *"all Federal Agencies to, in consultation with the U.S. Fish and Wildlife Service, proactively conserve listed species by carrying out programs aimed at their recovery. Moreover, section 7(a)(1) allows for Federal agencies to prioritize the conservation and recovery of listed species along with other traditional agency mandates or missions. To this effect, section 7(a)(1) imposes on each Federal agency an affirmative duty to conserve listed species."*

Species Biology/Ecology

Kirtland's warblers migrate from their winter habitat in The Bahamas to their breeding habitat in Michigan in early to mid May. Their average arrival date in Michigan is May 12; the earliest known arrival is May 3.

Kirtland's warblers typically occupy jack pine stands greater than 80 acres in size, with a stocking density of 1100 or more trees per acre. Stands of 1,000 acres and larger have been found to improve nesting density and duration of stand use (Huber et al 2001).

Initial use may start when tree height reaches 5 to 7 feet or at an age of 6 to 10 years old. Generally, occupancy occurs as long as trees retain relatively dense living branches near the ground. This structure is often lost by the time the trees attain a height of 12 to 20 feet, or at an age of 16 to 21 years old. Warblers typically occupy a new nesting area in small numbers at first, gradually increasing for a few years until a peak or plateau is reached, and then decline for a few more years until the area becomes unsuitable and no warblers remain. Kirtland's warbler nesting habitat is dynamic and ephemeral. Warbler nesting locations move across the landscape through time as new jack pine stands become suitable and other stands age and become unsuitable. Warblers are adapted to finding and using new breeding habitat. Their survival depends on continuous, uninterrupted regeneration of new breeding habitat throughout the northern Michigan jack pine forests.

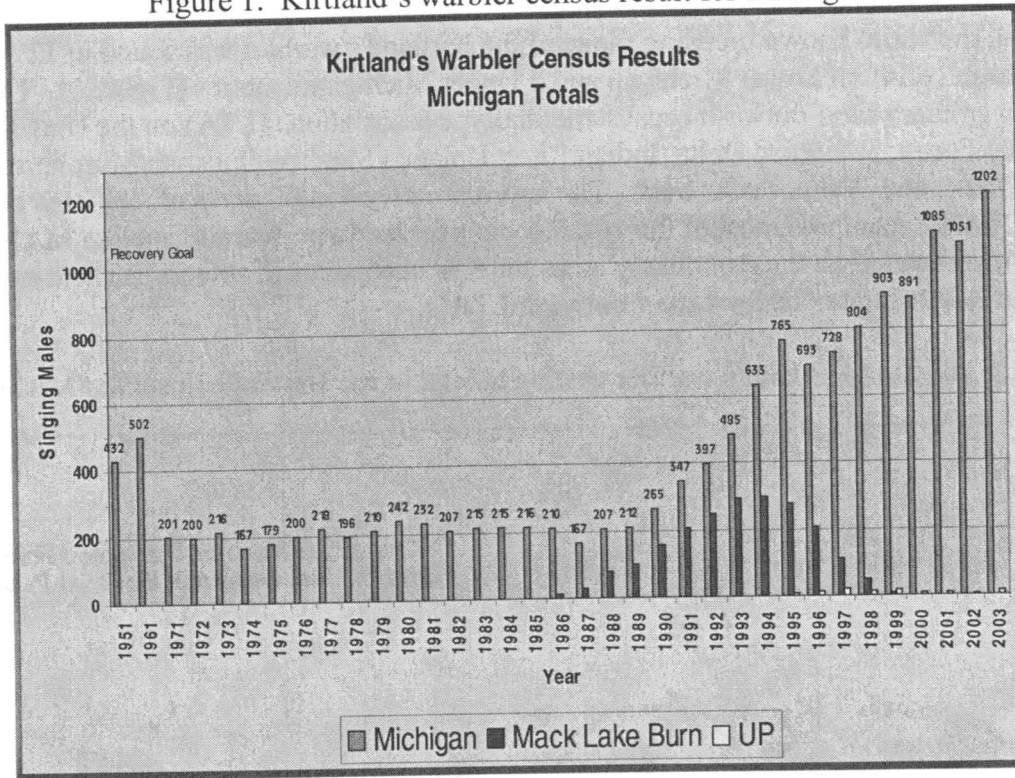
The required habitat type is uncommon in Michigan and is restricted to poor, sandy soils of glacial origin. Areas of suitable nesting habitat are scattered and separated by areas of unsuitable habitat. Males occupy breeding territories which they appear to delineate by loud, persistent singing. Nests are constructed on the ground and by late May or early June clutches of 4 to 5 eggs are complete. Incubation requires about 14 days, and nestlings fledge in about 9 days (Walkinshaw 1983). Some Kirtland's warbler pairs nest a second time following a successful first nest.

Kirtland's warblers begin leaving the breeding areas for the migration south in mid August. They depart over a lengthy period, with the last birds leaving Michigan as late as early October (Sykes et al. 1989). Their migration path, based on sightings (Mayfield 1960), seems direct between Michigan and the Bahamas. USFWS research biologists visited several islands of the Bahamas and Turks and Caicos in 1984 and 1985 in an attempt to study the birds' behavior and identify any adverse factors affecting their survival there (Mike DeCapita, pers. comm. With Paul Sykes). Sufficient warblers for a scientifically valid sample could not be located. Two individual warblers observed, as well as observations of availability of and likely threats to winter habitat, led the biologists to conclude that this species does not face significant adverse effects during winter (Mike DeCapita, pers. comm. With Paul Sykes). New research is currently ongoing in The Bahamas to identify preferred winter habitat, quantify habitat use and diet, identify factors affecting distribution, and quantify site fidelity and winter site persistence.

Species Status

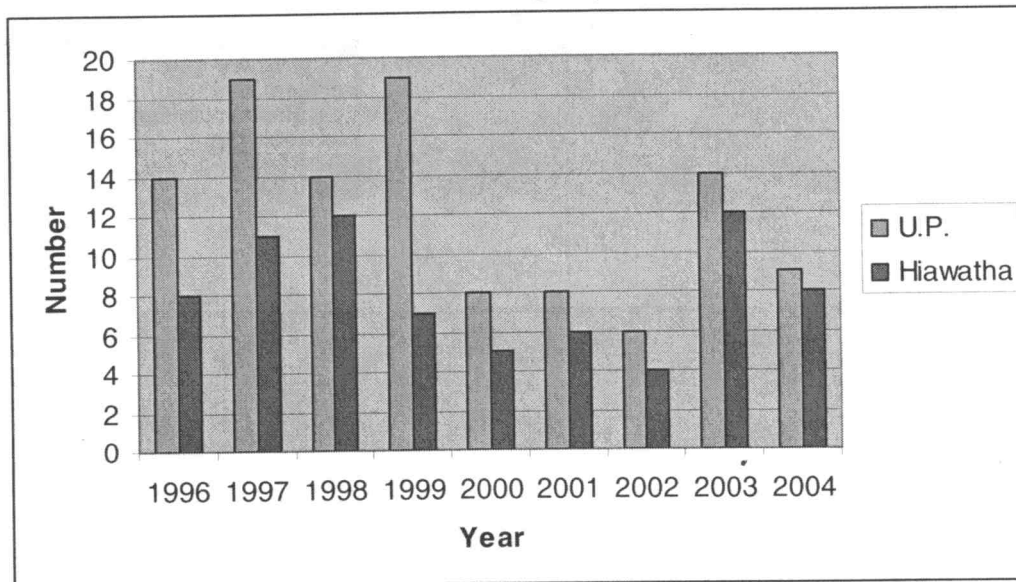
The Kirtland's warbler population was first censused in 1951 by counting singing males (432 males). Total breeding adult population is assumed to be double the number of singing males counted. The next count in 1961 was 502 males, but the third count in 1971 declined 60% to 201 males. Between 1972 and 1989, the population remained somewhat stable, ranging from 167 to 214 males. Since 1989, the population has increased annually, exceeding 1000 pairs every year since 2001 (Figure 1). The recent population increase is a result of habitat and cowbird population management by the 3 State and Federal resource agencies, as well as the creation of a large block of natural habitat by the 1980 Mack Lake Fire.

Figure 1. Kirtland's warbler census result for Michigan.



The number of Kirtland's warblers on the HNF has changed over the past 9 years (Figure 2). KW numbers in the UP were highest in the late 1990's due to several wildfires that occurred in the 1980's (Indian Lake Fire, 8-Mile fire, wildfires near Gwin, MI). Limited management efforts on the HNF, designed to create KW habitat, began in the early 1990's and have resulted in KW occupancy of a few managed jack pine stands.

Figure 2. KW population changes on the Hiawatha National Forest and in the Upper Peninsula of Michigan (1996-2004)



In 2004, the entire known breeding range of the Kirtland's warbler was found in 12 counties in Northern Lower Michigan and 6 Upper Michigan counties (Figure 3). There are four primary sand-outwash ecosystem landtype associations (LTA) on the Hiawatha National Forest; Whitefish Delta, Indian River Uplands/Steuben Outwash/Mint farm, Raco Plains, and Wetmore Outwash. The approximately 46,000 acres of jack pine in these LTA's encompass most of the 10-20 ecological landtype, are allocated to MA 4.2 and 4.4, and would be the most likely areas for KW occupancy (Table xx). There may be suitable KW habitat outside of the 4 outwash LTA's.

Figure 3. Potential Kirtland's warbler nesting habitat in the Upper Peninsula of Michigan.

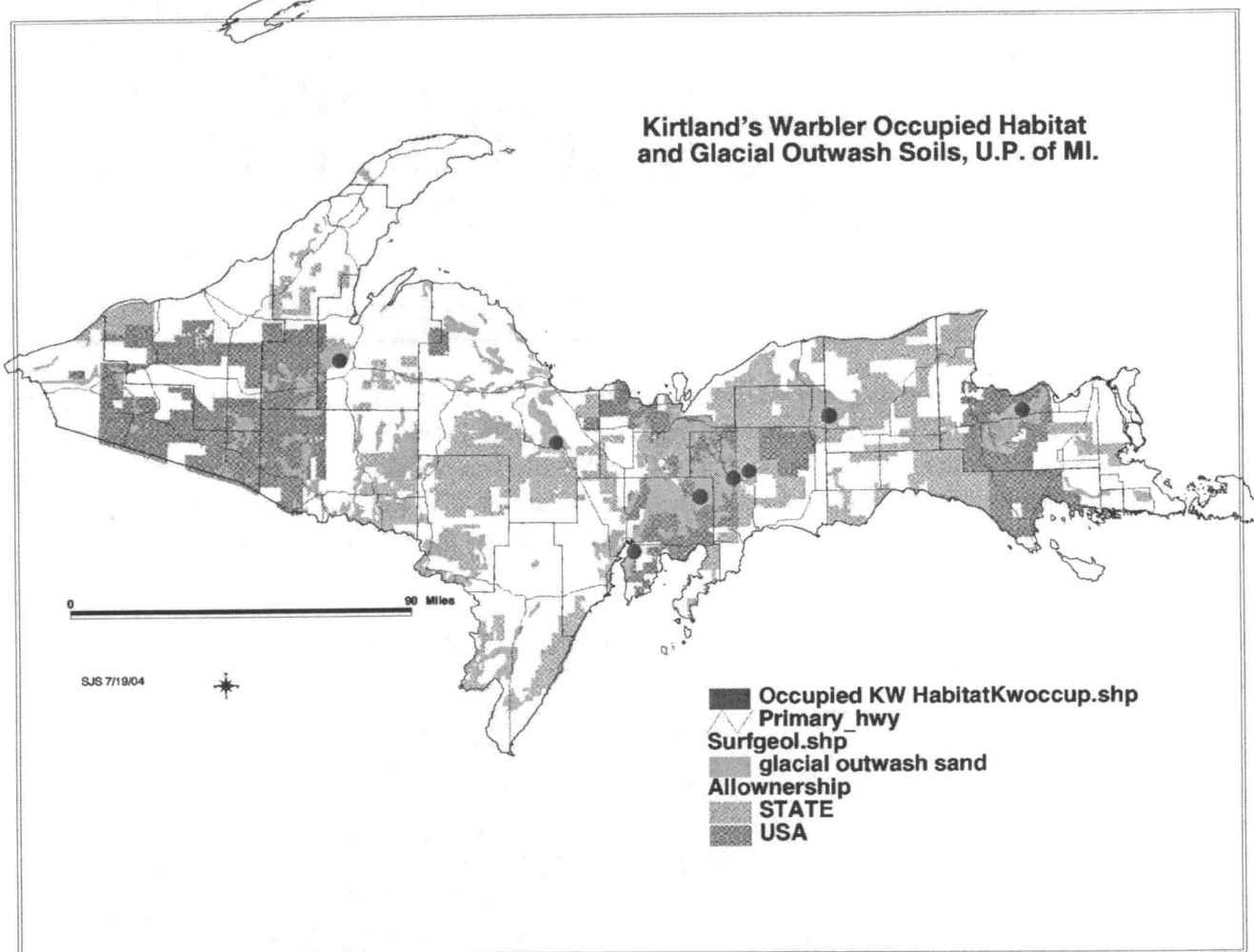


Table xx. Approximate distribution of jack pine acres on HNF

Age Class						
	Forest Wide	Raco Plains	Wetmore Outwash Plain	Indian River Uplands/Steuben Outwash	Mint Farm (adjacent to Indian River)	Whitefish Delta
0 - 10	12,040	6,964	1,225	1,224	113	1,178
11 - 20.	7,173	1,225	1,436	1,563	361	1,333
21 - 30	7,361	2,229	1,409	697	364	651
31 - 40	4,257	1,113	291	894	62	110
41 - 50	5,312	2,613	588	378	11	72
Over 50	32,123	9,836	3,186	2,450	2,033	375
Total	68,266	23,980	8,135	7,206	2,944	3,719

Factors Essential to the Conservation and Recovery of the Species

This section summarizes the key factors affecting Kirtland's warblers on the HNF. These factors are used to analyze the effects of the alternatives on the species.

The KW Recovery Plan (KWRP) identifies objectives (factors) needed to achieve a viable Kirtland's warbler population. The following factors are relevant to the HNF's Kirtland's warbler population, and can be summarized into three main categories:

1. **Availability of breeding habitat.**
2. **Human activity and disturbance.**
3. **Nest parasitism by the brown-headed cowbird (*Molothrus ater*).**

The factors are explained in more detail below and are used to compare whether, and to what degree the alternatives affect key factors for the Kirtland's warbler.

Availability of breeding habitat

Kirtland's warblers evolved in the jack pine ecosystem where large wildfires occurred frequently. Prior to modern fire suppression, natural wildfires burned thousands of acres of jack pine forest on the dry sand plains in the Upper Peninsula (U.P.) of Michigan. Jack pines are adapted to regenerate after fire. Heat from fire opens cones which then release thousands of seeds. The seeds germinate on ground cleared of vegetative competition by the fire. Most jack pine wildfires burned vast areas and created very diverse vegetative conditions. In just a few years, these burned areas were covered with young jack pine intermixed with small sedge and grass openings. These new stands of young jack pine provided natural habitat for the Kirtland's warbler. However, modern fire control beginning in the early 20th century substantially decreased the frequency and size of wildfires, severely curtailing the natural process of habitat creation and helped lead to the species' decline. Therefore, the KWRP prescribes active management for the Kirtland's warbler using the following assumptions/objectives for Michigan;

Age of Occupied Habitat	8-22 Years
Duration of Use	15 Years

Acres of Habitat Required Annually for 1000 Pairs	38,000
Total Acres Required for Management	127,500

The KWRP states that “public lands offer the best opportunity for a successful management program. Even though acreage available for summer range development is limited, it is quite adequate to support the goal of 1,000 pairs...each agency is responsible for developing habitat on the land with which it is entrusted.” Therefore, the primary goal of the KWRP as it relates to HNF is to implement the Management Plan, which was replaced by the Strategy.

The KWRP also mentions protecting existing nesting habitat from destruction and degradation. It calls for suppression of wildfires that threaten breeding habitat, and controlling insects and diseases if it can be accomplished without directly or indirectly adversely affecting the breeding population. The KWRP calls for improving habitat by creating small openings where necessary. On the HNF, loss of habitat from wildfire occurs infrequently. The Strategy calls for distributing habitat across landscapes to minimize the risk of catastrophic losses due to wildfire and other causes.

The Strategy for Kirtland’s Warbler Habitat Management recommends that “all dead trees should be left in the sale area. An overall objective of 15-25 dead trees per acre is desirable. In those cases where fewer than 10 standing dead trees per acre are present, live trees greater than 6 inches DBH may be used to recruit snags” (pg 15).

Treatment blocks of 300 acres or larger are recommended. Given the limits of existing stand conditions, visual considerations, and land ownership patterns, some blocks will be smaller. However, treatment blocks of 1000 acres or larger are desirable to optimize Kirtland’s warbler productivity.

Jack pine stocking density is an important aspect of KW breeding requirements. KW habitat standards suggest an average stocking density of 1,089 trees per acre including small non-forest inclusions (approximately 25% open per acre). Ideal tree spacing is approximately 6’X 6’ or less, with one to five well dispersed openings per acre. Due to the openings, the actual tree density (outside the opening) is about 1450 trees/ac. This can be accomplished with planting or natural regeneration (chop/chain/seed).

The KWRP also provides suggestions for acquiring key parcels of land to meet habitat management objectives, providing information and education services to the public, meeting research needs, and evaluating and monitoring habitat management objectives. The HNF actively provides information and education services related to occupied habitat, cooperates in research, and monitors habitat management objectives.

Human activity and disturbance

This factor addresses the human activities that may adversely affect reproduction and survival of Kirtland's warblers. One objective of the KWRP is to reduce human factors that adversely affect reproduction and survival of Kirtland's warblers. Potentially disturbing activities include unauthorized entry into occupied breeding habitat, the annual census, research, special uses (photography, recording, etc.), recreational trails, and special events.

The Strategy provides direction for controlling human activities that may be detrimental to the Kirtland's warbler. State and Federal land management agencies in the Lower Peninsula have additional guidelines and direction for controlling human activities. These guidelines provide direction on habitat closures and posting, roads, recreational trails, mineral development, fire prevention and control, insect and disease control, timber harvest, reforestation and other activities. Conflicts between human activity and KW populations in the U.P. are not significant at this time. As the KW population increases, or as human activity increases, in the U.P. there could be an increase in potential conflict between human activities and KW.

Nest parasitism by the brown-headed cowbird

The brown-headed cowbird was not native to northern Michigan prior to logging and settlement which began in the late 19th century. Unlike other North American passerine birds that have long been parasitized by the cowbird, the Kirtland's warbler did not evolve defenses against cowbird nest parasitism. Cowbird parasitism was recognized as a threat to the warbler by the 1920's (Mayfield 1960) and by 1972 nearly 70% of all warbler nests were affected, with production suppressed to less than 1 young per pair per year (Walkinshaw 1983).

In 1972, the USFWS began annual removal of cowbirds from warbler nesting areas. Cowbird removal essentially has eliminated warbler nest parasitism, but the removal program must be maintained annually for the foreseeable future. Walkinshaw (1983) documented a parasitism rate below 6% from 1972 to 1978, along with increased warbler clutch sizes and fledging rates. The USFWS has successfully trapped cowbirds in the Lower Peninsula since 1972. The Kirtland's warbler population increase of recent years indicates that warbler reproduction and survival is healthy and that cowbird parasitism is under control. There are currently relatively low cowbird populations in the U.P. This could change over time if cowbirds continue to expand north.

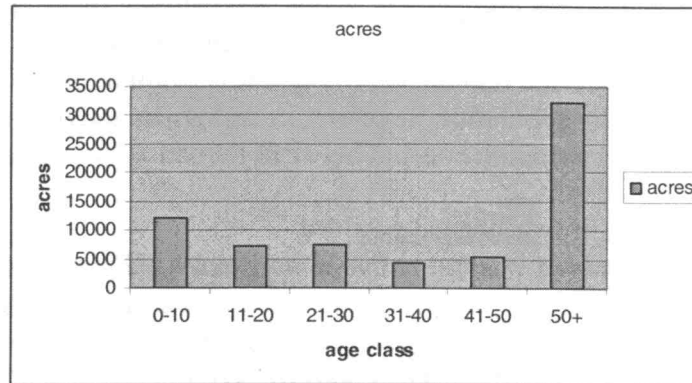
Current Conditions (Affected Environment)

At present, nesting habitat is found almost entirely on State and Federal public forest land. The US Forest Service and the Michigan Department of Natural Resources began habitat management in the 1960s and together have dedicated 24 management areas on about 150,000 acres for the Kirtland's warbler in the Lower Peninsula. Typically, habitat management in the Lower Peninsula consists of clearcutting 200 acres or larger stands of jack pine on a 50-year rotation followed by mechanical or hand planting of 2-year-old jack pine seedlings. Approximately 2760 acres must be managed annually to provide about 38,000 acres of occupiable nesting habitat in any year. Habitat management has been extremely successful. The Kirtland's warbler population in Michigan has increased in response to the increase in availability of occupiable nesting habitat and cowbird control.

There are currently about 68,000 acres (7.2%) of jack pine on the HNF in a variety of age-classes (figure XX). There were about 110,000 acres of jack pine on the Forest in 1980. At a coarse scale, early land surveyors noted that there were at least 28,000 acres of pure jack pine classified on the Forest in 1850, prior to settlement (Hiawatha NF data). However, the presettlement landscape would have also included stands of jack pine within the pine barrens (44,000 acres) and red pine/jack pine (18,000 acres) ecosystems. The total land area of native jack pine

fluctuates over time because this tree species is fire-dependent and linked to fire regimes, drought cycles and jack pine budworm population dynamics.

Figure XX. Current age class distribution of jack pine on the Hiawatha NF.



In 2004 there were 8 male KW's counted on the Hiawatha. Research has shown that KW's in the U.P. successfully breed and interact with populations in the lower peninsula (Probst et al 2003). Figure XX shows that there are about 16,000 acres of jack pine in the 0-20 age-classes and in suitable outwash-sand ecosystems. Figures xxx and xxx show the size and spatial attributes of potential and occupied KW habitat. However, the precise extent of currently suitable KW habitat on HNF is unknown due to a lack of spatially-linked tree-stocking data, specifically for KW habitat requirements, and the lack of a KW management plan for the Forest. General observations would indicate there may be 1,000-4,000 acres of suitable KW habitat (6-24 years old, in blocks larger than 100 acres and at least 1,089 trees/ac) on the Forest at this time.

Figure xx. Jack pine and potential KW habitat on the west unit of the HNF

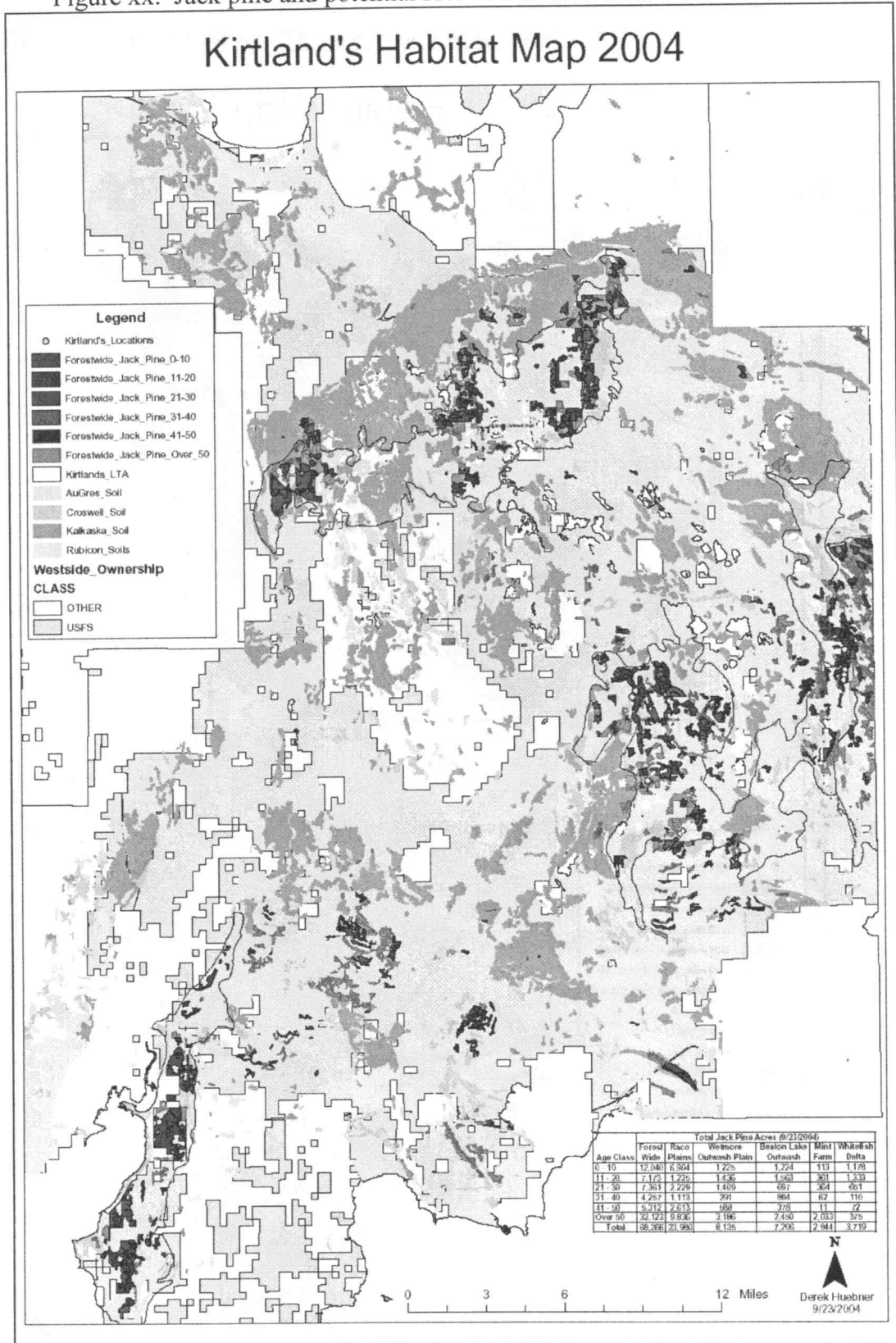
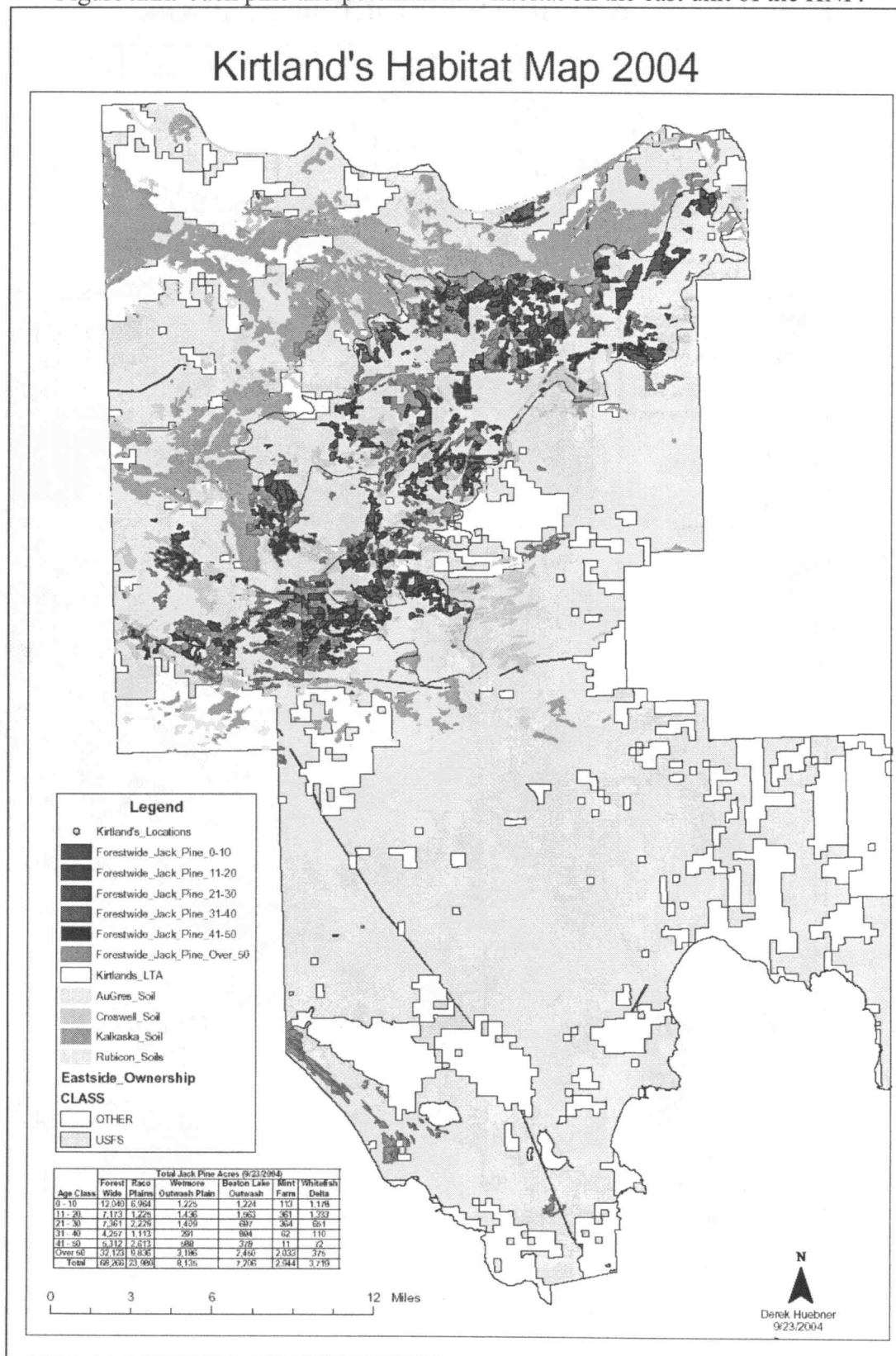


Figure xxx. Jack pine and potential KW habitat on the east unit of the HNF.



Strategy direction suggests that treatment blocks are scheduled for regeneration close to other blocks in space and time. An examination of Kirtland's warbler biogeography (Probst et al, 1995) suggests that the birds prefer to nest in large stands (1000+ acres) of young jack pine. Kirtland's warblers nest in higher densities in larger stands, and these large stands are used for a longer period of time than smaller stands.

There is currently no program direction on the HNF to provide a sustained flow of breeding habitat for Kirtland's warblers. The HNF does not maintain a schedule of habitat treatments by year and there are limited attempts to distribute the treatments across the landscape. The jack pine management guidelines in the current Forest Plan are primarily those that are relevant to other, non KW resource concerns. For instance, the Forest Plan allows temporary opening treatment blocks up to 300 acres in sharp-tailed grouse management areas.

Human activities including research, monitoring, fire suppression and recreational activities have the potential to impact KW on the Hiawatha. Conflicts between human activity and KW populations in the U.P. are not known to be significant at this time. Area closures are not used as they are in other parts of the breeding range. Relatively low human population and relatively low KW populations have minimized opportunities for conflict in the past. As KW populations increase and as more people move into the U.P. the potential for conflict will increase.

Cowbird trapping was tried on the HNF in the mid 1990's with little success since there were too few birds to justify maintaining the traps. Cowbirds in the U.P. tend to be concentrated near agricultural and urban areas and few are observed in more remote forested areas. It is possible that their range is expanding to the north. Cowbird parasitism is not considered a significant factor for conservation of KW in the U.P. at this time, but that could change in the future.

Resource Protections

This section describes the current Forest Plan goals, objectives, standards, and guidelines that are relevant to the Kirtland's warbler. Secondly, it describes proposed changes in Kirtland's warbler habitat management as a result of new information on the species. This new information is the result of a working session of the Kirtland's Warbler Recovery Team (July 2001), and is presented in a paper called *Kirtland's Warbler Essential Habitat Update* (Bocetti et. al 2001). This information was then used in the Species Viability Evaluation (SVE) for the Forest Plan Revision. Finally, this section describes the proposed Forest Plan objectives, Standards and Guidelines for alternatives that are relevant to the Kirtland's warbler.

Current Forest Plan Goals (Chapter IV):

- Provide adequate habitat for threatened, endangered, and sensitive wildlife populations.
- Cooperate with the State and the United States Fish and Wildlife Service in the restoration of habitat for extirpated, threatened, endangered, and sensitive fish and wildlife species.
- Meet local demand for fiber and provide an even flow of aspen and jack pine.

- Increase visual diversity while maintaining a natural-appearing Forest.

Current Forest Plan Objectives (Chapter IV):

- The Forest is currently experiencing insect and disease problems due primarily to a lack of adequate age-class distribution in its shorter-lived forest types.
- Forest managers will cooperate with approved recovery plans for threatened and endangered species, including the whooping crane, peregrine falcon, bald eagle, timber wolf, and Kirtland's warbler. This may include Identifying critical habitat, prescribing measures to prevent destruction or adverse modification of such habitat, and cooperating with the reintroduction of some species.
- Cooperate with the Michigan Department of Natural Resources in identifying potential Kirtland's warbler breeding areas within the Forest boundary.
- The Forest will emphasize restructuring the vegetative management Plans, creating better coordination between management of the wildlife resource and other resources.
- Where habitat components are lacking, direct habitat improvement projects will be planned to provide habitat.
- The Forest manager will emphasize the need to increase indirect wildlife habitat improvements that occur as a result of the timber sale program. These Include improvements in the size, shape, age, and distribution of regenerated stands and protection of habitat such as snags, den trees, and hard mast producing trees for sensitive species.
- Annual jack pine clearcut objective for decade 1 is 1,041 acres per year, and for decade 2 it is 1,350 ac per year.

Current Forest Plan Standards and Guidelines (Chapter IV):

Recreation and Related Resource Management

- Management practices which create openings should: Retain reserve islands and clumps in openings that may exceed five acres, Retain single trees in the immediate foreground to frame views, Retain single trees along the edge of the opening where existing vegetation provides a backdrop.
- Temporary and permanent openings will have a natural appearing configuration.
- The maximum temporary opening to be allowed is 40 acres (except sharptail grouse areas, up to 300 acres, and salvage operations).

2400 Timber Management

- Direct seeding or natural regeneration are the preferred method of regenerating jack pine when the water table is within 7' of the surface.

- Direct seed jack pine in early spring prior to snowmelt . Obtain seed from approved seed collection areas.
- On droughty soils where the water table is deeper than 7 feet, planting has proven to be more reliable for jack pine regeneration.
- Plant jack pine at stocking levels of 600 to 800 trees per acre.
- Generally, precommercial thinning of jack pine is not needed. If needed to prevent stagnation, mechanical thinning is preferred and could be scheduled in seedling/sapling stands containing over 2,000 trees per acre.
- In general, jack pine on sites with site index 55 or better should be converted to red pine, except that jack pine should be retained as needed to obtain compositional objectives for the management area and for spatial arrangement within the management area.
- The maximum size limit of temporary openings created by even-aged management is stated under each management area where timber harvest occurs. Also refer to Forest-wide standards and guidelines for the visual resource. The only exceptions to those limits are: Temporary openings up to 300 acres in size are permitted in designated sharptail grouse habitat (see Appendix P for a map of this habitat), The NFMA regulations allow the following exceptions: Size limits exceeding 40 acres are permitted on an individual timber sale basis after 60 days' public notice and review by the Regional Forester. The size limit stated under each management area shall not apply to areas harvested as a result of natural catastrophic condition such as fire, insect and disease attack, or windstorm.

Wildlife Management

- Identify threatened, endangered, or proposed sensitive species habitat that require protection prior to implementing resource management activities.
- Identify habitat needs to meet population objectives and carry out National Forest responsibilities in recovery plans for threatened and endangered (T&E) species.
- Chart 2600-4 gives standards for the minimum number of snag and cavity trees in each diameter group to be left per acre. The diameter limits provide habitat as follows: pileated woodpecker (over 20 inches), flicker (over 12 inches), end downy woodpecker (over 8 inches). These species are the primary excavators of trees which provide den for the 37 species that utilize den trees for cover, nesting, or feeding.

Fire Management

- Wildfires will be suppressed.

Proposed Changes in Kirtland's Warbler Habitat Management

In 2001, The Kirtland's Warbler Recovery Team reviewed the KWRP, particularly the assumptions used at the time to determine the amount of essential habitat needed to meet the

recovery goal of 1000 pairs. This data was based on the best information available at that time. The goal stated in the KWRP was to develop and maintain 38,000 acres of breeding habitat at all times by managing approximately 127,500 acres on Federal and State lands on a 45- to 50-year rotation: 53,488 acres (42%) on Federal lands and 74,143 (58%) acres on State lands. This would require regenerating 2,550 acres of jack pine annually. It also assumed approximately 1 breeding pair per 30 acres during a jack pine stand's optimum stage, and 15 years total occupancy (KWRP, pp. 20-23).

More recent data suggests that some of these numbers may need to be updated. The average territory size is estimated to be 38 acres, not 30 acres. This estimate is based on the annual singing male census from 1980 to 1995. The average length of time (duration) a stand is used by Kirtland's warblers is estimated to be less than 10 years, not 15 years. This estimate is based on duration analysis of stands on the Huron NF.

The number of acres of occupiable habitat required annually to establish and sustain a Kirtland's warbler (KW) population at a minimum level of 1000 pairs is the same as it was in the KWRP (38 acres/pair x 1000 pairs = 38,000 acres). However, the total acreage required to be managed as essential habitat would be higher, due to the shorter duration of occupancy, if jack pine is managed on a 50-year rotation:

$$\text{Total KW habitat required for management} = \\ 38,000 \text{ acres} \times (50\text{-year rotation}/10\text{-year duration}) = 190,000 \text{ acres}$$

At present, approximately 151,000 acres of essential habitat has been identified in the Lower Peninsula for KW breeding habitat management. Based on the information presented above, this represents a shortfall of approximately 39,000 acres of habitat required to sustain the breeding population of Kirtland's warblers at 1000 pairs.

The Hiawatha SVE team recommended a minimum of approximately 33,000 acres of the Forest's jack pine be managed for KW habitat, in order to improve the current KW viability rating on the Forest. At this level, about 1/2 of the Forest's annual jack pine output would provide KW habitat as a benefit of the jack pine management program, while about 1/2 of the annual jack pine offer would be managed for standard fiber production, and would not provide KW habitat.

Using the updated habitat information, 33,000 acres of jack pine habitat would translate to;

$$6,600 \text{ acres} \times 5 \text{ decades (50-year rotation)} = 33,000 \text{ acres of jack pine managed as} \\ \text{suitable habitat under new assumptions} \\ 6,600 \text{ acres in habitat at any time divided by 38 acres/pair} = 173 \text{ KW pair} \\ \text{(Occupiable for approximately 10 years)}$$

The team also proposed increasing the recommended number of snags to improve habitat conditions for the Kirtland's warbler and other species and be consistent with the Strategy. Other proposed changes include allowing Forest-level authority to harvest KW habitat blocks up to 550 acres without Regional Forester review.

Proposed Forests' Plan Objectives, Standards and Guidelines (Alternatives 2-4 except where stated)

The following are proposed changes to the current Forests' Plan goals, objectives, Standards and Guidelines relevant to the management of the HNF for the Kirtland's warbler. These changes are from the draft chapter 2 of the revised Forest Plan and would be incorporated into Alternatives 2-4. The language from the current Forest Plan as described above will not be included in the revised Plan.

Wildlife, Fish and Sensitive Plant Habitat Management

Kirtland's Warbler Goals:

- Provide for Kirtland's warbler management within forest-wide vegetation goals.
- Provide a minimum of 10,000 acres of jack pine in the 6 to 20 year age class, striving to achieve desired Kirtland's warbler stocking levels on ELT 10/20 in Management Area 4.4 (*Alternative 2 goal*).
- Provide a minimum of 5,000 acres of jack pine in the 6 to 20 year age class with desired Kirtland's warbler stocking levels on ELT 10/20 in Management Area 4.4 (*Alternative 2 goal*).

Kirtland's Warbler Objectives:

- Regenerate an average of 670 acres of jack pine per year in Management Area 4.4 on ELT 10/20 to provide Kirtland's warbler habitat.

Kirtland's Warbler Guidelines:

- For Kirtland's warbler management, strive to regenerate jack pine stands with a target density of an average of 1,089 trees per acre with small non-forest inclusions.
- Pre-commercial thinning or release of jack pine less than age 20 should not occur in Kirtland's warbler management areas.
- Temporary openings should not exceed 550 acres for Kirtland's warbler management.

Wildlife Management

Goals:

- Provide diverse, healthy, productive and resilient habitats for aquatic and terrestrial wildlife.
- Provide ecological conditions to sustain viable populations of native and desired non-native species and to achieve objectives for management indicator species.
- Enhance habitat for resident and migratory wildlife species.
- Project implementation will emphasize the need to protect TES and include indirect wildlife habitat improvements that occur as a result of the timber sale program.

Objectives:

- Implement vegetation management and aquatic and riparian objectives to move terrestrial and aquatic habitats toward desired conditions.

Guidelines:

- The maximum size of temporary openings for sharp-tailed grouse and Kirtland's warbler management should not exceed 550 acres.
- Two to ten snags per acre should be reserved, except where additional snags would be beneficial to rare species or unless they present a safety concern or interfere with mechanical site preparation. Additional snags should be recruited from live trees where there are fewer than two snags per acre.

Threatened and Endangered Species Management

Goals:

- Contribute to the conservation and recovery of federal threatened and endangered species.
- Work cooperatively with U.S. Fish and Wildlife Service, other state and federal agencies and recovery teams to update and implement threatened and endangered species recovery plans. *and mgmt strategies*

Standards:

- Signed federal recovery plans for threatened and endangered species will be implemented. Deviations specific to the Hiawatha National Forest may be allowed after consultation with the U.S. Fish and Wildlife Service.
- All known populations of threatened and endangered plant species and wildlife nest and denning sites will be protected.

Vegetation Management

Goals:

- Native vegetation communities are diverse, productive, healthy and resilient.
- Vegetation conditions contribute toward ecosystem sustainability and biological diversity.
- Vegetative conditions represent native species in age, size and successional states that support native wildlife and fish species and other uses of the forest.

Guidelines:

- An ecological classification system, soil resource inventory or on-site soil investigation information should be used prior to prescribing species conversion.
- Reforestation of harvest areas through natural regeneration or seeding should be emphasized. Interplanting to restore components of the ecosystem which are in decline or absent should be allowed.
- 40-60 year rotation in Jack pine MA 4.4 40-70 MA 4.2
- A temporary opening should be considered forested when the re-established stand has reached a height that is greater than 20 percent of the height of the surrounding trees.
- Openings should be separated by a stand of at least the minimum stand size, normally 10 acres.

Soil Resources Management

Objectives:

- In this planning period, on a project level basis, identify areas of ELT 10, 20 where soil organic matter has been lost due to past land use and wildfire. Where practicable and not in conflict with other management objectives, seek to restore organic matter on these sites through long-term vegetation management objectives.

Guidelines:

- In areas managed for timber production, whole-tree timber harvest methods should not be used on sites with inherently low fertility and low organic matter reserves (ELT 10/20, phase 0, 1 and 2; Grayling and Rubicon soil series). Slash will be left evenly distributed across the site.

Pest Management

Goal;

- Maintain or restore missing ecosystem components to improve ecosystem resiliency.

Fuel management

Goals:

- Establish, maintain or improve vegetative conditions using prescribed fire, mechanical treatments and other tools.
- In this planning period, vegetation is treated in high fire hazard areas within the wildland/urban interface areas to reduce the risk from wildland fire.

Objectives:

- In this planning period, reduce wildfire risks by fuel management of an average of 1,000 acres per year.

Fire Suppression

Goals:

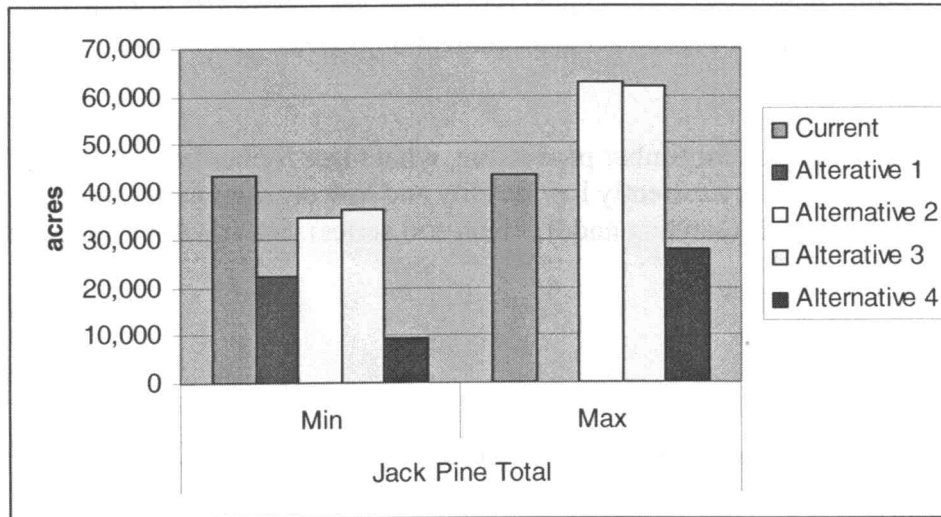
- Manage fires in a safe and economically efficient manner. Consideration will be given to the effects on resource values and risks to life and property.

Environmental Consequences

Kirtland's warbler habitat under all alternatives is constrained by vegetation goals that limit the amount of jack pine habitat. Alternative vegetation goal-ranges for jack pine vary based on the amount of land dedicated to each management area (figure xx). The vegetative goals would allow for jack pine to be managed below, above or at current levels for alternatives 1, 2 and 3 which could have a corresponding impact on the trend for KW habitat. Alternative 1 has no maximums and did not use ELT's, however maximum jack pine acreage could be limited by the minimum vegetative goals of other cover types at approximately 56,000 acres. Since the

maximum jack pine goal for alternative 4 is less than current, jack pine acres would decrease to meet the vegetation goals.

Figure xx. Vegetation goal summary by alternative for jack pine in MA 4.2 and MA 4.4, ELT 10-20



Chapter 2 of the revised draft Forest Plan lists the following goals for KW habitat for Alternative 2;

1. Provide for Kirtland's warbler management within forest-wide vegetation goals.
2. Provide a minimum of 10,000 acres of jack pine in the 6 to 20 year age class, striving to achieve desired Kirtland's warbler stocking levels on ELT 10/20 in Management Area 4.4.
3. Provide a minimum of 5,000 acres of jack pine in the 6 to 20 year age class with desired Kirtland's warbler stocking levels on ELT 10/20 in Management Area 4.4.

The goals/objectives in Chapter 2 assume a 15 year duration of suitable KW occupancy (age 6-20). Goal 1 implies that KW could be managed in any MA as long as vegetation goals are met. Goal 2 suggests that an initial reforestation effort would be made to meet KW stocking density. However, due to concerns about the economic cost of reforestation, follow-up reforestation efforts, if needed to assure KW stocking, would occur on a minimum of 1/2 of the acres (Goal 3). Acres that are not stocked to suitable KW stocking density would not be considered suitable habitat.

The goals for KW habitat vary by alternative (Table XX). Actual KW habitat available at any one time could range between 0 and 15,000 acres, with the total amount managed for jack pine between 0 and 50,000 acres. The table column for "Minimum total jack pine managed with KW stocking assured" would represent the HNF contribution to the projected 39,000 acre minimum habitat shortfall.

TableX. Acres of potential KW habitat for the alternatives

Alternative	Goal for 6-20 year age-class, striving to achieve KW stocking	Minimum 6-20 year old jack pine with KW stocking assured	Goal for total jack pine striving to achieve KW stocking	Minimum total jack pine managed with KW stocking assured	Annual jack pine managed for KW stocking
1*	0	0	0	0	0
2	10,000	5,000	33,333	16,666	335-670
3	15,000	7,500	50,000	25,000	500-1,000
4	5,000	2,500	16,666	8,333	166-330

* Alternative 1 did not set goals and minimums but allows for an unspecified amount of KW habitat management as determined at the project level.

Alternative 1 (Current Forest Plan)

Direct and Indirect Effects

Availability of Breeding Habitat

Alternative 1 would move the Forests toward the desired conditions, goals and objectives in the current Forests' Plan. The Standards and Guidelines under Alternative 1 provide little direction for producing KW habitat, and provide few protective measures specifically for the Kirtland's warbler.

It is not known if this alternative would provide sufficient acreage of suitable habitat to sustain KW populations over the short and long terms. Additional acres of managed habitat are needed to provide enough breeding habitat to increase the KW viability rating on the Forest (HNF SVE process 8/24/04) and provide sustainable habitat. Alternative 1 would provide some KW habitat, but the precise amount is uncertain.

There are no goals or guidelines specifically for jack pine management of Kirtland's warbler habitat under the existing Forest plan. However, Endangered Species Act compliance efforts have resulted in several project level decisions that provide suitable KW habitat using modifications of standard jack pine forestry practices (i.e., larger block size and tree stocking density suitable for KW). While there are currently about 16,000 acres of suitably aged jack pine on sand outwash systems on the Forest, not all of these existing acres are in large blocks or stocked appropriately for KW breeding. Guidelines do allow for harvest blocks up to 300 acres in sharptail grouse management areas which frequently overlap potential KW habitat. While 300 acre blocks provide better KW habitat than the standard 40 acre harvest block size, it is not as large as recommended by the Strategy or the action alternatives.

Although recommended minimums are low, Alternative 1 guidelines do not prescribe a maximum amount of dead snags that can be left in clearcuts, which allows managers to reserve all dead trees, or at least 15-25 dead trees per acre, as suggested by the KW management Strategy. While snags and down wood are not likely to be critical to the

Kirtland's warbler, the structural diversity would likely benefit KW and other species native to the jack pine ecosystem.

Alternative 1 would have an adverse effect on the Kirtland's warbler over the short and long terms because the HNF would continue to suppress wildfires. Wildfires in jack pine usually create Kirtland's warbler breeding habitat. However, fire suppression could also be beneficial to the Kirtland's warbler if a wildfire occurred in developing or occupied breeding habitat.

This alternative would allow firewood gathering in Kirtland's warbler habitat. Under Alternative 1, snags and down trees are intentionally reserved in treatment blocks during harvest to provide future singing, perching and foraging habitat for the Kirtland's warbler. This is not expected to be a large impact since jack pine is not highly sought for use as firewood, and dead wood far from roads would not likely be collected for firewood. While removal of these trees by firewood gatherers is not likely to be critical to Kirtland's warbler, it would degrade existing and future nesting habitat by reducing structural diversity over the short and long terms.

Human Activity and Disturbance

Under Alternative 1, the HNF would continue to allow certain activities in occupied habitat such as Kirtland's warbler tours, the annual Kirtland's warbler census, research, monitoring, professional photography and recording of the Kirtland's warbler. While these activities have substantial benefits to the Kirtland's warbler information and education program, a small direct risk to individual Kirtland's warblers exists. These activities could cause the direct loss of Kirtland's warbler eggs or young, nest abandonment, or increase the risk of nest predation. Therefore, these activities may adversely affect the Kirtland's warbler over the short and long terms.

Nest Parasitism by the Brown-Headed Cowbird

There is nothing in alternative 1 that would prevent trapping of cowbirds in KW habitat and trapping has occurred on the Forest in the past. Cowbird trapping is not currently needed but could be needed in the future. Cowbird trapping provides direct benefits to the Kirtland's warbler by substantially reducing nest parasitism within 1 mile of the traps. However, cowbird trapping activities pose a minor risk to individual Kirtland's warblers because accessing the traps in vehicles or on foot may disturb nesting warblers. The traps occupy a very small area of habitat that could otherwise be used by Kirtland's warblers. Kirtland's warblers have never been known to be caught in a trap.

Cumulative Effects

Alternative 1, when combined with future State, tribal, local or private actions in Michigan, would likely have adverse cumulative effects on the Kirtland's warbler.

Based on past land management, the MDNR and others are expected to continue to suppress wildfires on State and private lands. This is expected to continue to have a

negative effect on Kirtland's warbler because insufficient natural breeding habitat would be created over the short and long terms.

In 1980 there were approximately 110,000 acres of jack pine on the HNF, and by 1993 jack pine had declined to about 73,000 acres on the Forest (HNF Monitoring and Evaluation Report for FY95). There are currently about 68,000 acres of jack pine on the HNF, representing a 42,000 acre reduction in jack pine on the HNF since 1980. The vegetative goals and Spectrum model outputs project a continued jack pine decline for alternatives 1, 2 and 4 resulting in a cumulative effect on species that use jack pine habitat. Alternative 3 would likely not contribute to the downward trend due to higher habitat goals for KW.

Forest inventory data provided by the North Central Forest Experiment Station indicate a similar trend towards decreasing acreage of jack pine in the eastern Upper Peninsula. Since 1980, jack pine has decreased from 227,000 acres to 192,000 acres. The 68,000 acres of jack pine on the Hiawatha represents about 32% of the jack pine in the eastern Upper Peninsula. The remaining 136,00 acres (68%) of jack pine in the eastern Upper Peninsula is spread across multiple ownerships. The soil and block size characteristics required for KW suitability have not been analyzed across the eastern Upper Peninsula. The possible continuing jack pine decline for alternative 1, combined with the previous planning period, would result in a downward trend in KW habitat.

Although no specific non-Federal actions are reasonably certain to occur within the action area, it may be expected that some activities, particularly on private lands, could have a progressive negative effect on Kirtland's warblers in the action area. Human populations in the counties with Kirtland's warbler habitat have been generally increasing in recent years. Human population growth is accompanied by increased urbanization, including road construction and land subdivision and development. These activities could result in the permanent loss of potential Kirtland's warbler habitat. Additional actions performed on private lands that may adversely affect the Kirtland's warbler in the future are fire suppression, application of pesticides, mineral extraction, and non-Kirtland's warbler focused timber harvest. Increasing urbanization is likely to result in the construction of fuel breaks on adjacent federal lands, potentially reducing Kirtland's warbler habitat.

The MDNR and US Fish and Wildlife Service (USFWS) are partners in Kirtland's warbler recovery effort. Annually, each agency can be expected to continue to manage an unknown number of acres of KW habitat in the U.P. to benefit the species. The bulk of Kirtland's warbler habitat is on state and federal lands. There is potential suitable habitat in other ownerships, for example there are about 5,000 acres of jack pine on Marquette County lands near Gwin that have recently been occupied by KW. Alternative 1 would not create sufficient breeding habitat to meet the recovery objective of 1000 pairs throughout its known range over the short and long terms. Currently, approximately 151,000 acres are managed for the Kirtland's warbler on State and Federal lands in the northern Lower Peninsula. Based on the new assumptions, approximately

190,000 acres are required. Therefore, Alternative 1 would contribute an undetermined amount of KW habitat to the shortfall of approximately 39,000 acres.

Summary of Effects

Alternative 1 would benefit the Kirtland's warbler over the short and long terms because:

1. It would create an unpredictable amount of breeding habitat annually, thus some habitat would be available to an unknown number of nesting pairs of Kirtland's warblers annually.
2. Treatment blocks up to 300 acres could be placed in sharptailed grouse management areas without Regional Forester review. Treatment block size could be increased to 550 acres or larger with Regional Forester review.
3. It would suppress wildfires, protecting existing and potential breeding habitat.
4. With no maximum limit, snags and down wood could provide structural diversity and could meet Strategy objectives.
5. It would not prevent cowbird trapping if needed thus reducing nest parasitism.

However, this alternative would likely adversely impact the species over the short and long terms because:

1. It would not provide specific direction for producing quality breeding habitat, and protective measures for the Kirtland's warbler.
2. It would not provide enough habitat to raise viability and sustain breeding habitat and would not contribute to eliminating the shortfall of approximately 39,000 acres of essential habitat.
3. Wildfires would continue to be suppressed, and when considered with managed habitat, insufficient breeding habitat would be created.
4. This alternative would permit firewood gathering
5. It would allow cowbird trapping, which could potentially disturb nesting Kirtland's warblers.
6. Alternative 1 would permit activities such as guided Kirtland's warbler tours, the annual Kirtland's warbler census, research, monitoring, professional photography and recording of the Kirtland's warbler.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Availability of Breeding Habitat

The proposed goals and guidelines under Alternative 2 would provide direction for producing quality breeding habitat and protective measures for the Kirtland's warbler. However, as in Alternative 1, other factors within Alternative 2 are likely to adversely affect the Kirtland's warbler.

When compared to Alternative 1, Alternative 2 would have greater benefit to the Kirtland's warbler over the short and long terms because it would provide direction for managing a goal of 33,333 acres with a minimum of 16,666 acres of jack pine for KW

habitat. It would create approximately 335-670 acres of breeding habitat annually. Approximately 3,350-6,700 acres of habitat would be available to an average of 87-173 nesting pairs of Kirtland's warblers annually. The 10,000 acre suitable habitat goal equates to a total of about 33,000 acres or 48% of the Forest's current jack pine. The assured habitat portion, or 5,000 acres of suitable, would equate to a total of about 16,666 acres or 24% of the Forest's jack pine managed for KW. While the Forest has the ecological capability to exceed the proposed KW habitat goals of Alternative 2, economic concerns have resulted in goals that could maintain Hiawatha KW habitat production below potential.

Alternative 2 would increase the treatment block size to 550 acres, and eliminate the need for Regional Forester review. This change would be beneficial to the Kirtland's warblers because warblers nest in higher densities in larger blocks, and large blocks are used for a longer period of time than smaller blocks.

As with Alternative 1, Alternative 2 could have an adverse or beneficial effect on the Kirtland's warbler because the HNF would continue to suppress wildfires. However, unlike Alternative 1, Alternative 2 would provide more managed habitat for the species over the short and long terms.

The guideline that limits the amount of dead trees left in jack pine clearcuts to a maximum of 10 per acre, except where additional snags would be beneficial to rare species, could benefit habitat suitability for KW since the KW Strategy suggests all dead trees, or at least 15-25 dead trees per acre, be left in KW management areas. While snags and down wood are not likely to be critical to the Kirtland's warbler, the added structural diversity would likely benefit KW and other species native to the jack pine ecosystem.

Like Alternative 1, this alternative would permit firewood gathering in Kirtland's warbler habitat. This is not expected to be a large impact since jack pine is not highly sought for use as firewood, and dead wood far from roads would not likely be collected for firewood. The firewood collecting of Alternative 2 could slightly impact existing and future nesting habitat by reducing structural diversity over the short and long terms.

Human Activity and Disturbance

Under Alternative 2, the HNF would continue to allow certain activities in occupied habitat such as Kirtland's warbler tours, the annual Kirtland's warbler census, research, monitoring, professional photography and recording of the Kirtland's warbler. For the same reasons given in the discussion of Alternative 1, these activities may adversely affect the Kirtland's warbler over the short and long terms.

Nest Parasitism by the Brown-Headed Cowbird

Like Alternative 1, Alternative 2 would allow trapping of cowbirds in KW habitat, providing a direct benefit to the Kirtland's warbler by substantially reducing nest parasitism. However, cowbird trapping activities pose a minor risk to individual Kirtland's warblers because accessing the traps in vehicles or on foot may disturb nesting

warblers. The traps occupy a very small area of habitat that could otherwise be used by Kirtland's warblers for foraging or nesting.

Cumulative Effects

The cumulative effects of Alternative 2 would be similar to alternative 1 except alternative 2 would create additional breeding habitat. A range of KW habitat is possible under the alternative (16,666 acres to 33,333 acres). There is no way to accurately predict how many acres of jack pine will be suitable for KW above the assured minimum of 16,666. Habitat that is not suitably stocked will not provide KW habitat and the goals do not require KW stocking on acres above 16,666. There may be more KW habitat created in an effort to meet the higher goal, and if this habitat is adequately stocked it will benefit the species. However, it is difficult to plan, and establish inter-agency agreements, for more than the minimum assured acres of habitat, due to the uncertainty. The Hiawatha assured habitat goal of 16,666 acres, combined with contributions from other agencies, will address the habitat shortfall identified as needed for recovery of the species.

The Spectrum model run programmed to meet vegetation goals, while maximizing economic output, projected a maximum 14,000 acre (23%) jack pine decline for alternative 2. That projected decline when combined with the previous planning period, would result in a loss of over 38,000 acres of jack pine habitat since 1986. As discussed under alternative 1, this represents the continuation of a downward trend in jack pine habitat on the HNF and across the eastern U.P.

Summary of Effects

Alternative 2 would benefit the Kirtland's warbler over the short and long terms because:

1. It would provide direction for managing a minimum of 16,666 acres with a goal of 33,333 acres of Jack pine for KW habitat.
2. It would create approximately 335-670 acres of breeding habitat annually, thus habitat would be available to an average of between 87 and 173 nesting pairs of Kirtland's warblers annually.
3. It would allow all or at least 15-25 snags per acre to be reserved in KW habitat and meet Strategy objectives.
4. It would increase the treatment block size to 550 acres, and eliminate the need for Regional Forester review.
5. It would suppress wildfires, protecting existing and potential breeding habitat.
6. It would permit cowbird trapping, reducing nest parasitism.

However, this alternative would likely adversely impact the species over the short and long terms because:

1. When combined with lands managed by other agencies, it would not provide enough acres to meet the projected KW habitat shortfall required for species recovery.
2. Wildfires would continue to be suppressed, and when considered with managed habitat, insufficient breeding habitat would be created to sustain 1000 pairs range wide.
3. It would permit firewood gathering in KW habitat
4. It would permit cowbird trapping, which could potentially disturb nesting Kirtland's warblers.
5. Alternative 2 would permit activities such as Kirtland's warbler tours, the annual Kirtland's warbler census, research, monitoring, professional photography and recording of the Kirtland's warbler.

Alternative 3

When compared to Alternative 2, Alternative 3 would have greater benefit to the Kirtland's warbler over the short and long terms because it would provide direction for managing a goal of 50,000 acres with a minimum of 25,000 acres of jack pine for KW habitat. It would create approximately 500-1,000 acres of breeding habitat annually. Approximately 5,000-10,000 acres of habitat would be available to an average of 131-263 nesting pairs of Kirtland's warblers annually. The 15,000 acre suitable habitat goal equates to a total of about 50,000 acres or 79% of the Forest's current jack pine. The assured habitat portion, or 7,500 acres of suitable, would equate to a total of about 25,000 acres or 40% of the Forest's jack pine managed for KW. The 50,000 acres approaches the Forest's ecological capability to produce quality KW habitat, using existing jack pine stands. It is unknown what portion of the remaining 18,000 acres of jack pine could provide suitable KW habitat, since it could be in smaller blocks, more disjunct, or on soils unsuitable for KW management. KW habitat capability could likely be increased if existing red pine stands on rubicon soils were assessed for KW suitability. Perceived economic concerns about the cost of reforestation have resulted in goals and guidelines that would likely maintain Hiawatha KW habitat production below its ecological potential.

Additional managed habitat would be needed to provide enough breeding habitat to increase KW viability on the Forest (HNF SVE process 8/24/04) and provide sustainable habitat. Alternative 3 would provide the most KW habitat of any alternative and provide the best opportunity to raise KW viability on the Forest.

Other direct and indirect effects of Alternative 3 are similar to Alternative 2.

Cumulative effects

The cumulative effects of Alternative 3 would be similar to Alternative 2 except Alternative 3 would create additional breeding habitat to meet the recovery objective. A range of KW habitat is possible under the alternative (25,000 acres to 50,000 acres). There is no way to accurately predict how many acres of jack pine will be suitable for KW above the assured minimum of

25,000. Habitat that is not suitably stocked will not provide KW habitat and the goals do not require KW stocking on acres above 25,000. There may be more KW habitat created in a effort to meet the higher goal, and if this this habitat is adequately stocked it will benefit the species. However, it is difficult to plan, and establish inter-agency agreements, for more than the minimum assured acres of habitat, due to the uncertainty. The Hiawatha assured habitat goal of 25,000 acres, combined with contributions from other agencies, will address the habitat shortfall identified as needed for recovery of the species.

Summary of Effects

Alternative 3 would benefit the Kirtland's warbler over the short and long terms because:

1. It would provide direction for managing a minimum of 25,000 acres with a goal of 50,000 acres of jack pine for KW habitat.
2. It would create approximately 500-1,000 acres of breeding habitat annually, thus habitat would be available to an average of between 131 and 263 nesting pairs of Kirtland's warblers annually.
3. It would allow all or at least 15-25 snags per acre to be reserved in KW habitat and meet Strategy objectives.
4. It would increase the treatment block size to 550 acres, and eliminate the need for Regional Forester review.
5. It would suppress wildfires, protecting existing and potential breeding habitat.
6. It would permit cowbird trapping, reducing nest parasitism.

However, this alternative would likely adversely impact the species over the short and long terms because:

1. When combined with lands managed by other agencies, it would not provide enough acres to meet the projected KW habitat shortfall required for species recovery.
2. Wildfires would continue to be suppressed, and when considered with managed habitat, insufficient breeding habitat would be created to sustain 1000 pairs range wide.
3. It would permit firewood gathering in KW habitat
4. It would permit cowbird trapping, which could potentially disturb nesting Kirtland's warblers.
5. It would permit activities such as Kirtland's warbler tours, the annual Kirtland's warbler census, research, monitoring, professional photography and recording of the Kirtland's warbler.

Alternative 4

When compared to Alternative 2 or 3, Alternative 4 provide less benefit to KW over the short and long term because it would provide direction for managing a goal of 16,666 acres with a minimum of 8,333 acres of KW breeding habitat. Under Alternative 4, the HNF would create approximately 166-333 acres of breeding habitat per year.

Approximately 1660-3330 acres of habitat would be available to an average of 44-87 nesting pairs of Kirtland's warblers annually. Block size would be smaller due to the small annual habitat goal, which would tend to reduce KW habitat suitability. The 5,000 acre suitable habitat goal equates to a total of about 16,666 acres or 26% of the Forest's current jack pine. The assured habitat portion, or 2,500 acres of suitable, would equate to a total of about 8,333 acres or 13% of the Forest's jack pine managed for KW. While the Forest has the ecological capability to meet and exceed the proposed KW habitat goals of Alternative 4, economic concerns have resulted in goals that would maintain Hiawatha KW habitat production below its ecological potential.

Alternative 4 eliminates many acres of jack pine, converting 14,000 acres in the first decade, reducing total jack pine habitat to about 50,000 acres. Jack pine habitat continues to decline reaching a low of about 25,000 acres. Alternative 4 would have no area in MA 4.4, with most of these acres moved to a 4.2 designation. The primary tree species found in MA 4.2 would be red pine compared to jack pine in MA 4.4 (Chapter 3). Since MA 4.2 would feature more red pine, and require a reduction in existing jack pine, the potential to manage for Kirtland's warbler would decline.

Other direct and indirect effects of Alternative 4 are similar to Alternative 2.

Cumulative effects

The cumulative effects of Alternative 4 would be similar to Alternative 2 except Alternative 4 would create less breeding habitat to meet the recovery objective. A range of KW habitat is possible under the alternative (8,333 acres to 16,666 acres). There is no way to accurately predict how many acres of jack pine will be suitable for KW above the assured minimum of 8,333. Habitat that is not suitably stocked will not provide KW habitat and the goals do not require KW stocking on acres above 8,333. There may be more KW habitat created in an effort to meet the higher goal, and if this habitat is adequately stocked it will benefit the species. However, it is difficult to plan, and establish inter-agency agreements, for more than the minimum assured acres of habitat, due to the uncertainty. The Hiawatha assured habitat goal of 8,333 acres, combined with contributions from other agencies, will address the habitat shortfall identified as needed for recovery of the species.

Summary of Effects

Alternative 4 would benefit the Kirtland's warbler over the short and long terms because:

1. It would provide direction for managing a minimum of 8,333 acres with a goal of 16,666 acres of jack pine managed for KW habitat.
2. It would create approximately 166-333 acres of breeding habitat annually, thus habitat would be available to an average of between 44 and 87 nesting pairs of Kirtland's warblers annually.
3. It would allow all or at least 15-25 snags per acre to be reserved in KW habitat and meet Strategy objectives.

4. It would increase the treatment block size to 550 acres, and eliminate the need for Regional Forester review.
5. It would suppress wildfires, protecting existing and potential breeding habitat.
6. It would permit cowbird trapping, reducing nest parasitism.

However, this alternative would likely adversely impact the species over the short and long terms because:

1. When combined with lands managed by other agencies, it would not provide enough acres to meet the projected KW habitat shortfall required for species recovery.
2. It would create approximately 166-333 acres of breeding habitat annually resulting in average block sizes between 166 and 333 acres which would be smaller than recommended by the Strategy.
3. Wildfires would continue to be suppressed, and when considered with managed habitat, insufficient breeding habitat would be created to sustain 1000 pairs range wide.
4. It would permit firewood gathering in KW habitat
5. It would permit cowbird trapping, which could potentially disturb nesting Kirtland's warblers.
6. It would permit activities such as Kirtland's warbler tours, the annual Kirtland's warbler census, research, monitoring, professional photography and recording of the Kirtland's warbler.

Summary of the Action Alternatives

Table WL-xx. Summary of KW management by action alternative

Alternative	Minimum jack pine managed for KW	% of forest jack pine	Minimum KW breeding pairs	Minimum jack pine goal to be managed for KW	% of forest jack pine	Goal KW breeding pairs	Minimum contribution to 39,000 ac Recovery Team shortfall
2	16,666	24%	87	33,000	48%	173	16,666
3	25,000	40%	131	50,000	79%	263	25,000
4	8,333	13%	44	16,666	24%	87	8,333

Determination

Based on the analysis of effects of the Alternatives on the Kirtland's warbler, it is determined that Alternatives 1, 2, 3 and 4 are likely to adversely affect the Kirtland's warbler.

These adverse affect determinations are made because the potential for take or harrassment exists for the existing population. This take could take the form of nest abandonment or direct destruction of eggs from research, monitoring, recreational

activities, fire suppression and other human activities. While there are also beneficial aspects of the alternatives for KW, the risk of potential loss of individuals also exists.

Monitoring

The KWRP requires managing agencies to "monitor breeding populations...in order to evaluate responses to management practices and environmental changes." There are two phases to this monitoring program: (1) year-round inventory of potential breeding habitat, and (2) counting singing males during a short period in June. Coordination of this monitoring program has been delegated by the Recovery Team to the Michigan Department of Natural Resources. The Forests' Plan prescribes monitoring Kirtland's warblers on the HNF annually to determine progress in meeting Forest Plan direction.

Potential Breeding Habitat

Potential breeding habitat is monitored throughout the year, with field checks occurring in the spring, just prior to the annual census. Habitat will be tracked using a geographic information system (GIS). Timber sale and reforestation information will be tracked using a local database. This information will be presented to the Kirtland's Warbler Recovery Team annually in the form of summary tables and a graph.

Kirtland's Warbler Census

Since 1971, the Kirtland's warbler population has been monitored each year by professional resource managers and trained volunteers during the Kirtland's Warbler Census. Census procedures make use of the behavior of male Kirtland's warblers to locate and count all the territorial males during a twelve-day period in June. The field work consists primarily of using the mornings to traverse known colonies on foot and to map the location of singing male Kirtland's warblers. Habitat that is just developing and maturing nesting habitat are also included in the field survey.

Kirtland's warblers tend to occur in loose assemblages, which are referred to as "colonies". Unlike true colonial nesting birds, each male has an exclusive territory of ample size for the needs of the pair during courtship and nesting. In the past, individual "colonies" have had from one to nearly three hundred singing males. Male Kirtland's warblers defend their territories with loud and persistent singing. By skirting, or if necessary, traversing the habitat at appropriate times, census participants can locate and count the male birds present. It has generally been assumed that there is a breeding female for each singing male. Although this may not be true in some cases, an approximation of the total breeding population may be obtained by doubling the count of singing males.

Past research has suggested that there is an 85% probability that a territorial male will sing at least once during any five-minute period between sunrise and 11:00 a.m. in good weather during June. It was concluded that a male on his territory rarely moves more than one-eighth mile, although some may move over one-fourth mile. Under ideal conditions, an observer should be able to hear singing males for at least one-quarter mile; therefore, if you are on the male's territory you should be able to hear him anywhere on this territory. Singing males may approach very near each other momentarily at the boundary between territories. However, they are usually spaced so that they can easily be distinguished as separate birds.

The census is conducted according to specific instructions, distributed annual by the MDNR. The HNF Kirtland's warbler census is conducted by employees and volunteers walking or driving transects through occupied and potential habitat, listening for singing males, and mapping their locations. Singing males are counted, the data is assembled by the MDNR, and general information by county is made public only after authorization by the Recovery Team.

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