U. S. AIR FORCE

FINAL

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Nellis Air Force Base
Creech Air Force Base
Nevada Test and Training Range

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FINAL

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

NELLIS AIR FORCE BASE / CREECH AIR FORCE BASE/

NEVADA TEST AND TRAINING RANGE

Nellis Air Force Base, Nevada
99th Civil Engineering Squadron
Environmental Management Flight

In accordance with Public Law 105-85,
the Sikes Act Improvement Act of 1997
This Plan was prepared in coordination with the

U.S. Fish and Wildlife Service and
Nevada Department of Wildlife

June 2021

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ABOUT THIS PLAN

This installation-specific Environmental Management Plan utilizes the United States Air Force's (USAF's) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Non-United States territories will comply with applicable Final Governing Standards. Where applicable, external resources, including Air Force Instructions (AFIs); USAF Playbooks; federal, state, local, Final Governing Standards; biological opinions (BOs); and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, USAF-wide "common text" language to address USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the USAF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by USAF environmental Installation Support Teams, and/or installation personnel.

NOTE: The terms "Natural Resources Manager," (NRM) and "NRM/Point of Contact" are used throughout this document to refer to the installation person responsible for the natural resources program, regardless of whether this person meets the qualifications within the definition of a natural resources management professional in DoDI 4715.03.

DOCUMENT CONTROL

Record of Review—This INRMP is to be reviewed annually. It may be updated or revised more often if changes occur to natural resource management and conservation practices, including those driven by changes in applicable regulations. In accordance with the Sikes Act and AFI 32-7064, *Natural Resources Management*, the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews, updates, or revisions are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the Natural Resources Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration Fisheries, where applicable, and accomplishes pertinent revisions. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signature to the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed upon updates or revisions are then made to the document, at a minimum revising work plan.

During 2018 and 2019, the Air Force Civil Engineer Center (AFCEC) engaged the Center for Environmental Management of Military Lands (CEMML) at Colorado State University to assist USAF installations with meeting DoD requirements to include climate change assessments in their INRMPs (Agreement No W9128F-16-2-0020-0018). To accomplish this task, a Colorado State University team of climate scientists, ecologists, environmental planners, military land managers, and engineers reviewed the Nellis Air Force Base/Creech Air Force Base/Nevada Test and Training Range INRMP. They then generated downscaled temperature and precipitation data for the installation to develop climate projections under two future emission scenarios and used tools and models to assess impacts of future climate on the installation's natural resources (CEMML, 2019). In 2021, the results of this climate change assessment were integrated with the relevant sections of this INRMP.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

NELLIS AIR FORCE BASE, CREECH AIR FORCE BASE, AND THE NEVADA TEST AND TRAINING RANGE

PLAN YEARS 2019–2023

This INRMP for Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range, dated February 2019, has been prepared in accordance with the Sikes Act Improvement Amendment, DoD Instruction 4715.3 " Environmental Conservation," and Air Force Instruction32-7064, "Integrated Natural Resources Management," dated 18 November 2014, Incorporating Change 2, 22 November 2016. The INRMP also adheres to other standards and procedures of the Department of Defense and the Air Force and has been prepared in cooperation with the United States Fish and Wildlife Service, the Desert National Wildlife Refuge, and the Nevada Department of Wildlife. The signatures below indicate the mutual agreement of the parties concerning the conservation, protection, and management of the fish and wildlife resources present in the INRMP.

4 FEB 19

CAVAN K. CRADDOCK — Date

Colonel, United States Air Force
Commander, 99th Air Base Wing

3/8/19

GLEN W. KNOWLES — Date
Field Supervisor
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EXECUTIVE SUMMARY

The Mission and Natural Resources

The primary responsibility of the USAF is to project American airpower in order to enhance the defensive capabilities of the United States (U.S.). Realistic training and weapons testing in conditions similar to combat situations is crucial to the mission success of the USAF. Nellis Air Force Base (NAFB), Creech Air Force Base (CAFB), and the Nevada Test and Training Range (NTTR) is the largest military training installation in the U.S. The terrain, topography, and environmental conditions found on these installations are similar to conditions found on modern battlefields. As such, NAFB, CAFB, and the NTTR support a variety of military testing and training operations on three million acres in the state of Nevada in the northern Mojave and southern Great Basin Deserts.

The military and training operations conducted at NAFB and CAFB play a crucial role in the USAF's national defense efforts. The NAFB-based 99th Air Base Wing (99 ABW) assists the Air Combat Command (ACC) in arranging, training, and equipping tactical air forces of the U.S. and allied nations, primarily by providing advanced tactical training to fighter pilots. The Air Warfare Center is an intermediate headquarters for 4 wings and 24 detachments at NAFB.

Figure ES-1. Tolicha Peak on the Nevada Test and Training Range. NAFB photo library.

The NTTR located adjacent to CAFB is a unique national military asset. The range provides the opportunity for weapons system testing combined with the highest level of training available for USAF personnel. The NTTR provides an aerial battlespace that includes a robust threat environment, varied target arrays, operational airspace, topographic complexity, security, and public safety buffers (Figure ES-1). The NTTR is the only location in the U.S. where both individual and large multi-force training can be conducted in a natural environment that simulates full-scale battlefield scenarios. The advanced level of training and testing that the NTTR offers is crucial to the survival of U.S. and allied military personnel and the success of the USAF mission to defend the U.S. and to secure and enhance U.S. interests and policies worldwide.

Goals of the Integrated Natural Resources Management Plan

General natural resources management goals for NAFB, CAFB, and the NTTR are listed below.

- Assist the installation commander with the conservation and rehabilitation of natural resources consistent with the use of the installation, to ensure the readiness of the Armed Forces.
- Develop natural resources management guidelines that are consistent with the military mission and ensure no net loss in the capability of installation lands to support the military mission.
- Provide for the optimum use of land and water areas and access for military purposes while maintaining ecological integrity.

Regulatory Authority

The INRMP is prepared under authority of AFI 32-7064 18 November 2014 (Integrated Natural Resources Management) as implemented by Air Force Policy Directive 32-70 (Environmental Quality) and DoD Instruction 4715.03 (Environmental Conservation Program). The authority to establish natural resources management programs at DoD installations is provided by 16 U.S.C. 670 also known as the Sikes Act (Conservation Programs on Military Installations). Additional governing laws include the Endangered Species Act (ESA), Clean Water Act (CWA), the Migratory Bird Treaty Act (MBTA), and the Military Lands Withdrawal Act (MLWA) of 1999 (Public Law [PL] 10665).

Natural Resources and the Mission

The NTTR is the largest contiguous air and ground space available for peacetime military operations in the free world. The range occupies 2.9 million acres of land, 5,000 square miles of airspace that is restricted from civilian air traffic over-flight, and another 7,000 square miles of Military Operating Area, which is shared with civilian aircraft. The 12,000-square nautical mile range provides a realistic arena for operational testing and training aircrews to improve combat readiness. A wide variety of live munitions can be employed on targets on the range.

The general topographic and vegetative features of the area may also mimic features in locations around the world where the military may potentially be involved. Figure ES-2 shows an example of one of the unique areas that could be used for practicing military maneuvers. The most important natural resource used by the military mission is the remoteness and the general physical and biotic character of the area. Maintaining ecosystem integrity while sustaining the mission environment is of primary importance to the USAF when considering new projects, either internally or for other wings or directorates.

Figure ES-2. Tolicha Peak on the Nevada Test and Training Range. NAFB photo library.

The INRMP has been developed to support the military mission while facilitating effective ecosystem and natural resource management for NAFB, CAFB, and the NTTR to minimize impacts of military operations on natural resources and develop an appropriate framework for natural resources management. The INRMP provides the guidance to assist new construction/expansion projects on NAFB, CAFB, and the NTTR while avoiding impacts to natural resources during the planning, designing, and management phases, where practicable. The INRMP ensures that landscaping at new construction areas and some existing facilities will use xeric native species where possible, especially where development interfaces with natural habitats. The INRMP also ensures that sensitive habitats that support species such as the Mojave population of the desert tortoise (hereafter desert tortoise) are also considered during planning, site selection, and decision-making processes.

Natural Resources of Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range

According to the Draft Legislative Environmental Impact Statement compiled by NAFB in 2017, approximately 5% of the land area of the NTTR is directly impacted by mission activities (USAF, 2017). Human disturbance is further minimized on the NTTR because of the high level of security that allows little to no public access. These management activities have resulted in 2.7 million acres remaining largely undisturbed by human activity. Consequently, the ecological communities occurring on the NTTR are less affected by anthropogenic activities (off road vehicle impacts, introduction of exotic species, vandalism, littering, etc.) than similar communities occurring outside the range area. Continued proper management of natural resources at the NTTR will ensure that these healthy plant and animal communities will be conserved.

In addition to the plant communities and topographic features of the NTTR, large game species, including mule deer, pronghorn antelope, and desert bighorn sheep ,are found on the NTTR. Of these species, only desert bighorn sheep are hunted on the range. The Nevada Department of Wildlife (NDOW) manages licenses, enforces seasons, and bag limits for hunting in the State of Nevada.

Due largely to its size and topography, NAFB along with CAFB and the NTTR encompass a remarkable assemblage of biodiversity for the Great Basin and Mojave Deserts. It is also home to the desert tortoise, which is listed by the ESA as threatened (Figure ES-3). The desert tortoise is also protected by the State of Nevada. In addition, 23 species of animals with some form of formal protection deriving from the State of Nevada or the Federal Government have been documented on NAFB and, or the

Figure ES-3. Desert tortoise on the Nevada Test and Training Range. NAFB Photo Library.

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NTTR. Appendix E provides a list of animal species that occur on NAFB, CAFB, and the NTTR and have either federal or state protective status.

Section 7 consultation and a Biological Opinion (BO) provided by the USFWS govern the oversight and management of desert tortoise. There are also monitoring and survey programs in place to observe and record other sensitive species. Management and monitoring programs for sensitive species are described in Chapter 7. In addition to wildlife, several rare plant species have been identified and mapped on the NTTR by the Nellis Natural Resources Program (NNRP).

Conclusion

A more guidance-structured approach in gathering biological information concerning plant and animal populations on NAFB, CAFB, and the NTTR has been underway for more than a decade. The INRMP recommends that plant and animal surveys continue to establish an information base for further refinement of management guidelines in the future. This information will allow for proper and judicious management of the natural resources present at NAFB, CAFB, and the NTTR.

It is the intent and purpose of the INRMP to support the military mission while conserving the natural resources found on NAFB, CAFB, and the NTTR. The INRMP will assist the military mission with guidance to ensure mission sustainability to the highest degree in accordance with the Sikes Act, to support the military mission by noting compliance with Sec. 670a of the Act, and to ensure no net loss in the capability of military installation.

1.0 OVERVIEW AND SCOPE

This INRMP was developed to provide for effective management and protection of natural resources. It summarizes the natural resources present on the installation and outlines strategies to manage those resources adequately. Natural resources are valuable assets of the USAF. They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of USAF adaptability in all environments. The USAF has stewardship responsibility over the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in sustainable ways. The primary objective of the USAF natural resources program is to sustain, restore, and modernize natural infrastructure to ensure operational capability and no net loss in the capability of USAF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the legal driver for the INRMP.

1.1 Purpose and Scope

The INRMP serves as a practical management guideline for the management of the natural resources on NAFB, CAFB, and the NTTR. The INRMP development and implementation will be integrated with the development and implementation of the general plan (GP) for NAFB, the NTTR Comprehensive Range Plan (CRP), the Integrated Cultural Resources Management Plan (ICRMP), the Bird/Wildlife Airstrike Hazard (BASH) plan, and the Wildland Fire Management Plan. The INRMP is "integrated" because

- it brings together USAF mission requirements and natural resource management goals within a single document;
- it communicates federal, state, and local regulations, requirements, and USAF Policy;
- it is integrated with other installation plans;
- it is derived from multiple scientific disciplines;
- it describes an integrated ecosystem approach to environmental management, considering information from the environment; and
- it provides guidelines to sustain and conserve native vegetation on the NTTR and to maintain realistic training areas while protecting fragile desert ecosystems.

A substantial amount of time and effort has been put into documenting various aspects of the environment and ecology of NAFB, CAFB, and the NTTR. While many gaps in the data have been filled, there remain aspects of the ecology that are not well understood for a variety of reasons, and the ongoing nature of major environmental challenges such as changing weather patterns require ongoing data collection and analysis to identify trends. Remoteness of some areas makes collecting data difficult, and access by scientists is often limited due to the priorities of the military mission.

The data that have been collected contribute to the effective management of natural resources in support of the USAF mission.

The INRMP will accomplish the following for NAFB, CAFB, and the NTTR.

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- Identify remaining data gaps.
- Recommend and prioritize tasks to fill those gaps.
- Provide the framework for a geographic information system (GIS) database that will maintain and store current and past natural resource data in a format to be used as a tool for natural resource management.
- Provide specific guidelines to assist managers in making decisions to support mission operations.

Because the INRMP must accommodate changes in the military mission, state and federal regulations, climate, and the environment, when preparing this document we will

- review past natural resource studies that are pertinent to management decisions;
- refer to past studies and provide copies of those studies in PDF format on a compact disk for use by interested readers;
- provide technical guidance to assist in decision-making;
- implement adaptive management; and
- provide an easily updated GIS database to catalog natural resources found on NAFB, CAFB, and the NTTR. The GIS database can be used by resource managers to identify sensitive areas on NAFB, CAFB, and the NTTR; thus, new facilities and targets can be sited not only based on the requirements of the mission, but also in a manner that minimizes impacts to the environment. The GIS database will be useful for developing environmental assessments (EAs), environmental impact statements (EISs), and other planning documents.

In summary, the INRMP document will use the knowledge of past studies to develop management guidelines.

This plan also summarizes potential future changes in climate at the installation and discusses the implications of these changes for natural resources and the mission. By incorporating climate change considerations into relevant sections of this plan, the installation addresses guidance from the following documents.

DoD Directive 4715.21, *Climate Change Adaptation and Resilience*, which states that DoD Component Heads shall integrate climate considerations into DoD Component policy, guidance, plans, and operations; assess and manage risks to built and natural infrastructure, including changes to natural resources management; and leverage authoritative environmental prediction sources for appropriate data and analysis products to assess weather and climate impacts.

Department of Defense Manual (DoDM) 4715.03, *Integrated Natural Resources Management Plan Implementation Manual*, Enclosure 5, states that INRMP contents should contain an assessment of natural resource management that includes effects of climate change. Enclosure 8 (Planning for Climate Change Impacts to Natural Resources) provides data sources and processes for incorporating climate considerations in INRMPs.

Air Force Manual 32-7003, *Environmental Conservation*, Section 3.10.3. (Climate Considerations for INRMPs), states that, “Climate variability and extreme climatic events may significantly affect native ecosystems and require the USAF to adjust natural resources management strategies to support military

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mission requirements and address the needs of sensitive species. The installation INRMP must consider historical regional trends in climate, projections of future climate change vulnerabilities, and risk to natural infrastructure and sensitive species by using authoritative, region-specific climate science. The INRMP should list (or include by reference) installation-specific historical climate data and region-specific climate projections. INRMP goals and objectives for ecosystem management and biodiversity conservation must employ an adaptive, ecosystem-based management approach that will enhance the resiliency of the ecosystem to adapt to changes in climate."

This document provides an analysis of potential climate impacts derived from downscaled global climate data. Coordinating with AFCEC, the Colorado State University team established a base historical timeframe and selected two future timeframes and two emission scenarios for the simulations. The emissions scenarios are based on assumptions about future worldwide changes in demographic development, socio-economic development, and technological change that are likely to result in different greenhouse gas concentrations in the atmosphere. All analyses in this report are based primarily on publicly available data, augmented with spatial data obtained through AFCEC, with appropriate permissions.

Climate projections do not predict extreme weather events, which are short-term events (e.g., hurricanes, flash floods, heat waves) . Instead, climate describes trends in temperature and precipitation over a long period of time (usually at least 30 years) for a given location. The best-available science is used to develop global climate models from which these downscaled projections are derived; however, there are gaps in data about the influence of phenomena such as changes in globally-significant ice sheets, which add to uncertainty in climate projections (Intergovernmental Panel on Climate Change [IPCC], 2014). Furthermore, the climate system is complex and driven by competing feedbacks and interactions among systems, so climate models can produce diverse and sometimes counterintuitive projections. The projections provided here are intended to demonstrate the range of conditions to which a manager may have to adapt. Each section of the report includes details about the data and methods used and key takeaways of the implications of the potential changes in climate on essential natural resources at the installation.

1.2 Management Philosophy

The DoD recognizes that conducting ecosystem management, as a whole rather than by species, can best sustain the environmental integrity of their facilities (Lillie and Ripley, 1998). The overall philosophy behind the INRMP is to provide natural resource management guidance within the context of the ecosystems management concept. Ecosystem management integrates scientific knowledge within a complex sociopolitical as well as values framework with the overall goal of protecting ecosystem viability over the long term (Grumbine, 1994).

Principles of ecosystem management include

- adaptive management for native wildlife and their habitats;
- representation of all native ecosystem types across their natural range;
- maintenance of ecological processes;
- management over periods of sufficient duration to maintain evolutionary potential of species and ecosystems; and
- accommodate human use and occupancy within these constraints (Grumbine, 1994).

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The goal in managing ecosystems on NAFB, CAFB, and the NTTR is to support the military mission through conservation and enhancement of ecosystem integrity. By carrying out monitoring programs as prescribed by federal and state environmental laws, USAF activities on NAFB, CAFB, and the NTTR are in compliance with said laws and avoid issues that could slow or halt mission activities. Furthermore, by having a proactive conservation strategy, the USAF can align the interests of the military mission with those of regulatory agencies. The principles of the USAF for ecosystem management will be to maintain or restore ecological processes, hydrologic processes, and ecosystem types across their natural range where practical and consistent with the military mission. The NNRP assumes the responsibility of managing the ecosystems within NAFB, CAFB, and the NTTR in coordination with USFWS and NDOW.

This INRMP provides guidance for the conservation of natural resources at NAFB, CAFB, and the NTTR. These guidelines have been developed within the context of the military mission of NAFB, CAFB, and the NTTR. The military mission takes precedence over any of the guidance provided by the INRMP, but, wherever possible and feasible, the execution of the military mission may be modified in a manner to meet the goals and objectives of the INRMP.

NAFB, CAFB, and the NTTR ecosystems are representative of two of the four North American deserts, the Mojave Desert and the Great Basin Desert. As a part of the implementation of the INRMP, these desert settings have highly variable growing seasons. The conditions require that monitoring programs be developed to define and prioritize the measurable parameters of natural resources, thus allowing for proper evaluation of the effectiveness of management measures. Dry periods produce very different observation results for plant populations and for many animal populations when compared to those appearing after wet periods. Because natural resources are continually changing, their responses to disturbances, management actions, weather, and climate can be quantified only after long-term monitoring efforts have been evaluated.

Environmental conditions that result in slow rates of biotic changes on NAFB, CAFB, and the NTTR also result in slow recovery rates for the ecosystems exposed to human induced stresses. Desert vegetation that is disturbed, whether by trampling, vehicles, grading, or ordnance, is unlikely to return to some semblance of its pre-disturbance condition during an average human lifetime without some form of active management. The slow recovery of disturbed desert ecosystems necessitates patient and far-sighted approaches to natural resources management. Many disturbed sites will not return to their pre-disturbance structure and function for decades. If such areas are to benefit from environmental restoration, remediation activities should begin at the earliest practical opportunity. Military operations directly impact approximately 5% of the NTTR; however, a legacy of ranching and mining activities on portions of the North Range continues to this day and needs to be accounted for in management and remediation planning by the USAF.

Climate change-adaptation strategies described in this plan are in alignment with the ecosystem management approach. Most depictions of the adaptive management cycle include phases for planning, acting, and evaluation. Managers should explicitly address vulnerabilities to changing climate at several stages of the adaptive management cycle. For guidance on the adaptive management process, a comprehensive guide has been developed to assist DoD installations in planning for adaptation (Stein et al., 2019).

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1.3 Authority

This INRMP is prepared with the authority of AFI 32-7064, as implemented by Air Force Policy Directive 32-70 (Environmental Quality) and DoD Instruction 4715.03 (Environmental Conservation Program). The authority to establish natural resources management programs at DoD installations is provided by the Sikes Act. Resource-specific authority documents are listed in Table 1-1 (also see Appendix A).

The Sikes Act, as amended, provides for cooperation between the Department of Interior (DoI) and DoD, along with state agencies, in the planning, development, and maintenance of fish and wildlife resources on military reservations throughout the U.S. For the purposes of this document, resource priorities include species and habitats for which Desert National Wildlife Refuge (DNWR) was established in 1936; desert bighorn sheep in particular, as well as other plant and wildlife species that are covered by other regulations, such as the ESA and MBTA. Additional concerns regarding species managed by the NDOW and Bureau of Land Management (BLM) have been included if they occur on or near the South Range of the NTTR.

Protection of plant and animal species identified as threatened or endangered is required by the ESA of 1973 (PL 93-205, as amended). Wildlife species that are candidates for listing are not protected by the ESA, but conservation of such species may reduce the likelihood of their listing by the USFWS. AFI 32-7064, section 8.1.2 makes it USAF policy to protect candidate species and state-protected species when practical. In addition, BLM Manual 6840, section 6840.01, "Special Status Species Management Manual for the Bureau of Land Management," identifies BLM special-status species as "(1) species listed or proposed for listing under the ESA and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA and which are designated as Bureau sensitive by the State Director(s). All federal candidate species, proposed species, and delisted species in the five years following delisting will be conserved as Bureau “sensitive species." In this INRMP, rare species that are federally listed or candidate species, state-protected species, or BLM special-status species are referred to as sensitive species or species of concern.

The MBTA of 1918, as amended (16 U.S. Code [U.S.C.] § 703–712 et seq.), implements treaties signed between the U.S. and Great Britain (acting on behalf of Canada), Mexico, Japan, and Russia and prohibits the take of migratory birds or any part, nest, or egg thereof, without appropriate permits. Currently, there are no regulations that allow incidental take resulting from otherwise legal activities; therefore, federal activities must strive to minimize such take. Executive Order (EO) 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, dated 11 January 2001, aims to protect migratory birds. In 2002, environmental provisions in appropriations legislation (PL 107-315) exempted from this prohibition all taking of migratory birds during military readiness activities until regulations have been fully implemented to authorize incidental taking of these species by DoD. On 30 August 2006, a memorandum of understanding (MOU) between the DoD and the USFWS to “Promote the Conservation of Migratory Birds” was approved and states that “readiness activities” by the Armed Forces are exempt from the incidental taking of migratory birds (DoD and USFWS, 2006). Other activities by the military mission are not exempt and must follow the regulations of the MBTA.

Public Land Order 4079, dated 31 August 1966, as amended by PL 106–65 (Sec. 3011[b][3]), established the DNWR for the protection, enhancement, and maintenance of wildlife resources, including bighorn sheep. The National Wildlife Refuge Administration Act of 1966 (16 U.S. C6688dd seq.), as amended by the Desert National Wildlife Refuge System Improvement Act of 1997, establishes a unifying mission for the refuge system. It defines a process for determining compatible uses for refuges and the requirements for preparing comprehensive conservation plans for refuges. The Act states that the major mission of the NWR System is focused singularly on wildlife conservation. The Act also reinforces and expands the "compatibility standard" of the Refuge Recreation Act; thus, it authorizes the Secretary to permit the use of any area within the refuge system for any purpose, including but not limited to hunting, fishing, public recreation and accommodations, and access whenever the Secretary determines such uses are compatible with the major uses for which the areas were established. The only real limitation to use is that it be compatible with wildlife. Therefore, Public law 106-65 directs the USAF and the DoI to manage the Joint Use Area as an NWR and to establish an MOU. In addition, under PL 106-65, the USAF was given primary jurisdiction over 112,000 acres of DNWR, which now constitute the bulk of the South Range of the NTTR. Table 1-1 gives a detailed list of documents that can be referenced further.

Table 1-1. Natural resource management authority documents and topics.

Resource	Authority Document	Document Topic
Climate Change	DoD Directive 4715.21, Climate Change Adaptation and Resilience	Directs DoD Component Heads to integrate climate considerations into DoD policies, guidance, plans, and operations; assess and manage risks to built and natural infrastructure, including changes to natural resource management; and leverage authoritative environmental prediction sources for appropriate data analysis products to assess weather/climate impacts.
	Department of Defense Manual (DoDM) 4715.03, Integrated Natural Resources Management Plan Implementation Manual	States that INRMP contents should contain an assessment of natural resource management that includes effects of climate change.
	Air Force Manual 32-7003, Environmental Conservation, Section 3.10.3. Climate Considerations for INRMPs	States that changing climate conditions may have significant effects on native ecosystems, thus requiring that the USAF adjust natural resources management strategies to support military mission requirements and address the needs of sensitive species. As such, INRMPs must take into consideration historical trends in regional climate and projections of future climatic conditions, including resulting vulnerabilities of and risks to natural infrastructure and sensitive species through authoritative, region-specific climate science.
Birds and Wildlife	Sikes Act section 107 (16 U.S.C. 670e-2)	Professionally trained personnel required to administer fish and wildlife management programs.
	Neotropical Birds Conservation Agreement	Federal, state, and nongovernmental organizations, including USAF, conserve these birds.
	Bald and Golden Eagle Protection Act	Prohibits take of bald eagles and golden eagles.

Table 1-1. Natural resource management authority documents and topics.

Resource	Authority Document	Document Topic
Birds and Wildlife	MOU between the DoD, USFWS, and International Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resources Management Program on Military Installations, dated 31 March 2006	Provides the roles and responsibilities of the DoD and other agencies for natural resources management on military installations.
	Watchable Wildlife MOU	Conservation organizations and federal agencies, including USAF, agree to develop program.
	Sikes Act section 101(b)1)(H) (16 U.S.C. section 670a (b)(1)(H))	Requires wildlife law enforcement.
	Desert National Wildlife Refuge Comprehensive Conservation Plan (USFS, 2009b)	States as goals; maintaining and restoring when necessary healthy populations of wildlife in general and bighorn sheep in particular on DNWR lands.
	AFI 91-212	BASH program.
	AFI 32-7064	Integrated Natural Resources Management.
	Air Force Policy Directive 32-70	Installations maintain species and habitat inventory.
	EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	Protection of migratory birds.
	MOU Between the U.S. DoD and USFWS to Promote the Conservation of Migratory Birds, dated 5 September 2014	Protection of migratory birds with respect to military mission activities.
	Migratory Bird Treaty Act	Prohibits take of migratory birds.
Listed and Sensitive Species	Endangered Species Act (PL 93-205)	Protection of federally listed species.
	AFI 32-7064	Protection of sensitive and state-listed species.
	AFI 32-7064	Integrated Natural Resources Management.
Listed and Sensitive Species	Desert National Wildlife Refuge Comprehensive Conservation Plan (USFWS, 2009b)	Maintain the existing natural diversity of native wildlife and plants, including special-status species, at DNWR.
Wetlands	MOU between DoD and Bat Conservation International	Provides guidance for conservation of bats on military installations.
	EO 11990, Protection of Wetlands	Federal agencies protect wetlands.
Wetlands	AFI 32-7064	Integrated Natural Resources Management.

Table 1-1. Natural resource management authority documents and topics.

Resource	Authority Document	Document Topic
	CWA Section 404 (PL 95-217, as amended)	Wetland and surface water protection and documentation requirements.
	EO 11988, Floodplain Management	Federal agencies protect floodplains.
	AFI 32-7064	Integrated Natural Resources Management.
	AFI 32-1053	Major commands must approve pesticides contracts, pesticide applications.
Floodplains	AFI 32-7064	Integrated Natural Resources Management—Sections on Grounds Maintenance, etc.
	AFI 32-1053	Pesticide choices.
	PL 93-629	Noxious weed control.
Grounds Maintenance	AFI 32-7064	Integrated Natural Resources Management.
	2003 Nellis Pest Management Plan	Pesticide/herbicide application.
	AFI 32-7064	Integrated Natural Resources Management.
Pest Management	EO 13112 Invasive Species	Prevent the introduction and spread of invasive plant and animal species.
	Refuge Administration Act of 1966	USFWS given responsibility of managing NWRs.
	National Environmental Policy Act	Lead agency of any federal action potentially impacting the environment must prepare an EA or EIS for the action.
Invasive Species	AFI 13-212	Range Planning and Operations: Overall management and policy of ranges.
	MOU between DoD and USDA Natural Resources Conservation Service, dated 8 November 2006 ,on Cooperative Natural Resource Conservation	This MOU includes collaborating with the National Resources Conservation Service, state officials, and private landowners in the development of land management practices.
Wild Horse and Burro Management	Wild Horses and Burros Act (16 U.S.C. 1331–1340; 85 Stat. 649)	Management and control of wild horses and burros.
	Wild Free-Roaming Horse and Burro Act of 1971, as amended	Requires the protection, management, and control of wild free-roaming horses and burros on public lands.

Table 1-1. Natural resource management authority documents and topics.

Resource	Authority Document	Document Topic
Wild Horse and Burro Management	MOU between DoD, USFWS, International Association of Fish and Wildlife Agencies on Cooperative Integrated Natural Resource Program on Military Installations, dated 31 January 2006	This MOU ensures that the INRMP is developed in a manner to complement the management guidelines presented in the Nevada State Wildlife Action Plan and the USFWS Comprehensive Conservation Plan for DNWR.
	1962 Cooperative Agreement between NAFB Commander and BLM Nevada State Director	This Cooperative Agreement established the Nevada Wild Horse Range for the management of wild horses.
Desert National Wildlife Range	AFI 32-7064	Integrated Natural Resources Management.
	EO 7373, dated 20 May 1936	Established the Desert Game Range in Nevada.
	Public Land Order 4079, dated 31 August 1966, as amended by PL 106–65 (Sec. 3011[b][3])	Established the DNWR for the protection, enhancement, and maintenance of wildlife resources, including bighorn sheep.
	Desert National Wildlife Refuge Comprehensive Conservation Plan (USFWS, 2009b)	Sets five goals for the management of wildlife, land, and facilities on DNWR.
	National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd et seq.), as amended by the National Wildlife Refuge System Improvement Act of 1997	Provides for the administration and management of the NWR System.
General Land Management	The Military Lands Withdrawal Act (MLWA) of 1999, PL 106-65	Delineates responsibility of DoI and DoD for management of resources on withdrawn lands.
	National Environmental Policy Act	Lead agency of any federal action potentially impacting the environment must prepare an EA or EIS.
	AFI 13-212	Range Planning and Operations; Overall management and policy of ranges.
	MOU between DoD and USDA Natural Resources Conservation Service, dated 8 November 2006, on Cooperative Natural Resource Conservation	Includes partnering with the National Resources Conservation Service, state officials, and private landowners in the development of land management practices.

Table 1-1. Natural resource management authority documents and topics.

Resource	Authority Document	Document Topic
General Land Management	MOU between DoD, USFWS, and International Association of Fish and Wildlife Agencies on Cooperative Integrated Natural Resource Program on Military Installations, dated 31 January 2006	Ensures that the INRMP is developed in a manner to complement the management guidelines presented in the Nevada State Wildlife Action Plan and the USFWS Comprehensive Conservation Plan for DNWR.
	AFI 32-7064	Integrated Natural Resources Management.
	MLWA of 1999: PL 106-65	Delineates responsibility of DoI and DoD for management of resources on withdrawn lands.

1.4 Integration with Other Plans

The primary goal of scientific data collection and ecosystem monitoring is to develop a working understanding of the structure, composition, and function of regional and installation ecosystems. Data will be collected and evaluated to support the military mission while promoting ecosystem management.

Table 1-1 lists many of the laws, MOUs, and instructions that the NNRP must work within while performing management duties on NAFB, CAFB, and the NTTR. These guidelines often work in tandem; however, at other times personnel must be aware of and mitigate any conflicting activities prescribed by different regulations. NNRP personnel are responsible for collaboration with outside regulators as well as implementation of federal and state environmental and conservation laws. As such, communication with agencies is essential to ecosystem management on NAFB, CAFB, and the NTTR.

Within the USAF, an environmental impact analysis process (EIAP) is written into AFI32-7062 regarding comprehensive planning. Planners shall alert the EIAP Program Manager as early in the planning process as possible to initiate requirements of the National Environmental Policy Act (NEPA). Planning activities must integrate the NEPA processes to ensure that planning and decisions reflect environmental values, identify alternatives considered, document which alternatives would be carried forward for full analysis, including the rationale for those dismissed, and to avoid delays later in the process and potential conflicts. Additionally, EIAP supports the formulation of strategies to avoid or mitigate adverse environmental impacts. The INRMP supports these activities in that it outlines conservation activities that are mandatory according to law, and it delineates the responsibilities of stakeholders and agencies, thus providing guidance as to who needs to be contacted and collaborated with regarding planning activities.

Another program where integration with the INRMP is necessary is the Air Installation Compatible Use Zone (AICUZ) program. The purpose of the AICUZ program is to achieve compatibility between air installations and neighboring communities by conducting the following actions.

- Protect the health, safety, and welfare of civilians and military personnel by encouraging land uses compatible with aircraft operations.

- Protect Navy and Marine Corps installation investment by safeguarding the installation's operational capabilities.
- Reduce noise impacts caused by aircraft operations while meeting operational, training, and flight safety requirements, both on and in the vicinity of air installations.
- Inform the public about the AICUZ program and seek opportunities for cooperative efforts to minimize impacts of noise and aircraft accident potential by promoting compatible development in the vicinity of military air installations.

Given that land use is a large component of the AICUZ program, the INRMP delineates how future development is to be overseen from an environmental perspective. It also indicates which pertinent laws, regulations, and collaborations must be addressed regarding changes in land use and construction.

To avoid potential aircraft collisions with birds and wildlife, USAF installations must develop a BASH plan. BASH plans and INRMPs are mutually supportive in that both plans aim to reduce the number of birds and wildlife that are struck by planes while also ensuring any activities conducted to reduce these collisions promote the USAF mission.

Invasive species management is a goal for both the INRMP and the Integrated Pest Management Plan (IPMP) on USAF lands. Both plans are subject to provisions of the National Invasive Species Management Plan and the Federal Noxious Weed Act (7 U.S.C. 2814; National Invasive Species Council [NISC], 2016). Pest or exotic species can impact ecological integrity and cause a number of problems for the military mission. Goals set by both the INRMP and the IPMP are in concert with outside land and resource management agencies and require cooperation. The INRMP defines the responsibilities of the USAF and outside agencies in regard to land and wildlife management, including the control of pest and exotic species.

Ecosystem management requires quality data sets for understanding individual components of the ecosystem and how they interact with and affect each other. Indicator species within specific plant communities can be selected and periodically monitored to represent snapshots of the overall health of the ecosystem. Existing data from previous and ongoing studies will be augmented with data from surveys designed to provide relevant information in a cost-effective manner. Members of the 99 CES staff are collecting and compiling ecosystem management information from diverse sources in a broad variety of disciplines to help achieve this goal. These sources include the scientific literature, as well as legal documents, and government reports from military sources, federal and state land agencies, and conservation organizations. Moreover, conservation activities on NAFB, CAFB, and the NTTR require personnel to be versed in many different disciplines, including wildlife management, botany, landscape ecology, and community ecology. Personnel also should be versed in the various laws and regulations affecting activities on the bases and ranges. As more elements of the NAFB, CAFB, and the NTTR ecosystem are described and cataloged, ecosystem management decisions can be made more easily by managers for the daily operations of NAFB, CAFB, and the NTTR and for proper siting of future military development in the area.

To achieve the fundamental premise of ecosystem management, other monitoring efforts will be needed. Monitoring may include periodically surveying and/or monitoring (1) rare or sensitive plant populations; (2) indicator plant or animal species, such as vegetative species in a community that co-occur with a target species; (3) wetland-associated plant species listed on the national wetland plant list; (4) species known to occur on desert pavement as a means of monitoring for disturbance; and (5) documenting changes in vegetation communities once initial survey work is completed. Monitoring allows managers to evaluate the health of an ecosystem before, during, and after management activities. Hence, monitoring will be a key tool for ensuring that ecosystem management actions are environmentally sound and developed and implemented with the ultimate goal of biodiversity conservation within the constraints of the NAFB, CAFB, and the NTTR mission.

2.0 INSTALLATION PROFILE

2.1 Installation Overview

2.1.1 Location and Area

NAFB, CAFB, and the NTTR are located within the Basin and Range physiographic province of the western U.S. (Fenneman, 1931). It is a region typified by broad desert valleys bounded by relatively high mountain ranges. These areas lie within two major geographic regions of the U.S., the Mojave Desert and the Great Basin Desert. NAFB, CAFB and the South Range of the NTTR lie within the Mojave Desert. The North Range of the NTTR lies largely within the Great Basin Desert (Figure 2-1).

2.1.1.1 Nellis Air Force Base

NAFB is located northeast of the City of North Las Vegas in Clark County, Nevada (Figure 2-2). It occupies approximately 14,163 acres. The Desert Wells Annex is one mile west of the NAFB main gate and the Small Arms Range (SAR) is three miles north of NAFB. The average elevation of NAFB is approximately 1,900 feet above mean sea level (MSL). NAFB is divided into three areas. Area I includes base facilities southeast of Las Vegas Boulevard. Aircraft facilities, administrative buildings, residential housing, recreation facilities, and personnel services are located here. Area II is in the northeast portion of NAFB and contains the 820th Red Horse squadron, Nellis Gun Club, 896th Munitions Squadron, and the largest above-ground weapons storage complex in the U.S. Area III contains facilities northwest of Las Vegas Boulevard. It includes the Mike O'Callaghan Federal Hospital, administrative areas, a reserve center, a solar energy development, and industrial facilities. The Desert Wells Annex, a small lot of disturbed desert one mile west of the main gate on Craig Road, is also managed by NAFB. The SAR is the final section of NAFB. The SAR comprises 10,941 acres of land and is disjunct from the rest of NAFB, lying north of Interstate 15, east of County Highway 215, west of U.S. Highway 93, and south of the DNWR. Except for a few buildings and access roads to support a small arms firing range, the SAR is undeveloped desert scrub. The elevation of the SAR varies from 2,100 to 3,600 feet MSL.

2.1.1.2 Creech Air Force Base / Nevada Test and Training Range

CAFB is located near the town of Indian Springs, Nevada, approximately 45 miles northwest of Las Vegas, along U.S. Highway 95 (US-95) (Figure 2-3). USAF facilities are found on both the north and south side of the highway, with the majority of assets located to the north (e.g., runways; hangars; and maintenance, administrative, and operational facilities). CAFB is home to the famed "Hunters" of the 432d Wing and 432d Air Expeditionary Wing. The base also hosts the operations of the 556th Test and Evaluation Squadron, 99th Ground Combat Training Squadron, Air Force Reserve's 78th Reconnaissance Squadron, and Nevada Air National Guard's 232nd Operations Squadron.

The NTTR is an expansive area, covering approximately 2.9 million acres of federally-owned lands that were withdrawn from DoI management for military use under PL 106-65. The NTTR is a unique range area because it has excellent flying weather year-round. It contains more than 1,600 bombable targets. The physical and environmental conditions on the NTTR provides a realistic arena for operational testing and training aircrews to improve combat readiness. Restricted public access combined with the remoteness of the NTTR allows for a wide variety of live munitions to be employed on the range.

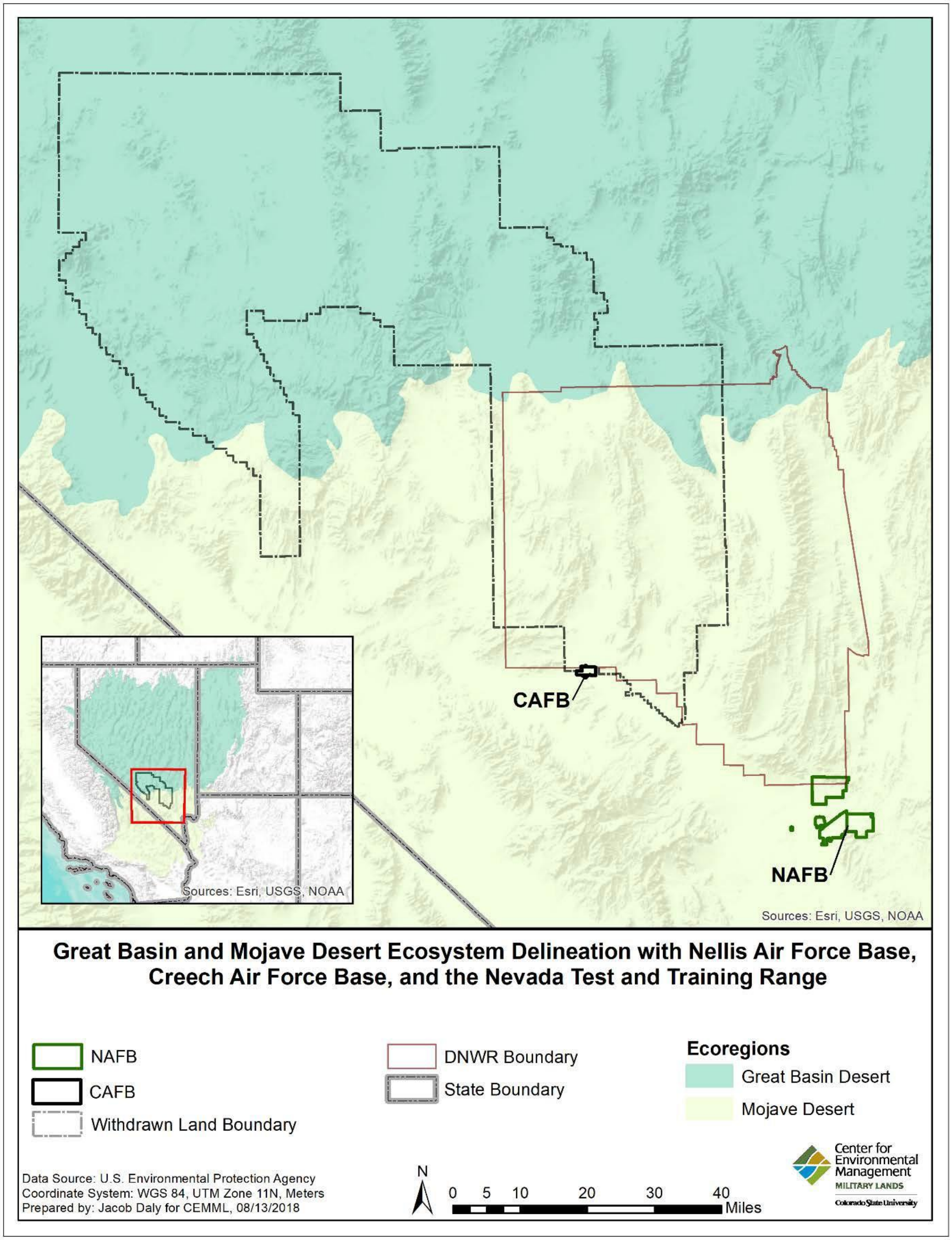

Figure 2-1. Location of Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range with respect to the Great Basin and Mojave Desert Ecoregions.

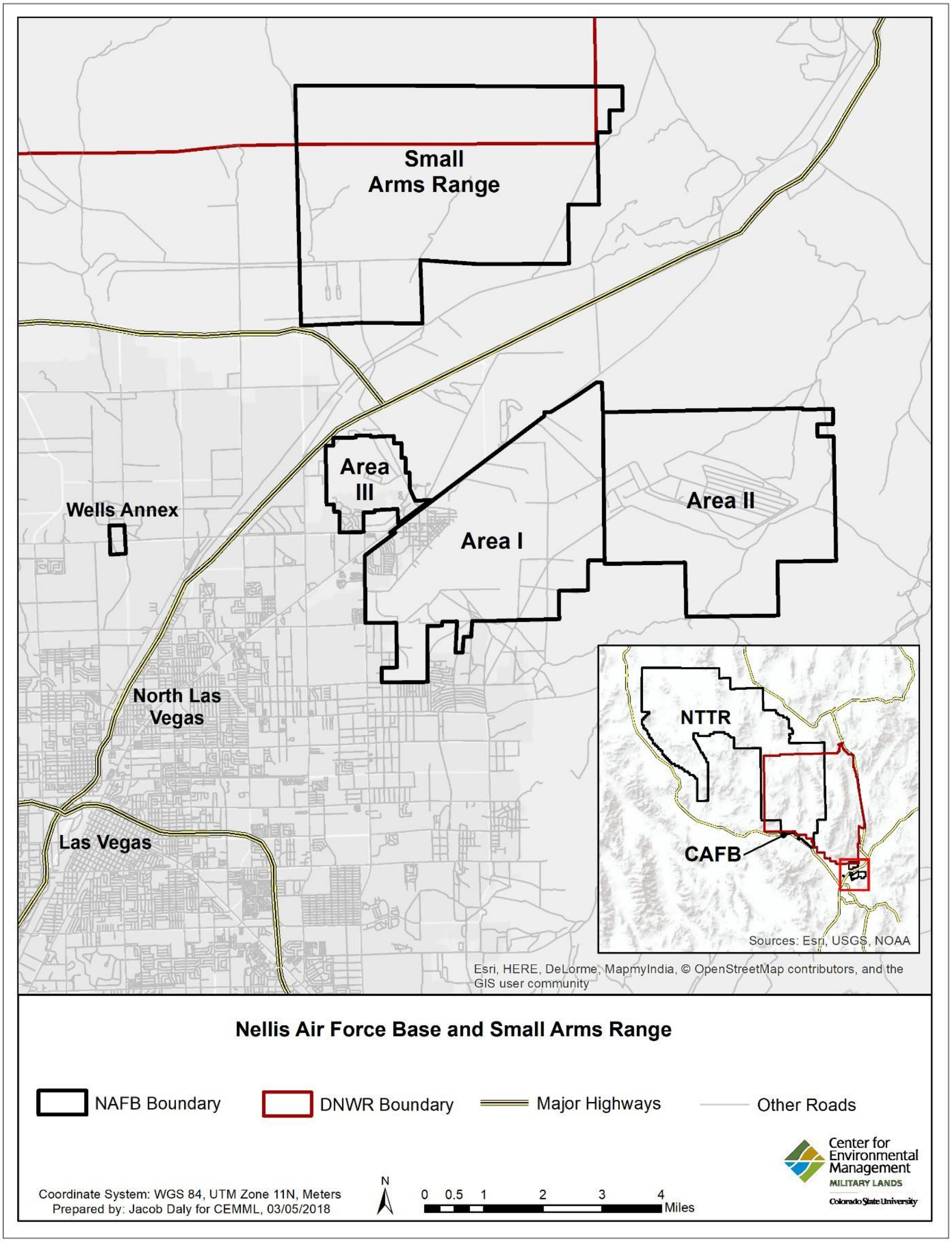

Figure 2-2. Layout of Nellis Air Force Base and the Small Arms Range.

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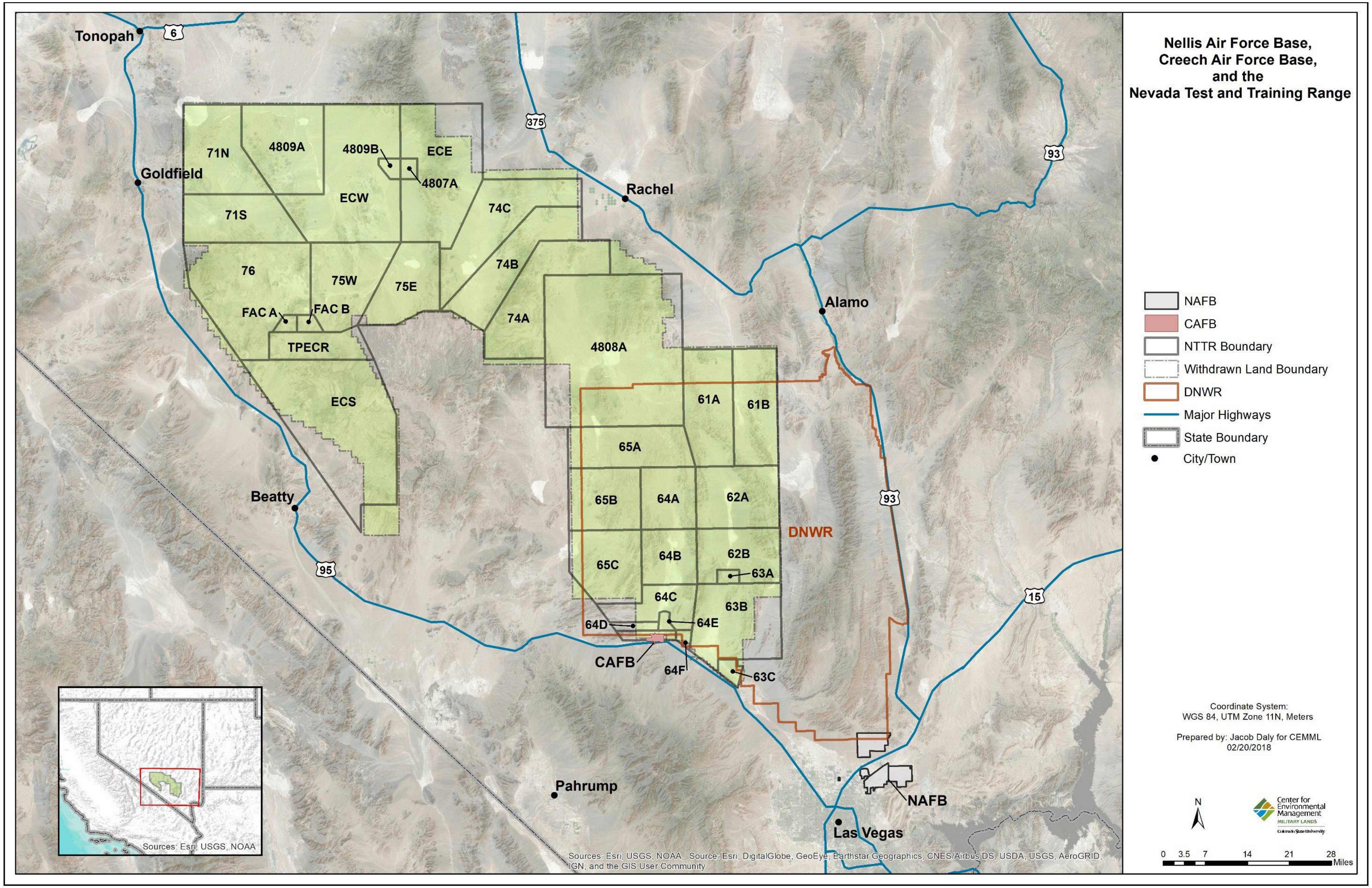

Figure 2-3. Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range boundaries and extent.

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Section 3014 of PL 106-65 identifies management of lands renewed for the military mission. Section 3014 notes that "the Secretary of the Interior shall manage the lands withdrawn pursuant to the Federal Land Policy and Management Act of 1976, other applicable law, and this subtitle." PL 106-65 also states that management plans will be developed by the Secretary of the Interior "…after consultation with the Secretary of the military department concerned." The Record of Decision for the BLM Resource Management Plan (RMP) for the NTTR was approved on 1 July 2004. The DNWR, as with all NWR lands, is managed by the DoI Secretary under the National Wildlife Refuge System Administration Act of 1966, as amended in 1997. PL 106-65 directs the Secretary to manage the DNWR portion of the NTTR as a NWR.

The NTTR, often collectively referred to as the "Range," is divided into two parts. The South Range occupies approximately one-third of the total NTTR lands. The North Range accounts for the remaining two-thirds. The NTTR accounts for approximately 12.4% of the 25 million acres of U.S. domestic DoD lands, and almost one-third of the 9 million acres of USAF lands in the U.S. It lies in portions of Clark, Lincoln, and Nye Counties, northwest of the city of Las Vegas. The South Range/DNWR lands are co-managed by the USAF and USFWS under an MOU (November 1997). The North Range includes the 1,330,540-acre Nevada Wild Horse Range (NWHR), established in 1962. Management of wild horses on the NWHR is the responsibility of the BLM's Southern Nevada District, Pahrump Field Office. The named and numbered areas that make up the North and South Ranges are shown in Figure 2-3.

2.1.2 Installation History

2.1.2.1 Nellis Air Force Base

Between 1929 and 1941, NAFB property was used for private flight operations. The base at that time consisted of dirt runways, a few buildings, and some utility service. The City of Las Vegas purchased the property in 1941, and later offered it to the Army Air Corps (Paher, 1971). The Army Air Corps Gunnery School used the site for training between 1941and 1942 (Paher, 1971). The USAF took command in 1949, and in 1950 renamed it Nellis Air Force Base (Paher, 1971). The Tactical Air Command assumed command of NAFB in 1958, and the Tactical Fighter Weapons Center was established there in 1966 (Paher, 1971). The 554th Operations Support Wing was activated in 1979. Command responsibility for NAFB was transferred to the Air Combat Command on 1 June 1992.

2.1.2.2 Nevada Test and Training Range

The NTTR includes portions of Clark, Lincoln, and Nye counties in Nevada. These lands were the domain of Native American tribes that include the Mojave, Shoshone, and Paiute peoples. Settlement of these areas by Euro-Americans did not begin until the late nineteenth century. Cattle ranching brought small numbers of people to the area (Thompson and West, 1881; Zanjanik 1988; McMullen et al., 1995), but thousands came during the mining booms, particularly to areas around the towns of Tonopah and Goldfield in the early 1900s (Shearer, 1905; Elliott, 1966). The Mellan and Clarkdale mining districts were established in the 1930s. As the twentieth century progressed, demand for vehicle access to the mines increased, which brought more roads into areas that would eventually become the NTTR (Shearer, 1905; Carpenter et al., 1953; Zanjani,1988).

The NTTR was originally established in 1940, when approximately 846,000 acres of the Desert Game Range (now the DNWR) was reserved for use by the War Department as a weapons and gunnery range. Airfields and military lands added over time developed into the Nellis Range Complex. A December 1949 MOU (updated in 1997, 2013, and 2014) between USAF and USFWS permits the military to use the part of the DNWR that extends northwest from Las Vegas, over the Las Vegas, Sheep, and Pintwater Mountain Ranges (USAF and USFWS, 1997, 2013, 2014). Dry lakebeds in this area subsequently have been used by the military for air-to-ground and air-to-air bombing practice.

In December 1941, plans were made to develop Indian Springs as an AT-6A training center on land granted on 22 September 1941. Construction started in February of 1943 and came to include nearly 50 buildings. Use of the Indian Springs Air Field slowed after June of 1945, as the Fixed Gunnery Department was closed. Under the Department of the Air Force, NAFB, which itself was inactive between 1947 and 1949, reactivated Indian Springs in October 1950, calling it the Indian Springs Air Force Base, later renaming it in April 1964 (NAFB, 1993a). On 20 June 2005, the USAF renamed Indian Springs Air Force Auxiliary Field as CAFB in honor of Gen. Wilbur L. Creech.

On the North Range, the Tonopah Test Range was among the areas designated by President Franklin D. Roosevelt to be included in the Las Vegas Bombing and Gunnery Range. This effectively cleared up civilian titles in areas near Tonopah, Nevada (NAFB, 1993a), and, in August of 1941, about 2,500 acres were transferred to NAFB jurisdiction. More than 82,500 acres were added to military uses in 1963. Today, the NTTR covers about 2.9 million acres of land. Originally developed as a training center for Army pilots, the adjacent Tonopah Army Air Field served over 6,000 personnel in 1940. The Tonopah Test Range was developed by the Atomic Energy Commission in 1957, and the four Roller Coaster events (atomic weapons tests) were carried out in 1963 and resulted in plutonium contamination of four areas totaling about 193 acres (Science Applications International Corporation, Inc., and Desert Research Institute [SAIC and DRI], 1999). Several divisions of the NTTR are used for electronic warfare, which began in 1975. The Stealth F-117A program was developed at the Tonopah Test Range (as acknowledged in 1988), and its 37th Fighter Wing was inactivated in 1992. Currently the NTTR is used for training, testing, and weapons evaluation operations by the USAF, U.S. Army, U.S. Marine Corps, U.S. Navy, Air National Guard, Department of Energy (DoE), reserve forces, and other federal agencies. Foreign military allies of the U.S. also train here.

2.1.3 Military Missions

2.1.3.1 United States Air Force Warfare Center

The U.S. Air Force Warfare Center (AFWC) is located at NAFB and reports directly to the ACC Center. It was founded on 1 September 1966 as the U.S. Air Force Tactical Fighter Weapons Center, it was later renamed AFWC.

Purpose

The AFWC exists to ensure that deployed forces are well trained and well equipped to conduct integrated combat operations. From testing and tactics development programs to training schools and venues, AFWC provides airmen with proven and tested technology, the most current tactics, superb academic training and a unique opportunity to practice integrated force employment. The AFWC vision, mission, and priorities are central to supporting the ACC's mission to provide dominant combat airpower for America with Warrior Airmen committed to excellence, trained to fly, fight, and win . . . anytime, anyplace.

Commander's Vision and Mission

The mission of the AFWC is to develop innovative leaders and full-spectrum capabilities through responsive, realistic, and relevant testing, tactics development, and advanced training across the full spectrum of warfare. The AFWC's vision is a team of proud, professional, and highly-skilled airmen who, through innovation, influence and support the USAF and Joint partners with responsive, realistic, and relevant testing, tactics development, and training across air, space, and cyberspace domains.

2.1.3.2 Nellis Air Force Base

NAFB, a part of the USAF's ACC, is located approximately eight miles northeast of Las Vegas. The base itself covers more than 14,000 acres, while the total land area occupied by NAFB and its restricted ranges is about 5,000 square miles. An additional 7,700 square miles of airspace north and east of the restricted ranges are also available for military flight operations.

NAFB is a major focal point for advanced combat aviation training. Its mission is accomplished through an array of aircraft, including fighters, bombers, refueling aircraft, and aircraft used for transport, close-air-support, command and control, and combat search and rescue. The NAFB work force of about 9,500 military and civilians makes it one of the largest single employers in southern Nevada. The total military population numbers more than 40,000, including family members and military retirees in the area.

99th Air Base Wing
Activated in October 1995, 99 ABW is the host wing for NAFB and CAFB. The wing provides installation support for more than 10,000 personnel assigned to NAFB, CAFB, and the NTTR. Three groups are assigned to the wing: 99th Mission Support Group, 99th Medical Group, and the 799th Air Base Group.

99th Civil Engineering Squadron
The 99th Civil Engineering Squadron (99 CES), via the 99 CES Installation Management Flight, Environment Element, Environmental Assets Section (99 CES/CEIEA) oversees the NNRP.

53rd Wing
Located at Eglin Air Force Base, Florida, the 53rd Wing (53 WG) serves as the focal point for the combat air forces in electronic combat, armament and avionics, chemical defense, reconnaissance, command and control, and aircrew training devices. The 53 WG is also responsible for operational testing and evaluation of new equipment and systems proposed for use by the forces. On NAFB, CAFB, and the NTTR, the 53rd supports six different flights of fighter and helicopter aircraft: A-10, F-15C, F-15E, F-16C, F-22A Raptor, and HH-60G. The 53 WG conducts operational tests for ACC on new hardware and upgrades to each of the five aircraft in a simulated combat environment.

505th Command & Control Wing
The 505th Command and Control Wing, represented by the 505th Test and Evaluation Group at NAFB, oversees the operations of the 505th Test Squadron. This 505th Test Squadron's mission is to integrate air, space, and cyber capabilities by conducting operational test and evaluation, developing advanced tactics, techniques, and procedures supporting data exchange and architectures to ensure all source information is available to the warfighter. In addition, the 505th Test Squadron supports Combined Air and Space Operations Center training to produce fully trained joint and multinational warfighters at the operational level of war.

Air Force Joint Test Program Office
The mission of the Air Force Joint Test Program Office is to generate, develop, and support Joint Test activities that enhance USAF capabilities and mission effectiveness in joint operations. The is an effort by the Office of the DoD Secretary designed to help the services solve inter-service operational problems in a joint environment and alleviate test and evaluation difficulties through work on testing methodologies. The

Air Force Joint Test Program Office provides continuous, proactive management of USAF participation in the Office of the Secretary of Defense Joint Test & Evaluation Program.

57th Wing

The 57th Wing provides advanced aerospace training to world-wide combat air forces and showcases aerospace power to the world while overseeing the dynamic and challenging flying operations at NAFB. It manages all flying operations at NAFB and conducts advanced aircrew, space, logistics, and command and control training through the USAF Weapons School, Red Flag and Green Flag exercises. Important components of the training include adversary tactics replication (provided by the wing's aggressor squadrons) and graduate-level instruction and tactics development (accomplished through each of its schools). The wing also supports the AFWC's test and evaluation activities and showcases U.S. air power through the USAF Flight Demonstration Squadron, the "Thunderbirds."

2.1.3.3 Creech Air Force Base

Current Operations

The growth of the global remotely piloted aviation mission, to include aircrew training as well as supporting, directing, and coordinating combat sorties halfway across the globe, continues to the present. On 13 March 2007, the arrival of the first MQ-9 Reaper remotely piloted aircraft at CAFB marked another milestone in the base's growing fleet of remotely piloted aircraft. The USAF activated the 432nd Wing on 1 May 2007 and, with the activation of the 432nd Air Expeditionary Wing on 15 May 2008, formally recognized the full spectrum of these operations. CAFB also continues to serve as the aerial demonstration training site of the USAF's Thunderbirds and to engage in daily overseas Contingency Operations as the home base of remotely piloted aircraft systems that fly missions across the globe.

Major Units

The 432nd Wing and 432nd Air Expeditionary Wing "Hunters" consist of combat-ready Airmen who fly MQ-9 Reaper remotely piloted aircraft (RPA) in direct support to the joint forces warfighter. The RPA systems provide real-time intelligence, surveillance, and reconnaissance, as well as precision attack against fixed and time-critical targets. The "Hunters" also conduct RPA initial qualification training for aircrew, intelligence, weather, and maintenance personnel. The wing oversees operations of the 432nd Operations Group (OG), 432nd Maintenance Group, 732nd OG, 11th Attack Squadron (ATKS), 15th ATKS, 17th ATKS, 18th ATKS, 20th ATKS, 22nd ATKS, 30th RS, 42nd ATKS, 44th RS, 89th ATKS, 867th ATKS, 432nd Operations Support Squadron, 432nd Aircraft Maintenance Squadron, 432nd Maintenance Squadron, and 432nd Aircraft Communications Maintenance Squadron. Various Air National Guard and Air Force Reserve units also support the wing's missions.

The base also houses the operations of the 556th Test and Evaluation Squadron and 99th Ground Combat Training Squadron, along with those of the Air Force Reserve's 78th and 91st Attack Squadrons, Nevada Air National Guard's 232nd Operations Squadron, and various other Air Force Reserve and Air National Guard units around the country. The missions of these and other tenant units are supported by the 799th Air Base Group, a geographically separated unit of the host 99 ABW at NAFB.

The 799th Air Base Group, "Diamondbacks," consists of the 799th Air Base Squadron and the 799th Security Forces Squadron. These squadrons provide critical support functions, including base security, civil engineering capabilities, force support, logistics readiness, communications, and medical support.

432D Operations Group

The 432nd OG employs remotely piloted aircraft in 24/7/365 Combat Air Patrols in support of combatant commander needs and deploys combat support forces worldwide. This includes combat command and control, tactics development, intelligence support, weather support, and standardization and evaluation oversight for the USAF ACC, Air Forces Central Command, Air Force Material Command, Air National Guard, Air Force Reserve Command, and Royal Air Force remotely piloted aircraft units. The group is also responsible for all air traffic control, airfield management, and weather services for operations at CAFB. The 432nd OG currently oversees global operations of six squadrons: 11th ATKS, 15th ATKS, 20th ATKS, 42 ATKS, 89th ATKS, 489th ATKS, and the 432nd Operations Support Squadron.

432D Maintenance Group

The 432nd Maintenance Group ensures that Airmen, MQ-9 aircraft, ground control stations, Predator Primary Satellite Links, and a global integrated communications network are fully mission capable to support aircrew training, combat operations, operational test and evaluation, and natural disaster support. The 432nd MXG currently oversees three squadrons: 432nd Aircraft Maintenance Squadron, 432nd Maintenance Squadron and the 432nd Aircraft Communications Maintenance Squadron.

732D Operations Group

The 732nd OG employs remotely piloted aircraft in theaters across the globe year-round. The group also trains and equips forces to provide special capabilities and develops techniques and procedures with new technology to provide cutting edge combat support for worldwide operations requiring remotely piloted aircraft. The group is a total force unit comprised of members from both the Nevada Air National Guard and the Air Force Reserves. The 732nd OG oversees global operations of four squadrons: 17th ATKS, 22nd ATKS, 30th RS, 44th RS, and the 867th ATKS.

799th Air Base Group

The 799th Air Base Group is comprised of two squadrons that enable success through innovative base support and training. The 799th Air Base Squadron provides mission ready Airmen, infrastructure, services and communications support to enable the CAFB mission and community success through innovative base support. The 799th Security Forces Squadron also provides integrated defense for CAFB. The chart in Figure 2-4 shows the organizational structure**.**

2.1.4 Nevada Test and Training Range

The Nevada Test and Training Range, formerly the 98th Range Wing, provides the warfighter a flexible, realistic and multidimensional battlespace to test tactics development, and advanced training in support of U.S. national interests (Figure 2-3). The NTTR also provides instrumentation and target maintenance support for Green Flag-West at the National Training Center and Leach Lake Tactics Range.

As a major range test facility base activity, the NTTR supports the DoD advanced composite force training, tactics development, and electronic combat testing, as well as DoD and DoE testing, research, and development. The NTTR hosts numerous Red Flag and USAF Weapons School exercises each year, as well as various test and tactics development missions.

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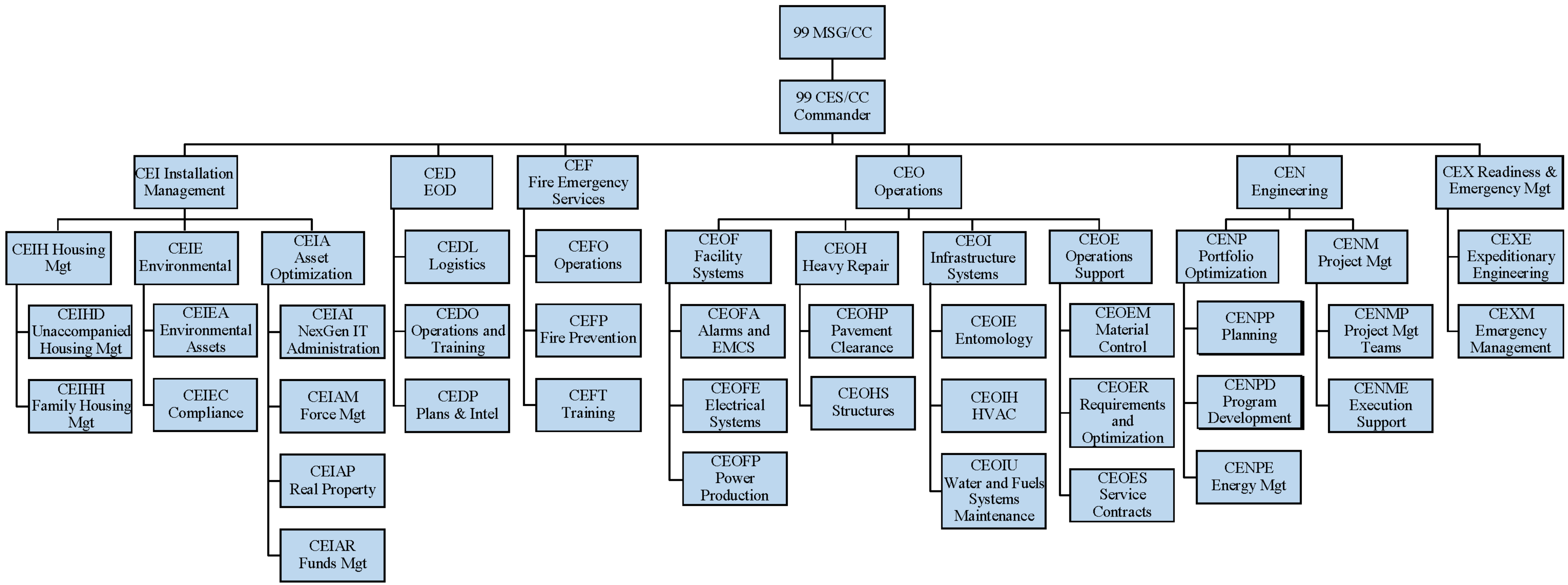

Figure 2-4. Organizational chart for Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

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The NTTR coordinates operational and support matters with major commands, other services, DoE and DoI as well as other federal, state, and local government agencies. The NTTR acts as the single point of contact for range customers.

2.1.4.1 Desert National Wildlife Refuge

President Franklin D. Roosevelt issued Executive Order 7373 on 20 May 1936 establishing the Desert Game Range (Refuge) on approximately 2.25 million acres stating, in part, that "*. . . this range or preserve, insofar as it related to conservation and development of wildlife, shall be under the joint jurisdiction of the Secretaries of the Interior and Agriculture, …and they shall have power jointly to make such rules and regulations for its protection, administration, regulation, and improvement, and for the removal and disposition of surplus game animals, as they may deem necessary to accomplish its purposes,…the natural forage resources therein shall be first utilized for the purpose of sustaining in a healthy condition a maximum of one thousand eight hundred (1,800) Nelson's mountain sheep* [desert bighorn sheep], *the primary species and such nonpredatory secondary species in such numbers as may be necessary to maintain a balanced wildlife population or the primary protection and sustainable management . . .*" The original 2.25 million-acre range was gradually decreased to 1.6 million acres, solely managed by the USFWS under the National Wildlife Refuge Administration Act. With the onset of World War II, Roosevelt issued Executive Order 8578 on 29 October 1940, which reserved approximately 846,000 acres of the Desert Game range for the War Department to use for bombing and aerial gunnery training. This overlay is commonly referred to as the Joint Use Area of the South Range of the NTTR.

2.1.5 Surrounding Communities

NAFB is situated within Clark County, which has a population of 1.95 million (2010 census). Areas to the north and east of NAFB are undeveloped areas mostly owned and managed by the BLM. To the west of NAFB is the city of North Las Vegas, which has a population of over 216,961 (2010 census), and a major portion of its land area is devoted to commercial and industrial development. South of NAFB is a commercial/industrial area, with some residential areas to the southeast. Because of the high growth rate of Las Vegas, the potential for continued development of land to the west, south, and northeast of NAFB is likely. Encroachment of development around NAFB is doubtful because of NAFB's lands acquisition and BLM ownership of land to the east.

The NTTR, in contrast, is more rural, with only a few small towns, including Tonopah, Beatty, Indian Springs, Goldfield, Alamo, and Rachel, all located on the periphery near the boundaries. Encroachment of development by these towns on the NTTR is unlikely.

2.1.6 Local and Regional Natural Areas

There are several protected natural areas in the vicinity of NAFB, CAFB, and the NTTR. The most prominent is the DNWR, which is managed by the USFWS. Over 826,000 acres of the 1.5 million-acre refuge is within the boundaries of the South Range (Figure 2-3). That portion of the DNWR encompassing the Sheep Range, the northern Las Vegas Range, and the North Desert Range, is managed by the DNWR as a proposed wilderness area. The primary mission of the DNWR is to manage and maintain habitat for desert bighorn sheep, not unlike the purpose of the preceding and larger Desert Game Range established in 1936, which overlapped the NTTR/DNWR joint-use area, CAFB, and the northern half of the adjacent Spring Mountains. Public access to the DNWR is gained by two roads originating at the USFWS Corn Creek Field Station, approximately 23 miles north of downtown Las Vegas and east of US-95.

The DNWR is part of USFWS's Desert National Wildlife Refuge Complex. Management of the Complex includes three additional preserves: the 5,380-acre Pahranagat NWR, the 116-acre Moapa Valley NWR east of the NTTR in Lincoln and Clark Counties, and the 23,528-acre Ash Meadows NWR in Nye County to the west. Together, the four refuges protect a broad range of native plants, invertebrates, and vertebrate species, some of which are endemic to southern Nevada. Lists of rare species protected by the DNWR are available from the USFWS. In addition, the permanent lakes and marshes of the Pahranagat NWR are an important link in the Pacific flyway for birds migrating between their summer and winter habitats. The three smaller units of the DNWR Complex provide unique aquatic and wetland habitats for plants and animals that are rare or nonexistent on NAFB, CAFB, and the NTTR.

Several Wilderness Study Areas (WSA) managed by the BLM are located within the airspace boundaries of the NTTR. These include the 54,320-acre Kawich WSA, 106,200-acre South Reveille WSA, 99,550-acre Palisade Mesa WSA, and 38,000-acre The Wall WSA (USAF, 2017). These areas are set aside to protect the wilderness characteristics of these lands until they are officially designated as wilderness or the BLM is directed to manage them for other multiple uses.

To the west of the NTTR and US-95, within Clark and Nye Counties, are the Spring Mountains, administered primarily by the Humboldt-Toiyabe National Forest. In August 1993, Congress directed the U.S. Forest Service to develop a multiple-use plan for this 316,000-acre area, to be known as the Spring Mountains National Recreation Area. The recreation area is adjacent to the Red Rock Canyon National Conservation Area, managed by the BLM, which is of approximately equal area. Adjacent to and southeast of NAFB lies the 1,500,000-acre Lake Mead National Recreation Area (LMNRA), administered by the National Park Service. As the nation's first recreation area, it is shared by Nevada and Arizona and includes two reservoirs on the Colorado River: 100 mile-long Lake Mead and 68 mile-long Lake Mohave. A multitude of recreational opportunities are found in LMNRA, including swimming, diving, boating, fishing, camping, picnicking, wildlife viewing, and hunting. LMNRA is a prominent stopover in the Pacific flyway for migrating birds, and it provides a significant wintering area for the bald eagle.

Three recently established National Monuments (NM) are located in proximity to NAFB, CAFB, and the NTTR. Basin and Range NM, created in 2015, is over 704,000 acres of near roadless desert west of U.S. Highway 93 and north of Crystal Springs and Alamo, Nevada. Tule Springs Fossil Beds NM, established in 2014, encompasses 22,650 acres between US-95 and DNWR south of the NTTR. The newest NM in the area, Gold Butte NM, was created in 2016 and spans 296,937 acres northeast of LMNRA.

2.2 Physical Environment

Proper management of natural resources requires a broad-based knowledge of flora and fauna and their interactions with the physical environment. The natural resource database will provide the Nellis community with the information required to make well-founded planning decisions with respect to NAFB, CAFB, and the NTTR. Also, comprehensive data on natural resources reduces the time and need for consultation with federal and state agencies and assists the mission win locating sites suitable for training.

This section of the INRMP will familiarize the reader with the major natural resources on NAFB, CAFB, and the NTTR. Review of past studies and use of maps in this INRMP will be restricted to referencing the available reports and data available in the natural resource database prior to 2017. This section will be devoted to discussion of management issues and guidelines for natural resources at NAFB, CAFB, and the

NTTR. Unless necessary, no differentiation will be made between NAFB, CAFB, and the NTTR within the context of resource management, since the guidelines are generally the same for all three.

2.2.1 Climate

NAFB, CAFB, and the NTTR lie between 36°15' north latitude and 37°53' north latitude in interior western North America, with the Sierra Nevada Range approximately 90 miles to the west and the Wasatch Range 135 miles to the east. NAFB and CAFB lie within the Mojave Desert, while the majority of the NTTR lies within the Great Basin Desert (Morrison, 1965). The NAFB, CAFB, and the NTTR are dominated by a continental climate with pronounced winter and summer seasons and little rainfall.

2.2.1.1 Nellis Air Force Base

NAFB is located in the Mojave Desert. The Mojave's climate is characterized by mild winters and hot summers. It receives several nights of frost each year. Monthly mean temperatures range from a mean low of 37 °F (Fahrenheit) in January to a mean high of 104 °F in July. Mean annual precipitation recorded is approximately four inches (Figure 2-5).

2.2.1.2 Creech Air Force Base /Nevada Test and Training Range

The elevation and latitude differences between the South and North Ranges result in marked temperature and precipitation differences between the two (El-Ghonemy et al., 1980). A mean low temperature of 28 ºF in January, and a mean high of 100 ºF in July, as recorded at the DNWR weather station at the Corn Creek Field Station, is generally representative of CAFB and the South Range valleys of the NTTR (Ashby, 1996; Table 2-1; Figures 2-6 and 2-7). In contrast, the North Range of the NTTR has a mean low temperature of 22 ºF in January, and a mean high of 88 ºF in July, as extrapolated from data collected at the Goldfield weather station near Range 71 (Figure 2-6). The daily mean temperature measured on the North Range for January fell below freezing for 20 out of 48 years recorded. Data collected on the South Range has never included a daily mean temperature below freezing in January.

Precipitation is limited throughout the NTTR's North Range. Nearby Goldfield has a mean annual precipitation of 6.5 inches, whereas near the South Range, the mean annual precipitation is 4.3 inches (Figure 2-5; Ashby, 1996). Although slightly more rain falls in the North Range than in the South Range, and the mountain tops receive significantly more precipitation than the valley floors, the entire area lies within some of the most arid terrain in North America. Regular, strong winds, combined with low relative humidity, yield an annual evaporation rate exceeding precipitation by as much as 10 times. The lack of rainfall and vast undeveloped acreage contribute to making the NTTR ideal for military ground and air exercises and training (Tables 2-1 through 2-3).

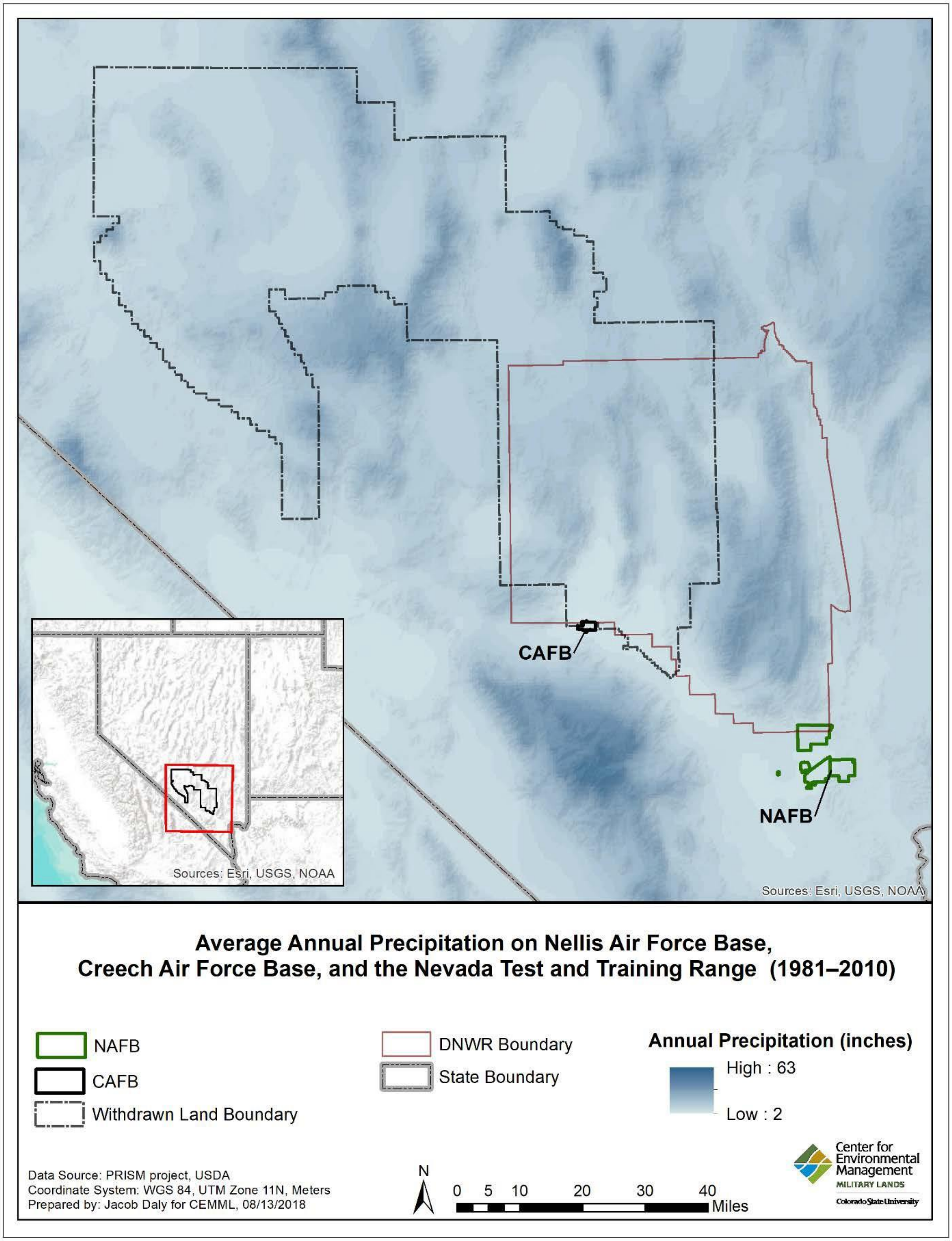

Figure 2-5. Average annual precipitation in the area surrounding Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

Table 2-1. Temperature and precipitation data recorded at the U.S. Fish and Wildlife Service's Corn Creek Field Station, Clark County, Desert Game Range*, Nevada, 1940–2016.

Month	Mean Temperature (ºF)		Precipitation (inches)
	Daily Max.	Daily Min.	Monthly Mean
January	57.5	29.7	0.47
February	61.9	33.1	0.57
March	68.2	37.7	0.54
April	76.5	44.2	0.31
May	86.2	52.5	0.17
June	96.0	60.2	0.11
July	101.8	67.1	0.39
August	99.6	65.6	0.41
September	92.3	57.8	0.38
October	79.8	46.9	0.33
November	66.1	36.3	0.34
December	57.1	30.0	0.43

Source: Western Regional Climate Center, http://www.wrcc.dri.edu.
*Desert Game Range is now known as Desert National Wildlife Refuge.

Table 2-2. Temperature and precipitation data recorded at Goldfield, Nevada, 1906–2010.

Month	Mean Temperature (ºF)		Precipitation (inches)
	Daily Max.	Daily Min.	Monthly Mean
January	42.2	20.3	0.63
February	47.1	24.3	0.77
March	54.2	29.0	0.63
April	62.5	35.2	0.54
May	71.3	42.9	0.50
June	81.4	50.9	0.37
July	89.6	58.7	0.45
August	87.4	56.9	0.52
September	79.4	48.9	0.44
October	66.5	38.8	0.44
November	52.9	28.3	0.38
December	43.3	21.5	0.39

Source: Western Regional Climate Center, http://www.wrcc.dri.edu.

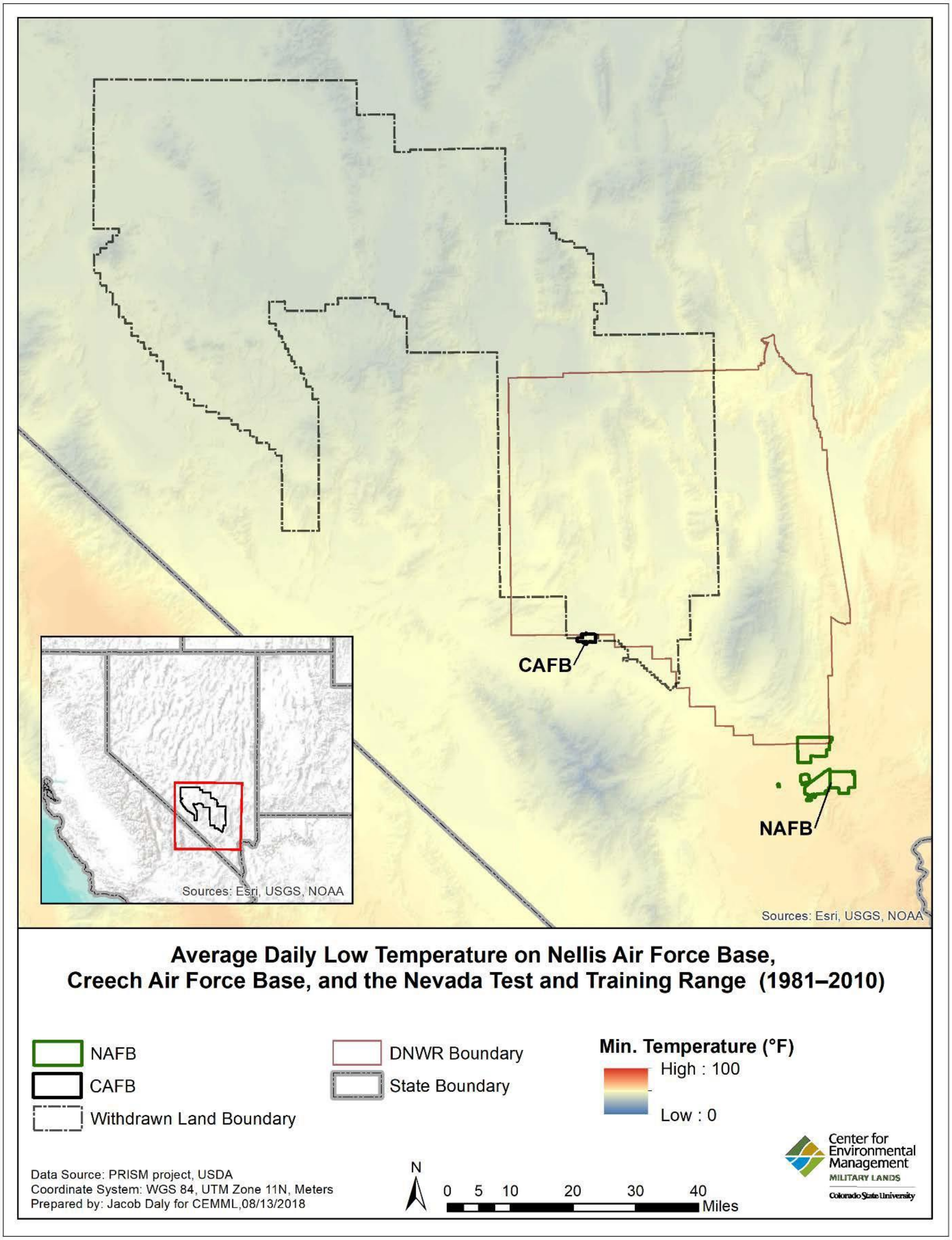

Figure 2-6. Average daily low temperature each year across Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

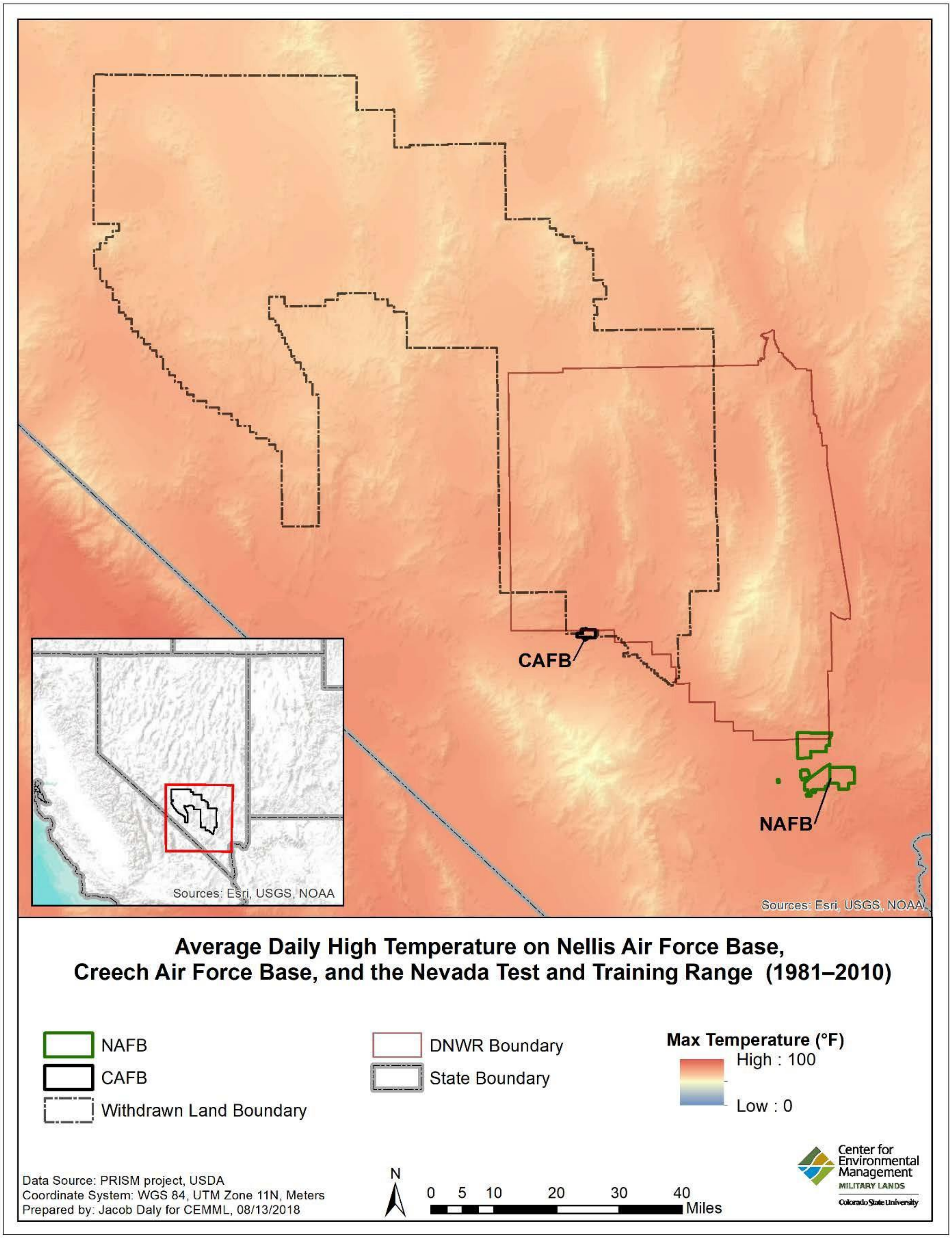

Figure 2-7. Average daily high temperature each year across Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

Table 2-3. Temperature and precipitation data recorded at Las Vegas McCarran International Airport, Nevada, 1948–2016.

Month	Mean Temperature (ºF)		Precipitation (inches)
	Daily Max.	Daily Min.	Monthly Mean
January	57.0	34.6	0.50
February	62.5	39.0	0.57
March	69.5	44.5	0.43
April	78.2	51.9	0.20
May	88.4	61.2	0.14
June	98.6	70.1	0.07
July	104.5	76.8	0.43
August	102.3	75.1	0.45
September	94.8	66.8	0.33
October	81.3	54.6	0.27
November	66.5	42.1	0.36
December	57.2	34.9	0.41

Source: Western Regional Climate Center, http://www.wrcc.dri.edu.

2.2.1.3 Climate Concerns, Impacts, and Future Projections

Climate projections were calculated using the National Center for Atmospheric Research Community Climate System Model (CCSM4) simulations prepared for the IPCC–5th Assessment Report (Gent et al., 2011; Hurrell et al., 2013; Moss et al., 2008, 2010). CCSM4 was chosen because it provides consistent and moderate climate representation across various climate regions. These projections used Localized Constructed Analogs CCSM4 data with a 6-kilometer (km) spatial resolution (Pierce et al., 2014).

Climate data used in this report were generated originally for international climate assessment reports sanctioned and provided by the Intergovernmental Panel on Climate Change–5th Phase of the Coupled Model Intercomparison Project (Hibbard et al., 2007; Moss et al., 2008, 2010), and they were subsequently used by the U.S. Fourth National Climate Assessment Report (U.S. Global Change Research Program, 2017). Coordinating with AFCEC, a baseline historical time period was established. DAYMET (DAYMET = a derived data product used to extrapolate from daily surface weather data to produce estimates of daily weather parameters on a 1-km grid) (Thornton et al., 2012) weather data from 1980 to 2009 were used to represent the historical period. DAYMET provides gridded daily temperature and precipitation data at a 1-km spatial resolution. The historical climate data represent the 30-year historical reference point used by the IPCC to define climate change scenarios.

CEMML generated separate installation-specific climate projections for NAFB, CAFB, and NTTR under two future carbon-emission scenarios: Representative Concentration Pathway (RCP) 4.5 (moderate emission levels) and RCP 8.5 (high emission levels). Emission scenarios are based on assumptions about future worldwide changes in demographic development, socio-economic development, and technological

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change that result in different concentrations of greenhouse gas in the atmosphere. Future climate conditions under the RCP 4.5 and RCP 8.5 emission scenarios were projected to produce a decadal time series of daily climate values for the decades around 2030 (2026–2035) and 2050 (2046–2055). Note that in the discussions below, all projections of change in temperatures and precipitation are relative to the historical averages for each year-RCP scenario.

The system-wide impacts of a changing climate are highly dependent on the ability of flora and fauna to cope with changing seasons, temperature extremes, and more rapid temperature variations. Most scenarios project decreased precipitation along with rising temperatures that will continue to increase periods of drought. The combined effects could push species and ecosystems to their limits, particularly during summer months.

Nellis Air Force Base

For the decade centered around 2030, both scenarios project an increase in annual average temperature (TAVE) at NAFB of 2.9 °F (1.6 °C) to 3.0 °F (1.7 °C) (Table 2-4). Both emission scenarios project more warming by 2050, with RCP 4.5 projecting a warming of 3.3 °F (1.8 °C) and RCP 8.5 projecting a warming of 5.0 °F (2.8 °C).

Annual average precipitation (PRECIP) at NAFB varies between emission scenarios and over time due to larger interconnected ocean-atmosphere dynamics associated with the National Center for Atmospheric Research CCSM4 model. For 2030, the RCP 4.5 scenario projects a 9.9% increase in PRECIP, whereas RCP 8.5 shows a 13.0% decrease in PRECIP. For 2050, RCP 4.5 projects a 26.9% decrease in PRECIP, whereas RCP 8.5 projects a 9.3% decrease in PRECIP (Table 2-4). Although most scenarios project reduced precipitation annually, these changes are not projected to be consistent throughout the year. Models project that, under each scenario, some months will have increased precipitation and others will have reduced precipitation (CEMML, 2020).

Table 2-4. Summary of climate data for Nellis Air Force Base. The annual averages are provided for the historical time period (1980–2009) and as projected with RCP 4.5 and 8.5 emissions scenarios for the 2030 (2026–2035) and 2050 (2046–2055) time periods.

Variable	Historical	RCP 4.5 2030	RCP 4.5 2050	RCP 8.5 2030	RCP 8.5 2050
PRECIP (inches)	4.3	4.8	3.2	3.8	3.9
TMIN (°F)	50.2	54.1	52.7	53.3	54.9
TMAX (°F)	82.8	85.0	86.9	85.9	88.2
TAVE (°F)	66.5	69.5	69.8	69.6	71.6
GDD (°F)	6,127	6,673	6,755	6,694	7,054
HOTDAYS	148.2	161.2	174.8	168.3	178.2
WETDAYS	0.0	0.1	0.0	0.0	0.0

Notes: TAVE °F = annual average temperature; TMAX °F = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD °F = Average annual accumulated growing degree days with a base temperature of 50 °F; HOTDAYS (average # of days per year) = average number of days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

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Creech Air Force Base and Nevada Test and Training Range South (Mojave Desert Section)
For the decade centered around 2030, models project an increase in TAVE at CAFB and NTTR South of 2.9 °F (1.6 °C) for RCP 4.5 and 3.0 °F (1.7 °C) for RCP 8.5. The two emission scenarios project higher warming by 2050, with RCP 4.5 projecting a warming of 3.5 °F (1.9 °C) and RCP 8.5 projecting a warming of 4.9 °F (2.7 °C). For 2030, the RCP 4.5 scenario is associated with an 11.6% increase in PRECIP, whereas RCP 8.5 is associated with a 19.6% decrease in PRECIP. For 2050, RCP 4.5 is associated with a 23.1% decrease in PRECIP, whereas RCP 8.5 is associated with an 11.9% decrease in PRECIP (Table 2-5). Changes in precipitation are not projected to be consistent throughout the year. Models project that, under each scenario, some months will have increased precipitation and others will have reduced precipitation (CEMML, 2020).

Table 2-5. Summary of climate data for Creech Air Force Base and Nevada Test and Training Range South. The annual averages are provided for the historical time period (1980–2009) and as projected with RCP 4.5 and 8.5 emissions scenarios for the 2030 (2026–2035) and 2050 (2046–2055) time periods.

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	6.5	7.3	5.0	5.2	5.7
TMIN (°F)	43.2	46.7	46.0	46.1	47.7
TMAX (°F)	74.9	77.4	79.2	78.2	80.3
TAVE (°F)	59.1	62.1	62.6	62.1	64.0
GDD (°F)	4,737	5,247	5,402	5,280	5,606
HOTDAYS	97.2	115.9	126.0	116.0	126.0
WETDAYS	0.0	0.0	0.0	0.0	0.0

Notes: TAVE °F = annual average temperature; TMAX °F = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD °F = Average annual accumulated growing degree days with a base temperature of 50 °F; HOTDAYS (average # of days per year) = average number of days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

Central Portion of Nevada Test and Training Range (Southeastern Great Basin Section)
For the decade centered around 2030, both scenarios project a similar increase in TAVE at the central portion of NTTR of 2.8 °F (1.5 °C) and 2.9 °F (1.6 °C). Both projections show more warming by 2050, with RCP 4.5 projecting a warming of 3.6 °F (2.0 °C) and RCP 8.5 projecting a warming of 4.9 °F (2.7 °C). For 2030, the RCP 4.5 scenario is associated with a 15.6% increase in PRECIP, whereas RCP 8.5 is associated with a 17.6% decrease in PRECIP. For 2050, RCP 4.5 is associated with a 21.0% decrease in PRECIP, whereas RCP 8.5 is associated with a 6.7% decrease in PRECIP (Table 2-6). Although most scenarios project reduced precipitation annually, these changes are not projected to be consistent throughout the year. At NTTR, the RCP 4.5 2030 scenario projects increases in precipitation during August–-November (CEMML, 2020). The predicted late-summer and fall precipitation spike at NTTR under this scenario may have especially important impacts for wildland fire management (see Section 7.9).

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Table 2-6. Summary of climate data for central Nevada Test and Training Range. The annual averages are provided for the historical time period (1980–2009) and as projected with RCP 4.5 and 8.5 emissions scenarios for the 2030 (2026–2035) and 2050 (2046–2055) time periods.

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	9.5	11.0	7.5	7.8	8.9
TMIN (°F)	38.0	41.0	40.9	40.6	42.4
TMAX (°F)	69.3	72.0	73.7	72.7	74.8
TAVE (°F)	53.6	56.5	57.3	56.6	58.6
GDD (°F)	3,802	4,235	4,442	4,287	4,595
HOTDAYS	57.7	77.0	88.7	81.8	91.7
WETDAYS	0.0	0.0	0.0	0.0	0.0

Notes: TAVE °F = annual average temperature; TMAX °F = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD °F = Average annual accumulated growing degree days with a base temperature of 50 °F; HOTDAYS (average # of days per year) = average number of days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

Northwestern Portion of Nevada Test and Training Range (Lahontan Basin Section)

For the decade centered around 2030, both scenarios project a TAVE increase in the northwestern portion of NTTR. The RCP 4.5 scenario projects a 2.9 °F (1.6 °C) increase in TAVE and the RCP 8.5 scenario projects a 3.1 °F (1.7 °C) increase in TAVE. Both projections show more warming by 2050, with RCP 4.5 projecting a warming of 3.8 °F (2.1 °C) and RCP 8.5 projecting a warming of 5.1 °F (2.8 °C). For 2030, the RCP 4.5 scenario is associated with a 15.0% increase in PRECIP, whereas RCP 8.5 is associated with a 22.4% decrease in PRECIP. For 2050, RCP 4.5 is associated with a 22.1% decrease in PRECIP, whereas RCP 8.5 is associated with a 2.4% decrease in PRECIP (Table 2-7). Although most scenarios project reduced precipitation annually, these changes are not projected to be consistent throughout the year. At NTTR, the RCP 4.5 2030 scenario projects increases in precipitation during August–November (CEMML, 2020). The predicted late-summer and fall precipitation spike at NTTR under this scenario may have especially important impacts for wildland fire management (see Section 7.9).

2.2.2 Landforms

2.2.2.1 Description of Current Conditions

NAFB, CAFB, and the NTTR lie in the Basin and Range physiographic region, characterized by a series of north-south trending mountain ranges and intervening basins that extend from southeast Oregon into Mexico (Fenneman, 1931). Individual mountain ranges rise out of both the Mojave and Great Basin Deserts, and their tendency to be aligned along similar axes provides some degree of connectivity to the high-elevation habitats of the two deserts, particularly for bird species. The basins between the mountains increase in elevation from south to north such that elevation as well as latitude contributes to the decline in thermal regimes to the north and the consequent vegetation change along the basins.

Table 2-7. Summary of climate data for northwestern Nevada Test and Training Range. **The annual averages are provided for the historical time period (1980–2009) and as projected with RCP 4.5 and 8.5 emissions scenarios for the 2030 (2026–2035) and 2050 (2046–2055) time periods.**

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (inches)	8.0	9.2	6.3	6.2	7.8
TMIN (°F)	37.4	40.4	40.6	40.1	42.2
TMAX (°F)	67.1	70.1	71.7	70.7	72.7
TAVE (°F)	52.3	55.2	56.1	55.4	57.5
GDD (°F)	3,528	3,978	4,185	4,051	4,345
HOTDAYS	43.8	64.3	77.2	70.9	79.4
WETDAYS	0.0	0.0	0.0	0.0	0.0

Notes: TAVE °F = annual average temperature; TMAX °F = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = average annual precipitation; GDD °F = Average annual accumulated growing degree days with a base temperature of 50 °F; HOTDAYS (average # of days per year) = average number of days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

2.2.2.2 Nellis Air Force Base

NAFB lies in the northeastern portion of the broad Las Vegas Valley at an elevation of about 1,900 feet. The toes of alluvial fans extending south from the Las Vegas Range and northwest from Sunrise Mountain reach the edges of NAFB. Between these lies a broad, very gently sloping valley floor underlain mostly by fine-grained alluvial silts. The SAR consists largely of alluvial fans extending from the Las Vegas Range and the Apex Hills. The SAR is bisected by a large levee to divert and channel floodwaters that occasionally flow off the Las Vegas Range. Geology in the vicinity of NAFB includes sand dunes (within the Nellis Dunes Recreation Area and north side of Area II) and alluvial fans below the Las Vegas Range and Sunrise Mountain (east of NAFB). Topographic features in NAFB area include Sunrise Mountain, Frenchman Mountain, and the Dry Lake Range.

2.2.2.3 Creech Air Force Base /Nevada Test and Training Range

The topography over most of the NTTR is undisturbed; however, some areas have been locally modified by human-made features, including cantonment facilities, sand and gravel pits, underground mining, drainage improvements, airstrips, landfills, fuel staging and storage areas, bombing targets, roads, and cratering from aerial bombing. Because the NTTR lies across 1.5 degrees of latitude and 1.75 degrees of longitude, and elevation varies from about 1,900 feet to over 8,500 feet MSL, there is a great diversity of climatic zones within the NTTR. There is a marked rise in the basal elevations of Mojave/Great Basin valleys from approximately the latitude of Lake Mead to the latitude of Tonopah. The valley floors of the South Range vary from 2,900 to 3,600 feet MSL, while the valley floors of the North Range vary from 3,900 to 5,200 feet MSL. The maximum elevation of the surrounding mountains also has a tendency to increase from south to north. The mountain ranges reach over 6,000 feet in the South Range and over 8,500 feet in the North Range. In the latter, block-faulted mountains, composed of massive Paleozoic carbonate rocks, rise abruptly from their flanking alluvial fans or bajadas. The bajadas themselves are prominent physiographic features in this area, and in the South Range they can attain relatively steep grades. Those

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bajadas that lie downwind of valley bottom playas often support a sand sheet composed of sediments originating from the playas. Since the prevailing wind in this region is from the west, sand ramps mantle the bajadas of the west side of the Desert and Pintwater Ranges where they extend into the Three Lakes and Indian Springs Valleys. The lower portions of the alluvial fans commonly attain grades of 5% or less and end at playas that occupy the floors of closed valleys.

Although the North Range also lies in the Basin and Range physiographic province, the contrast between "basin" and "range" is not as pronounced in this area. The topography that provides the bold contrast between the valleys and mountains of the South Range is buried under great accumulations of Tertiary volcanic rocks in the North Range. Volcanic ash forms the surface of western Pahute Mesa, and volcanic rocks compose the mountains of this area (e.g., Timber, Stonewall, and Black Mountains, the Cactus and Kawich Ranges; Cornwall, 1972). The massive outflow deposits of volcanic ash are more broken by faulting in the northern portions of the North Range (Ranges 71, 74, 75, 76, Electronic Combat West [ECW], and Electronic Combat East [ECE]). Here, the valleys are broader than in the South Range and many of these valleys include playas (e.g., Mud Lake, Stonewall, and Cactus Flats). The topographic landscape of the NTTR links habitats, species, communities, and ecosystems without fragmentation, which frequently occurs in areas outside of the NTTR (Noss and Cooperider, 1994). The NTTR, with its lack of major highways and agriculture, provides relatively uninterrupted north-south migration corridors in the Great Basin and Range Province. Topographic conditions also allow the NTTR to provide protected, relatively undisturbed areas in which species can exist without being affected by civilian development and a broad spectrum of other human activities.

2.2.3 Geology and Soils

2.2.3.1 Description of Current Conditions

The geologic formations on NAFB, CAFB, and the NTTR can be divided into the southeastern area, which is mostly Paleozoic sedimentary rocks, and a northwestern area, which is dominated by volcanic rocks of the Cenozoic age (Nevada Bureau of Mines and Geology [NBMG], 1997).

2.2.3.2 Nellis Air Force Base

NAFB lies in the Las Vegas Valley, which is predominantly made up of sedimentary formations and alluvial deposits. The sedimentary formations consist of limestone mixed with sandstone, shale, dolomite, gypsum, and interbedded quartzite. The alluvial fans found to the east and north of NAFB are composed of many coalescing fans dissected by numerous drainage channels. In the upper reaches, these alluvial fans are comprised of poorly sorted gravelly, cobbly, and stony sand deposits that grade to finer textured material toward the valley floors. Basin floors are depositional areas of late laid silt and clay and younger alluvial deposits. Most of these alluvial deposits have been transported by water and deposited on the sloping basin floors of the floodplains. The deposition of alluvium is a continuing process.

2.2.3.3 Creech Air Force Base /Nevada Test and Training Range

In the NTTR, the mountain ranges in the South Range are dominated by Paleozoic carbonate rocks mixed with smaller amounts of quartzite, sandstone, and shale. Valleys in this area contain thick deposits of alluvium originating from erosion of adjacent mountain ranges. Sedimentary rocks from lakes and rivers have been deposited in shallow basins and outcrops in several areas within the NTTR, particularly in the southern Spotted Range, the Pintwater Range, and the Desert Range. Older Tertiary valley fill sediments that were uplifted with the underlying Paleozoic bedrock are exposed on the flanks of the mountains (Longwell et al., 1965; NBMG, 1997).

Volcanic rocks dominate the geology of the North Range of the NTTR. The Timber Mountain caldera is one of several sources of volcanic activity in the North Range. Other sources include the Black Mountain, Cactus Range, Silent Canyon calderas, and Mount Helen dome. Volcanic tuff (hardened clay) originating from the volcanic sources extends throughout the North Range, including the extensive tableland of western Pahute Mesa, the southern Cactus and Kawich Ranges, and Stonewall Mountain (Cornwall, 1972; NBMG, 1997).

The tectonic history of the region is very complex. Most faults are a result of regional thrust, folds, and wrench faults developed during compressional deformation associated with mountain building. A more detailed discussion of faults in southern Nevada can be found in Armstrong (1968) and Caskey and Schweickerty (1992). The western one-third of the NTTR is located within Seismic Zone 3, wherease all of CAFB and NAFB and the eastern two-thirds of the NTTR are located in Seismic Zone 2B. Seismic Zone 3 is considered an area with major damage potential, whereas Seismic Zone 2B is considered an area of moderate damage potential. The Yucca fault, located in the south-central portion of the NTTR, is the only fault that is considered active based on displacement of surface alluvium. Several inactive or potentially active faults are also present at the NTTR. These faults include the Carpetbag fault located west of the Yucca fault and the Pahranagat fault system located in the South Range. Most faults on NAFB, CAFB, and the NTTR are considered inactive.

Maps providing accurate locations of geologic outcrops (a visible exposure of bedrock or ancient superficial deposits) at CAFB and the NTTR are not available. In addition, accurate information on faults and other evidences of tectonic activity is somewhat lacking. An accurate knowledge of geologic outcrops also allows biologists to predict potential habitat for various plant and animal species of concern. For example, the Las Vegas bearpoppy (*Arctomecon californica*), and the Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*) are both adapted to gypsum outcrops commonly found in alluvial fans and basins in and around NAFB. Additionally, specific geologic strata are more conducive to use by the desert tortoise.

Often mission activities require specific environments to mimic those being encountered by troops in combat. These specific areas may require certain types of geology, such as areas supporting caves, steep slopes, crevices, cliffs, and canyons. An accurate geologic map could assist in finding locations for mission activities and streamline the siting process.

In summary, improved, accurate mapping of geologic formation outcrops is critical to proper management of natural resources within NAFB, CAFB, and the NTTR. Presently, these are lacking. This information should be collected and incorporated into the natural resource database.

2.2.4 Hydrology

2.2.4.1 Nellis Air Force Base

NAFB is located in the northern part of the Las Vegas Valley, which extends in a northwest to southeast direction and drains through the Las Vegas Wash into Lake Mead. No natural perennial or intermittent streams, lakes, or springs are found on NAFB due to the low precipitation, high evaporation rates and low humidity (U.S. Army Corps of Engineers [USACE], 2001). All wetlands are artificial impoundments and located on the golf course. Water erosion is rare in the basin, but can be somewhat prominent along alluvial fans. This is especially evident in Area II along the base of Sunrise Mountain. The site contains several ephemeral streams or washes that eventually flow into Las Vegas Wash.

Area I of NAFB is an urban environment that contains aircraft facilities, including runways, residences, offices, and recreational facilities. Ponds have been established on the NAFB golf course, but are not considered jurisdictional waters because they are isolated from navigable waters. Storm water in all areas of NAFB generally flows into Clark County Regional Flood Control District channels to the southeast via the Nellis storm water system, from which it is routed into the Las Vegas Wash. Municipal sewage from NAFB is treated by the Clark County Sanitation District in a modern facility and then released into Las Vegas Wash southeast of the Valley. In the past, the Las Vegas Wash was connected directly to the Colorado River; however, as of March 2003, it was rerouted to Lake Mead via a channel below Lake Las Vegas. After emerging from beneath Lake Las Vegas, the Las Vegas Wash flows approximately one-half mile before emptying into Lake Mead. Because the Las Vegas Wash is connected to the Colorado River, any ephemeral streams and washes eventually emptying into the Las Vegas Wash could potentially carry silt, sedimentation, and debris downstream into the river; therefore best management practices shall be used to prevent storm water pollution. Furthermore, any actions placing fill in those streams and washes could negatively affect the storm water system.

Area II of NAFB is largely undeveloped, but it houses the Red Horse Squadron, explosive ordnance disposal (EOD), and a munitions storage area. These facilities are also connected to the municipal sewage system. Runoff from the undeveloped desert areas north and east of NAFB during infrequent storm events drains into the Las Vegas Wash to the southeast, which eventually drains into Lake Mead, which is part of the Colorado River.

Area III of NAFB, including the supporting residential area, hospital, and gasoline storage tanks, is connected to the municipal sewage system. The SAR also contains many ephemeral streams, alluvial fans, and draws, all of which could be affected by silt, sedimentation, and debris, potentially impacting the Colorado River as well as the storm water system.

2.2.4.2 Creech Air Force Base/Nevada Test and Training Range

The NTTR is located in a semiarid to arid region with few surface water resources and groundwater often hundreds of feet below the surface. Over 100 springs and seeps have been identified at the NTTR, many of which have hydrophytic (water dependent) vegetation, but often do not have water tables high enough to expose surface water. Those that have surface waters are essential for the maintenance of terrestrial wildlife populations. The NTTR seeps and springs with shallow water tables have often developed micro ecosystems that support a variety of plants and animals uniquely adapted to isolated surface waters in desert regions. These areas are fenced to protect the unique vegetation types from being overgrazed by ungulates, particularly wild horses (*Equus ferus caballus*). In the cases where riparian areas have had exclosures built around them, alternative water sources, such as guzzlers and water troughs, have been installed to sustain terrestrial wildlife while protecting sensitive wetland and riparian habitats.

Precipitation regimes on the NTTR are detailed in the Climate section 2.2.1 of this report. Average annual rainfall ranges from about 4 inches on the lower elevations of the desert floor to about 16 inches in higher-elevation areas. Although some thunderstorms are sufficiently intense to produce flash flooding, most precipitation in the summer is lost to evaporation a short time following storm events. Precipitation in the winter forms snow packs in the high elevations. These snow packs store moisture andf allow runoff to overcome high rates of evaporation and transpiration in the warm summer months. Melting snow provides water for drainages and riparian corridors in the early spring.

The North Range of the NTTR is mostly located within the Great Basin region of the U.S., which is characterized by internally drained basins, with the exception of Electronic Combat South (ECS) that drains into the Upper Amargosa drainage system. The southern portion of the NTTR is located in the Mojave Desert region, where Range 63 drains into the Las Vegas Valley and eventually into Las Vegas Wash drainage system (Figure 2-8). Most of the surface water drains internally into many playas found throughout the area. In the playas, water collects and then eventually evaporates, leaving behind high concentrations of salts and other materials that often cause playas to be devoid of vegetation. Under current regulations of the USACE, playas and their associated drainage basins are no longer jurisdictional waters because they are isolated and not connected to navigable waters of the U.S. Therefore, consultation with the USACE under Section 404 is not required if the actions place fill material in isolated waters of the U.S., such as playas. Surface waters at the NTTR are ephemeral and exist only in dry washes and on playa surfaces for a few hours following summer storms and possibly a few weeks following winter storms. Very few surface waters and streams would be considered intermittent or perennial because their water source is surface water runoff, not groundwater. Historically Breen Creek had perennial surface water, but due to increased periods of drier conditions, surface water tables are generally below the surface of that riparian corridor. Figure 2-8 shows the different watershed areas found in the NTTR. Of the six watersheds overlapping with the NTTR, four of those drainage basins are contained, and do not connect to navigable waters of the U.S. (Figure 2-8). Except for some manmade ponds, dugouts, and guzzlers, the only perennial surface waters result from springs, which form pools or flow for short stretches across the ground (Figure 2-9). Dugouts are usually located in areas that were excavated in the past to accumulate surface water for livestock.

An investigation of surface soils after bombing of targets was conducted to determine whether practice-bombing activities cause surficial soil contamination (NAFB, 1996). The results of this study indicated that some contamination occurred at target sites, but the concentration of contaminants was relatively low, and there was little or no risk to people and the environment. Precipitation would tend to transport and disperse these soil contaminants under normal circumstances; however, most target areas are located in basins with no connections to surface waters outside of the basin, and any contamination moved by surface waters would remain in playa lakes and valley bottoms. At these locations, most contaminants would be immobilized by the high level of clays found in the playa lakes (NAFB, 1999). Based on these findings, studies to determine the effects of long-term buildup/increased concentrations of contaminants in playas on plants and animals and surface water quality appear unwarranted.

Two areas in the study area fall under the requirements for National Pollutant Discharge Elimination System permitting. These include the NTTR and CAFB and allow for discharge of storm water in accordance with general permit number GNV00022233.

According to the EIS prepared for the floodplain analysis (USAF, 1997), surface waters found in the NTTR characteristically show three different watershed features.

- Alluvial fans
- Valley collectors
- Dry lake beds or playa lakes

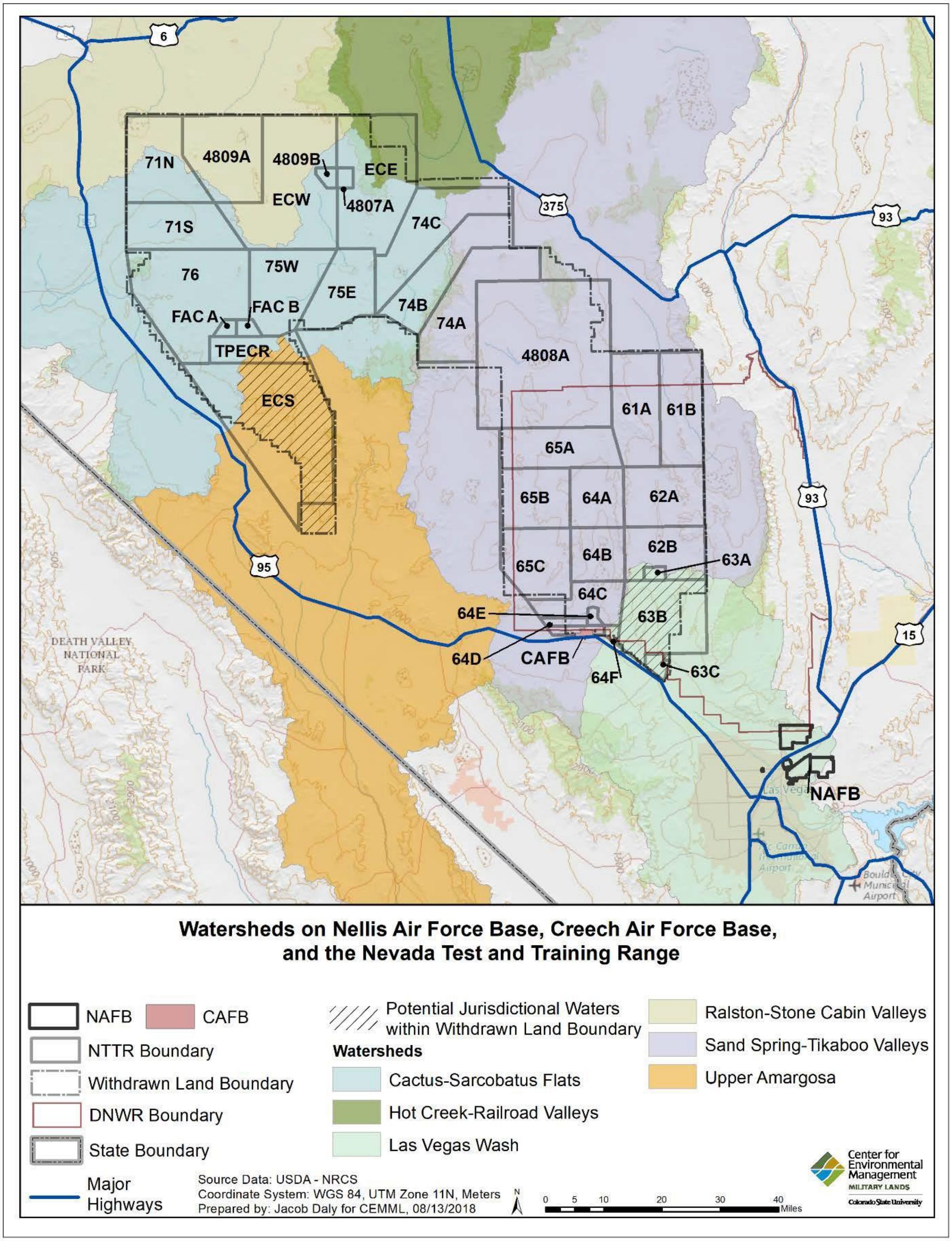

Figure 2-8. Watersheds on the Nevada Test and Training Range.

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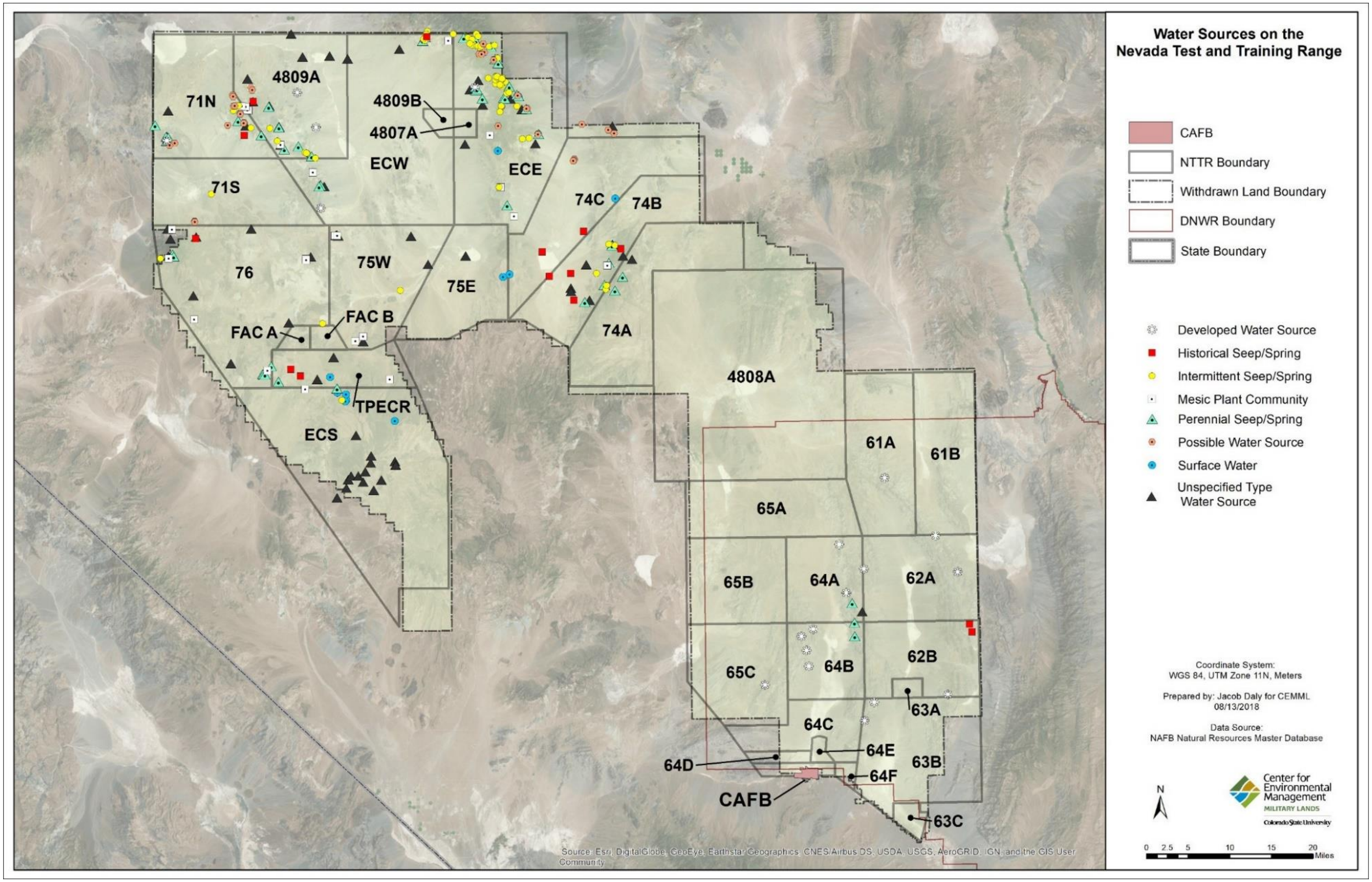

Figure 2-9. Water sources on the Nevada Test and Training Range.

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Alluvial fans are found at the base of mountains where flooding is characterized by high-velocity flows, active processes of erosion, sediment transport and deposition, and flow paths that are unpredictable. Alluvial fans are different from normal stream channels in that flooding in the upper portion of the alluvial fan is confined to a single channel that disperses into multiple channels as it flows downhill. Conventional stream channels tend to coalesce into larger channels as they move down slopes. Farther downslope from the mountain front, the alluvial fans join and coalesce. When the slope flattens out, shallow flooding may occur.

At the bottom of alluvial fan systems, a single channel often forms. This channel is termed a "valley collector." The valley collector collects and transmits the flow from several systems of alluvial fans to a topographic outlet connected to other waters of the U.S., or to a playa lake when no outlet is present. Valley collectors are important features within the NTTR ecosystem. Even though these features are dry for a significant portion of the year, they tend to support higher densities of vegetation along and near their banks. This vegetation is supported by higher moisture levels that last longer after precipitation. and provides critical food and cover for various wildlife species.

Dry lakebeds are typically located at the lowest elevation compared to the surrounding watersheds. During or immediately after storm events, these dry lakebeds fill with water, either directly from precipitation falling on the lakebed or from valley channels that drain surrounding upland areas. Dry lakebeds will hold water for shorter periods. The water flowing into the lakebeds contains sediments and dissolved solids. Sediments spread evenly over the lake's surface, creating the flat topography commonly associated with these lakebeds. As water evaporates, dissolved solids are deposited on top of the sediments. This results in a barren terrestrial surface that does not support vegetation. Although lakebeds do not support significant populations of vegetation, they have been shown to be important to migratory birds after significant rainfall or snow has occurred. They provide food sources, such as brine shrimp, insects, and other invertebrates.

2.2.4.3 Groundwater

Nellis Air Force Base

NAFB is located on the eastern side of Las Vegas Valley, an intermountain basin within the Basin and Range Province of the United States. Groundwater flows from west to east within Las Vegas Valley. The valley fill sediments of the Las Vegas basin are host to a large groundwater reservoir. Groundwater currently accounts for about 15% of the water supply for NAFB. The deeper aquifers at NAFB are not known to have been affected by contaminants identified in shallow groundwater. Laboratory analyses of samples from six NAFB production wells did not detect volatile organic compounds or nitrates; however, three production wells with water exceeding the maximum allowable levels for arsenic are used only to irrigate the golf course.

Creech Air Force Base /Nevada Test and Training Range

CAFB and the NTTR are located within the carbonate rock province of the Great Basin (Prudic, 1993). This province extends across much of eastern and southern Nevada and western Utah. Due to the permeability of carbonate rocks, the area supports an extensive, regional groundwater flow system. Groundwater within the carbonate rock province is stored within two interconnected aquifer systems: a regional system that is largely within deeply buried carbonate bedrock, and additional shallow alluvial aquifer systems residing in individual basins or watersheds. Winter precipitation recharges these systems. Groundwater discharge occurs primarily through evapotranspiration from the valley floors and from discharge at large springs.

Groundwater flow within the carbonate rock is relatively shallow and is confined to individual mountain-valley watersheds. The direction of flow in these shallow aquifer systems does not necessarily coincide with flow in the deeper, regional groundwater system, which crosses individual mountain ranges. In general, deep groundwater at the NTTR is believed to flow in a southwest direction; however, there are only a few wells that could be used to confirm groundwater levels or gradients. Flows in the local aquifer systems are believed to follow surface drainages in most cases. Groundwater is expected to move from the surrounding highlands toward the topographic low point within an individual valley or basin.

Several regional groundwater flow systems have been identified in the Great Basin (Harrill et al., 1988). Many of the target complex sites on the NTTR are located within the Death Valley regional flow system. The Death Valley flow system is composed of fractured carbonate and volcanic rock and is characterized by inter basin flow toward the west and southwest, where discharge occurs at several large regional springs. The Death Valley playa in California is considered the terminus of this regional flow system.

The Death Valley flow system has been further divided into smaller hydrographic basins, which possess distinct recharge areas (Harrill et al., 1988). These areas contain valley fill groundwater reservoirs recharged primarily by snowmelt from adjacent mountains. Precipitation that falls on the valley floors is largely lost to evaporation and evapotranspiration; thus it provides little recharge to the groundwater systems Water-quality information is largely limited to regional data on dissolved solids concentrations and the dominant chemical types (Thompson and Chappell, 1984). Generally, the groundwater within the North Range has dissolved solids concentrations that do not exceed 500 milligrams per liter. This groundwater is rich in sodium bicarbonate. Groundwater in the South Range has dissolved solids concentrations, which typically vary from 500 to 1,000 milligrams per liter, and is rich in calcium/magnesium bicarbonate.

The amount of groundwater recharge in mountains in and adjacent to the NTTR depends on precipitation, evapotranspiration, permeability of the surface soils, and the types and abundance of vegetation. The greatest opportunity for groundwater recharge is in areas of permeable surface materials during periods when the amount of precipitation exceeds the rate of evapotranspiration. Evaporation at the NTTR, however, usually exceeds precipitation at rates ranging from -50 to -65 inches annually (Hazardous Waste Remedial Action Program, 1992); therefore, the amount of recharge from valley floors to the groundwater is generally limited.

Well records from the Nevada Division of Water Resources indicate that there are nine permitted water-supply wells on the NTTR (Roe, 1996). In addition, there are wells on the NTTR that are used for testing and hydrogeological research projects associated with the adjacent Nevada National Security Site (formerly the Nevada Test Site). The only known wells within active bombing targets are on Range 75 in southern Gold Flat and on Range 63.

See Section 2.3.5 for information on wetlands and floodplains.

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

The classification of vegetative communities provides the framework of ecosystem structure and services that allow environmental managers to maintain habitats for multiple species while identifying critical habitat areas where anthropogenic activity will have the greatest impact on ecosystem health. According to

(Chg 2, 7 Apr 2021)

Bailey's ecoregion classifications, NAFB, CAFB, and the NTTR are located within the Dry Domain. The southern portion of NTTR and all of NAFB and CAFB are located in the Tropical/Subtropical Desert Division, American Semi-Desert and Desert Province, and the Mojave Desert Section. The Northern portion of NTTR is located within the Temperate Desert Division and Intermountain Semi-Desert and Desert Province. The Northeast corner of NTTR is located in the Southeastern Great Basin Section and the Northwest corner of NTTR is located in Lahontan Basin Section (Bailey, 2014).

For over 25 years, NatureServe has been working to develop a comprehensive system to characterize global vegetative communities through the advancement of several inter-related ecosystem classification systems, including the International Vegetation Classification (IVC) system and its derivative, the U.S. National Vegetation Classification (USNVC) system (NatureServe, 2017). These systems provide a fine-filtered approach for the conservation of species and their habitats. Through the classification and tracking of terrestrial ecosystems, ecologists are able to quantify the extent of habitat types, allowing species biologists to focus on rare and sensitive species and their respective habitats (NatureServe, 2017). The classification system breaks down vegetative communities from broad-based Formation Classes, containing globally recognized dominant growth forms to finer-detailed alliance- and association-level descriptions composed of local to regional compositional similarity (Federal Geographic Data Committee [FGDC], 2017). The most current vegetation classification standard for the U.S. is the USNVC Natural Vegetation of the Conterminous U.S., derived from the IVC. This classification system is composed of vegetative community information encompassing the top six vegetation levels of the U.S., including alliance and association information for the lower 48 states (FGDC, 2017).

Since the publication of the 2010 INRMP, vegetative community identification has been primarily derived from the IVC for use on NAFB, CAFB, and the NTTR to characterize plant community structure and composition, as well as to update the classification of vegetation and habitat mapping efforts (Auxilio and SWCA, 2017) and SWCA, 2017). Vegetation classification work done between 2010 and 2016 for NAFB, CAFB, and the NTTR is described in Table 2-8. Work is ongoing to continue to delineate and describe vegetation types according to the IVC and respective domestic NVC classification systems. Those systems are continually being refined and will continue to be the prime source of vegetation classification information used to define and describe the vegetation communities found on NAFB, CAFB, and the NTTR. Once a full inventory of vegetation types has been documented, delineated, and described on NAFB, CAFB, and the NTTR withdrawn lands, the rarity rankings, distribution, and extent of those communities will support wildlife and conservation planning and ultimately military mission planning and execution on the installation.

Figure 2-10. Sagebrush-Juniper plant community, North Range. NAFB Photo Library.

(Chg 2, 7 Apr 2021)

Table 2-8. Vegetation classification mapping progress (2011–2017) on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

Vegetation Report	Range(s) Surveyed	Vegetation Classification System	Vegetation Classification Level	Mapping Software or Method Used	Percent Range(s) Mapped	Area (acres) Mapped
2017						
Auxilio et al. (2017a)	R75W	IVC/ Nevada Natural Heritage Program (NNHP) (Peterson, 2008)	Association	ArcMap Image Classification	100	102,808
Auxilio et al. (2017b)	R62B, R63A	IVC/ NNHP (Peterson, 2008)	Association	ArcMap Image Classification	100	81,553
2016						
NAFB (2016a)	R64C-F, R65C, ECS	IVC/ NNHP (Peterson, 2008)	Association	eCognition	100	413,485
NAFB (2016a)	R64A-C, R65C, R71N, R71S, ECS, ECE, ECW	NDOW Key Habitats (2012)	Key Habitat Community	eCognition	85	1,103,287
2015						
NAFB (2015f)	R64B	IVC/ NNHP (Peterson, 2008)	Association	eCognition, Manual Polygon Delineation	100	54,467
NAFB (2015g)	R71N	IVC/ NNHP (Peterson, 2008)	Association	eCognition, Manual Polygon Delineation	100	106,783
NAFB (2015h)	R71S	IVC/ NNHP (Peterson, 2008)	Association	eCognition, Manual Polygon Delineation	100	92,446
AMEC Environmental and Infrastructure, Inc. (2015)	R64A, ECW	None; USNVC (Federal Geographic Data Committee [FGDC], 2017a, 2017b)	Vegetation Community	ArcGIS Software, Manual Polygon Delineation	100	270,474
2014						
NAFB (2014e)	R64F(SFA), Tolicha Peak Electronic Combat Range (TPECR), R71N, R71S, R76	None; USNVC (FGDC, 2017a, 2017b)	None	eCognition, Manual Polygon Delineation	75	444,443

Table 2-8. Vegetation classification mapping progress (2011–2017) on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

Vegetation Report	Range(s) Surveyed	Vegetation Classification System	Vegetation Classification Level	Mapping Software or Method Used	Percent Range(s) Mapped	Area (acres) Mapped
NAFB (2014d)	NAFB, SAR, R64F, TEPCR, R71N, R71S, ECW, R64A	None; NDOW Key Habitats (2012)	None	ArcView GIS, Manual Polygon Delineation	75	549,410
2013						
NAFB (2013d)	NAFB, SAR, R64F, TPECR, R71N, R71S, ECW, R64A	None; NDOW Key Habitats (2012)	None	ArcView GIS, Manual Polygon Delineation	75	549,410
2012						
NAFB (2012b)	NAFB, SAR, R76, R63B, TPECR, R71N, R71S	None; NDOW Key Habitats (2012)	None	ArcView GIS, Manual Polygon Delineation	75	586,454
2011						
NAFB (2011b)	71N, R71S, R76, R63C	None; NDOW Key Habitats (2012)	None	ArcView GIS, Manual Polygon Delineation	50	399,252

Only 16 of the 28 accessible NTTR range sections have presently undergone ground-truthing surveys to support vegetation classification mapping and modeling efforts across the installation (Table 2-8). Within these ground-truthed sections of the NTTR, 16 ranges that represent 1,363,186 acres have undergone initial vegetation polygon delineation with IVC classification. Those ranges initially classified with the IVC system in the North Range of the NTTR include 71N, 71S, 75W, 76, TPECR, ECW, and ECS, comprising 1,018,100 acres. The classified North Ranges have been found to be dominated by shrubland associations, with approximately 60% of the area covered by saltbush (*Atriplex* spp.) alliances (Auxilio et al., 2017a). South ranges initially mapped with the IVC system include 62B, 63A, 64A-F, and 65C, comprising 345,086 acres. The classified South Range has also been found to be dominated by shrubland associations with creosote (*Larrea tridentata*) and saltbush alliances that cover approximately 67% and 18% of the area, respectively (Auxilio et al., 2017b). Figure 2-11 depicts the overall progress of mapping efforts across the NTTR since 2010. The data gaps within both the North and South Range of the NTTR, demonstrate the relevance and necessity for future vegetation survey and mapping efforts on the installation. Detailed vegetative community information and maps for the North and South Ranges of the NTTR are provided in Section 2.3.2.2.

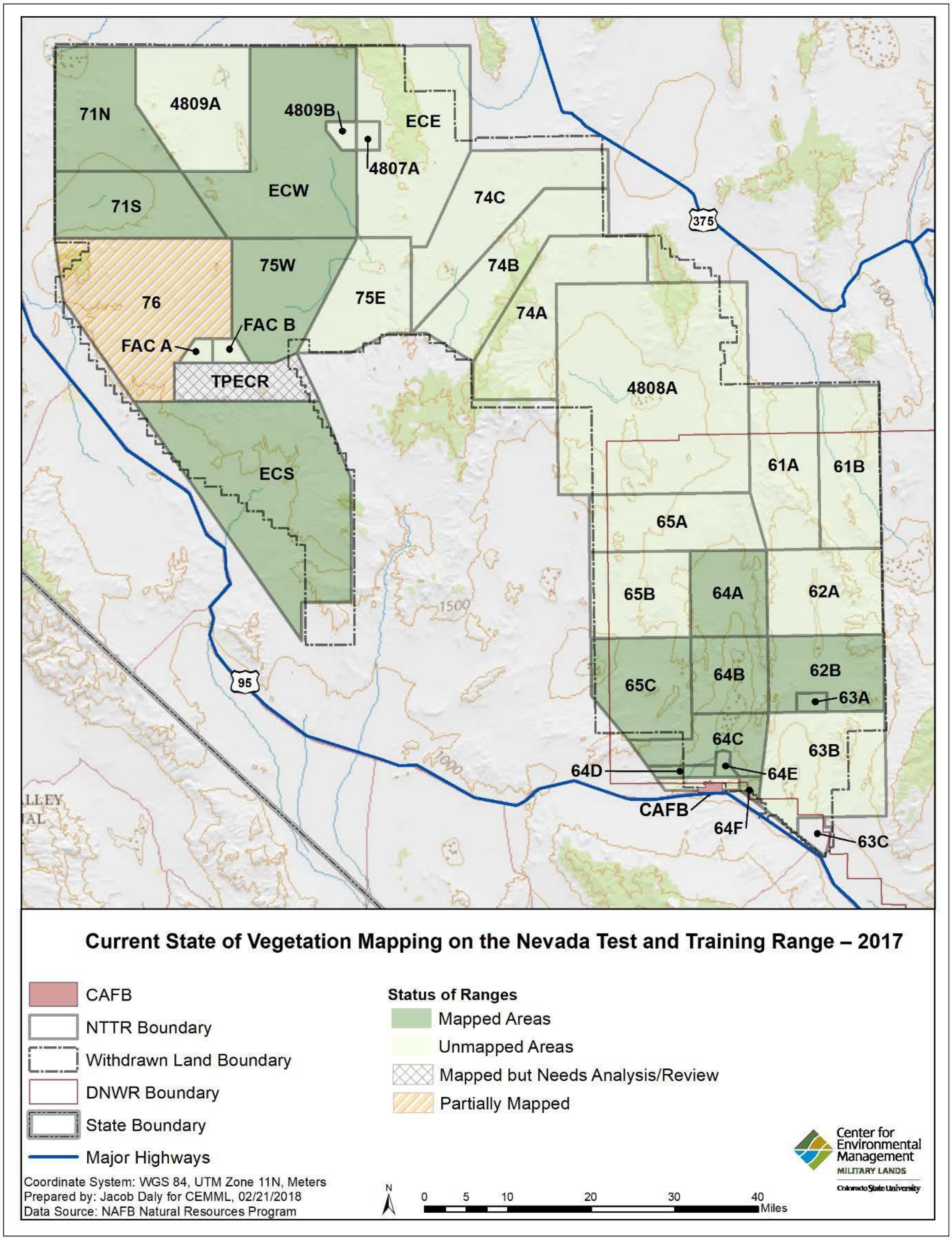

Figure 2-11. Current state of vegetation mapping progress on the Nevada Test and Training Range based on records up to 2017.

In addition to the IVC system, past classification efforts have used the NDOW Key Habitat identification information for depicting vegetative communities across the installation. This descriptive system is a product of the Nevada Wildlife Action Plan (NWAP) developed by NDOW in 2012. Current delineations of the Key Habitats of the NTTR are depicted in Figures 2-13 and 2-14

Multiple vegetation alliances and associations have been identified across the installation in recent years. A 2016 study delineated vegetation communities on ranges 75W, 63A, and 62B. Within those ranges, 4 formation classes, 15 alliances, and 21 associations were identified (Auxilio et al., 2017a, 2017b). The 2016 vegetation communities were assigned alliance or association designations according to the IVC Alliances and Associations Occurring in Nevada with Proposed Additions publication based on the USNVC classification system (Peterson, 2008).

Past efforts to classify vegetation communities across the installation have resulted in myriad polygon delineation arrangements and differentiated community designations across multiple range locations; however, as of 2017, 17 ranges are still in need of ground-truth surveys, polygon delineation, and/or community designations. Vegetation classification maps depicting the current distribution of known vegetation alliances within mapped ranges are displayed in Section 2.3.2.2 (see Figures 2-22 through 2-24 and 2-26 through 2-28). Each map provides information on the extent of vegetation classification efforts within each range, with vegetation alliance or community types delineated by classification. Polygons generated by various mapping software programs. The maps provide not only visual reference of past mapping efforts, but also to the location of data gaps and future vegetation classification needs. Continued ground-truthing vegetation surveys and mapping efforts are needed to fully describe the vegetative communities across the installation, thus improving habitat informational mapping in support of environmental management and military mission training activities.

Figure 2-12. Typical creosote bush habitat around Nellis Air Force Base. NAFB Photo Library.

Documented within the most recent NAFB geodatabase, multiple vegetation surveys have been conducted on NAFB since 2002. Survey types include rare plant surveys, invasive plant surveys, and general floral species inventory surveys, none of which resulted in the mapping of known vegetation communities found on the base. As such, vegetation community classification has not been produced for NAFB. Of those areas on NAFB, approximately 10% (26,470 acres) have been surveyed to date (Figure 2-15). Additional vegetative community information and maps for NAFB are detailed in Section 2.3.2.2.

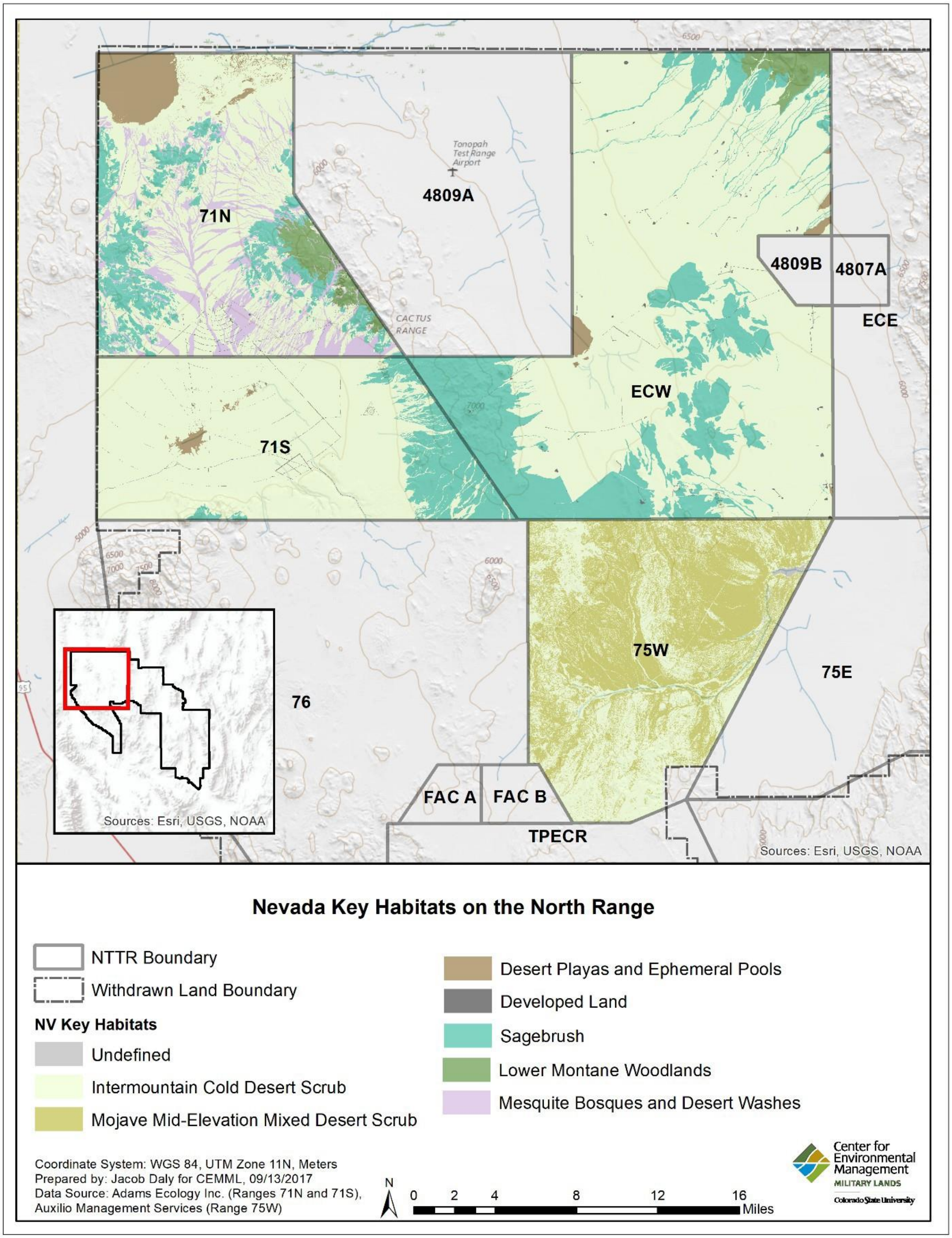

Figure 2-13. Nevada Key Habitats on the North Range.

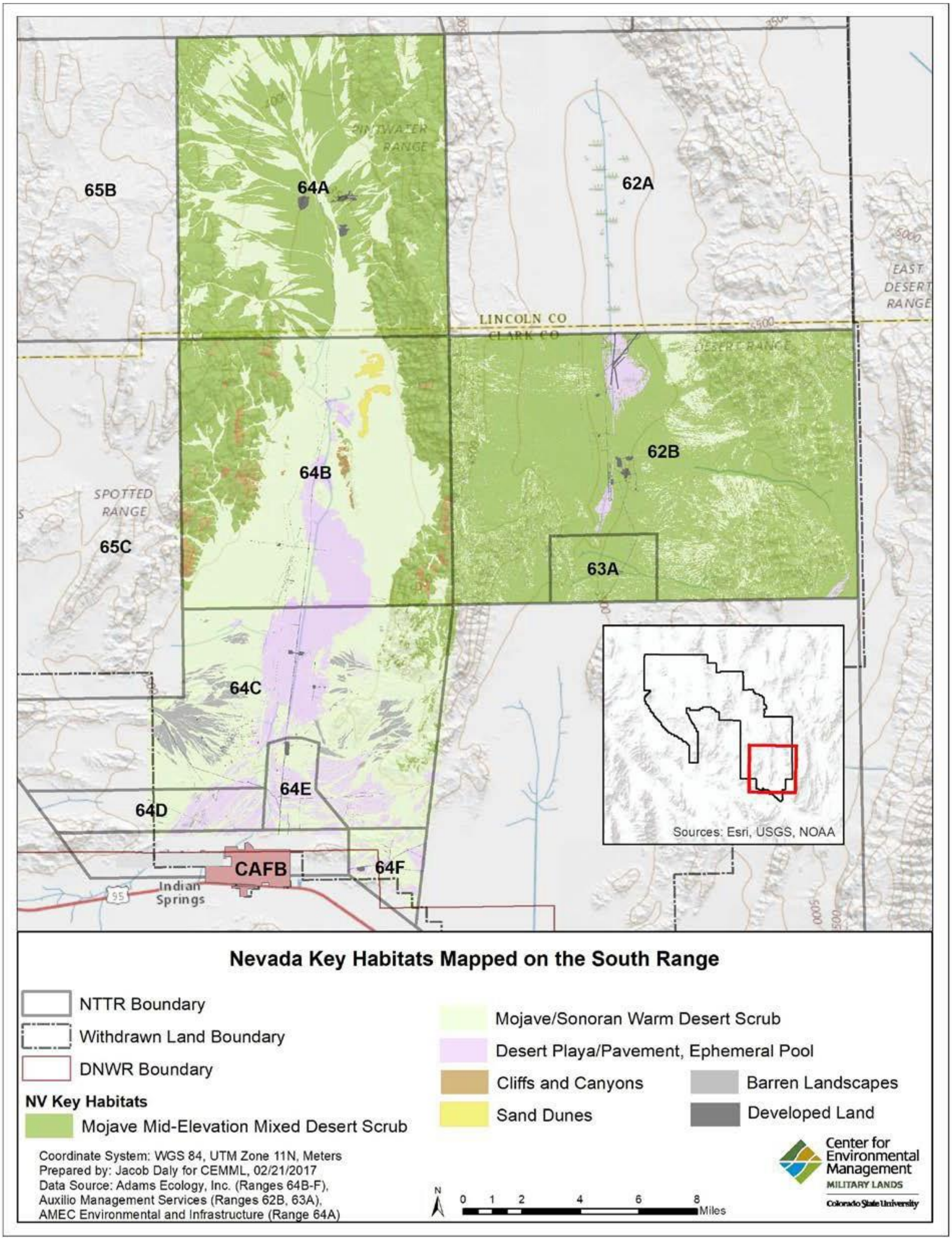

Figure 2-14. Nevada Key Habitats on the South Range.

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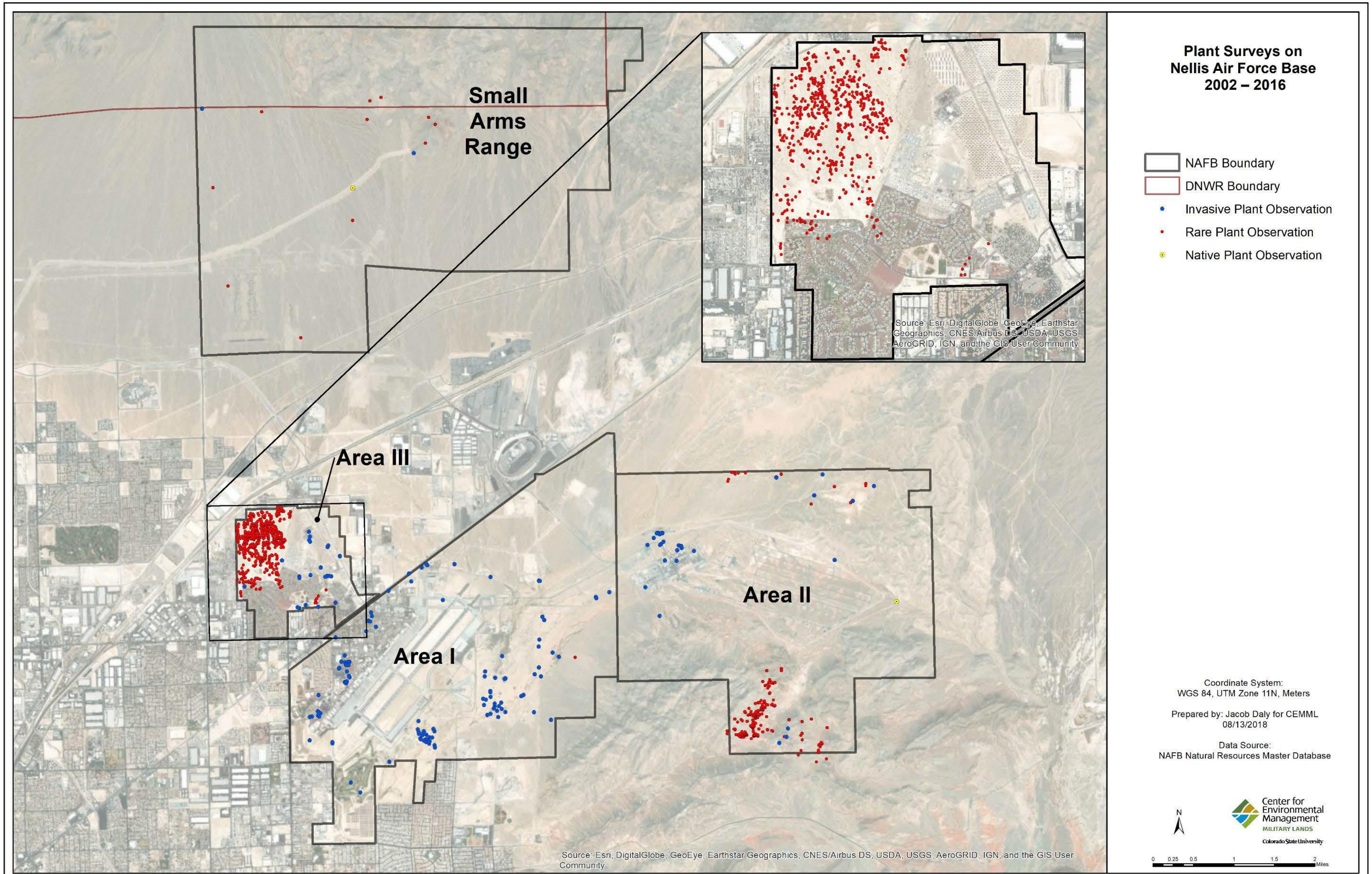

Figure 2-15. Nellis Air Force Base vegetation survey locations, 2002–2016.

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Additional information regarding the hierarchal structure of vegetative communities and individual community descriptions can be found on the NatureServe website (www.natureserve.org) or the USNVC website (www.usnvc.org), as well as in the 2011–2017 NAFB, CAFB, and the NTTR vegetation community reports (Table 2-8).

2.3.2 Vegetation

2.3.2.1 Historical Vegetative Cover

The Las Vegas Valley, which includes NAFB, was widely settled for a long period, but the NTTR is a remote area, which historically encompassed only isolated, small settlements. As such, more historical vegetation information is available for NAFB. On the NTTR, the historical composition and structure of the vegetation was essentially unknown as of the 1970s (Beatley, 1976). Much of the NTTR has remained undisturbed for years with some remote areas potentially experiencing little or no direct impacts by Euro-Americans. Numerous ethnographic, ethnobotanical, and prehistorical/historical archaeological studies have been conducted on the NTTR and these references can be found in the 2017 ICRMP or by contacting the NAFB Cultural Resources Manager.

Figure 2-16. *Opuntia engelmannii* blooming. NAFB Photo Library.

In historical times, the Las Vegas Valley contained many natural artesian springs and the perennial Las Vegas Big Spring, which released recharge water from the Spring, Sheep, and Las Vegas mountain ranges. The available surface and near surface water supported oases in the surrounding arid landscape and suggested the place name (Las Vegas is Spanish for “the meadows”) to early Spanish-speaking cartographers (Jones and Cahlan, 1975). The springs and outflow channels initially supported distinct riparian habitats, typified by cottonwood trees (*Populus fremontii*), willows (*Salix* spp.), cattail (*Typha latifolia*), and other plants that thrive in mesic environments (NAFB, 2010a).

Although European explorers, trappers, and missionaries passed through the valley between the 17th and 19th centuries, it was not until the late 19th century that continuous European settlement began in the area. Settlers extracted increasing amounts of groundwater for human consumption, livestock watering, crop production, and, by 1905, operating steam locomotives. The first well was drilled in 1907. Withdrawals continued, and eventually the demand exceeded the recharge rate (NAFB, 2010a). Riparian habitats were gradually reduced and replaced by a modern urban landscape supporting a city of more than two million residents today. Substantial valley subsidence (decreasing elevation) has resulted from aquifer withdrawal in excess of recharge. Some remnants of historical riparian plant communities are still present in the valley, most notably at the Las Vegas Valley Water District well field, which is now bounded by residences, a large shopping mall, and a six-lane highway. The well field is closed to the general public.

Historically, most of the NTTR was only accessible by foot or on horseback. With the advent of motor vehicle travel, it has become more accessible, although access is still limited for safety and security reasons. Most early Euro-Americans traveling through the NTTR area did not find the area hospitable for settlement, with the prominent exception of those who stayed briefly to extract mineral resources. It is likely that historical vegetation impacts did occur near mining settlements, town sites, and homesteads. The grazing of domestic livestock, reduction of native herbivores (e.g., unregulated hunting and varmint control, livestock-wildlife competition for forage and water, livestock-borne diseases), and wood harvesting for both fuel and structural materials likely impacted vegetation composition in the North Range (Noss and Cooperider, 1994). In the absence of historical records, the degree of this impact is unknown, and the degree of impact on and subsequent recovery of native vegetation cannot be evaluated accurately. It has been suggested that lower elevations and bajadas on the South Range were historically dominated by vegetation typically found in the creosote bush/white bursage (*Ambrosia dumosa*) and saltbush communities, and on the North Range by the blackbrush (*Coleogyne ramosissima*) and Great Basin Desert scrub communities (NAFB, 2010a).

Historically, vegetation types occurring on NAFB, CAFB, and the NTTR have been characterized and described according to the plant community classification system used regionally by Beatley (1976). In this system, a plant community is named after the dominant and co-dominant plant species. Other historical vegetation classification systems include a vegetation map of Nevada prepared by Utah State University as part of the nationwide Gap Analysis Program with coverage including NAFB, CAFB, and the NTTR. Additional historical vegetation classification systems used for NAFB, CAFB, and the NTTR are listed below.

- National Vegetation Classification Standard (FGDC, 1997)
- Terrestrial Vegetation of the United States (Grossman et.al., 1998)
- International Vegetation Classification Alliances and Associations Occurring in Nevada with Proposed Additions (Peterson, 2008)
- NDOW’s Nevada Wildlife Action Plan Team (WAPT): Key Habitats (WAPT, 2012)

Since 2007, information has been accumulated in a standardized geodatabase documenting plant species and their respective communities on the installation. Formal vegetation community classification using the current standard IVC system and NDOW NWAP Key Habitats (WAPT, 2012) has been implemented on the NAFB, CAFB, and the NTTR since the publication of the 2010 INRMP. Multiple range locations have been surveyed to obtain vegetation community information to be used in the mapping and modeling of vegetative communities found on the installation. A comprehensive list of vegetation community surveys and mapping efforts conducted since 2010 is depicted in Appendix C., Current Vegetative Cover.

Figure 2-17. *Coryphantha vivipara* blooming. NAFB Photo Library.

2.3.2.2 Current Vegetation Cover

Environmental and physical characteristics of an area, such as climate, soils, and hydrology, play a key role in determining the types of plant communities that establish in any given location. In turn, plant composition and state indicate the level to which species of wildlife can inhabit an area, thus acting as a strong indicator of the overall health of an ecosystem. Plant composition can be used to determine the carrying capacity of an ecosystem and provide a warning sign if that capacity has been or is expected to be exceeded. Those species sensitive to ecosystem disturbance can also play a role indicating the level to which an area may have been affected by various impacts, providing ecologists with a better understanding of how to address issues negatively affecting the habitat (NAFB, 2010a). Through the understanding of plant communities and, subsequently, their successional stages, restoration and recovery efforts for areas impacted by natural or anthropogenic factors can be more effectively applied to preserve the integrity of native vegetation diversity and structure so essential to the nature of the NTTR training environment. Understanding the variety of vegetation communities and their function within an area informs sustainable land management and compliance with NEPA, ESA, CWA, and other federal regulations (EGC, Inc., 2007; Auxilio et al., 2017a).

Currently, 515 floristic species have been documented on NAFB, CAFB, and the NTTR. Of those species known to occur on the installation, 46 have been documented by the Nevada Natural Heritage Program (NNHP) as Sensitive in Nevada (Appendix C).

Nellis Air Force Base Vegetative Communities

Large expanses of the Mojave Desert valley floors that encompass NAFB primarily support creosote bush/white bursage vegetation communities (Vasek and Barbour, 2007). Creosote bush/white bursage communities are characteristic of much of the Mojave Desert at elevations ranging from below sea level to approximately 3,940 feet, and they still can be observed in less developed areas of NAFB, such as in the eastern portion of Area II and the SAR. Historical riparian vegetation associated with spring pools, outflow channels, and washes, dominated by cottonwood and mesquite (*Prosopis glandulosa* and *P. pubescens*), is still present in the Las Vegas Valley Water District north wellfield (Bradley and Deacon, 1967). Tamarisk (*Tamarix* spp.), or salt cedar, is a nonnative perennial plant species that has had the most notable effect on these plant associations (Gulf South Research Corporation, 2012). The most common tamarisk species in the region is *T. ramosissima*, an arborescent shrub that aggressively colonizes areas where groundwater is shallow or seasonal moisture is available. Tamarisk is known for releasing salt into surrounding soils, which, in combination with the plant's aggressive growth and colonization, typically

Figure 2-18. Las Vegas bear poppy (*Arctomecon californica*). NAFB Photo Library.

leads to the establishment of dense, monospecific stands that often preclude native spices from becoming established.

Las Vegas bearpoppy and Las Vegas buckwheat are two sensitive plant species present on gypsiferous soils on NAFB. These species have been observed in three different locations on NAFB. Las Vegas bearpoppy (Figure 2-18) is considered critically endangered by the state of Nevada (NNHP, 2017a, 2017b). The Las Vegas buckwheat (Figure 2-19) is considered critically imperiled by the state of Nevada (NNHP, 2017a, 2017b), and it has been placed on several rare species watch lists.

Figure 2-19. Las Vegas buckwheat (*Eriogonum corymbosum var. nilesii*). NAFB Photo Library.

One occurrence of the Las Vegas bearpoppy has additionally been recorded on the South Range in 64C. Populations of the Las Vegas buckwheat may be present where gypsiferous soils are present, but to date, no record of it exists on the South Range. It should be noted that plants within the state of Nevada are designated critically endangered and/or threatened with extinction by the State Forester Fire Warden in accordance with Nevada Administrative Code (NAC) 527.270. The State Forester has included the Las Vegas Bearpoppy on the list of fully protected species of native flora found at NAC 527.010. Once on the list, no members of the species may be destroyed or removed from non-federal lands except through a permit issued by the State Forester.

The Sikes Act, at 16 U.S.C. § 670a(b), requires each military installation to enhance fish and wildlife habitat, so long as there is no net loss in the land's ability to support the installation's military mission. AFI 32-7064 requires installations to address conservation of any federally-listed threatened and endangered species in the INRMP. When practical, similar protection is given to plants and animals that are candidate species for federal listing. Installations are also required to protect and conserve state-listed protected species "when practicable." Although not required by the ESA, it is USAF policy to protect state-listed species when such protection is not in direct conflict with the military mission. In order to comply with these directives, NAFB organizations will avoid activities that negatively impact sensitive species. If negative impacts cannot be avoided, organizations will consult with NDOW and/or Nevada Division of Forestry (NDOF), as appropriate, to determine which mitigation measures should be employed.

Las Vegas bearpoppy populations in the Las Vegas Valley have been shown to be genetically unique, and so are of concern to NDOF, Clark County, USFWS, and the USAF. Currently, The Nature Conservancy describes the plant as globally rare and state imperiled, and the State of Nevada lists it as critically endangered. This plant species is known to occur only in Clark County, Nevada and Mohave County, Arizona (Sheldon, 1994). USFWS considers this plant to be among its highest priorities for protection in the state. They hope to avoid federal listing of it as threatened by protecting the existing populations on

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public lands, which includes populations found on NAFB (Bair, 1997). The species is found exclusively on gypsiferous soils (Sheldon, 1994) and projects proposed on other soil types are not likely to affect the Las Vegas bearpoppy.

NAFB continues to take steps to conserve the bearpoppy, including early planning of new construction projects to avoid areas known to have bearpoppy plant communities. No development will occur within the 233 acres of undeveloped Las Vegas bearpoppy and Las Vegas buckwheat habitat located in Area III without required consultation with NDOF and USFWS. Consultation will occur at the pre-planning/internal review stage of development, when the Description of the Proposed Action and Alternatives is received, to discuss impacts, alternative actions, and future management of the Area III habitat. NAFB will refrain from development in areas populated by the Las Vegas bearpoppy and Las Vegas buckwheat, although a permanent area cannot be set aside for conservation (U.S. Government Accountability Office Opinion, 16 October 1998).

Presently, vegetation classification mapping on NAFB has not been completed. Figure 2-15 shows vegetation surveys conducted on NAFB from 2002–2016. Within that time, biologists conducted three types of vegetation surveys on NAFB, including vegetation community surveys, invasive plant surveys, and rare plant surveys (Gulf South Research Corporation, 2012). The corresponding map depicts survey point locations per survey type. Each point represents the location of identified plant species observed during the course of individual survey efforts. At each survey point, species identification and other ecological parameters were recorded within the area. A list of those observed species can be found within the comprehensive vegetation species list for NAFB provided in Appendix C.

Creech Air Force Base and the Nevada Test and Training Range Vegetative Communities

The North and South Ranges of the NTTR lie in the Great Basin and Mojave biogeographic provinces, respectively, as described by Brown (1982). A biogeographic province is a widespread region that is characterized as distinct from another such region, primarily based on predominant vegetation and wildlife habitat types. The South Range generally encompasses an area that supports vegetation and habitat types that are characteristic of the Mojave Desert province; the North Range generally encompasses an area that supports vegetation and habitat types characteristic of the Great Basin Desert.

Figure 2-20. Plant community near seep/spring. NAFB Photo Library.

One indirect, widespread, and persistent effect of Euro-American settlement in this area, as elsewhere in the West, is the presence of introduced annual and perennial plants, which sometimes dominate local vegetation and are considered invasive species. The three most prominent annual invasive species are Russian thistle (*Salsola*

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tragus), red brome (*Bromus rubens*), and cheatgrass (*Bromus tectorum*). Red brome is desert-adapted and has become common on the South Range, whereas cheatgrass is adapted to cooler steppe environments and occurs primarily on the North Range. Both grasses are found in remote habitats that otherwise appear pristine and unaffected by Euro-American activities. Russian thistle, red brome, and cheatgrass are aggressive colonizers that may displace native populations of annuals on disturbed soils. If disturbance is not repeated, Russian thistle often does not persist; however, red brome and cheatgrass can continue to be the dominant annuals in certain habitats, regardless of the disturbance regime. The pest management program for NAFB, CAFB, and the NTTR includes control and management of invasive plants, more detailed information for which can be found in Section 7.11.

Figure 2-21. Rock outcrop plant community with lichen. NAFB Photo Library.

North Range Vegetation

The hydrographic region of the Great Basin was described and named by J.C. Fremont in 1844. While crossing over multiple mountain ranges on his travels, Fremont saw that the valley floors he encountered did not have hydrologic outlets, a condition called endorheic (Hubbs et al., 1974). The Great Basin is a collection of endorheic basins that lie between north-south trending mountain ranges. Most of the precipitation is snow, which remains until it is absorbed into the ground or evaporated but does not drain from the region. Though the region is warm in the summer and has low relative humidity throughout the year, low temperatures and typically strong winds during the winter make this one of the coldest desert regions in the U.S. The entire NTTR lies within the hydrographic region of the Great Basin, with the exception of the southern tip of Range 63.

The Great Basin Desert floristic region was defined by Shreve (1942) as a region typified by sagebrush and saltbush vegetation north of Beatty, Nevada. In this area, winter temperatures are too low to support plants typical of the warmer deserts of the Southwest, such as creosote bush. Therefore, while both the North and South Ranges of the NTTR lie within the hydrographic region of the Great Basin, only the North Range lies within the floristically defined Great Basin Desert, and most of the South Range lies within the Mojave Desert.

The North Range of the NTTR consists predominantly of cold desert scrub vegetative communities that experience a varied climate due to a dramatic elevation gradient ranging from 3,000–9,000 feet and annual precipitation from 4–14 inches per year (NAFB, 2016a). The landscape of the North Range is predominantly composed of shrubland communities, dominated by saltbush alliances at approximately 60%. This alliance type is common in the Great Basin and generally forms in areas where the availability of water for plants is impacted by soils retaining or draining water, or they occur with variation in alkalinity or salinity levels (Auxilio et al., 2017a).

The Auxilio et al. (2017a) North Range Vegetation Classification Report documented four vegetation Classes, 11 Alliances, and 30 Associations during the vegetation surveys of the North Range. According to the report, the shrubland Class was the most commonly observed, comprising over 86% of land cover. The remaining classes included herbaceous vegetation (6%), dwarf shrubland (5%), desert pavement (<1%), and unclassifiable (1.5%). Although desert pavement is not yet a recognized vegetation classification within the IVC, the communities were different enough in their vegetation structure and lack of cover to be recorded as an individual Class. Furthermore, the 2017 report states that these areas can be considered sensitive and fragile, requiring a considerable length of time to form, and so should be documented for future habitat management.

Currently, range maps with vegetation classification determinations are available for ranges 71N, 71S, ECW, and ECS within the North Range (Figures 2-22 through 2-24). Vegetation communities delineated on ranges 71N, 71S, and ECS were assigned alliance designations based on IVC naming convention sources. Range ECW was described according to the NWAP Key Habitat descriptions (WAPT, 2012). Although NWAP Key Habitats reflect vegetation community structure and initial composition, this informational source does not provide the level of detail and consistent naming conventions necessary to generate continuity and accuracy across the installation. ECW, and all other ranges defined only to this level, will need further work both on the ground and within mapping efforts to update vegetation classification determinations to IVC standards.

The vegetation of the basin floors of the North Range is typified by shadscale (*Atriplex confertifolia)* and greasewood (*Sarcobatus vermiculatus*). Both of these salt-tolerant shrubs may occur in relatively monotypic stands or may be codominant with winter fat (*Krasheninnikovia lanata*) and green molly (*Kochia americana*). Intermediate-elevation slopes are dominated by Great Basin mixed desert scrub characterized by various species of horsebrush (*Tetradymia* spp.), rabbitbrush (*Chrysothamnus nauseosus*, *C. viscidiflorus*), hopsage (*Grayia spinosa),* greasewood, shadscale, and bud sagebrush (*Picrothamnus desertorum*) (Beatley, 1976).

With increasing elevation, the predominance of junipers and pinyons increases with an understory of black sagebrush (*Artemisia nova*). Other species that occur in this community include rabbitbrush, ephedra (*Ephedra* sp.), and occasional Joshua tree (*Yucca brevifolia*). Greasewood may occur as a codominant with sagebrush. The blackbrush community reaches its northernmost limit on upper bajadas below the western face of the Groom Range Mountains (Beatley, 1976). Elsewhere, blackbrush vegetation occurs in the southerly portions of the North Range at intermediate elevations between the shadscale community and sagebrush-pinyon/juniper community. The dominant vegetation in the North Range Mountains, above 4,920 feet elevation, is sagebrush-pinyon-juniper woodland. White fir (*Abies concolor*) occurs at elevations above approximately 8,200 feet on Bald Mountain in the Groom Range (Beatley, 1976), with singleleaf pinyon and limber pine (*Pinus flexilis*). A comprehensive vegetation species list for the installation is provided in Appendix C.

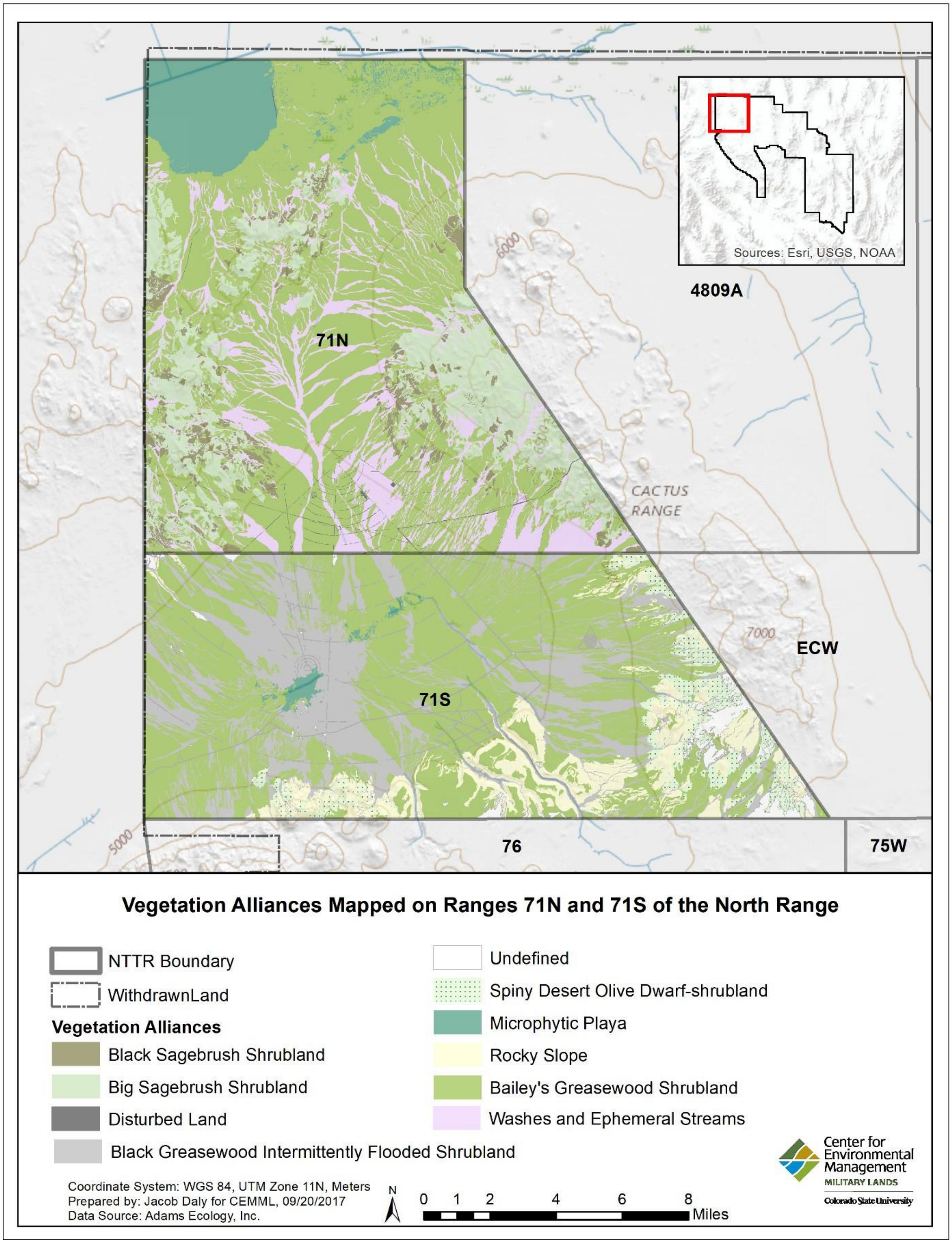

Figure 2-22. IVC-classified, alliance-level polygons for ranges 71N and 71S on the North Range.

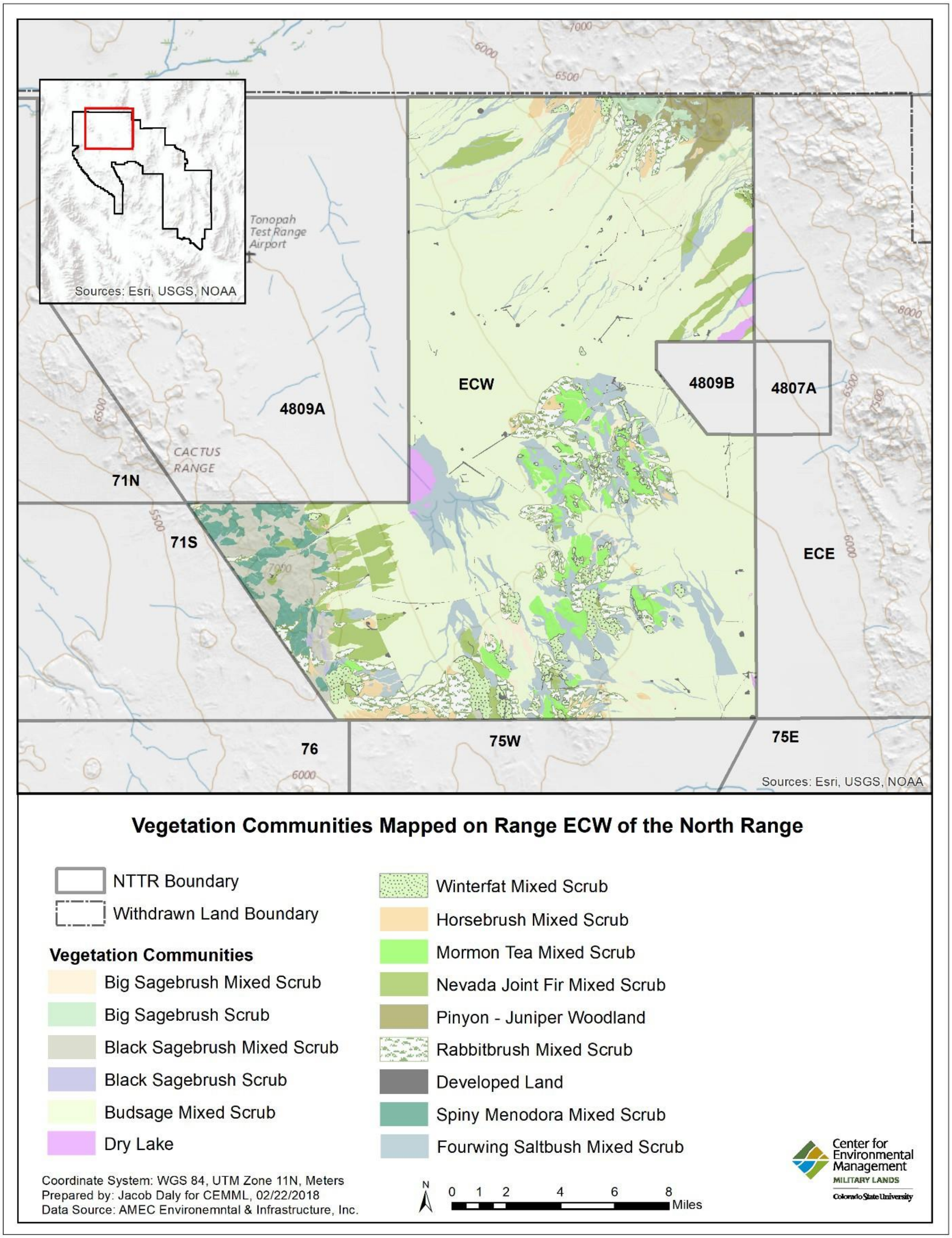

Figure 2-23. Nevada Department of Wildlife key habitat-level community polygons for range Electronic Combat West (ECW) on the North Range.

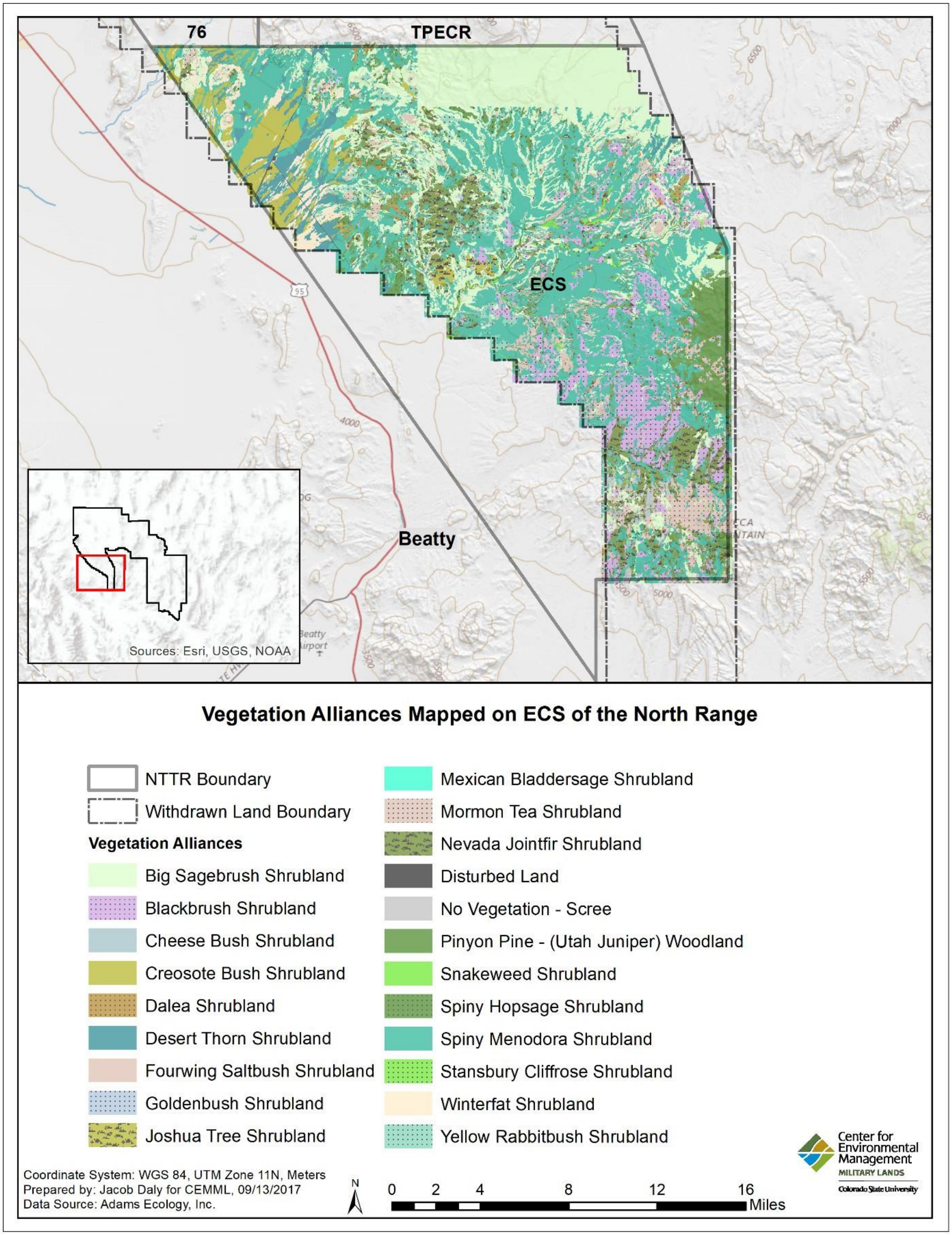

Figure 2-24. IVC-classified, alliance-level polygons for range Electronic Combat South (ECS) on the North Range.

South Range Vegetation

The South Range of the NTTR lies in the northeastern portion of the Mojave Desert, among the driest of North America's arid lands, where precipitation is often less than four inches per year (Rundel, 1996). The area consists of predominantly warm desert scrub vegetative communities, and, according to Auxilio et al. (2017b), the landscape is covered by shrubland communities mostly dominated by creosote bush and saltbush alliances (approximately 67% and 18%, respectively). These alliances are common in the Mojave Desert and generally form in areas where the availability of water for plants is impacted by soils retaining or draining water, or they occur due to varied alkalinity or salinity levels (Auxilio et al., 2017b).

Figure 2-25. *Echinomastus johnsonii* in bloom in the Mojave Desert. NAFB Photo Library.

The South Range Vegetation Classification Report for 2016 documented 3 vegetation Classes, 11 Alliances, and 18 Associations during vegetation surveys of the South Range (Auxilio et al., 2017b). According to the report, the shrubland Class was the most commonly observed, comprising over 93% of land cover. The remaining classes included dwarf-shrubland (1%), desert pavement (5%), and unclassifiable (1%). Although desert pavement is not yet a recognized vegetation classification within the NVC, this community type is different enough in vegetation structure and lack of cover to be recorded as an individual Class. Furthermore, these areas can be considered sensitive and fragile, requiring a considerable length of time to form. No herbaceous vegetation classes were observed during the spring and summer 2016 vegetation surveys. One record of the Las Vegas bearpoppy in Range 64C was documented in 2011 in the NNRP database, but has not been published in any annual reports and needs confirmation. Currently, classified range maps are available for ranges 65C, 64C-F, 64A, and 64B within the South Range (Figures 2-26 through 2-28). As found in the North Range, vegetation communities delineated on ranges 65C, 64B, and 64C-F were assigned alliance designations based on IVC naming convention sources, the most up to date classification information available. Range 64A was described according to the NWAP Key Habitat descriptions (WAPT, 2012). As stated above, this range, and all other ranges defined only to this level, will need to be revisited both on the ground and within mapping efforts for the most accurate vegetation classification determinations.

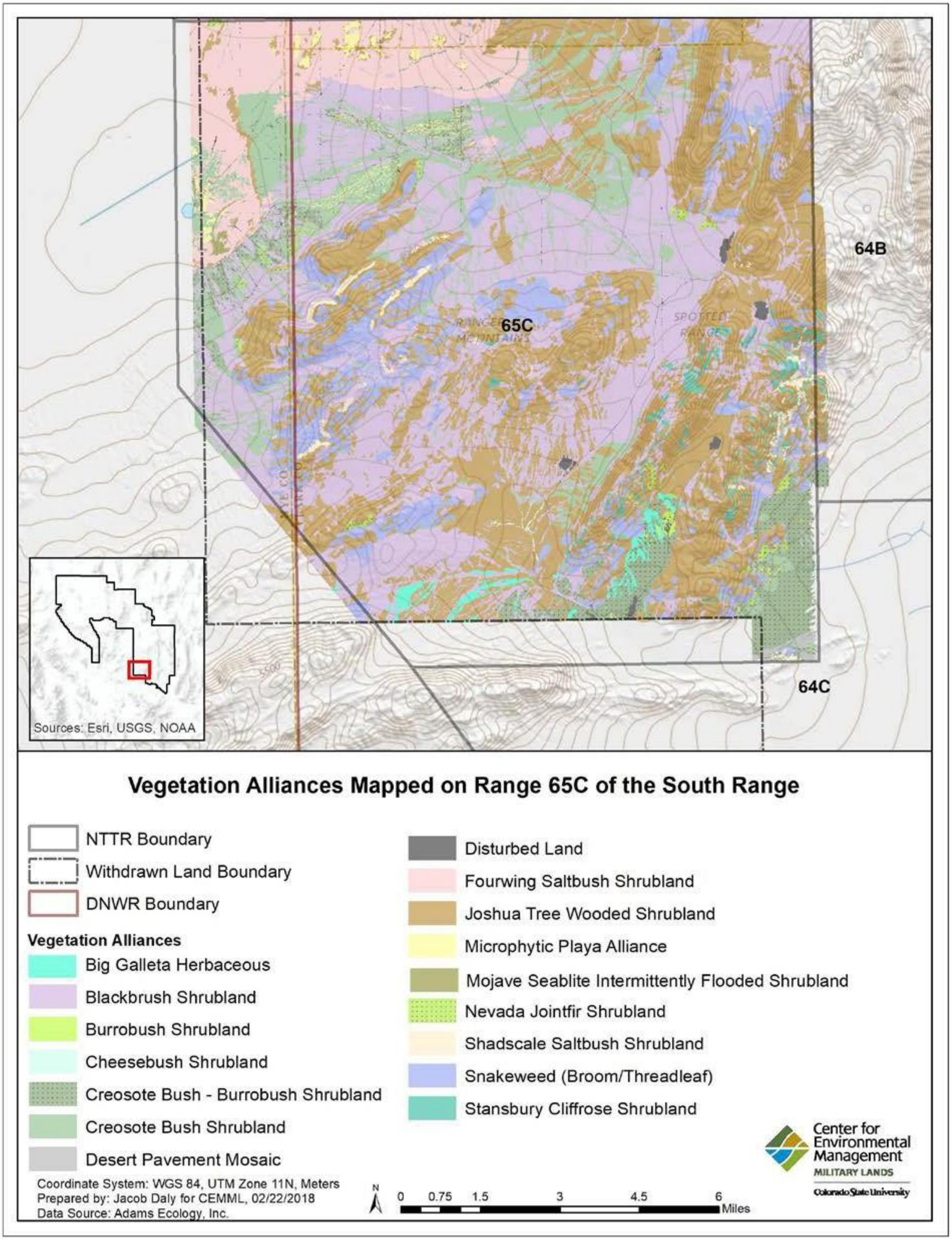

Figure 2-26. IVC-classified, alliance-level polygons for range 65C on the South Range.

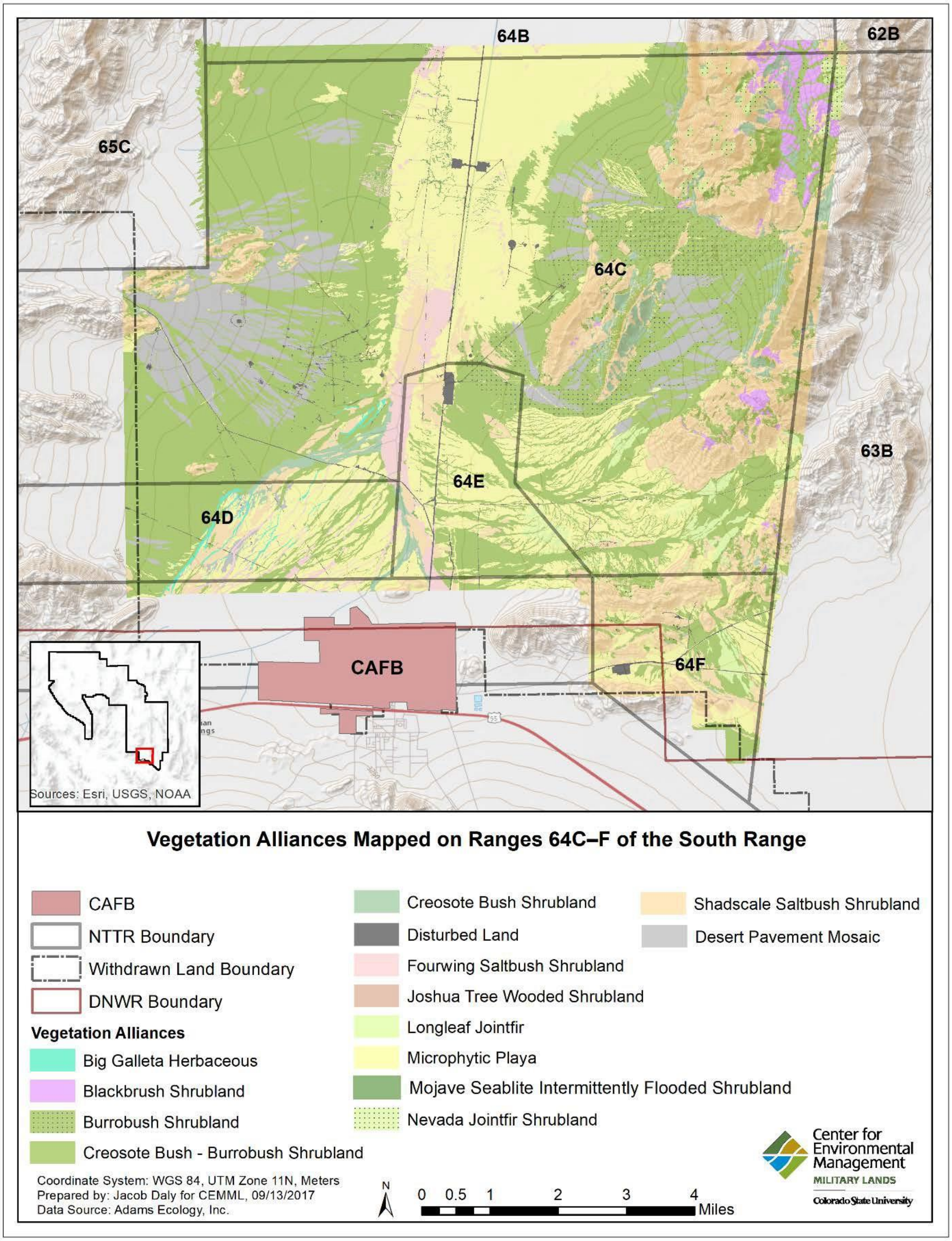

Figure 2-27. IVC-classified, alliance-level polygons for ranges 64C-F on the South Range.

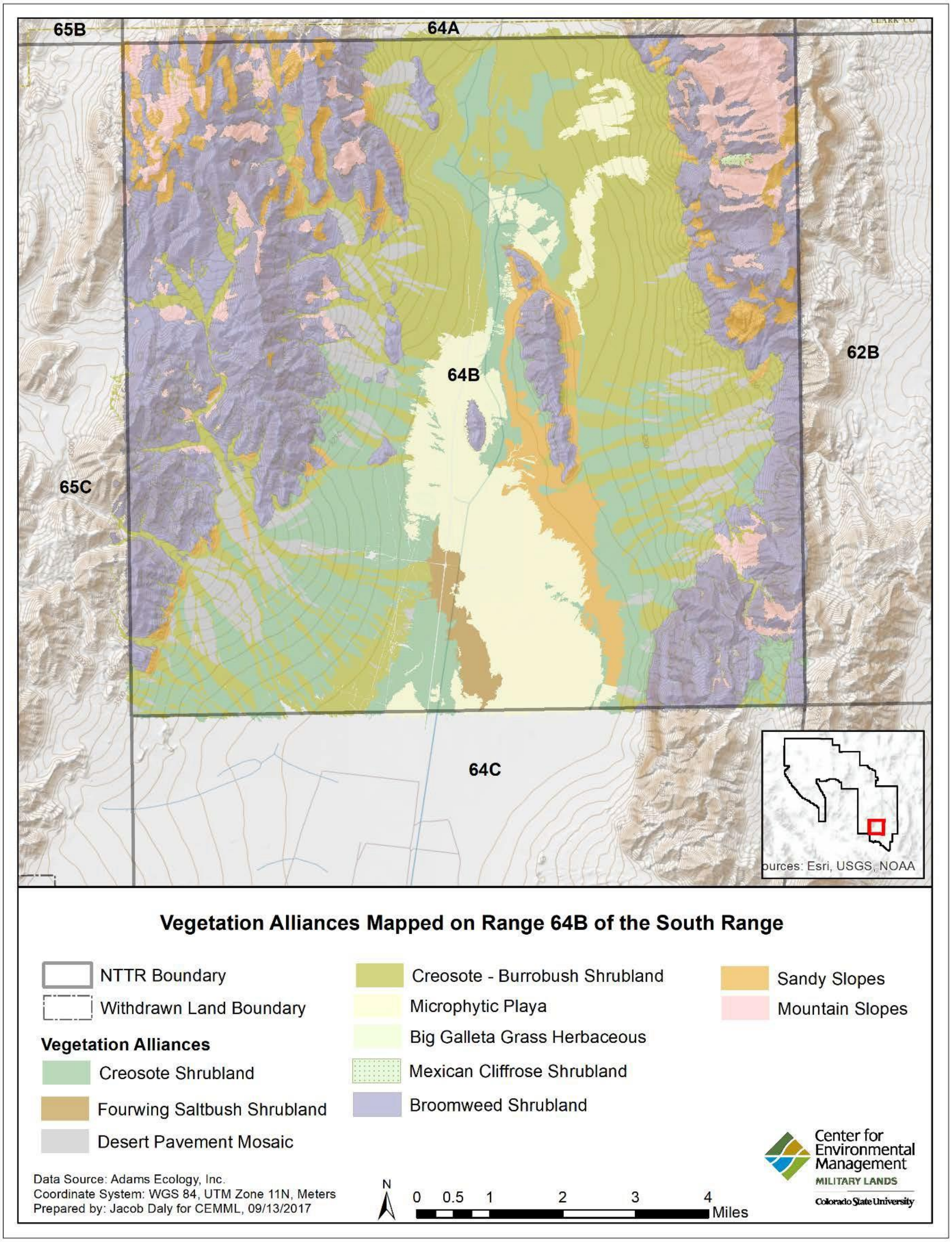

Figure 2-28. IVC-classified, alliance-level polygons for range 64B on the South Range.

Vast areas of the basins and bajadas in the Mojave Desert below approximately 3,940 feet elevation support plant communities dominated by creosote bush and white bursage. Saltbush species, ephedra, brittlebush (*Encelia virginensis*), desert globemallow (*Sphaeralcea ambigua*), succulents (especially prickly pears [*Opuntia* spp.] and chollas [*Cylindropuntia* spp.]), and Mojave yucca (*Yucca shidigera*) also may occur in this community. Where soils are especially alkaline and clay rich, as on the margins of dry lakebeds (playas) at the lowest elevations, saltbush, including four wing saltbush (*Atriplex canescens*), cattle spinach (*A. polycarpa*), and shadscale, dominate the vegetation.

At higher elevations (approximately 3,940–5,900 feet), blackbrush often is the dominant vegetative community. This plant community includes blackbrush, ephedras, turpentine broom (*Thamnosma montana*), and range rhatany (*Krameria parvifolia*). Joshua tree may also occur at higher elevations within the creosote bush/white bursage and the blackbrush communities. While it is rarely the dominant species in terms of numbers or cover in these communities, the Joshua tree contributes a significant proportion of biomass in the local area. Its mature height of up to 20 feet contributes to its visual domination over the surrounding low shrubs, most of which grow to less than three feet tall. The structure and biomass of the Joshua tree makes it an important component of the Mojave Desert ecosystem.

The sagebrush/pinyon-juniper woodland community is distinctive of the Mojave and Great Basin Deserts at higher elevations (4,920–5,900+ feet MSL). At these higher elevations, increased precipitation and lower temperatures facilitate the development of this woodland habitat. Dominant species in the community include big sagebrush (*Artemisia tridentata*), single leaf pinyon and Utah juniper in habitats with deeper soils, and black sagebrush in areas with shallow, rocky soils. Joint fir (*Ephedra viridis*) and rabbitbrush are common subdominants in this shrub- woodland. Although this vegetative community was more widespread in the lowlands during the last glacial age, post-glacial desertification led to the restriction of this woodland to the highest mountains of the South Range (Spaulding, 1985, 1990).

The blackbrush and sagebrush/pinyon-juniper communities are more limited in distribution, as they are restricted to higher elevations than the creosote bush/white bursage and saltbush communities. A relict population of singleleaf ash (*Fraxinus anomala*), consisting of only a few individuals, is present on the west side of the Spotted Range, in Range 65B (NAFB, 1997a). A comprehensive vegetation species list for the installation is provided in Appendix C.

Transition Zone

On the NTTR, a transitional vegetation zone between the Great Basin and Mojave Deserts exists along Pahute Mesa on the North Range. This area would be expected to include plants from both deserts distributed in a random pattern (Beatley, 1976). Extrapolation of Beatley's transition zone boundaries as it applies to the NTTR suggests that little of the expected vegetation matrix would be represented on either the North or South Ranges, with the possible exception of ECS. Alternatively, if the simpler, single boundaries proposed by other authors have more utility, then substantially greater amounts of the boundary or transition may be represented on the NTTR. Johnston et al. (1992) noted that transition-zone boundaries can be difficult to determine, especially where community changes are gradual.

The transition zone on the NTTR represents an important area ecologically, supporting species from distinct biotic regions. A greater diversity of plant and animal species is likely to be found there, which may include unique species. Generally, transition zones serve as corridors for some species and as barriers for others. On geologic time scales, species occupying transitional zones are often ephemeral, usually persisting less than 10,000 years (Hansen and di Castri, 1992).

Figure 2-29. *Pentstemon* sp. with perennial grasses. NAFB Photo Library.

The Nature Conservancy conducted a statistical analysis of the vegetative makeup of 185 plots on the NTTR, sampled between 1994 and 1997. Of the 185 plots, 78% were classified as either Great Basin or Mojave Desert vegetation types, 15% were classified as transition vegetation, and 7% were unclassified. Sampling of 185 plots was considered a bare minimum, and further sampling was strongly recommended; however, the available data support the hypothesis that the majority of the NTTR vegetation is closely associated with one desert or another. The Great Basin/Mojave Desert transition, where present, represents a small percentage of the NTTR vegetation (NAFB, 1997a).

2.3.2.3 Future Vegetation Cover

Desert ecosystems are sensitive to climate drivers that exacerbate the already hot and dry conditions, increasing vulnerability for many species that already exist close to their physiological limits. As such, even small changes in temperature and precipitation can have a significant impact on plant composition, distribution, and abundance in this region. Interacting disturbances (e.g., flooding and wildfire) have the potential to further alter species survival and composition.

Creosote bush (*Larrea tridentata*) is a dominant member of most plant communities of NAFB, NTTR South, and Range 77 (ECS) on NTTR North. Because creosote requires summer rains for flowering success, the decreasing precipitation projected by climate models could have substantial negative impacts on the species' reproductive success. The iconic Joshua tree (*Yucca brevifolia*) faces similar risks; the projected decrease in precipitation during its flowering period (March–May) could hinder the reproduction of trees, both directly (through water stress on individual trees) and indirectly (e.g., by influencing the plant-pollinator relationship and viable seed production, seed germination, seedling establishment, and recruitment). Water stress due to lower precipitation and higher temperatures could be particularly hard on seedlings, hindering growth. Species of low, shrub-like trees that thrive in riparian areas (e.g., cottonwood and mesquite) also could be sensitive to the expected climate changes, including increased minimum temperatures and altered flooding patterns. On the other hand, a drier climate might discourage the invasive nonnative tamarisk species, which could benefit efforts to control it.

Desert vegetation is expected to shift westward and upward in elevation over the coming century (Barrows, 2011; Barrows and Murphy-Mariscal, 2012) and, in some areas, may replace upslope vegetation that is less suited to the increasingly hot and seasonally dry conditions (Friggens et al., 2013; Lenihan et al., 2008). In addition, rising temperatures likely will enhance soil decomposition and reduce plant productivity over

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large areas. Loss of vegetative cover coupled with increases in precipitation intensity (often associated with climate change) and climate-induced reductions in soil aggregate stability could dramatically increase potential erosion rates.

The projected changes in climate may impact the success of invasive annuals on the installation, including cheatgrass and red brome. As described in Section 2.3.2.1, red brome is desert-adapted and has become common on NTTR South, whereas cheatgrass is adapted to cooler environments and occurs primarily on NTTR North. These *Bromus* species are both aggressive colonizers, and because they are now established on several parts of the installation, attempts to fully eradicate them have become impractical. Concerns caused by *Bromus* invasions include the creation of a grass-fire cycle that can have long-term effects on the structure and species composition of native plant communities (Abella, 2009; Engel and Abella, 2011).

The impacts of climate change on *Bromus* invasion will depend largely on the amount and timing of precipitation. Models project that average annual precipitation at NAFB will decrease overall under most scenarios; however, several scenarios show the potential for increased precipitation concentrated during the fall and/or winter months (CEMML, 2020). These precipitation patterns are reflected in other climate models for arid systems in North America (Westerling et al., 2003; IPCC, 2007) and are expected to favor expansion of exotic grasses, increasing the risk of fire and favoring the grass-fire cycle (Brooks et al., 2004). Alternatively, large portions of southern Nevada and southern Utah may become climatically unsuitable for cheatgrass in the case of hotter and drier conditions (CEMML, 2020) and red brome may well expand to fill any range that cheatgrass vacates (Bradley, 2009). Other factors relating to land use, soils, competition, or topography also will interact with climate change to determine *Bromus* success at the local scale (Bradley, 2009). Ultimately, the combination of changing conditions and invasive grasses could result in conversion to a grassland system (EcoAdapt, 2017). Alternatively, the shift in climate with fewer invasive grasses and absence of fire could lead to a shrub-dominated ecosystem or ecosystem that is shrub-dominated and interspersed with grassy patches (CEMML, 2019).

2.3.2.4 Turf and Landscaped Areas

The moderate climate regime of NAFB and CAFB allows for the proliferation of a wide variety of deciduous trees and shrubs, evergreen trees and shrubs, perennial species, vines, and grasses within improved areas. Overall maintenance of the turf and landscaped areas of NAFB and CAFB is directed by the Grounds Maintenance Plan, an updated version of which is not available at this time. Improved grounds at NAFB and CAFB include areas of turf grasses and ornamental landscaping that require regular maintenance, such as mowing, irrigation, and fertilizing. Past reports indicate that the preferred mixture of turf grasses for NAFB was a 60%-30%-10% mix of Kentucky bluegrass (*Poa pratensis*), Italian domestic ryegrass (*Lolium perenne* var. *multiflorum*), and creeping red fescue (*Festuca rubra* [fallax]). With regular irrigating, this mix can be maintained as attractive turf; however, warm-season grasses, such as buffalo grass, Bermuda grass, or zoysia, would require less irrigation and be better adapted to the desert environment. Deciduous and evergreen trees are also maintained at the installations, all supported with irrigation and shallow groundwater. Joshua trees, cacti, and other desert-adapted species planted in xeriscapes require no watering. Over the last several years, the installation has shifted to planting native vegetation. The current, authorized vegetation list used by NAFB is the same as the Southern Nevada Water Authority's 2006 Water Smart Landscapes Program Plant List. Additional information regarding landscape maintenance is available from the Southern Nevada Water Authority. The local water authority is a valuable

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resource providing comprehensive landscape watering information that includes local watering restrictions and irrigation-method guidance. This information can be obtained on their website (Southern Nevada Water Authority, 2017).

Since 1994, NAFB has been recognized as a Tree City by the Tree City USA Program. The program recognizes towns and counties across the nation that have implemented successful urban forestry projects. NAFB programs supporting the inventory and maintenance of trees on the base include the 2013 Urban Forest Inventory (NAFB, 2014g; Table 2-9).

2.3.3 Fish and Wildlife

2.3.3.1 Reptiles and Amphibians

Reptiles are found across NAFB, CAFB, and the NTTR, whereas amphibians are relatively scarce and appear to be found only in areas with water. Dedicated herpetofauna surveys, combined with incidental observations during other biological surveys, have begun to provide a picture of the distribution of herpetofauna across NAFB, CAFB, and the NTTR. Table 2-10 summarizes records of herptile species observed on NAFB, CAFB, and/or the NTTR during surveys from 2005 to 2016. The data show that several diurnal lizard species are both widespread and abundant on the installation. This may be due, in part, to sampling bias, as most survey effort has occurred diurnally. Nocturnal survey methods added in 2016 show a notable trend in species composition as one moves from southern/lower-elevation areas to northern/higher-elevation areas.

The desert tortoise (*Gopherus agassizii*) is the only federally-listed threatened reptile found on NAFB, CAFB, and the NTTR. Conservation and management of this species is discussed in detail in Section 2.3.4.1. The banded Gila monster (*Heloderma suspectum cinctum*), Sonoran mountain kingsnake (*Lampropeltis pyromelana*), rosy boa (*Lichanura orcutti*), Amargosa toad (*Anaxyrus nelsoni*), and northern leopard frog (*Lithobates pipiens*) are state-protected species with the potential to occur on the NTTR. A single Gila monster was observed in 1992 from NAFB and remains the only record of that species on the installation to date (NAFB, 2017a).

Table 2-9. Landscape plant species occurring within improved grounds on Nellis Air Force Base, as recorded from the 2013 Urban Forest Inventory.

Common Name	Scientific Name		Common Name	Scientific Name
African Sumac	*Searsia lancea*		Hollyleaf Gilia	*Gilia latiflora*
Arizona Ash	*Sorbus dumosa*		Honey Mesquite	*Prosopis glandulosa*
Arizona Cypress	*Hesperocyparis arizonica*		Italian Cypress	*Cupressus sempervirens*
Banana Yucca	*Yucca baccata*		Japanese Black Pine	*Pinus thunbergiana*
Black Walnut	*Juglans nigra*		Joshua Tree	*Yucca brevifolia*
Blue Palo Verde	*Cercidium floridum*		Lace Bark Elm	*Ulmus parvifolia*
Bottlebrush	*Callistemon sp.*		Live Oak	*Quercus virginiana*
Broadfruit Combseed	*Pectocarya platycarpa*		Mediterranean Fan Palm	*Chamaerops hulilis*
California Fan Palm	*Washingtonia filifera*		Mexican Fan Palm	*Washingtonia robusta*

Table 2-9. Landscape plant species occurring within improved grounds on Nellis Air Force Base, as recorded from the 2013 Urban Forest Inventory.

Common Name	Scientific Name		Common Name	Scientific Name
Canary Island Date Palm	*Phoenix canariensis*		Modesto Ash	*Fraxinus velutina var.*
Carob	*Ceratonia siliqua*		Mojave Yucca	*Yucca schidigera*
Catclaw Acacia	*Acacia greggii*		Mondel Pine	*Pinus brutia var. eldarica*
Chastetree	*Vitex agnus-castus*		Palo Brea	*Parkinsonia praecox*
Cherry Plum	*Prunus cerasifera*		Sago Palm	*Cycas revoluta*
Chinaberrytree	*Melia azedarach*		Screwbean Mesquite	*Prosopis pubescens*
Chinese Pistache	*Pistacia chinensis*		Shamel Ash	*Fraxinus uhdei*
Coolabah	*Eucalyptus microtheca*		Siberian Elm	*Ulmus pumila*
Cottonwood	*Populus sp.*		Silktree	*Albizia julibrissin*
Crapemyrtle	*Lagerstroemia indica*		Texas ebony	*Ebenopsis ebano*
Desert Willow	*Chilopsis linearis*		Texas Mountain Laurel	*Sophora secundiflora*
Edible Fig	*Ficus carica*		Thornless Chilean Mesquite	*Prosopis chilensis*
European Olive	*Olea europaea*		Washington Palm	*Washintonia robusta*
Fan Tex Ash	*Fraxinus velutina*		Weeping Willow	*Salix babylonica*
Fruitless Mulberry	*Morus alba*		Western Honey Mesquite	*Prosopis glandulosa var.*
Gambel Oak	*Quercus gambelii*		White Mulberry	*Morus alba*
Glossy Privet	*Ligustrum lucidum*		Whitethorn Acacia	*Acacia constricta*
Holly Oak	*Quercus ilex*		Yellow Paloverde	*Parkinsonia microphylla*

Additional information regarding installation landscaping and ground maintenance practices can be found in Section 7.7.

Table 2-10. Herpetofauna observed on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range, 2005–2016.

Common Name	Scientific Name	North Range	South Range/ CAFB	NAFB/ SAR	Total
Federal- and State-Protected Herpetofauna Species					
Desert Tortoise	*Gopherus agassizii*	0	1	11	12
Nevada Species of Conservation Priority (SOCP)					
Chuckwalla	*Sauromalus ater*	12	37	4	53
Desert Horned Lizard	*Phrynosoma platyrhinos*	24	7	2	33
Desert Iguana	*Dipsosaurus dorsalis*	0	1	7	8

Table 2-10. Herpetofauna observed on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range, 2005–2016.

Common Name	Scientific Name	North Range	South Range/ CAFB	NAFB/ SAR	Total
Desert Night Lizard	*Xantusia vigilis*	0	1	1	2
Great Basin Collared Lizard	*Crotaphytus bicinctores*	59	40	8	107
Long-nosed Leopard Lizard	*Gambelia wislizenii*	27	7	2	36
Mojave Sidewinder	*Crotalus cerastes*	1	5	6	12
Spotted Leaf-nosed Snake	*Phyllorhynchus decurtatus*	0	1	1	2
Western Red-tailed Skink	*Plestiodon gilberti*	4	0	0	4
Western Banded Gecko	*Coleonyx variegatus*	6	8	31	45
Great Basin Spadefoot Toad	*Spea intermontana*	12	0	0	12
Other Native Herpetofauna					
Great Basin Whiptail Lizard	*Aspidocelis tigris*	69	82	25	176
Side-blotched Lizard	*Uta stansburiana*	62	51	53	166
Yellow-backed Spiny Lizard	*Sceloporus uniformis*	67	12	0	79
Great Basin Fence Lizard	*Sceloporus occidentalis*	121	0	0	121
Sagebrush Lizard	*Sceloporus graciosus*	4	0	0	4
Zebra-tailed Lizard	*Callisaurus draconoides*	42	31	3	76
Great Basin Skink	*Plestiodon skiltonianus*	1	0	0	1
Great Basin Rattlesnake	*Crotalus oreganus lutosus*	7	0	0	7
Panamint Rattlesnake	*Crotalus stephensi*	8	0	0	8
Southwestern Speckled Rattlesnake	*Crotalus pyrrhus*	0	0	2	2
Great Basin Gopher Snake	*Pituophis catenifer*	22	0	3	25
California Kingsnake	*Lampropeltis californiae*	2	0	0	2
Coachwhip (Red Racer)	*Coluber flagellum*	1	1	0	2
Striped Whipsnake	*Coluber taeniatus*	10	0	0	10
Desert Night Snake	*Hypsiglena chlorophaea*	1	0	0	1
Mojave Patch-nosed Snake	*Salvadora hexalepis*	1	3	0	4
Western Long-nosed Snake	*Rhinocheilus lecontei*	3	0	1	4
Glossy Snake	*Arizona elegans*	2	0	0	2
Woodhouse's Toad	*Anaxyrus woodhousii*	0	0	15	15
Nonnative/Introduced Herpetofauna					
Mediterranean Gecko	*Hemidactylus turcicus*	0	0	14*	14*
Rough-tailed Bowfoot Gecko	*Cyrtopodion scabrum*	0	0	17	17
Bullfrog	*Lithobates catesbiena*	0	0	0	0

*Many are likely rough-tailed bowfoot geckos that were misidentified.

The 2010 INRMP (NAFB, 2010a) also discussed the greater short-horned lizard (*Phrynosoma hernandesi*), relict leopard frog (*Lithobates onca*), and Columbia spotted frog (*Rana luteiventris*). The greater short-horned lizard is a Nevada Species of Conservation Priority (SOCP) and has no federal status. In 2015, the USFWS declared that ESA listing for the relict leopard frog is warranted, however its listing has been delayed. There has been a conservation agreement in place for the relict leopard frog since 2005. The Columbia spotted frog was a candidate for ESA listing; however, in October 2015, the USFWS decided against listing due to a conservation agreement entered into by NDOW, USFWS, and seven other conservation partners. A literature search, combined with surveys since 2010, indicate that it is highly unlikely that these three species occur on NAFB, CAFB, or the NTTR. The nearest known populations are greater than 100 miles from the installation boundaries and/or they lack suitable habitat. Unless NDOW or other survey efforts document these species closer to the installation boundaries, they are not considered species with potential to occur on these Air Force-managed lands.

Many common and widespread species are listed as SOCP under the state of the NWAP. While SOCP designation provides no state legal protection, the SOCP can be considered a list of species the state wishes to monitor to determine whether development, habitat alteration, climate change, or commercial collection are causing declines in these species (WAPT, 2012). Eleven SOCP, 19 other native species, and 2 nonnative/introduced herptile species have been documented on NAFB, CAFB, and/or the NTTR between 2010 and 2016 (NAFB, 2017a).

This trend appears to coincide with the transition from Mojave Desert to Great Basin Desert habitats, and certain Mojave Desert species, including the sidewinder (*Crotalus cerastes*), the chuckwalla (*Sauromalus ater*), and western banded gecko (*Coleonyx variegatus*) that occur surprisingly far north along the western portions of the NTTR, where lower-elevation Mojave Desert habitat penetrates higher-elevation Great Basin scrub. Mojave Desert species documented on NAFB, CAFB, and southern portions of the NTTR include the sidewinder, chuckwalla, desert iguana (*Dipsosaurus dorsalis*), western banded gecko, desert night lizard (*Xantusia vigilis*), southwestern speckled rattlesnake (*Crotalus pyrrhus*), and spotted leaf-nosed snake (*Phyllorhynchus decurtatus*).

Figure 2-30. Spotted leaf nosed snake on Nellis Air Force Base. NAFB Photo Library.

Some known Great Basin species found on the northern and higher-elevation portions of the NTTR include the Great Basin fence lizard (*Sceloporus occidentalis*), striped whipsnake (*Coluber taeniatus*), and Great Basin rattlesnake (*Crotalus oreganus lutosus*).

There are numerous species considered Mojave-Great Basin generalists and that are widespread on both the northern and southern portions of the NTTR, and most have been documented on NAFB as well. Among these are the zebra-tailed lizard (*Callisaurus draconoides*), Great Basin whiptail lizard (*Aspidocelis tigris*), yellow-backed spiny lizard (*Sceloporus uniformis*), desert horned lizard (*Phrynosoma platyrhinos*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), and Great Basin gopher snake (*Pituophis catenifer deserticola*). The collared lizard and the leopard lizard are both Nevada SOCP. Figures 2-33 and 2-34 show collared lizard and leopard lizard observations on NAFB/SAR and the NTTR, respectively. Figures 2-35 and 2-36 are maps of observations for many of these snake species on the NTTR. Figures 2-37 and 2-38 are maps of observations for many of these snake species on NAFB and the SAR.

Only two amphibians have been documented: The Great Basin spade-foot toad (*Spea intermontana*) on the North Range in the area around Breen Creek and George's Water, and Woodhouse's toad (*Anaxyrus woodhousii*) in and around the golf course ponds on NAFB. Two introduced geckos have been documented on NAFB: the Mediterranean gecko (*Hemidactylus turcicus*) and the rough-tailed bowfoot gecko (*Cyrtopodion scabrum*). Introduction and distribution of the rough-tailed bowfoot gecko is discussed in the 2016 NAFB Reptile and Amphibian report (NAFB, 2017a).

Figure 2-31. Great Basin spade foot toads in amplexus at Breen Creek. NAFB Photo Library.

Rattlesnakes

Four of the five species of rattlesnake with the potential to occur on NAFB, CAFB, or the NTTR have been documented. They are the Great Basin rattlesnake, Panamint rattlesnake (*Crotalus stephensi*), southwestern speckled rattlesnake, and Mojave sidewinder (*C. serastes*). While only one is a SOCP (the sidewinder), NDOW has taxonomic and research interest in all native rattlesnake species (Jones, 2017). The 2010 INRMP indicated that the Mojave rattlesnake (*Crotalus scutulatus*) is a "common" species; however, it has not yet been documented on NAFB, CAFB, or the NTTR. No NDOW records have documented the Mojave rattlesnake northwest of Las Vegas (along the US-95 corridor) or northeast of Las Vegas (NAFB, Apex area, and along the Interstate 15 corridor) until one reaches the Mesquite area. There is apparently a disjunct population along the U.S. Highway 93 in Lincoln County from Alamo to Hiko. (Jones, 2017). Based on this, the Mojave rattlesnake could possibly be found on the NTTR in ranges 61 or 62. Figure 2-35 show observations of rattlesnakes on the NTTR, and Figure 2-37 includes rattlesnake observations on NAFB. These maps are a good start at defining the distribution of these keystone species; however, more survey effort would better define the distribution of these species, especially in the South Ranges where no Mojave, Panamint, or southwestern speckled rattlesnakes have been documented.

Figure 2-32. Panamint rattlesnake on the North Range. NAFB Photo Library.

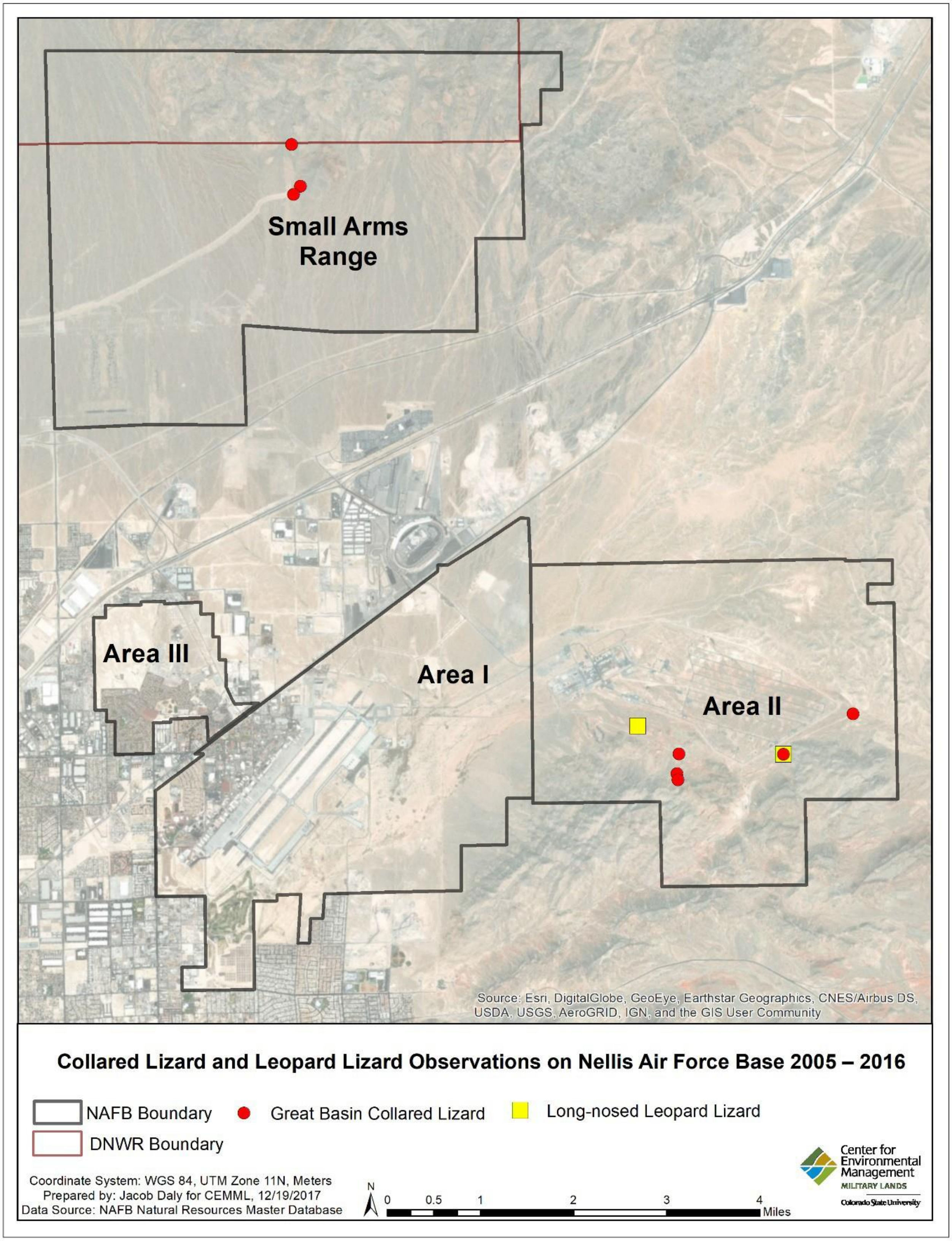

Figure 2-33. Collared and leopard lizard observations on Nellis Air Force Base, 2005–2016.

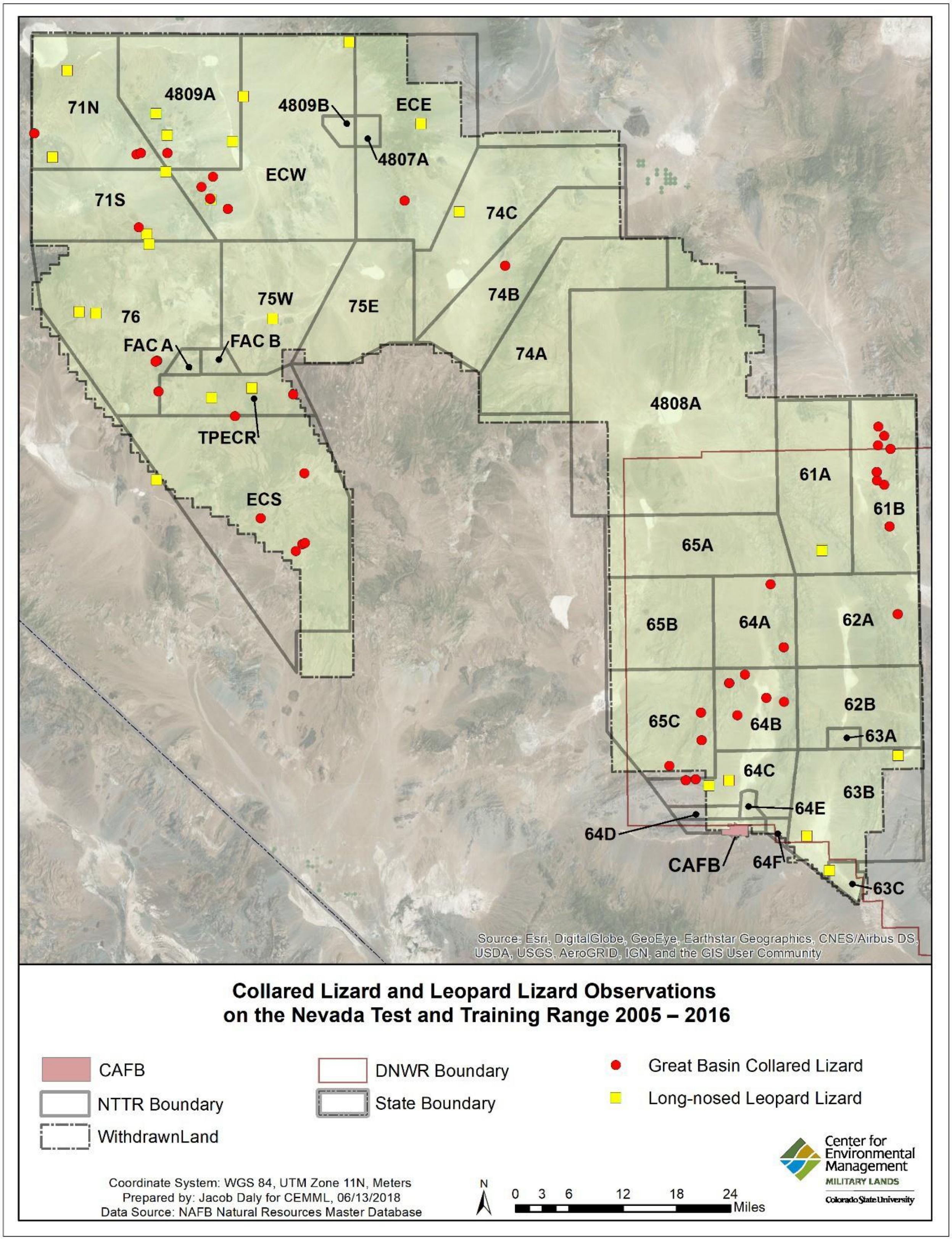

Figure 2-34. Collared and leopard lizard observations on the Nevada Test and Training Range, 2005–2016.

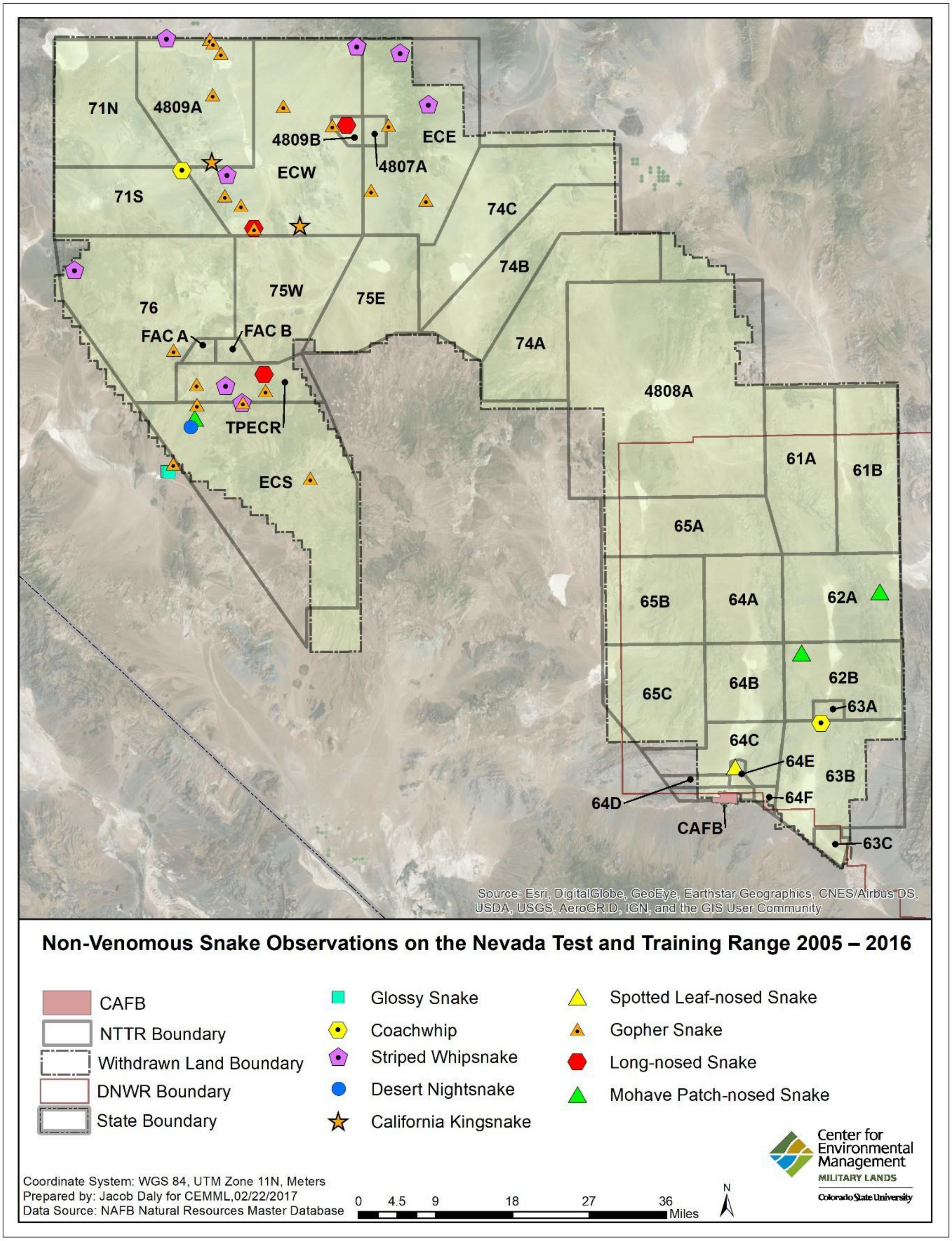

Figure 2-35. Non-venomous snake observations on the Nevada Test and Training Range, 2005–2016.

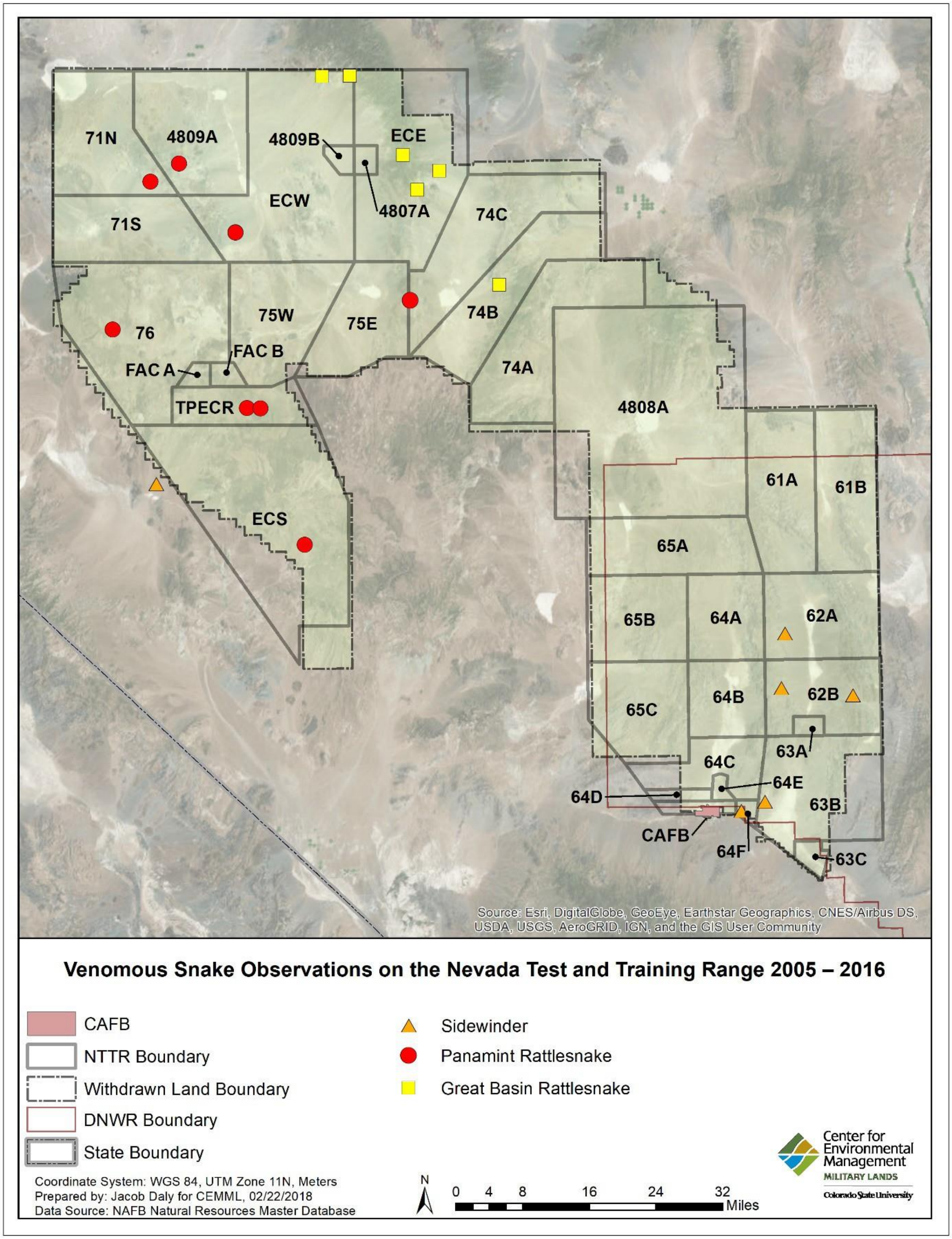

Figure 2-36. Venomous snake observations on the Nevada Test Training Range, 2005–2016.

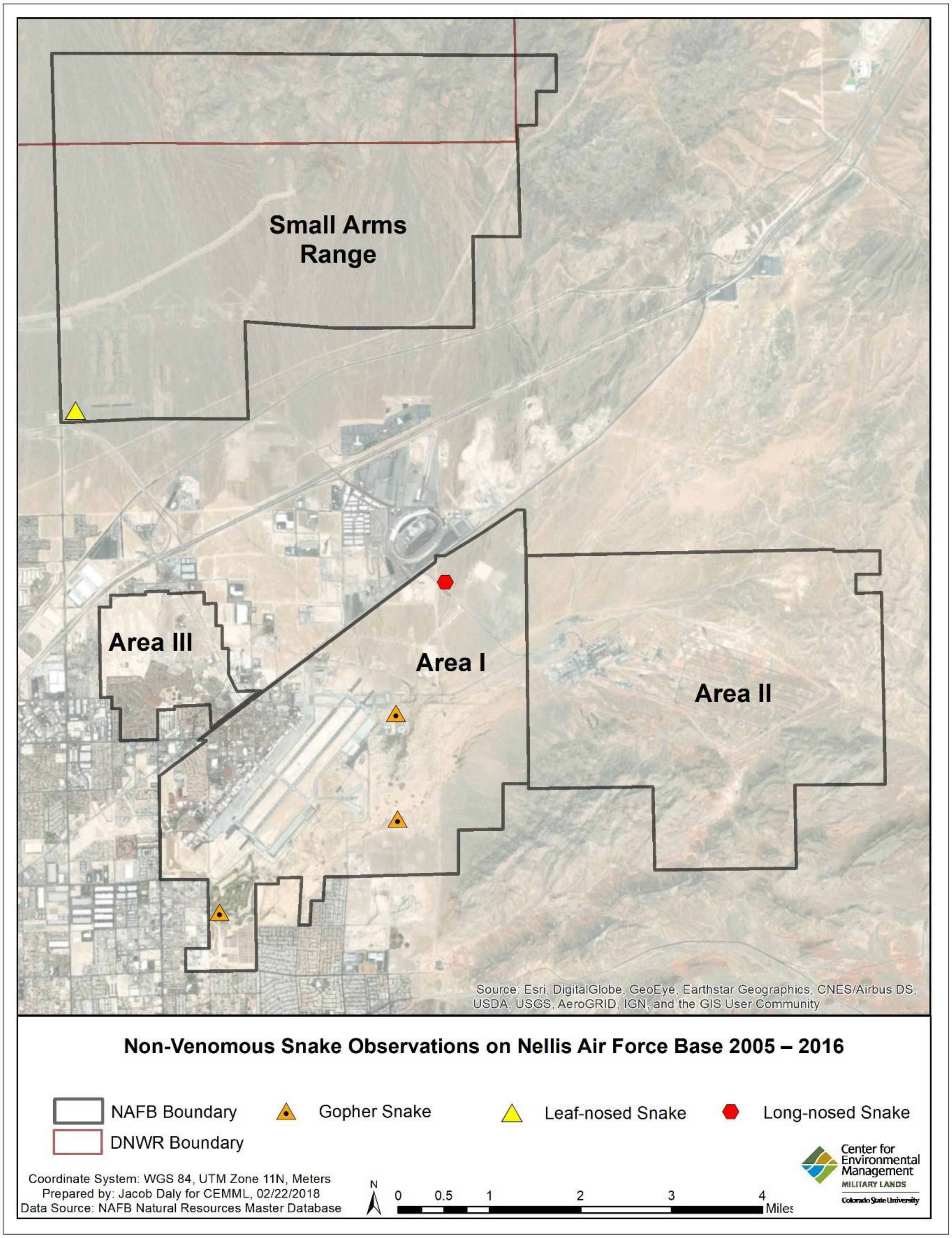

Figure 2-37. Non-venomous snake observations on Nellis Air Force Base and the Small Arms Range, 2005–2016.

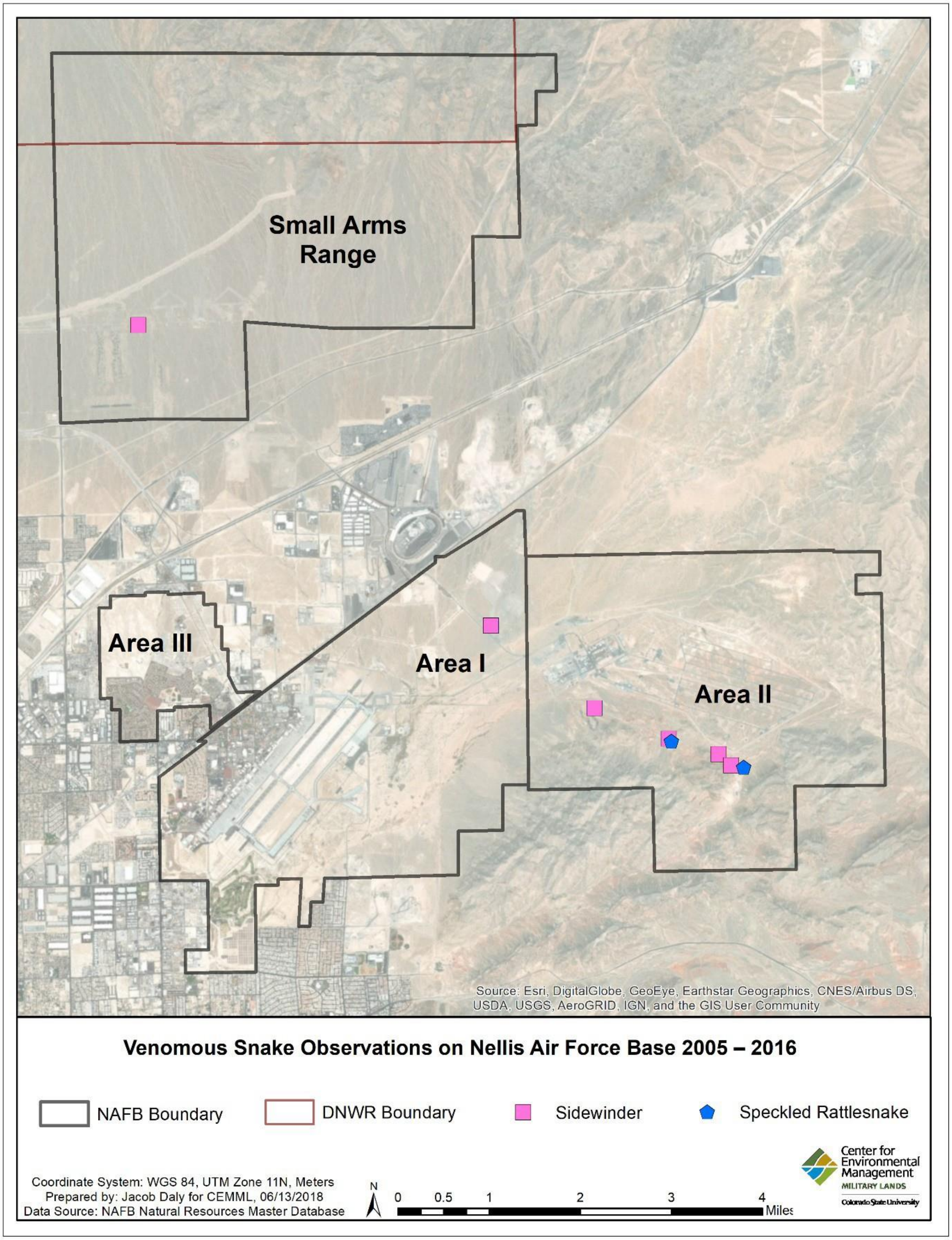

Figure 2-38. Venomous snake observations on Nellis Air Force Base and the Small Arm Range, 2005–2016.

Species Not Yet Documented

As a group, herpetofauna are often the most difficult terrestrial vertebrates to inventory and monitor (WAPT, 2012). Despite the success of the 2010–2016 surveys, there are a number of herptile species, including some protected and SOCP, which have the potential to occur in the survey areas but have not yet been documented. Amargosa toads have been documented in the Beatty area, at artificial water sources on private land (Coffer Ranch), as well as in the Oasis Valley west of the NTTR boundary. A number of secretive and fossorial snakes and amphibians that spend most of their life underground or under shelter have not been documented on NAFB, CAFB, or the NTTR. Additional survey effort during suitable environmental conditions (cloudy, rainy, or overcast weather), or utilizing long-term monitoring methods (coverboards or pitfall traps), may enable detection of these species in future field seasons.

2.3.3.2 Migratory Birds and Raptors

Migratory birds and raptors are protected by the MBTA and EO 13186 (2001), Responsibilities of Federal Agencies to Protect Migratory Birds, dated 10 January 2001. This agreement directs the USAF to avoid or minimize negative impacts to migratory birds and takes steps to protect birds and restore or enhance their habitats whenever possible. The bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrystaeos*) are further protected by the Bald and Golden Eagle Protection Act (BGEPA), and NAC 503.050 (2004) provides for protection of sensitive bird species at the state level. Additionally, the DoD has sought to actively manage its natural resources and support avian conservation through its collaboration with Partners in Flight (PIF) since signing a memorandum of agreement in 1991 that established a federal Neotropical Migrating Bird Conservation Committee (PIF DoD Natural Resources Program, 2014).

Figure 2-39. Yellow warbler in tamarisk on Nellis Air Force Base. NAFB Photo Library.

Actions mandated for the protection of birds on federal lands in EO 13186 include restoring and enhancing habitat for migratory birds and preventing pollution and detrimental alteration of the environment as practicable within the constraints of the military mission. The EO also directs the USAF to minimize take of migratory birds and notify USFWS if take of migratory birds resulting from USAF actions is having or is likely to have measurable negative impacts on migratory bird populations, except where it pertains to certain mission-critical duties. Furthermore, EO 13186 requires that migratory bird conservation measures are to be incorporated into agency planning processes whenever possible and promotes coordinated inventory and monitoring efforts for migratory bird species on federal lands (EO 13186, 2001). Other guidance documents include the Great Basin Bird Observatory's Nevada Comprehensive Bird

Conservation Plan (2010), PIF's Landbird Conservation Plan (Rosenberg et. al, 2016), and the Strategic Plan for DoD Bird Conservation and Management (2014).

Together, NAFB, CAFB, and the NTTR encompass a diverse array of habitats within the Great Basin and Mojave Desert ecoregions. This ecosystem diversity supports a large variety of bird species. For a comprehensive list of all bird species recorded through 2016, refer to Appendix B.

Figure 2-40. Blue-winged teal over playa on the Nevada Test and Training Range. NAFB Photo Library.

During wet years, playas on the NTTR may provide habitat and foraging opportunities for many species of ducks, geese, and shorebirds that are seasonal migrants. On the NTTR, most surface waters are ephemeral and only attract waterfowl during short time periods following storm events. Small populations may inhabit permanent bodies of water located around seeps and springs. In general, the number of waterfowl found in these areas is small and transient (NAFB, 2012a).

Sagebrush communities on the NTTR provide habitat for a variety of bird species, including the sage thrasher (*Oreoscoptes montanus*), sagebrush sparrow (*Artemisiospiza nevadensis*), common poorwill (*Phalaenoptilus nuttallii*), and horned lark (*Eremophila alpestris*). Less frequently observed species include the green-tailed towhee (*Pipilo chlorurus*), common nighthawk (*Chordeiles minor*), and western meadowlark (*Sturnella neglecta*). Brewer's sparrow (*Spizella breweri*) is also found in sagebrush communities and is state protected and further classified as Sensitive. Chukar (*Alectoris chukar*) is listed as a state upland game bird and has been introduced into the area, where it typically inhabits rocky habitat and desert scrub near springs and other freshwater sources (NAFB, 2012a; NNHP, 2017a, 2017b; NAC 503.050, 2004).

Figure 2-41: Townsend's solitaire at spring on the Nevada Test and Training Range. NAFB Photo Library.

Canyons and cliffs in the NTTR provide structure for habitat that attracts raptors and other cliff-nesting avian species. Some of the birds commonly using the cliffs and canyons of the NTTR include golden eagle (classified as Sensitive by the BLM and further protected by the BGEPA), prairie falcon (*Falco* *mexicanus*), peregrine falcon (*Falco peregrinus*; designated as state endangered), white-throated swift (*Aeronautes saxatalis*), rock wren (*Salpinctes obsoletus*), and canyon wren (*Catherpes mexicanus*) (NAFB, 2012a; NNHP 2017a, 2017b).

The pinyon-juniper woodlands support the greatest bird diversity in the area. Species commonly found in this habitat include the blue-gray gnatcatcher (*Polioptila caerulea*), gray vireo (*Vireo vicinior*), black-throated gray warbler (*Dendroica nigrescens*), juniper titmouse (*Baeolophus ridgwayi*), gray flycatcher (*Empidonax wrightii*), pinyon jay (*Gymnorhinus cyanocephalus*; designated as Sensitive by the BLM), and Townsend's solitaire (*Myadestes townsendi*) (NAFB, 2012a; NNHP, 2017a, 2017b).

Birds present in the Mojave Desert creosote scrub plant communities found on NAFB and much of the South Range of the NTTR include the horned lark (*Eremophila alpestris*), Costa's hummingbird (*Calypte costae*), loggerhead shrike (*Lanius ludovicianus*; classified as Sensitive by BLM and NDOW), mourning dove (*Zenaida macroura*), black- throated sparrow (*Amphispiza bilineata*), western burrowing owl (*Athene cunicularia hypugeae*; a BLM Sensitive species), greater roadrunner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), and Gambel's quail (*Callipepla gambelii*) (NAFB, 2012a; NNHP, 2017a, 2017b). Le Conte's thrasher (*Toxostoma lecontei*), an uncommon and secretive resident of the arid southwest classified as Sensitive by BLM, prefers sparsely vegetated creosote scrub. In general, the variety of bird species increases where vegetation and habitat associations are more diverse. An example is locations where Joshua trees, riparian vegetation, or large cacti are present (NNHP, 2017a, 2017b; Great Basin Bird Observatory [GBBO], 2010).

This more structurally diverse desert scrub habitat is preferred by Bendire's thrasher (*Toxostoma bendirei*), a rare resident of southern Nevada classified as Sensitive by BLM with potential to occur on NAFB and on the South Range of the NTTR (NNHP, 2017a, 2017b; GBBO, 2010). The cactus wren (*Campylorhyncus brunneicapillus*) is often associated with stands of cholla cactus, and Scott's oriole (*Icterus spurius*) is occasionally observed nesting in Joshua trees (NAFB, 2012a). Phainopepla (*Phainopepla nitens*), Lucy's warbler (*Oreothlypis luciae*), and black-tailed gnatcatchers (*Polioptila melanura*) are associated with riparian scrub habitat dominated by mesquite (NAFB, 2012a; GBBO, 2010).

Figure 2-42. Western tanager in Joshua tree on the Nevada Test and Training Range. NAFB Photo Library.

The NNRP initiated surveys to inventory and monitor birds in 2007, and these efforts have expanded over the years to include a large variety of projects designed to assess presence/absence, distribution, and productivity of migratory birds and raptors across the installation (NAFB, 2011b, 2012a, 2013a, 2014a, 2015a, 2016b, 2017b). NNRP biologists use an array of methods to survey bird populations. They include Nevada Bird Count Surveys, following protocol developed by the

GBBO; hour-long, stationary point counts; helicopter surveys in cliff and Joshua tree habitat for nesting raptors; power pole surveys for raptors by vehicle; placing remote wildlife cameras at water sources and other wildlife attractants; and Christmas Bird Counts following the National Audubon Society protocol. In addition to these efforts, the NNRP has conducted focused surveys and nest monitoring specifically for sensitive bird species (NAFB 2011b, 2012a, 2013a, 2014a, 2015a, 2016b, 2017b). See Sections 2.3.4.7 to 2.3.4.11 for information regarding projects that address sensitive bird species on the installation.

There are now considerable data for presence/absence and distribution of many avian species across most of the installation, and the NNRP is now beginning to conduct year to year assessments to monitor long-term trends in the abundance, distribution, and productivity of bird species across NAFB, CAFB, and the NTTR. Refer to Chapter 8 of this INRMP for objectives and projects the NNRP has established for general inventory and monitoring of migratory bird and raptor populations, as well as focused surveying and monitoring efforts for sensitive avian species.

Thirteen special-status bird species are known to occur on the installation, and six more have the potential to occur within installation boundaries. See Appendix E for a complete list of species and classifications.

2.3.3.3 Small Mammals

Description of Current Conditions

Terrestrial small mammals are common across NAFB, CAFB, and the NTTR. This group serves important ecological functions, such as providing food sources for carnivores, raptorial birds, snakes, and some lizards; facilitating seed dispersal and germination; mixing and aeration of soils; and nutrient cycle enhancement. Most are representatives of five families within the Rodentia order. Only the pale kangaroo mouse (*Microdipodops pallidus*) and the dark kangaroo mouse (*M. megacephalus*) are classified as protected by the State of Nevada and are discussed further in Section 2.3.4, as are other species of heightened conservation concern. The pygmy rabbit (*Brachylagus idahoensis*) has been removed from the state watch list but remains a BLM Sensitive species. Prior to its removal from the watch list, multiple surveys were conducted to determine its presence/absence on the NTTR. It has been identified on the northern end of the Kawich Range within the NTTR.

In 2005, the NNRP initiated surveys to identify the species composition, distribution, population size estimates, and habitat usage of small mammals. Surveys consist of setting Sherman (H.B. Sherman Traps Inc., Tallahassee, FL) and/or Havahart live traps (Havahart, St Lititz, PA), across the multiple habitats found throughout NAFB, CAFB, and NTTR. Each trap site consists of 45 traps set in 3 lines of 15. These traps are left open for three nights and are checked daily. Trapping sites are chosen based on habitat, along aircraft flight lines, or at potential sites for future development. In total, 21 species of small mammals have been captured and identified, including all five of the special-status species. Locations of all trapping sites are shown in Figures 2-43 and 2-44. Species are listed in Appendix B.

Other mammals documented on the NAFB, CAFB, and the NTTR, though not specifically trapped, include small to medium-sized carnivores and leporids. Many surveys specific to leporids have been conducted either as part of the pygmy rabbit surveys, or prey-base assessments for golden eagles on the NTTR. Other small- to medium-sized carnivores and leporids either have been spotted incidentally during surveys or documented in wildlife camera photos (Table 2-11).

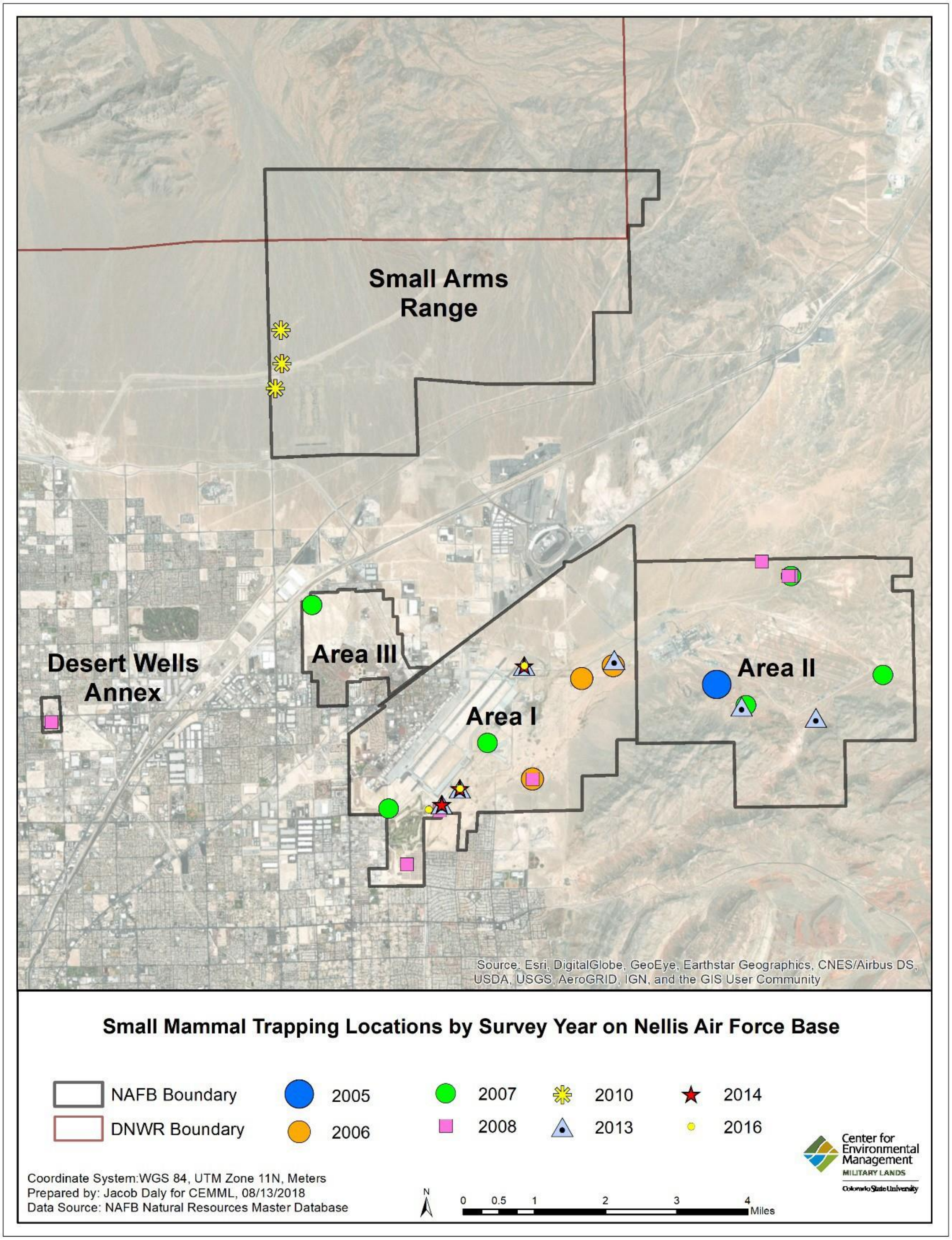

Figure 2-43. Small mammal trapping locations on Nellis Air Force Base, 2005–2016.

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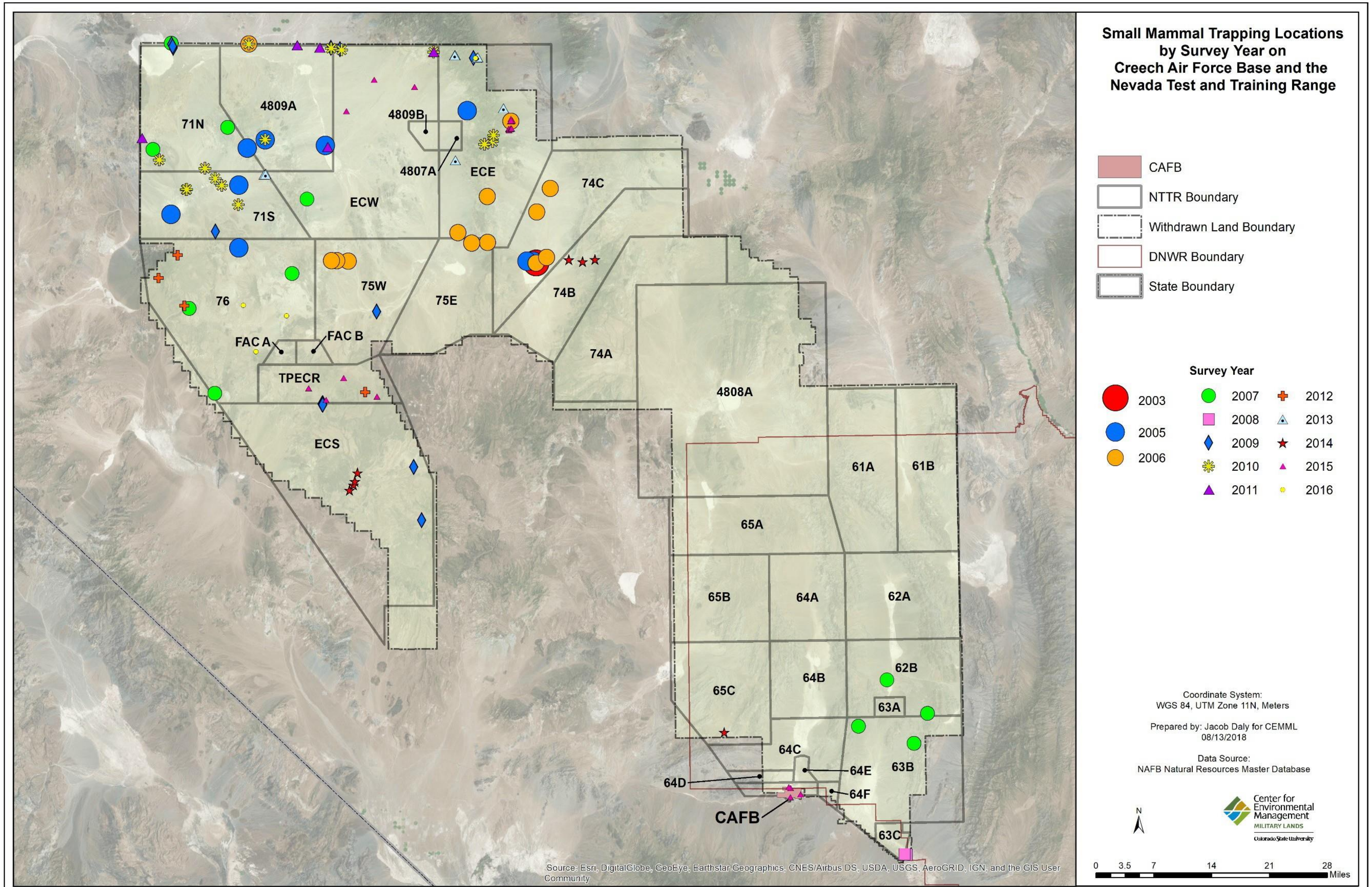

Figure 2-44. Small mammal trapping locations on Creech Air Force Base and the Nevada Test and Training Range, 2003–2016.

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Table 2-11. Small- to medium-sized carnivores and leporids documented on the Nevada Test and Training Range.

Common Name	Scientific Name
Leporids	
Desert Cottontail	*Sylvilagus audubonii*
Pygmy Rabbit	*Brachylagus idahoensis*
Black-tailed Jackrabbit	*Lepus californicus*
Felids	
Bobcat	*Lynx rufus*
Canids	
Coyote	*Canis latrans*
Kit Fox	*Vulpes macrotis*
Gray Fox	*Urocyon cinereoargenteus*
Procyonids	
Ringtail	*Bassariscus astutus*
Mephitids	
Western Spotted Skunk	*Spilogale gracilis*
Mustelids	
Long-tailed Weasel	*Mustela fenata*
American Badger	*Taxidea taxus*

2.3.3.4 Bats

Description of Current Conditions

The first bat surveys were conducted in 1996 and 1997. In those first surveys, six species were captured and identified, including the long-legged myotis (*Myotis volans*), fringed myotis (*Myotis thysanodes*), California myotis (*Myotis californicus*), canyon bat (*Parastrellus hesperus*), Townsend's big-eared bat (*Corynorhinus townsendii*), and pallid bat (*Antrozous pallidus*; NAFB, 1997b). Between 2008 and 2016, a more comprehensive bat program was established. During this period, data were collected during 11 mist-netting and over 60 acoustic-monitoring nights, and 19 habitat assessments were completed. Survey locations are illustrated in Figures 2-46 through 2-48.

Figure 2-45. Townsend's big eared bat. NAFB Photo Library.

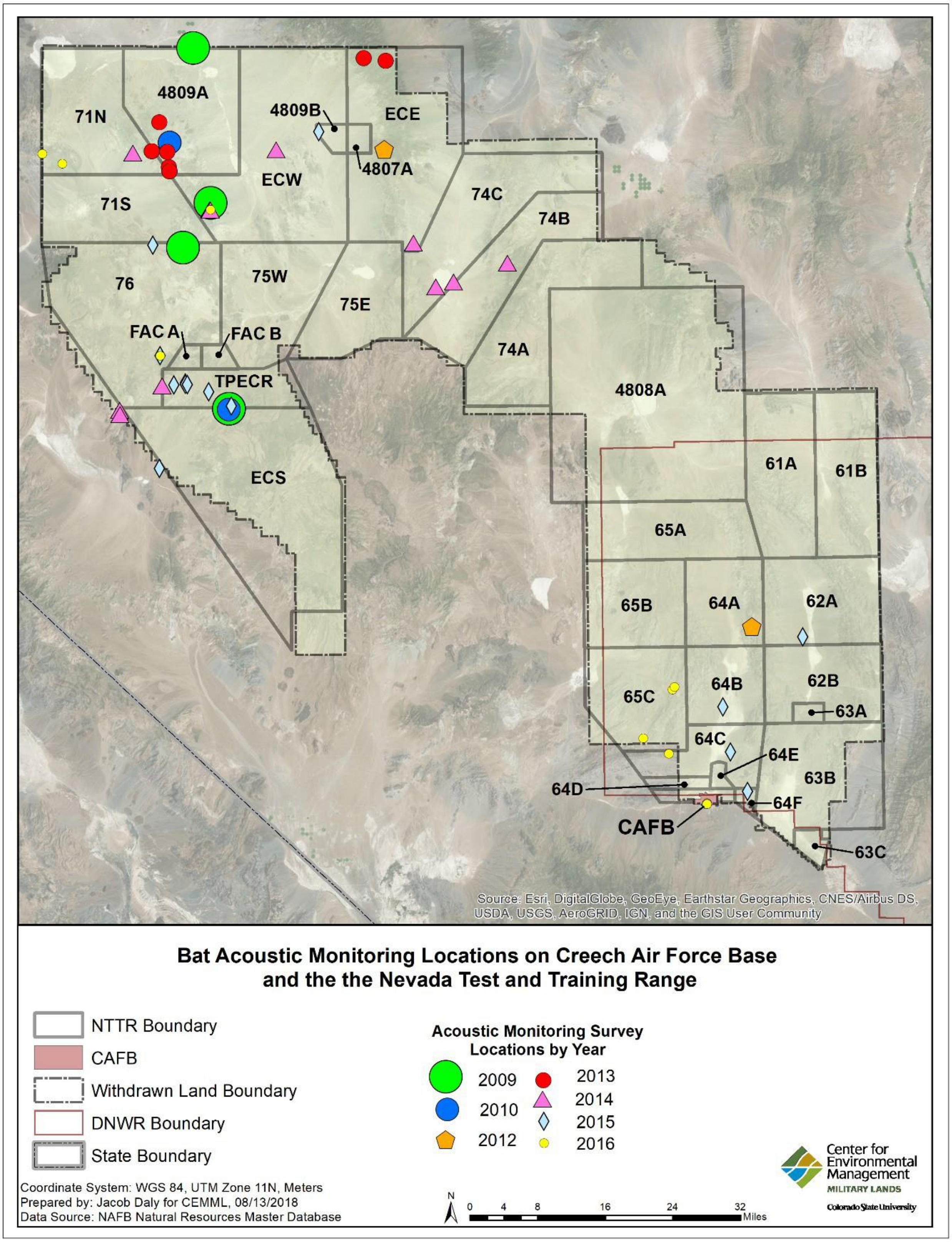

Figure 2-46. Bat acoustic monitoring sites on the Nevada Test and Training Range 2009–2016.

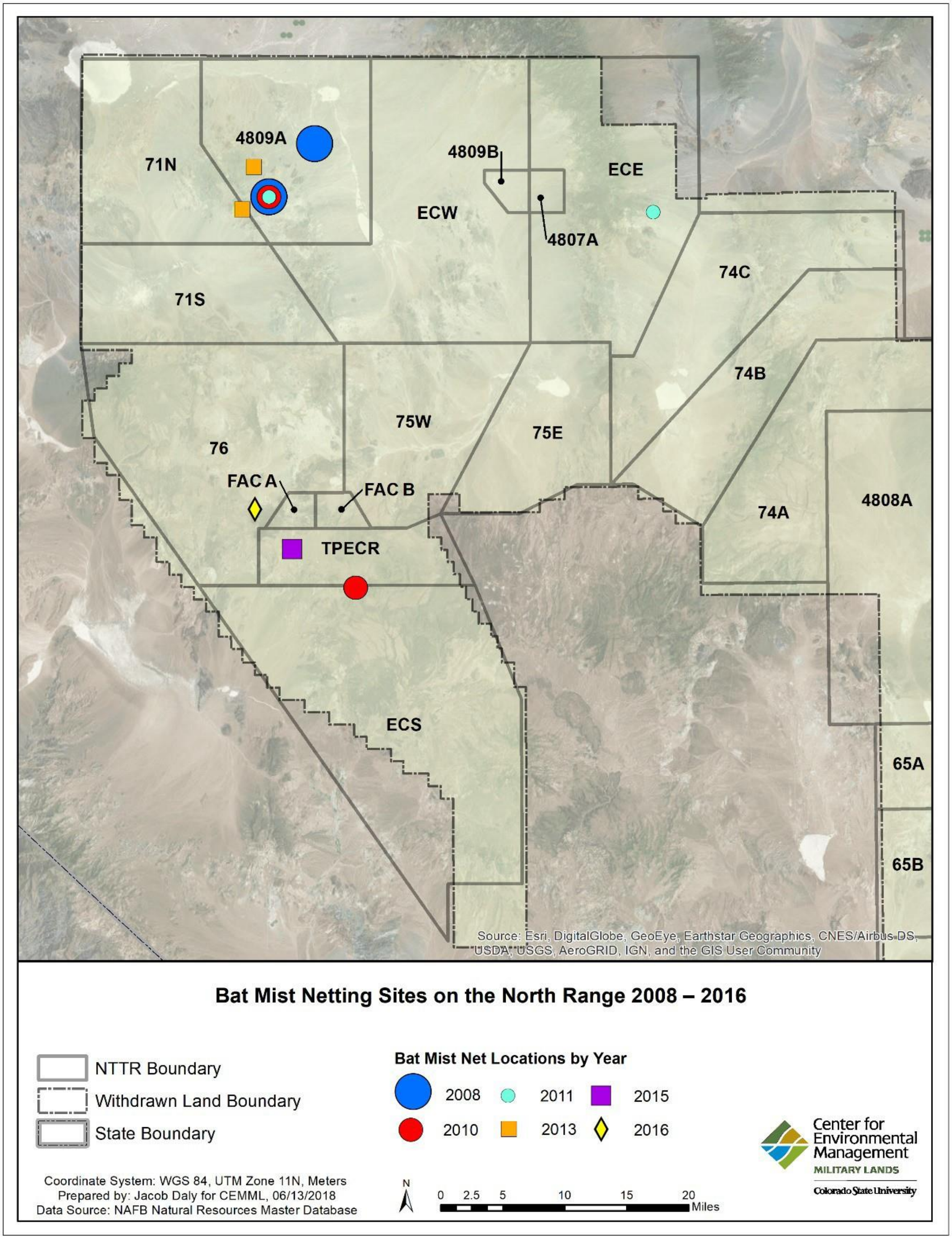

Figure 2-47. Bat mist-netting sites on the North Range, 2008–2016.

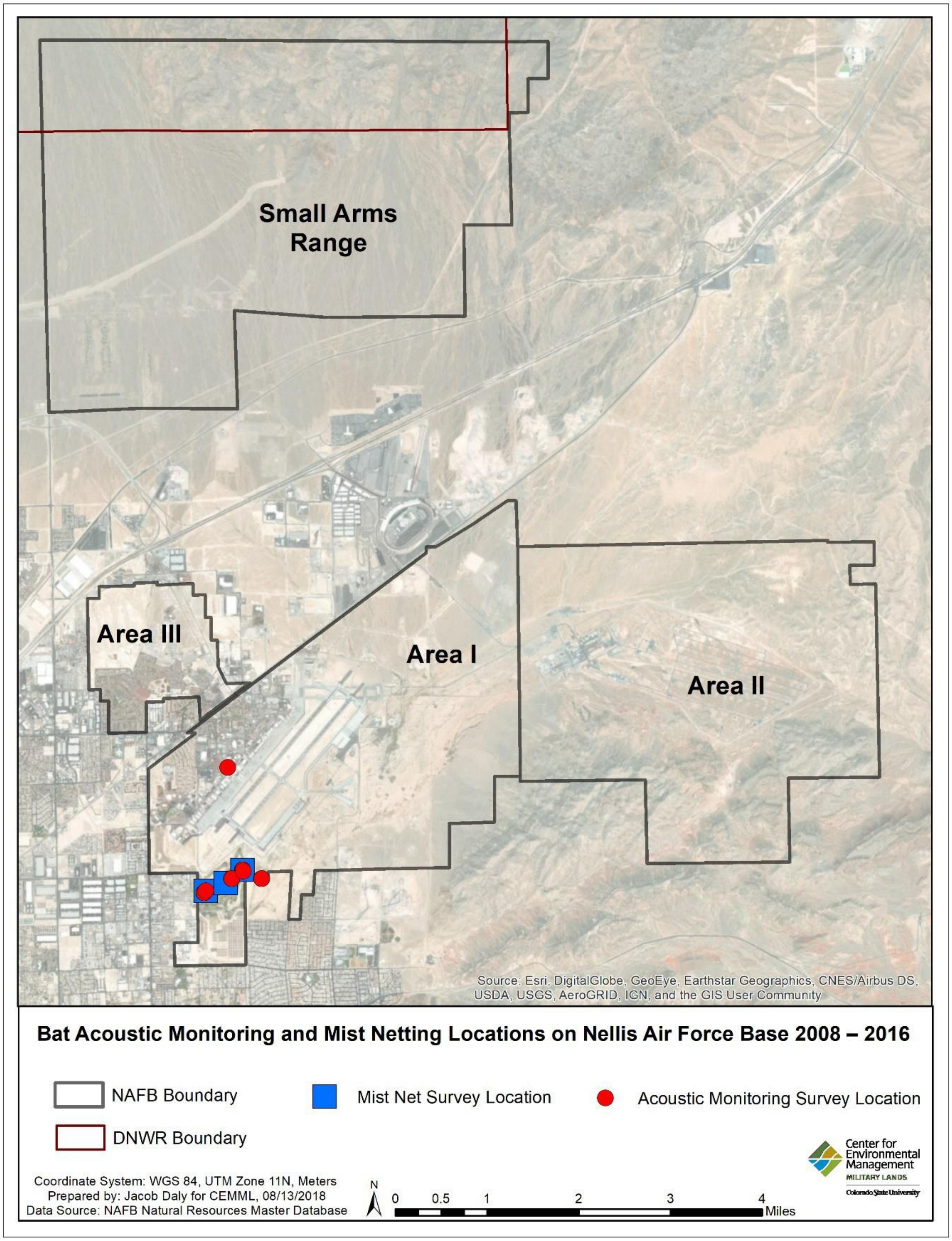

Figure 2-48. Bat acoustic monitoring and mist netting sites on Nellis Air Force Base, 2008–2016.

Figure 2-49. Pallid bat captured on the North Range. NAFB Photo Library.

Mist nets were set over open water sources. Bats drink on the wing and feed on insects attracted to the water. By setting a mist net over a water source, chances of capturing bats are increased. Eight species have been captured using mist nets (Table 2-12). In areas where mist netting is either impractical or range time restrictions are in place, acoustic monitoring devices were used. The acoustic monitoring devices record the ultrasonic echolocation calls bats emit. The recorded vocalizations are converted into a graph using a zero-crossing analysis. Bat species have unique call signatures that can then be used to identify which species of bats were recorded. Acoustic monitoring devices have been placed next to water sources, in flight corridors, potential feeding areas, and at mine openings. The acoustic recordings have identified 13 additional species not previously captured in mist nets, bringing the total number of bat species identified to 21 (Table 2-13). Fifteen bat species that were recorded are on special-status species lists and are further discussed in Section 2.3.4.13 (NAFB, 2017c). A comprehensive list of all captures and recordings, including those not on special status lists, can be found in Appendix B.

Table 2-12. Mist net capture results on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range, 1997–2016.

Scientific Name	Common Name	1997	2008	2010	2011	2013	2014*	2015	2016	Total
Antrozous pallidus	Pallid Bat	+	14	10	3				6	33
Corynorhinus townsendii	Townsend's Big-eared Bat	+		1	1	1				3
Myotis californicus	California Myotis	+	1		1					2
Myotis ciliolabrum	Western Small-footed Myotis		34	27	5	9		12	3	90
Myotis evotis	Long-eared Myotis			1						1
Myotis thysanodes	Fringed Myotis	+		10	1				1	12
Myotis volans	Long-legged Myotis	+			1			11	1	13
Parastrellus hesperus	Canyon Bat	+								

* 2014 had two mist-netting nights with no captures; 1998–2007, 2009, and 2011 had no mist-netting sessions.
+ Indicates that the species was present, but no numerical data are available.

Table 2-13. Anabat recording results, 2008–2016.

Scientific Name	Common Name	2008	2009	2010	2012	2013	2014	2015	2016	Total
**Antrozous pallidus*	Pallid Bat			29			119	28	162	338
**Corynorhinus townsendii*	Townsend's Big-eared Bat		6				1	8	49	64
Eptesicus fuscus	Big Brown Bat	1				1	4			6
Euderma maculatum	Spotted Bat						1		1	2
Eumops perotis californicus	Western Mastiff Bat						1			1
Lasionycteris noctivagans	Silver-haired Bat		7			104	19			130
Lasiurus blossevillii	Western Red Bat		5	4	1					10
Lasiurus cinereus	Hoary Bat			9		5	21		10	45
Macrotus californicus	California Leaf-nosed Bat	1	23							24
Myotis auriculus	Southwestern Myotis		26							26
**Myotis californicus*	California Myotis		74	3	164	3	77	2114	4451	6886
**Myotis ciliolabrum*	Western Small-footed Myotis		27	982		81	92	150	1647	2979
**Myotis evotis*	Long-eared Myotis			3			6		372	381
Myotis lucifugus	Little Brown Myotis			4		37	14			55
**Myotis thysanodes*	Fringed Myotis		3	58			96	98	12	267
Myotis velifer brevis	Southwest Cave Myotis		11							11
**Myotis volans*	Long-legged Myotis			5		8	20	22	1	56
Myotis yumanensis	Yuma Myotis				17	1546	462			2025
Nyctinomops macrotis	Big Free-tailed Bat						1			1
**Parastrellus hesperus*	Canyon Bat	10	158	181	531	895	1016	365		3156
Tadarida brasiliensis	Brazilian free-tailed Bat		69	17		352	447	2025	790	3700

* Indicates bats that also have been captured in mist nets.

2.3.3.5 Large Mammals—Including Wild Horses, and Burros

Mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), desert bighorn sheep (*Ovis canadensis nelsoni*), and mountain lion (*Puma concolor*) are the prominent large mammal species found on the NTTR. They serve as indicators of habitat conditions on the range. If populations of these animals

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remain at stable levels or have small and regular fluctuations, then it is likely that habitat is suitable. For some fauna (wild horses and burros, desert bighorn sheep, and pronghorn), aerial surveys are used to determine herd size, composition, and location. For more secretive species (mule deer and mountain lion), motion-sensor trail cameras placed at water sources is the best way to accumulate information on their habits.

Figure 2-50. Mule deer on the North Range. NAFB Photo Library.

Mule Deer

In general, mule deer reside year-round in the mountain ranges throughout the NTTR. The habitat preferred by mule deer includes open woodlands with an understory of big sage, black sagebrush, bitter brush, and cliffrose. Mule deer prefer areas that provide cover; thus, they are not easily detected during aerial surveys.

Mule deer prefer mountains, or at least steeper slopes, as a means of avoiding predation by mountain lions, primary predators in south and central Nevada. Poor water distribution during the summer and lack of cover appear to limit deer movements during the winter and spring. It is likely that mule deer move between mountain ranges; however, no regular migration pattern has been documented (USAF, 1985). During aerial surveys, the animals tend to hide under trees and shrubs, making detection extremely difficult. As such, the only population counts that are available are extracted from other flora and fauna surveys. Since 2005, 91 mule deer have been recorded on the NTTR during natural resources surveys. More data have been added from motion sensor cameras, which have detected deer at every water source on the North Range. Figure 2-51 displays where mule deer have been observed on the NTTR, both by trail cameras and during biological surveys. Figure 2-52 illustrates where on the NTTR trail cameras have been placed in the past (red squares) and where cameras are currently placed (yellow pentagons). The current locations that contain cameras are labeled and are mentioned throughout the document.

Pronghorn

The pronghorn is an archetypical member of the open ranges of western North America. Its Latin name, *Antilocapra americana*, means "American goat-antelope," but it is not a member of the goat or the antelope family. It is not related to African antelopes and is unique to North America. Herds of pronghorn have been shown to travel over five miles for water. Their populations on the NTTR appear to be highest where water sources are less than one to two miles apart. The pronghorn diet is comprised of forbs such as globemallow (*Sphaeralcea* spp.) in the spring and early summer and shrubs such as sagebrush (*Artemisia* spp.) in the winter (Koerth et al., 1984). Breeding occurs between late July and early October, and fawns are born in late May. Unlike mule deer, pronghorn prefer open habitats. When pronghorn detect danger, they can flee quickly, reaching speeds of 60 miles per hour. On the NTTR, pronghorn are year-round residents in the Cactus Flat, Kawich Valley, Sand Spring Valley, and Emigrant Valley in the North Range. Recently on the South Range, pronghorn males have been observed regularly as far south as a couple of miles north of CAFB.

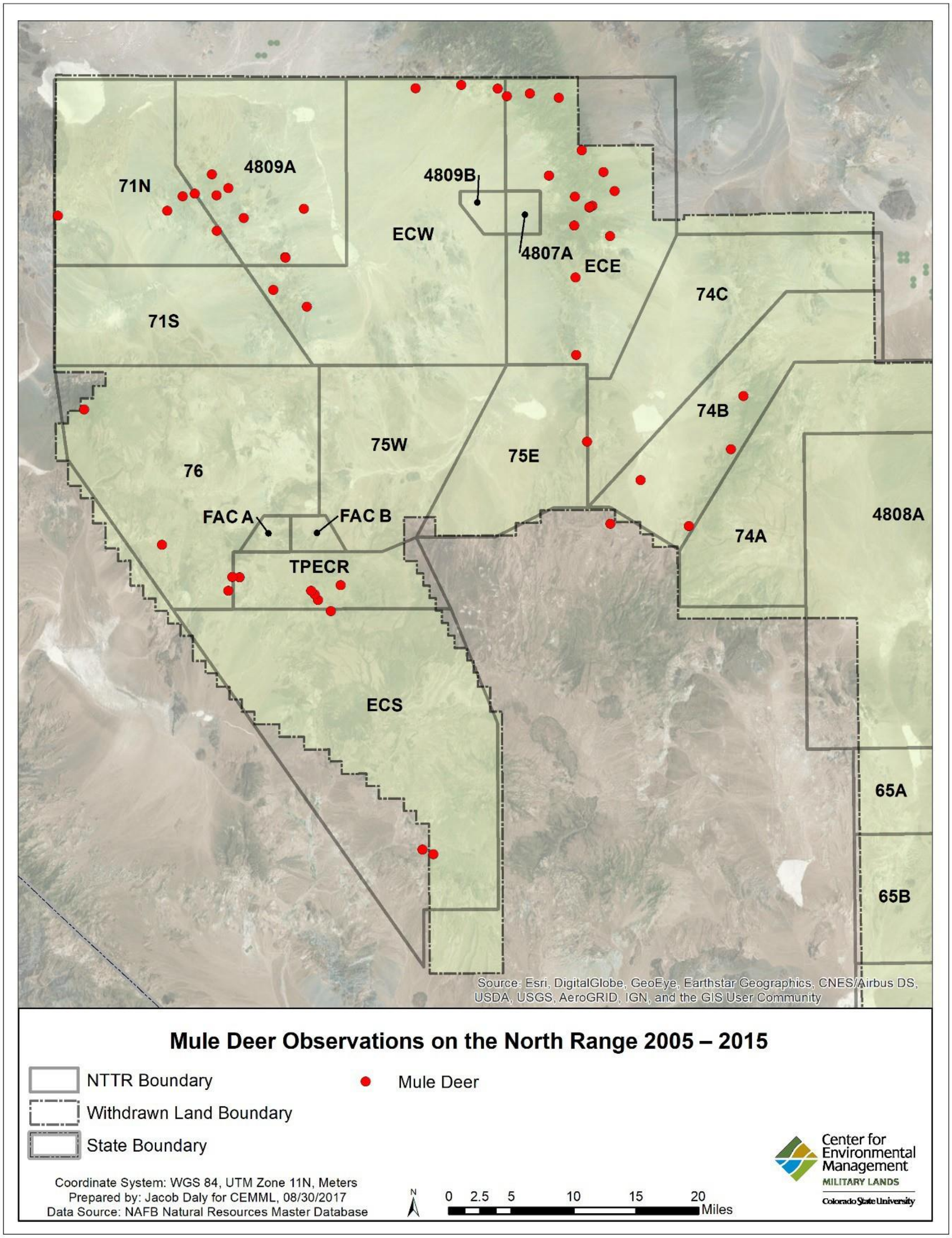

Figure 2-51. Mule deer observations on the North Range, 2005–2016.

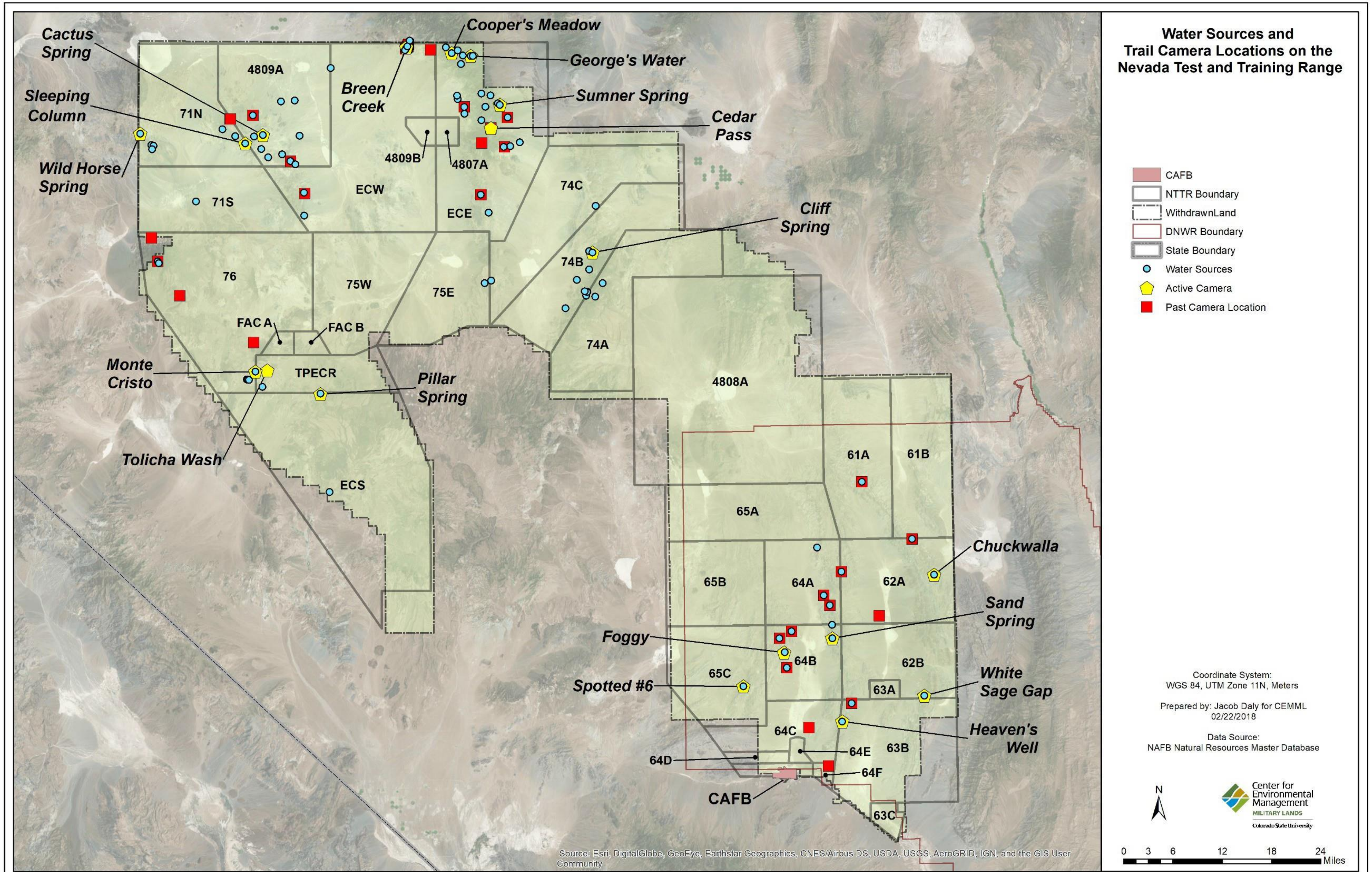

Figure 2-52. Locations of water sources and trail cameras on the Nevada Test and Training Range.

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Helicopter surveys are conducted during the summer on the North Range of the NTTR by NNRP biologists. The biologists sit on opposite sides of the helicopter to watch for animals. Transects are flown in areas where pronghorn are most likely to be present. These areas include the aforementioned open valleys and the habitat surrounding these valleys. When pronghorn are observed, the helicopter maneuvers as necessary to allow the biologists to quickly count the number of bucks, does, and fawns (if present). These counts are conducted as quickly as possible to avoid excess stress on the animals. Once the count for that herd is obtained, the helicopter resumes on the same transect course.

Figure 2-53: Pronghorn on the North Range. NAFB photo library.

Surveys were initiated in 2005 and continued annually until 2015. These surveys tabulated 1,766 sightings, with an average of 176.6 per year. The population residing on the NTTR grew steadily over the 10 years surveys were conducted. This increase could be contributed to the large-scale wild horse gathering in 2007, but it could be misleading to point to a single reason without examining weather patterns and predator populations. Pronghorn also have been recorded by motion-sensor cameras at every water source on the North Range except George's Water. Figure 2-54 shows the recorded locations for pronghorn during the annual surveys. The red dots do not necessarily represent single animals; rather, they depict where at least one animal was observed. Outside of the breeding season, pronghorn are gregarious, foraging in pairs or small herds of varying sizes (White et al., 2012).

Desert Bighorn Sheep

Desert bighorn sheep reside in arid mountainous habitats, with steep, rocky terrain. Ewes have shorter and thinner horns than rams. Bighorn sheep are often found near escape terrain, which is categorized as a slope of at least 60% with a contiguous, 137-meter (150 yards) buffer zone with slopes of 40%–60% (McKinney et. al, 2003). Desert bighorn sheep tend to stay close to escape terrain, remaining approximately less than 300 yards away (Singer et. al, 2001). The mating season, or rut, begins at the end of July and continues through early September. Gestation lasts approximately 180 days. Bighorn sheep are gregarious, except during lambing season. During late December through February, pregnant ewes depart from the herd, settling in rugged and remote areas to give birth.

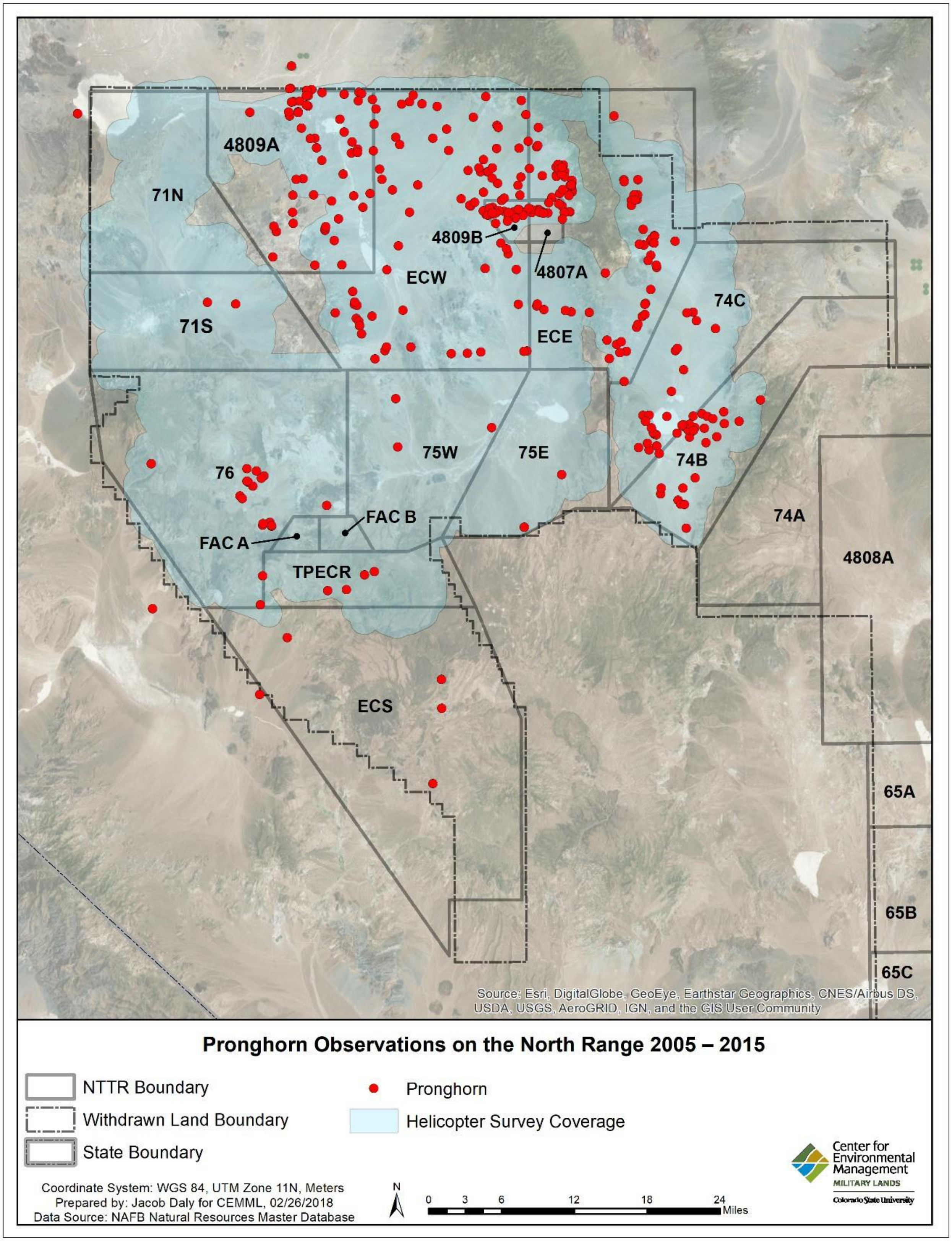

Figure 2-54. Pronghorn observations on the Nevada Test and Training Range, 2005–2015.

Figure 2-55. Desert bighorn sheep ewe and lamb on the South Range. NAFB Photo Library.

Besides predation, bighorn sheep are extremely vulnerable to respiratory diseases. Most recently, a very tiny but virulent bacterium, *Mycoplasma ovipneumoniae*, has been implicated as acting in concert with other pathogens and causing a debilitating pneumonia. The pathogens are host-specific and not shown to be harmful to people, but the pneumonia has affected entire bighorn populations across the western states, including Nevada. Lambs are most susceptible, as their immune systems are not fully developed. Infected animals will cough and might have a bloody nose, and although some may survive, most will die. This pneumonia is highly transmissible by inhalation or physical contact. Initial exposure of bighorn sheep to the pathogen is thought to be transmission from domesticated sheep (*Ovis aries*), the latter seemingly immune to it (Besser et al., 2014). In attempts to collect information regarding the prevalence of the disease across Nevada and general health of populations, the USAF is collaborating with NDOW, U.S. Geological Survey (USGS), and USFWS in capturing adult bighorn sheep and affixing global positioning system (GPS) tracking collars to them. During these capture events, blood samples and nasal swabs are collected and analyzed. The most recent capture events happened in November 2016 on the South Range and in 2015 on Stonewall Mountain.

Aerial surveys are conducted during autumn on the NTTR, with the South Range and the Stonewall area being surveyed by NDOW and USFWS in September, and the remaining North Range being surveyed by the NNRP in October. Bighorn are classified according to herd composition: rams, ewes, and lambs. Rams are aged to within a ±2-year accuracy. Surveys have counted 5,423 sheep since they began in the late 1970s. Surveys for desert bighorn sheep on the North Range were initiated in 1978 and then conducted biennially until 2003. Sheep surveys on the South Range have also been conducted for decades. From 2003 until 2006, NDOW collected desert bighorn sheep data only on the South Range and Stonewall Mountain area. In 2007, the NNRP established annual surveys on the North Range, while NDOW continued to regularly survey the South Range and Stonewall Mountain. Monitoring population composition and size, conducting disease surveillance, and understanding seasonal and spatial habitat use by bighorn sheep benefits the overall military mission.

NDOW conducts bighorn sheep surveys in the autumn months to establish the number of hunt tags that can be distributed for the annual hunts on the South Range and Stonewall Mountain. Hunts take place every year from 18 November to 10 December or from 16 December to 1 January, depending on hunt unit. NDOW manages these hunts, and only mature rams are permitted to be harvested from the NTTR.

Motion-sensor cameras also help monitor desert bighorn sheep, which have been observed at almost every major water source on the NTTR except Sumner Spring, George's Water, Breen Creek, Cliff Spring, and Wildhorse Spring. These springs are all located on the North Range, and although the first four are natural, they are in habitat that is not as preferable for desert bighorn sheep. Sumner, George's, and Cliff Springs are in predominantly pinyon-juniper habitat, while Breen is in the foothills of the Kawich in sagebrush habitat. These areas do not support desert bighorn sheep since they do not contain the sharp, rocky cliffs that are preferred for escape terrain. Wildhorse Spring is far from the Cactus Range, in the middle of rolling hills of greasewood and less palatable forage (Figure 2-57).

Figure 2-57 shows where desert bighorn sheep have been observed during annual surveys. This map shows a broad overview of preferred areas for desert bighorn sheep on the NTTR; the red points do not represent individual animals but rather where sheep have been observed. Occasionally, a single animal will be located during the survey; however, most of the points represent multiple animals. Like pronghorn, bighorn sheep herds can be fluid, with adults moving into and out of the herd throughout the seasons.

Mountain Lion

The mountain lion (also known as puma, cougar, or panther) is a top predator found throughout mountainous habitats in western North America. The favored terrain of mountain lions is composed of rocky cliffs and gradual slopes with juniper and other woody shrubs that afford cover when they stalkng prey (Dixon, 1982; Logan and Irwin, 1985). Mountain lions feed primarily on mule deer, but they will prey on bighorn sheep when the opportunity arises. Mountain lions are secretive, having been seen on the NTTR only a handful of times during other surveys. The best opportunity for seeing mountain lions on the NTTR is via motion-sensor cameras at water sources. Mountain lions have been caught on camera at George's Water, Jerome Spring, and Pillar Spring in the North Range, as well as White Sage Gap on the South Range.

Figure 2-56: Mountain lion at Jerome Spring on the North Range. NAFB Photo library.

Wild Horses and Burros

Throughout the past 200 years, ranchers, miners, and indigenous peoples have released horses (*Equus ferus*) and burros (*Equus asinus*) into western states, including Nevada. In 1972, PL 92-195, the Wild Free-Roaming Horse and Burro Act was signed into law. In 1974, the Cooperative Agreement between the BLM and USAF (Appendix B of the Record of Decision for the BLM Range Management Plan) gave BLM the responsibility of conducting annual censuses of horses and determining range condition.

In 1977, approximately 800 horses resided on the NWHR; since that time the population has increased substantially, reaching a peak of approximately 10,000 wild horses in 1993 (SCIA and DRI, 1999). Due to concerns about overpopulation and over-grazing by wild horses, the NWHR Herd Management Plan established an Appropriate Management Level of 2,000 wild horses on the NWHR in 1989. The most recent Appropriate Management Level was set by the Record of Decision for the NTTR Resource Management Plan EIS (BLM, 2004a) in 2004 and determined to be 300–500 horses.

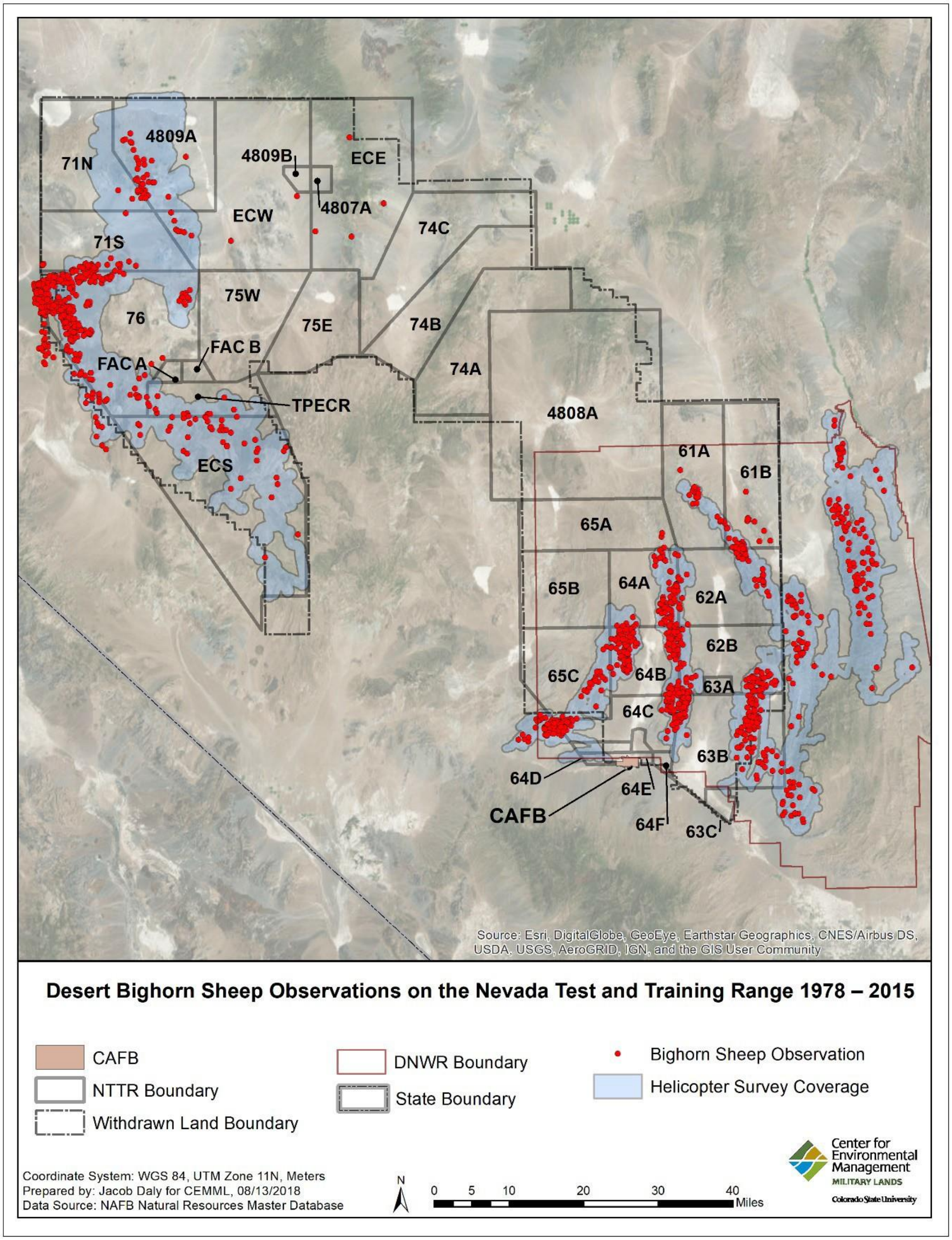

Figure 2-57. Desert bighorn sheep observations on the Nevada Test and Training Range, 1978–2016.

An extreme example of the potential negative impacts of wild horse grazing is seen in the Kawich Valley. Where wild horses are present in this area, vegetation has been uniformly cropped to heights of less than eight inches. Figure 2-59 shows where horses and burros have been observed on the NTTR during aerial surveys. This map shows a broad overview of preferred areas for equines on the NTTR; the red points do not represent individual animals but rather where they have been observed. It is rare that a single animal will be observed during the survey. The majority of the points represent multiple animals.

Figure 2-58. Wild horses on the North Range. NAFB Photo Library.

The closely cropped plants on the NTTR do not represent the condition of vegetation before horses were introduced. A report by Dames and Moore (1997) cited wild horses as the source for degradation at springs and seeps on the NTTR. As a result, some seeps and springs outside the NWHR have been fenced by the USAF to prevent grazing and trampling, subsequently allowing vegetation to improve and become beneficial for native wildlife.

Aerial surveys are conducted annually, by either by the NNRP or BLM. If the NNRP conducts the survey, a helicopter carrying two biologists and an escort flies transects through the valleys horses are known to inhabit. When herds are seen, biologists count the number of adults and juveniles. Burros in addition to horses and pronghorn are recorded. Surveys were initially conducted in 2005, during which 73 horses were counted. In 2009, surveys resumed annually for the next seven years and the numbers of equines have increased on the NTTR during those years (Figure 2-59). In 2016, surveys for wild horses were not conducted.

Wild burros migrate onto the NTTR from adjacent BLM-managed lands in the Goldfield, Stonewall Mountain, and Thirsty Canyon areas. The NWHR does not provide for the management of wild burros, and wild burros have not been identified for long-term management on the NTTR.

2.3.3.6 Domestic Animals

New grazing allotments are prohibited on NAFB, CAFB, and the NTTR. The only current grazing allotment on the NTTR extends into a small area of the North Range. The current grazing operation does not interfere with the NTTR mission and day-to-day operations. The USAF and the grazing lease holder have an MOU for access, fencing, and scheduling. The rancher has an NTTR access badge and follows normal range access procedures by calling Range Control to schedule range time.

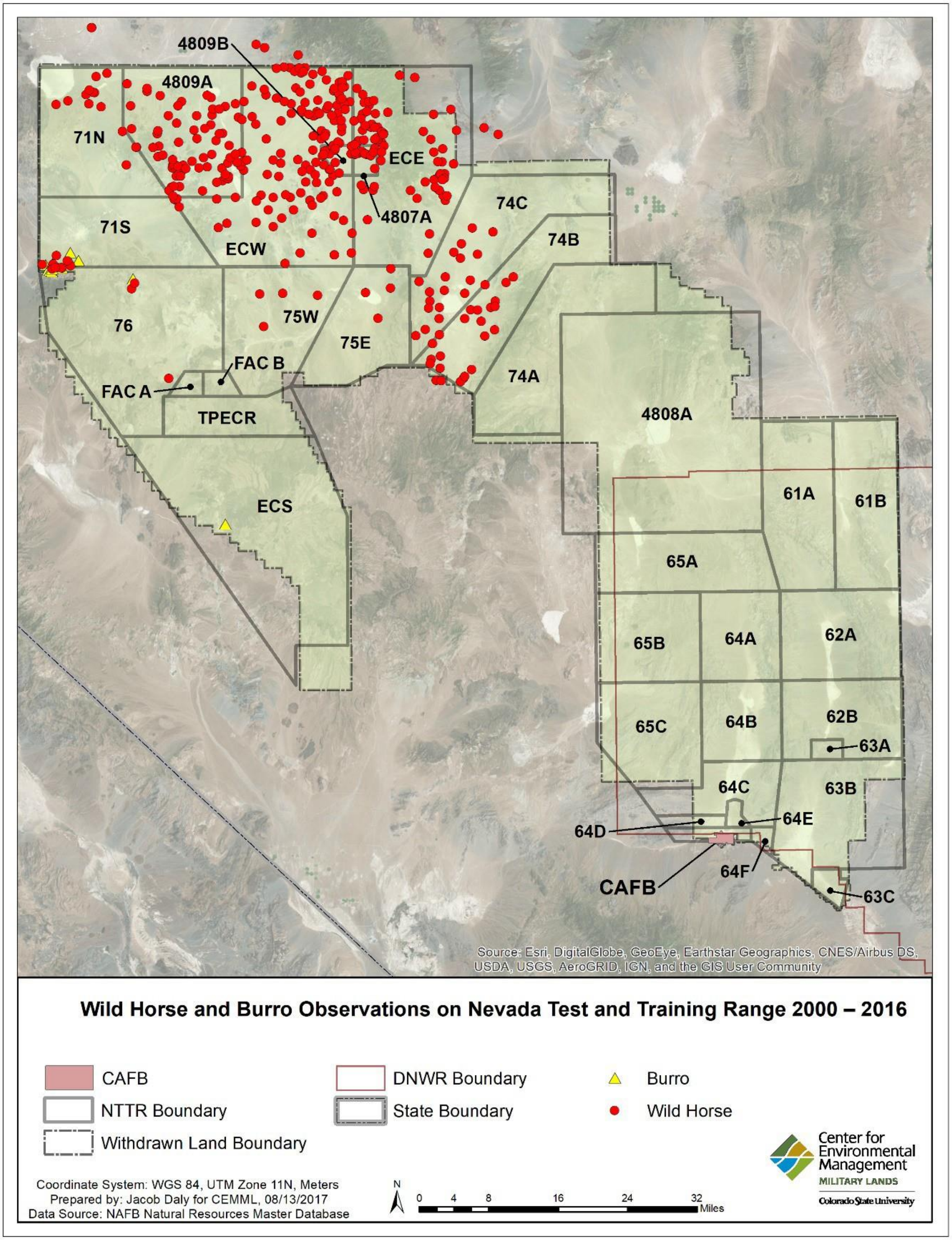

Figure 2-59. Wild horse and burro observations on the Nevada Test and Training Range, 2000–2016.

2.3.3.7 Climate Impacts on Fish and Wildlife

Climate change could have significant impacts on wildlife communities across NAFB, CAFB and the NTTR. A changing climate likely will favor newly arriving species, which often can outcompete native species, especially when native species are already experiencing reduced fitness due to shifting environmental conditions (Hellmann et al., 2008).

Aquatic habitats are already limited in these desert ecosystems and are likely to become further restricted as precipitation decreases. Higher air temperatures can affect water quality negatively, particularly in lentic systems. As water temperatures rise in lentic systems, lower dissolved oxygen content impairs water quality, particularly for larval amphibians and aquatic macroinvertebrates. Warmer water temperatures can also increase the chances of algal blooms, further depleting dissolved oxygen content and degrading habitat quality (Paerl et al., 2011). The loss of quality aquatic habitats likely would displace amphibians, such as Great Basin spade-foot toad and Woodhouse's toad. It also could limit the number of seasonal waterfowl migrants, such as common merganser (*Mergus merganser*) and green-winged teal (*Anas crecca*).

Decreased precipitation also could impose additional direct and indirect threats on many terrestrial wildlife species present on the installations. For example, if insect abundance is reduced due to decreased precipitation, a number of species that rely on insects (e.g., multiple myotis species, the canyon bat, pallid bat, sage thrasher, sagebrush sparrow, horned lark, loggerhead shrike, greater roadrunner, burrowing owl, side-blotched lizard [*Uta stansburiana*], zebra-tailed lizard, and small mammal species) may suffer. These bottom-up effects on the food chain could continue, as smaller animals are an important food source for larger predatory mammals, such as American badger (*Taxidea taxus*), coyote (*Canis latrans*), kit fox (*Vulpes macrotis)*, grey fox, and bobcat (*Lynx rufus*).

2.3.4 Threatened and Endangered Species and Species of Concern

The ESA is administered by the USFWS and provides for the protection of plants and animals in danger of becoming extinct. See Appendix E for a list of Threatened, Endangered, and Sensitive species known to or with the potential to occur on NAFB, CAFB, and the NTTR. The ESA was established to provide a means for conserving ecosystems upon which endangered and threatened species depend. The ESA requires that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities to further the purpose of this act. Please see Section 1.3 for more information regarding the ESA.

Of the 16 endangered species and 11 threatened species known to occur in Nevada, only one occurs on the installation: the desert tortoise (see Section 2.3.4.1). The desert tortoise is listed as a threatened vertebrate. It is found on both NAFB and the NTTR. The USAF has been in Section 7 consultation with the USFWS under ESA for several projects that concern the desert tortoise. Biological assessments (BAs) and BOs have been prepared for these projects (NAFB, 2017i), and they have set a precedent for desert tortoise management on NAFB, CAFB, and the NTTR. In addition to a list of endangered and threatened species, the USFWS maintains a list of candidate species, plants and animals for which there is sufficient information of biological status and threats for listing them under the ESA but for which development of a proposed listing regulation is precluded by other higher-priority listing activities (USFWS, 2017). According to AFI 32-7064, when practical, the USAF is to provide protection to candidate plants and animals similar to the protection afforded for endangered and threatened species. Neither of the two

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candidate species known to occur in the state of Nevada, the whitebark pine (*Pinus albicaulus*) and the Sierra Nevada red fox (*Vulpes vulpes necator*), inhabits NAFB, CAFB, or the NTTR.

Individual states maintain a list of sensitive species, a category for which there is no legal protection under the ESA. The Nevada Revised Statues (NRS) and NAC establish classifications for plants and wildlife regulated in the state. NAC 527.010 includes the list of plants declared by the state forester as endangered with extinction.

Under the Sikes Act, it is USAF policy to conserve species and habitats wherever possible. Wherever practicable within the constraints of the military mission, impacts to these species will be avoided and minimized and their habitats will be managed. Appendix E is a comprehensive list of all federally-listed, federally-sensitive (as designated by BLM or USFWS), and state-protected/sensitive species (as designated by NDOW) that have been documented on or potentially could occur on NAFB, CAFB, or the NTTR. All of the species on this list are considered when implementing the INRMP.

2.3.4.1 Desert tortoise

Description of Current Conditions

The Mojave population of the desert tortoise (*Gopherus agassizii*) was listed as threatened under the ESA in 1990. The desert tortoise is also protected by the state of Nevada (NAC 503.080). Protection is warranted due to declining populations resulting from habitat loss and fragmentation, disease, and direct mortality by human activity. The desert tortoise is a terrestrial species found in arid and semi- arid deserts. It occupies a variety of habitats from desert flats and slopes dominated by creosote scrub at lower elevations to the black brush and juniper woodland ecotone at intermediate elevations. The desert tortoise requires soils that are friable enough to construct burrows yet firm enough to prevent burrow collapse. Rocky habitats are also occupied, as they dig under rocks to create burrows, and their food sources are often present in washes/draws that funnel rainwater. The tortoise is considered a keystone species because its burrows and burrowing activities often provide or facilitate the creation of shelter for a wide variety of other wildlife in the Mojave Desert, and they promote nutrient cycling in desert soils.

The desert tortoise is an herbivore that feeds on a wide variety of desert plants, including grasses, flowers, annual plants, woody perennials, and cacti. Long-lived (up to 100 years) and slow-growing, females reach sexual maturity at 14–20 years. Additionally, they have a correspondingly low reproductive rate, and populations can be sensitive to the additive effects of mortality caused by humans. For example, ravens directly prey on hatchling desert tortoises, and people subsidizing resources used by ravens (e.g., water sources, nesting sites, garbage and other food sources) in suburban-wildland interfaces or in rural desert settlements have led to much larger raven populations than those occurring in the desert before human settlement, which often leads to correspondingly high predation on young desert tortoises.

Figure 2-60. Desert tortoise on Nellis Air Force Base Area II. NAFB Photo Library.

The desert tortoise ranges from extreme southwestern Utah and northwestern Arizona, to southern Nevada, and southern California in the Mojave Desert. In central Arizona and southeastern California, the Mojave population of the desert tortoise is replaced by the Sonoran Desert tortoise (*Gopherus morafkai*). In Nevada, the desert tortoise is found in southern Lincoln and Nye Counties and throughout most of Clark County in areas where it has not been displaced by human development. The desert tortoise has been documented on NAFB, the SAR, and the NTTR (South Range). The desert tortoise may range as far as the southern corner of the North Range (ECS). Fleur de Lis Canyon/Oasis Wash appears to be suitable habitat; however, surveys through 2016 have failed to document any evidence of desert tortoises in the North Range (no live/deceased animals, burrows, or scat). See Section 7.4 for monitoring efforts and management guidelines.

Climate Change Impacts on Desert Tortoise

Of all tortoise species, the desert tortoise resides in the hottest habitat, where summer temperatures can reach 122 °F (50 °C). Their habitat mainly consists of sandy flats, rocky foothills, alluvial fans, washes, and canyons (NDOW, 2014). These animals spend the majority of their lives in underground dens they dig in loamy soils to shelter from extreme summer temperatures. Up to 40% of their body weight is composed of water, urea, uric acid, and nitrogenous wastes, allowing them to survive more than a year without free water (NDOW, 2014); however, their ability to survive extreme drought and high temperatures does not extend to reproduction, as temperature change has a significant impact on sex ratios of the eggs. At 88.3 °F (31.3 °C), desert tortoise eggs produce a 1:1 ratio of male and female offspring; however, at 87 °F (30.5 °C), the eggs produce only males and at 90.5 °F (32.5 °C) the eggs produce only females (USFWS, 2011). Furthermore, low rainfall reduces egg yield. The species is most active from March to June and September to October, determined by precipitation and temperature patterns (NDOW, 2014). On NAFB and NTTR, this species could be impacted by the decrease in precipitation and increases in temperatures, mainly through their reproductive patterns and success. Changes in precipitation and the increase in wildfire and daytime temperatures also could indirectly affect the tortoises by impacting vegetation on the installation. Specifically, the projected conditions are likely to promote landscapes dominated by invasive brome that competes with vegetation included in the tortoise's diet and needed for thermoregulation and escape. For example, Drake et al. (2016) highlighted indirect negative effects of invasive grasses such as red brome on the desert tortoise diet. They concluded that red brome poses threats to the health, survival, and ultimately population recruitment for Mojave Desert tortoises.

2.3.4.2 Banded Gila Monster

Description of Current Conditions

The banded Gila monster is identified as a sensitive species by the BLM and is classified as protected by the State of Nevada under NAC 503.080. The Gila monster is not covered under the Clark County Multiple Species Habitat Conservation Plan (MSHCP) or ESA Section 10 incidental take permit because insufficient information has been collected to ensure that conservation measures facilitated by the County's MSHCP would benefit this lizard; thus, the Clark County MSHCP has listed Gila monsters as an "Evaluation—High Priority" reptile. The only documented observation of a Gila monster on NAFB, CAFB, or the NTTR was in NAFB Area II in 1992 (NAFB, 2017a). The banded Gila monster is found primarily in the eastern and northern Mojave Deserts of southern California, southern Nevada, northwestern Arizona, and extreme southwestern Utah.

Figure 2-61. Gila monster in Apex Hills. Photo: Stephen Stocking.

Gila monsters are secretive and very difficult to detect. In the northern Mojave Desert, the Gila monster is most active March to early June, and it spends 96% of its life underground (Beck, 2005). This makes survey efforts challenging, especially on the NTTR, where access is limited. The Gila monster is found primarily in Mojave Desert scrub, where it appears to prefer rocky hillsides, canyons, and areas with large rocks. These areas are often remote and steep, which contributes to difficult searching conditions. In addition to the 1992 observation, there have been three recent records by NDOW in the Apex Hills east of the SAR, so they probably occur on the SAR (Jones, 2017). It has been observed in multiple locations throughout Clark County, and has been found in southern Lincoln and Nye Counties. There are documented occurrences on the DNWR along Alamo road, very close to the NTTR boundary; therefore, these aniamls likely occur on the South Range in the Desert Range and Pintwater Range mountains. The Gila monster is one of only two venomous lizard species in North America. Gila monsters feed on (1) squamate (snake and lizard) eggs, (2) desert tortoise eggs, (3) eggs and hatchlings of ground-nesting birds, and (4) newborn and juvenile mammals. The Gila monster is a facultative nest predator, and usexs its excellent sense of smell and memory to find hidden nests (Beck, 2005).

It is recommended that the NDOW protocol be followed to document a lizard if/when one is found in the project area. This protocol includes (1) educating NAFB, CAFB, and the NTTR military and operations personnel; (2) reporting any Gila monster observation to the NDOW (or salvage and preserve roadkills); and (3) if NDOW's assistance would be delayed, having biological or equivalent-acting personnel on site to detain the Gila monster out of harm's way until NDOW personnel can respond (NDOW, 2020).

If the NDOW is not immediately available to respond for photo-documentation, a digital camera (greater than five mega-pixels) will be used to take good-quality images of the Gila monster in situ at the location of a live encounter or salvage (dead).

If/when a Gila monster is documented, the observation should be followed up with focused searches of the area for additional lizards. The area should be documented in a GIS database and management actions taken to minimize impact to the habitat, if possible. Given a preference for rocky hillsides and canyons, it is unlikely that valley floors or other high use areas will harbor Gila monsters.

2.3.4.3 Sonoran Mountain Kingsnake—Description of Current Conditions

The Sonoran mountain kingsnake is classified as a Sensitive Species by the BLM and is protected by the State of Nevada under NAC 503.080. The snake is protected due to its occurrence in isolated populations, leaving it vulnerable to decline with respect to climate change, groundwater withdrawals, and poaching (WAPT, 2012). It is a medium-sized constrictor with smooth, shiny scales and alternating red, black, and white bands (a "tri-colored" snake). The black bands become wider mid-dorsally, often merging at the midline of the back and "bridging" across the red bands. Its head is wider than the neck with a white to cream snout. Mountain kingsnakes are found primarily in rocky, montane habitats near streams or springs from the pinion-juniper level up, but it also has been observed in dry pinion-juniper or sagebrush habitat that lacks surface water, provided rocks are present. These snakes are primarily active from late spring to early fall, preferring cloudy or shady conditions for surface activity during the day. They feed primarily on lizards, small mammals, and other snakes.

Figure 2-62. Sonoran mountain kingsnake, Yavapai Co., Arizona. Photo: thehibbits.net.

The Sonoran mountain kingsnake does descend to lower elevations (3,800 feet) in mesic canyons (Hubbs, 2012). Isolated populations occur locally in east-central Nevada mountain ranges within White Pine and Lincoln Counties, and it has been recorded from the Virgin Mountains in extreme northeastern Clark County (WAPT, 2012). The species has not been observed on NAFB or the NTTR. Its known range in Nevada is east of the NTTR, but it could potentially be found in the mountain ranges along the east side of the NTTR such as The Kawich Mountains, Belted Range, or Reveille Peak. Summer Spring, George's Water, and Cliff Spring all appear to be suitable habitat. The Sonoran mountain kingsnake's range in Nevada is poorly understood due to its secretive and fossorial habits.

If the Sonoran mountain kingsnake is eventually documented on the NTTR, it will probably be in remote, higher-elevation, rocky habitats in the Belted or Kawich Ranges. Coverboards have been placed near Cliff Spring in the Belted Range; this survey method can increase the probability of detecting these secretive snakes in the spring. A documented site should be recorded in a GIS database, and management actions should be taken to minimize impact to the known location, if possible.

2.3.4.4 Rosy Boa

Description of Current Conditions

The rosy boa is protected under NAC 503.080 and is an SOCP due to its very limited range within the State of Nevada. The snake has no federal status, as it appears to be widespread and secure in Arizona and California. Its range in Nevada appears to be at its extreme northern geographic limit. The rosy boa is a medium-sized snake that is heavy-bodied with the head only slightly wider than the neck. Scales are smooth and shiny, and pupils are vertical. The dorsal pattern typically consists of three longitudinal stripes that vary in color from brown, rust, reddish, or orange. The ground color often varies from tan, grey, yellowish, cream, to steel blue (Stebbins, 2003). The rosy boa, an inhabitant of rocky shrublands and deserts, is often attracted to permanent or ephemeral water sources, but it does not require surface water.

Nocturnal and secretive, the rosy boa feeds largely on lizards and rodents (Stebbins, 2003). It has been documented in Nevada by only a single record (WAPT, 2012). The species occurs in Death Valley National

Park, and it has been observed along the California-Nevada state line a few miles west of Beatty. It has not been observed on NAFB, CAFB, or the NTTR, but its range in Nevada is poorly understood due to its secretive habits. It could potentially be found in the North Range of the NTTR in areas east and north of Beatty. The Oasis Wash/Fleur de Lis Canyon area appears to have suitable habitat. If the rosy boa is ever documented on the NTTR, the site should be recorded in a GIS database, and management actions should be taken to minimize impact to the known location, if possible.

2.3.4.5 Amargosa Toad

Description of Current Conditions

The Amargosa toad (*Anaxyrus nelsoni*) is a BLM sensitive species, it is protected under NAC 503.075, and it is considered a SOCP due to its extremely small geographic range and threats from introduced species (WAPT, 2012). The Amargosa toad is known only from the Amargosa River Valley near Beatty, Nevada (Stebbins, 2003). This moderately-sized toad can be distinguished by its lack of a cranial crest and a prominent, light, mid-dorsal strip on a dark ground color. It has a relatively narrow head and longer snout when compared to other *Anaxyrus* toad species.

Most of the species' known range and habitat is along the Amargosa River and adjacent canyons near the town of Beatty, and extending north along the river into the Oasis Valley. Land ownership is largely a mosaic of private landowners. In the past, the Amargosa Toad was a USFWS candidate species for federal listing. In 2010, however, the USFWS ruled that listing was not warranted, largely due to the formation of the Amargosa Toad Working Group and a Cooperative Agreement and Strategies (CAS) signed by NDOW, BLM, the city of Beatty, Nye County, and various local land owners (USFWS, 2010). In 1999, the Nature Conservancy purchased a ranch inhabited by the toad. The CAS provides for habitat protection and restoration and annual population monitoring by NDOW. The Amargosa toad has not been found on NAFB, CAFB, or the NTTR, but has been documented in LaFleur Spring in the Oasis Wash, less than three miles from the Fleur de Lis gate to ECS on the NTTR. The toad potentially could be found in Fleur de Lis canyon at sites with permanent or ephemeral surface water.

If the toad is ever documented on the NTTR in Oasis Wash, further survey efforts should commence in the area to determine whether there is an extant breeding population in a permanent or ephemeral water site on the NTTR. In such a case, the USAF should consider joining the Amargosa Toad Working Group and CAS groups to continue monitoring such a population and participate in conservation efforts with local partners. If a toad is documented but determined to be moving during a dispersal event from a known breeding site south/downstream from the NTTR, contact with NDOW should be considered to determine how to proceed (i.e., should the animal be left alone, or detained and transferred to the NDOW to return it to a known breeding site).

2.3.4.6 Northern Leopard Frog

Description of Current Conditions

The northern leopard frog is classified as sensitive by the BLM, protected by the State of Nevada under NAC 503.075, and considered a SOCP due to population fragmentation and habitat loss from unsustainable agricultural practices, such as grazing and water impoundments. The species is a medium-sized, slender frog with a narrow head and long legs. It can be green, tan, or brown above, with dark brown oval spots that have well-defined edges. It also has cream-colored, well- defined dorsolateral folds along its back that extend from shoulder to rump. Females grow up to 4.75 inches in length, up to an inch larger than the males.

The northern leopard frog has a wide northerly range from Canada into the northern U.S., and west into Colorado, Utah, Arizona, Nevada, and parts of northern California (Stebbins, 2003). Historically, the species occurred throughout eastern and northwestern Nevada; however, many populations have been extirpated (NDOW, 2020).

The northern leopard frog requires a mesic habitat where it can overwinter and breed, as well as upland post-breeding habitats. It uses areas of permanent water with rooted aquatic vegetation, such as springs, slow streams, marshes, bogs, ponds, reservoirs, and lakes. The species is diurnal and nocturnal, and is adapted to cold conditions. Its diet consists of invertebrates, and occasionally small vertebrates, such as fish and amphibians. The northern leopard frog has not been observed on the NAFB, CAFB, or the NTTR. There is a 1939 record from the Beatty area, but that population has most likely been eliminated by the invasive bullfrog. There is also a 1953 record in Eden Creek in the Kawich Range, just north of the NTTR boundary.

Given the northern leopard frog's complex habitat requirements, including permanent water sources with rooted aquatic vegetation combined with upland habitats, it is unlikely that the species will be found on the NTTR. Water-course diversions and alterations in the Kawich for the wild horse program have also likely removed the best candidates for suitable habitat. If a population were to be documented, its location should be recorded in the GIS database, and management actions taken to avoid impacts to the water source the population relies upon. If nonnative goldfish were removed from the Operations and Management pond and site 22 ponds (located in ECW), they could serve as suitable sites for the leopard frog.

2.3.4.7 Golden Eagle

One of North America's largest raptors, the golden eagle is classified as Sensitive by the BLM and protected by the BGEPA (NNHP, 2017a, 2017b; NAC 503.050). NAFB and CAFB are too heavily developed to provide preferred foraging habitat for the golden eagle. It also lacks the cliff structures ideal for nesting; however, the NTTR encompasses a vast amount of golden eagle habitat for both nesting and foraging and supports a population of resident golden eagles.

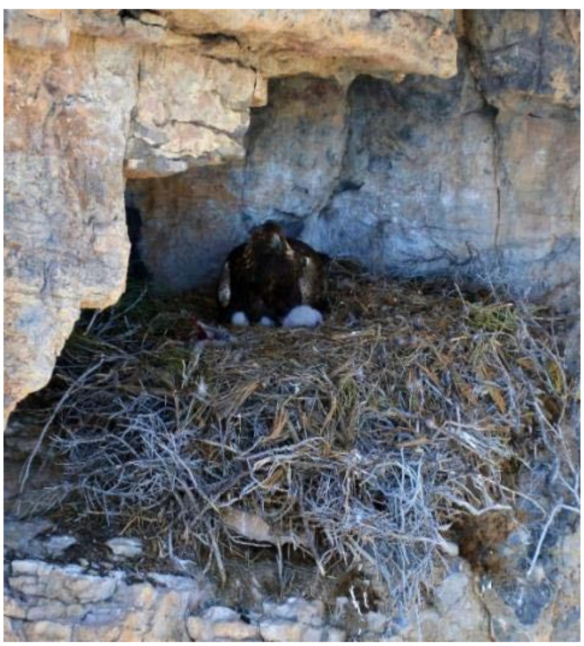

Figure 2-63: Golden eagle on nest with chicks, Nevada Test and Training Range. NAFB Photo Library.

Recognizing the need for information regarding golden eagle productivity and distribution across the range, the NNRP initiated helicopter surveys to identify and monitor golden eagle nests in 2011. Each year from 2011 through 2016, surveyors flew both the North and South Ranges of the NTTR multiple times during the nesting season to view known golden eagle nests, find new nests, and assess reproductive success (NAFB, 2011b, 2013b, 2014b, 2015c, 2016c, 2017d) (Figure 2-64).

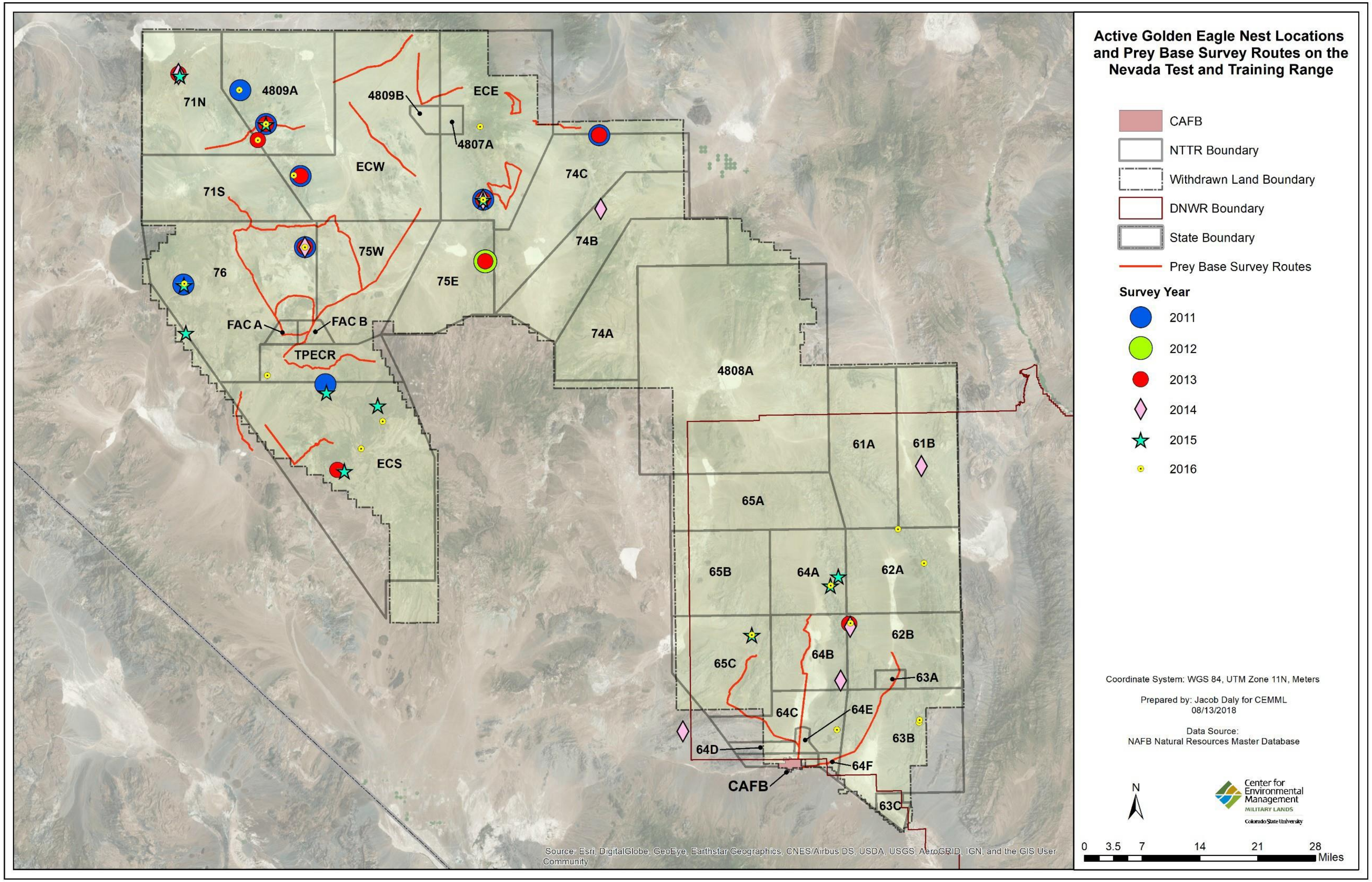

Figure 2-64. Locations of active golden eagle nests and routes of prey-base surveyss on the Nevada Test and Training Range, 2011–2016.

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In addition to continuing surveys for nests and monitoring nest occupancy and productivity, the NNRP expanded its golden eagle survey efforts in 2014 to include powerline surveys, in which large tracts of the NTTR were covered via driving the roads and surveying power poles for perching golden eagles and other raptors. The NNRP also began conducting nocturnal spotlight surveys for prey species important for golden eagle productivity and survivorship, such as the black-tailed jackrabbit (*Lepus californicus*) and other small mammals, to investigate changes in prey-base numbers from year to year (NAFB, 2015b, 2016d, 2017d). The result of these ongoing survey and monitoring efforts has been to acquire a substantial amount of data regarding golden eagle distribution, nesting locations, and nest success across the NTTR, as displayed in Figures 2-66 and 2-67.

2.3.4.8 Western Burrowing Owl

The western burrowing owl is a small, ground-dwelling owl that inhabits arid landscapes, including some urban and agricultural environments. Classified as Sensitive by the BLM and protected by the MBTA, the western burrowing owl occurs in many locations across NAFB and both the North and South Ranges of the NTTR. Western burrowing owls have not been observed on the small, heavily developed installation of CAFB. Western burrowing owls on NAFB and the NTTR may be migratory or year-round residents (NAFB, 2012a).

Figure 2-65. Burrowing owl adult and chicks at nest. NAFB Photo Library.

In 2010, the NNRP partnered with USFWS and Red Rock Audubon Society to monitor nest success of burrowing owls on NAFB, particularly at artificial burrows that the USFWS installed in 2009 in the far southwest corner of Area 1 after the flood canal there was paved. Known burrowing owl nests on NAFB are surveyed between 1 April and 31 August each year at the artificial burrows and at natural burrows on the Sunrise Vista Golf Course (NAFB, 2011a, 2012c, 2013c, 2014c, 2015d, 2016e, 2017h). The locations of these monitored burrows are shown in Figure 2-68. In 2013, the NNRP initiated call-playback surveys for burrowing owls in suitable habitat across NAFB and the NTTR to assess burrowing owl distribution throughout the installation. In addition to these survey and monitoring efforts, numerous burrowing owls have been encountered across NAFB and the NTTR during the course of other surveys, such as Nevada Bird Count and stationary point-count surveys, as demonstrated in Figure 2-66 (NAFB, 2011a, 2012c, 2013c, 2014c, 2015d, 2016e, 2017h) and Figure and 2-67 (NAFB, 2011c, 2012a, 2013a, 2014a, 2015a, 2016b, 2017b).

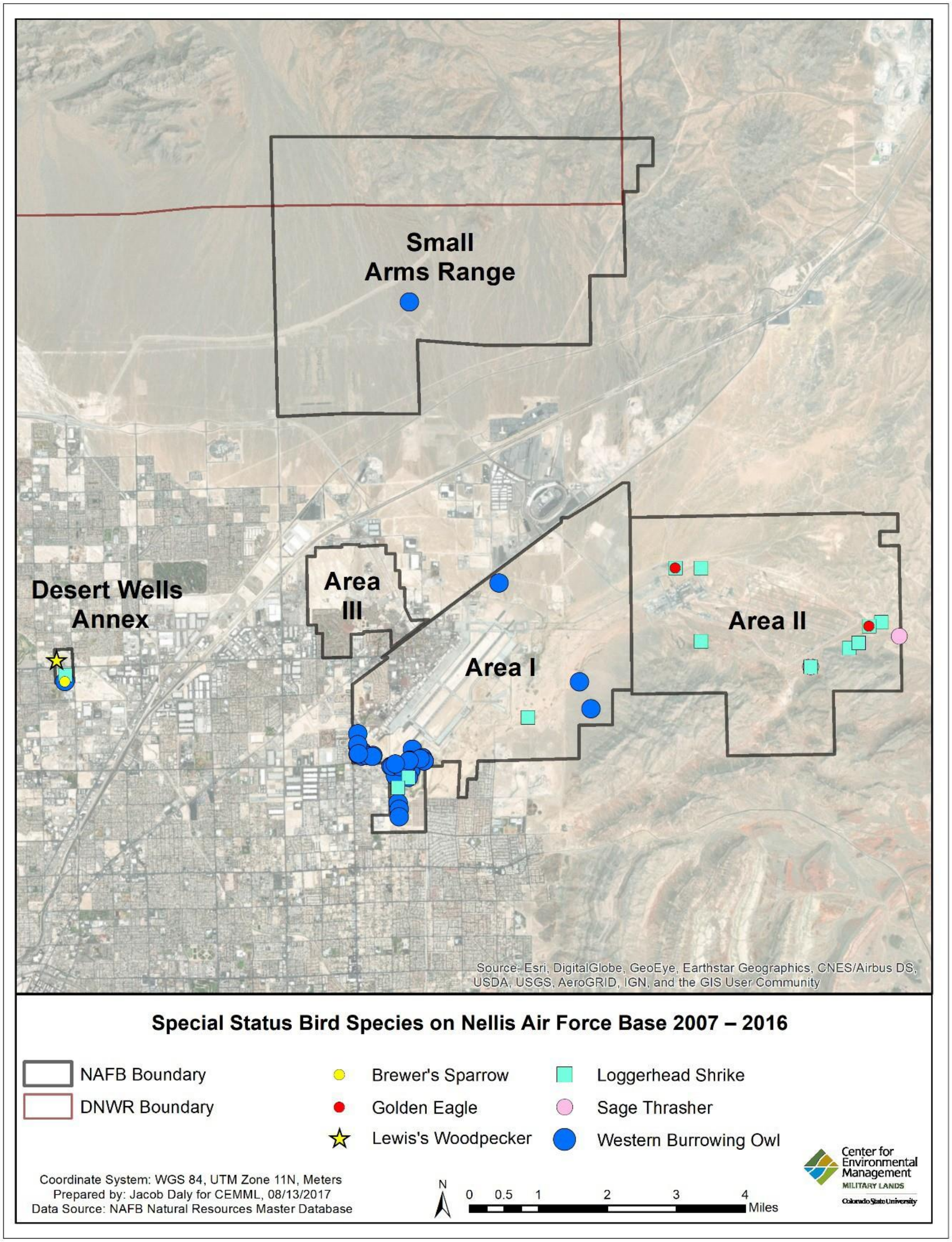

Figure 2-66. Special-status bird species on Nellis Air Force Base, 2007–2016.

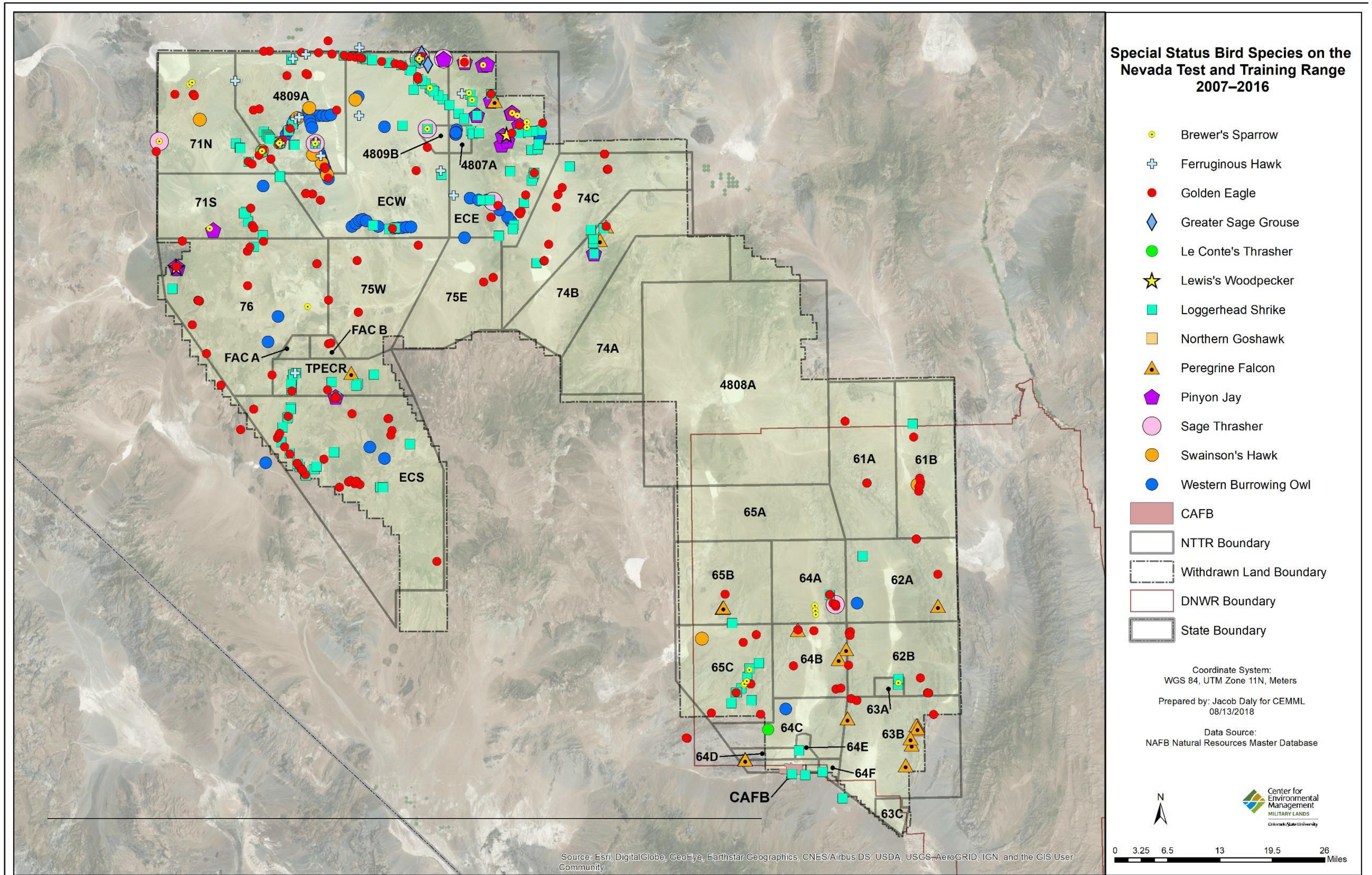

Figure 2-67. Special-status bird species on the Nevada Test and Training Range, 2007–2016.

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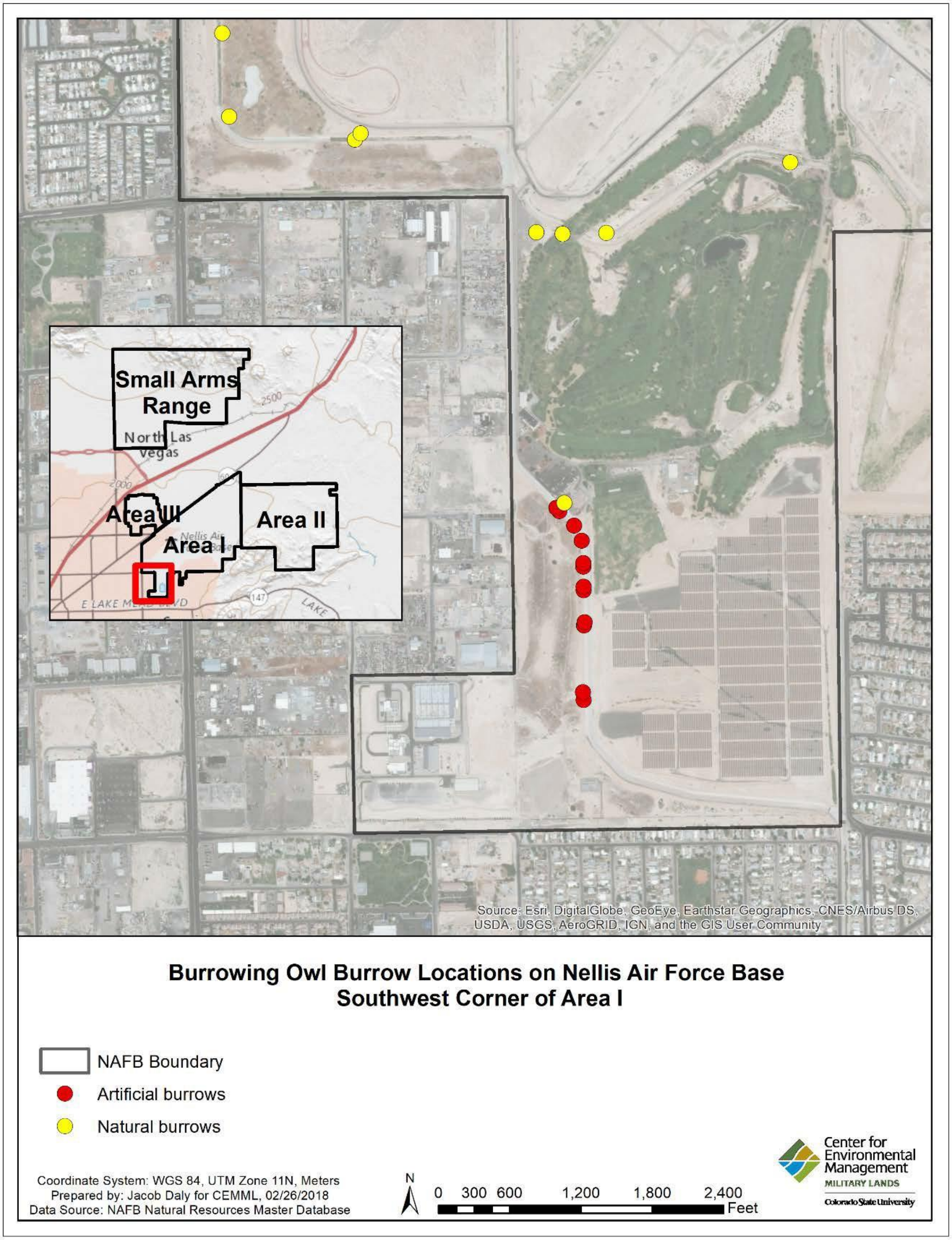

Figure 2-68. Burrowing owl burrow locations on Nellis Air Force Base, 2010–2016.

NAFB and the NTTR both support significant populations of western burrowing owl, but burrowing owls have experienced impacts to their habitat on NAFB in recent years due to increased development, and this encroachment is likely to continue in the future with ongoing base expansion. Therefore, owl burrows near construction are carefully monitored and protected according to the Arizona Burrowing Owl Working Group Project Clearance Protocol supported by the USFWS and NDOW, and burrowing owls continue to be observed on Areas I, II, and III of NAFB, as well as on the SAR (Arizona Burrowing Owl Working Group, 2007; NAFB, 2012a, 2017h).

2.3.4.9 Greater Sage-Grouse

Figure 2-69. Greater sage-grouse. Photo: USFWS.

The greater sage-grouse (*Centrocercus urophasianus*) is protected by the State of Nevada as an upland game bird (NAC 503.045), and it is a SOCP (WAPT, 2012) and a BLM sensitive species. Nevada's population of greater sage-grouse was proposed for ESA listing as threatened in December 2013, but, in 2015, the USFWS decided the greater sage-grouse did not warrant federal listing. The USFWS will review the 2015 listing decision in 2020 (USFWS, 2015).

The greater sage-grouse is dependent upon sagebrush (*Artemisia* spp.) communities, which are found only within a band of suitable habitat surrounding the Kawich Range of mountains on the North Range of the NTTR. In July and September of 2011, while conducting other wildlife surveys west of the Kawich mountains, a small brood of greater sage-grouse (one hen with two or three chicks) was observed by NNRP biologists in the Breen Creek area, which NDOW had delineated as critical late-summer habitat for the greater sage grouse (Figure 2-67).

Following these observations, in 2012 and 2013, remote wildlife cameras were set up in locations around Breen Creek and near potential sage grouse trails and water sources, and transect surveys for greater sage-grouse through suitable habitat have continued. In 2015, during aerial surveys for other wildlife species, there were unconfirmed sightings of sage-grouse in the Breen Creek area. There have been no further sage-grouse observations. It is thought that sage-grouse are transient on the NTTR due to the suboptimal condition of the sagebrush stands within installation boundaries. In recent years, some stands, such as those around Sumner Spring, have been badly trampled by wild horses (NAFB, 2011a, 2012c, 2013c, 2014c, 2015d, 2016e, 2017h).

2.3.4.10 Raptors

In addition to the golden eagle, four other sensitive raptor species been documented on NAFB, CAFB, and the NTTR, and a fifth raptor species has potential to occur on the installation. Swainson's hawk (*Buteo*

Figure 2-70. Peregrine falcon with eggs in cliff nest, the Nevada Test and Training Range. NAFB Photo Library.

swainsoni) and ferruginous hawk (*Buteo regalis*), both classified as Sensitive by the BLM and as SOCP by NDOW, have been observed nesting in Joshua tree habitat on the NTTR. The state-endangered peregrine falcon (*Falco peregrinus*) nests in the cliffs of the NTTR. These three raptors are encountered in the course of many surveys, including those for cliff- and tree-nesting raptors and raptor surveys conducted by vehicle along powerlines. Northern goshawk (*Accipiter gentilis*), classified as Sensitive by the BLM and the State of Nevada, was identified in the summer of 2012 via remote wildlife camera photographs taken at Cooper's Meadow, a spring located on the North Range of the NTTR (NAFB, 2011c, 2012a, 2013a, 2014a, 2015a, 2016b, 2017b; NAC 503.050). See Figures 2-66 and 2-67 for observations of these raptor species across the installation between 2010 and 2016.

The fifth species, the bald eagle, is a large, state-endangered raptor protected by the BGEPA (NNHP, 2017ab; NAC 503.050, 2004). It is a potential passage migrant across the installation. NAFB, CAFB, and the NTTR are located outside the specie's breeding range and do not contain any suitable bald eagle wintering habitat, such as high-elevation coniferous forest, trees near open water, or agricultural lands (GBBO, 2010).

Figure 2-71. Pinyon jay. Photo: USFWS.

2.3.4.11 Passerines, Near-passerines, and Shorebirds

Le Conte's thrasher, designated as Sensitive by the BLM and as a SOCP by NDOW, and sage thrasher, designated as Sensitive by the BLM and the State of Nevada and as a SOCP by NDOW, occur on the NTTR (NNHP, 2017a, 2017b; NAC 503.050). Bendire's thrasher, designated as Sensitive by the BLM and as a SOCP by NDOW, has the potential to occur on the installation. Le Conte's thrasher is an uncommon resident of the Mojave Desert that inhabits sparsely vegetated creosote scrub habitat, such as that which occurs on the South Range of the NTTR, where the species has been documented (NAFB, 2016b). Sage thrasher has been observed on both the North and South ranges of the NTTR in open shrubland habitats (Figures 2-66 and 2-67). Bendire's thrasher is a rare resident in southern Nevada and prefers Mojave shrubland environments that feature the presence of scattered, taller vegetation, such as mesquite or Joshua trees. This habitat occurs on both NAFB and the South Range of the NTTR, so there is potential for Bendire's thrasher to occur on the installation (GBBO, 2010).

Pinyon jay (*Gymnorhinus cyanocephalus*) and Lewis's woodpecker (*Melanerpes lewis*) are both classified as Sensitive by BLM and as SOCP by NDOW and both inhabit the pinyon- juniper ecosystem found on the North Range. Additionally, a Lewis's woodpecker was observed at the Well's Annex property of NAFB during a stationary point count (NAFB, 2011c, 2012a, 2013a, 2014a, 2015a, 2016b, 2017b; Figures 2-66 and 2-67). Black rosy finch (*Leucosticte atrata*), classified as Sensitive by BLM and as a SOCP by NDOW, inhabits high-elevation mountains in the central U.S. much of the year, where it breeds in alpine environments above the treeline. In winter, the black rosy-finch occupies open areas at lower elevations, such as high deserts, montane shrublands, and even abandoned mine entrances. All of these habitats are well represented on the North Range, so there is considerable potential for winter presence of black rosy finch (GBBO, 2010).

Figure 2-72. Loggerhead shrike. NAFB photo library.

Loggerhead shrike, classified as Sensitive by the BLM and the State of Nevada and as a SOCP by NDOW, is a year-round resident frequently observed hunting from atop fence posts and other conspicuous perches on NAFB and both the North and South ranges of the NTTR. Brewer's sparrow is also designated Sensitive by both the BLM and the State of Nevada and is a passage migrant and winter resident found on NAFB, CAFB, and the NTTR (NAFB, 2011c, 2012a, 2013a, 2014a, 2015a, 2016b, 2017b; NNHP 2017a, 2017b; NAC 503.050; Figures 2-66 and 2-67.

The interior population of western snowy plover (*Charadrius alexandrinus nivosus*), designated as Sensitive by the BLM and as a SOCP by NDOW, nests in areas where water is present throughout the entire breeding season, but it depends on ephemeral wetlands and playa habitats throughout much of its lifecycle for foraging opportunities. The NTTR encompasses numerous dry lakebeds that are characterized by brief, infrequent, and irregular water availability. Although dry and virtually lifeless most of the year, these lake beds can collect water during wet years and during periods of intermittent rains, subsequently supporting migratory and resident shorebirds and waterfowl by providing habitat and foraging opportunities. In this way, western snowy plover could potentially utilize ephemeral wetlands across the range opportunistically throughout the nonbreeding season (GBBO, 2010).

Figure 2-73. Phainopepla. NAFB photo library.

Phainopepla (*Phainopepla nitens*) is a silky flycatcher that favors lowland riparian and mesquite/catclaw habitats in which mistletoe (*Phoradendron californicum*) grows. This parasitic plant produces berries that, along with insects, compose the diet of the phainopepla. As the phainopepla was previously designated a Sensitive species by the Nevada BLM, the NNRP initiated targeted surveys for phainopepla and its preferred habitat across the installation in 2010 and continued these surveys through 2016. Although the NNRP is now focusing on other bird species that continue to be designated as Sensitive, many observations of phainopepla and suitable phainopepla habitat were made during this seven-year span, particularly at the Wells Annex and Area II of NAFB, both of which encompass mesquite bosques infested with desert mistletoe (NAFB, 2011a, 2012c, 2013c, 2014c, 2015d, 2016e, 2017h; Figures 2-66 and 2-67).

2.3.4.12 Small Mammals

At present, the NAC 503 lists as protected two species of small mammals that occur on NAFB, CAFB, and the NTTR: the dark kangaroo mouse (*Microdipodops megacephalus*) and the pale kangaroo mouse (*Microdipodops pallidus*) (Figure 2-74). Both species have been documented on the NTTR, as shown in Figure 2-75. The pale kangaroo mouse prefers fine, sandy soils with little to no gravel cover at elevations of 4,000–5,750 feet (Reid, 2006). Pale kangaroo mice are found in valley bottoms dominated by saltbush and greasewood. Although primarily granivorous, pale kangaroo mice will supplement their summer diet with insects (WAPT, 2012). In total, 49 pale kangaroo mice have been documented on the NTTR, making up two percent of all captures (NAFB, 2017f).

Figure 2-74. Pale kangaroo mouse. NAFB Photo Library.

The dark kangaroo mouse also prefers sandy soils, but, in areas where its range overlaps with that of the pale kangaroo mouse, it is found on more gravelly soil. The dark kangaroo mouse is found at elevations of 3,900–6,700 feet (Reid, 2006) in areas dominated by big sagebrush, rabbitbrush, and horsebrush. Seeds are its primary food source; however, like the pale kangaroo mouse, it will feed on some insects (WAPT, 2012). In total three individuals have been documented on the NTTR, making up less than one percent of all small mammal captures (NAFB, 2017f).

Botta’s pocket gopher (*Thomomys bottae*), desert kangaroo rat (*Dipodomys deserti*), and pygmy rabbit are all on the BLM Sensitive species list for Nevada. Botta’s pocket gopher is found in a variety of habitats and soil types and is largely fossorial and feeds on bulbs, roots, and other vegetative matter (WAPT, 2012). The desert kangaroo rat is found from below sea level to 5,600 feet in sandy soils, and it eats a variety of plant materials, including grasses, mesquite seeds, and creosote seeds. The species is primarily nocturnal, but it will be active during the day when cleaning burrows or excavating new ones (Reid, 2006).

The pygmy rabbit is the smallest leporid in the world (Himes and Drohan, 2007); its body length measures only 9.5 inches. The pygmy rabbit is distinguishable from juvenile cottontails by its lack of a white tail and relatively shorter ears compared to its head size (Reid, 2006). Pygmy rabbits are endemic to the Great Basin Desert and the adjacent intermountain regions in the Northwest (Himes and Drohan, 2007).

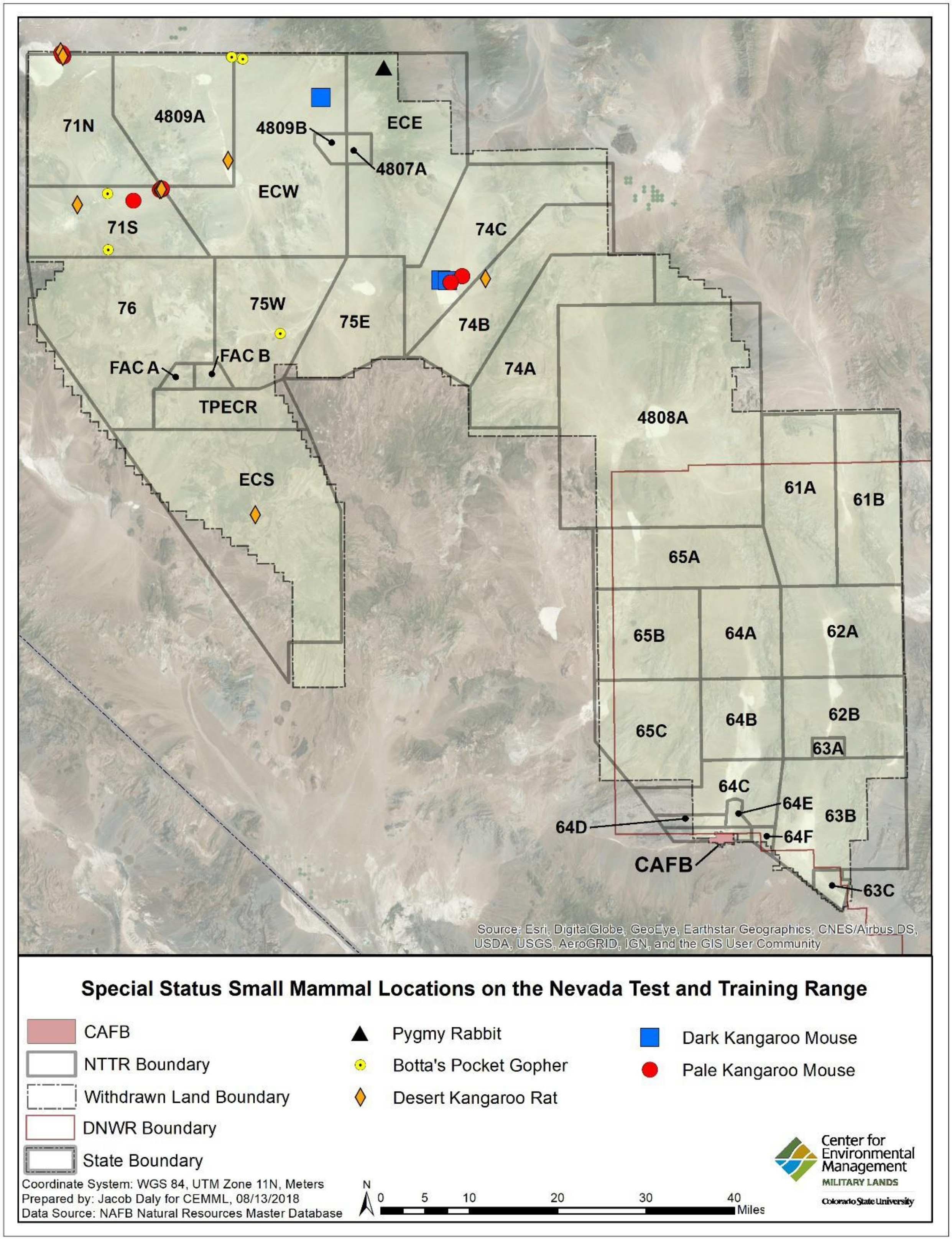

Figure 2-75. Capture lcations of special-status small mammal species on the Nevada Test and Training Range, 2003–2016.

2.3.4.13 Bats

Fifteen bat species with special status occur or have the potential to occur on NAFB, CAFB, and the NTTR. Eight bat species listed as protected by the State of Nevada NAC 503 have the potential to occur on NAFB, CAFB, and the NTTR (Appendix E). The other six special-status species are listed by the BLM as Sensitive. Fourteen of the 15 species have been documented either through acoustic recording or through mist-net captures.

Figure 2-76. Long-eared bat captured on the Nevada Test and Training Range. NAFB Photo Library.

The spotted bat (*Euderma maculatum*) is the only bat listed as threatened under NAC 503. It is a long-eared vesper bat with striking white spots on its dark body. Spotted bats prefer arid areas ranging from lowland deserts to ponderosa pine habitat at around 9,000 feet in elevation. It primarily eats large moths. The only documentation of this species has been through acoustic monitoring with merely two call sequences. The locations of which can be found in Figure 2-77.

The pallid bat, Allen's big-eared bat (*Idionycteris pyllotis*), and Townsend's big-eared bat also are members of the long-eared vesper bat group (Figure 2-77). Both the pallid bat and Townsend's big-eared bat have been captured in mist nets on the NTTR. The pallid bat is a state-protected mammal and is a BLM Sensitive species. Large insects, scorpions, and small vertebrates are the primary diet of the pallid bat, which hunts using noises the prey makes rather than through echolocation (Reid, 2006). The pallid bat has been captured 33 times and there are over 340 acoustic records of the animals as of 2016 (NAFB, 2017c). Allen's big-eared bat (a state-protected mammal and listed by BLM Sensitive) has not been captured or documented on NAFB, CAFB, or the NTTR. Allen's big-eared bat primarily occurs in woodlands. Most of the survey effort for bats have not been in woodlands; thus, the opportunity for detecting Allen's big-eared bat has been low. Townsend's big-eared bat has been captured three times and there are 68 acoustic records of this bat on the NTTR (NAFB, 2017c). Like other big-eared bats, it prefers moths and other flying insects. Habitat preferences includes arid scrub, pine forests, and wooded canyons (Reid, 2006). In Nevada, all known roosts sites have been in abandoned mines (WAPT, 2012).

The California leaf-nosed bat (*Macrotus californicus*) has been documented on the installation via 24 acoustic records on NAFB and the North Range (Figures 2-78 and 2-79). It is a State Sensitive Mammal and listed as Sensitive by the BLM. Its preferred habitat is lowland desert scrub and it feeds on moths, butterflies, and katydids (Reid, 2006). The Brazilian free-tailed bat (*Tadarida brasiliensis*) is a State-Protected Mammal and BLM Sensitive species. It has been documented by over 3700 acoustic records on both NAFB and the NTTR (Figures 2-78 and 2-79). Found throughout the southern United States and into South America, this bat frequents a large variety of habitats, including towns, deserts, and scrub.

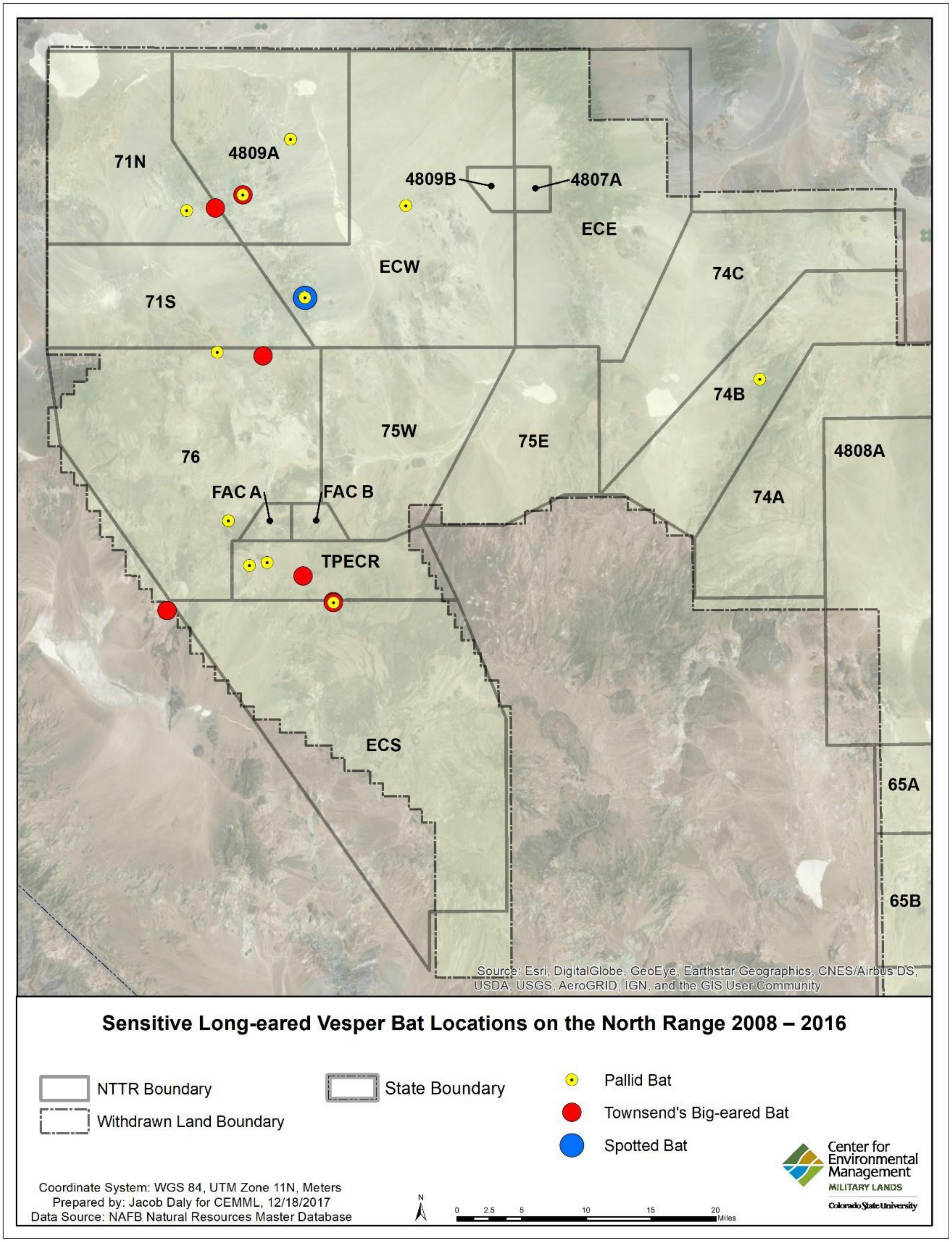

Figure 2-77. Locations of Sensitive long-eared vespertilionids detected by captures and acoustic monitoring on the North Range.

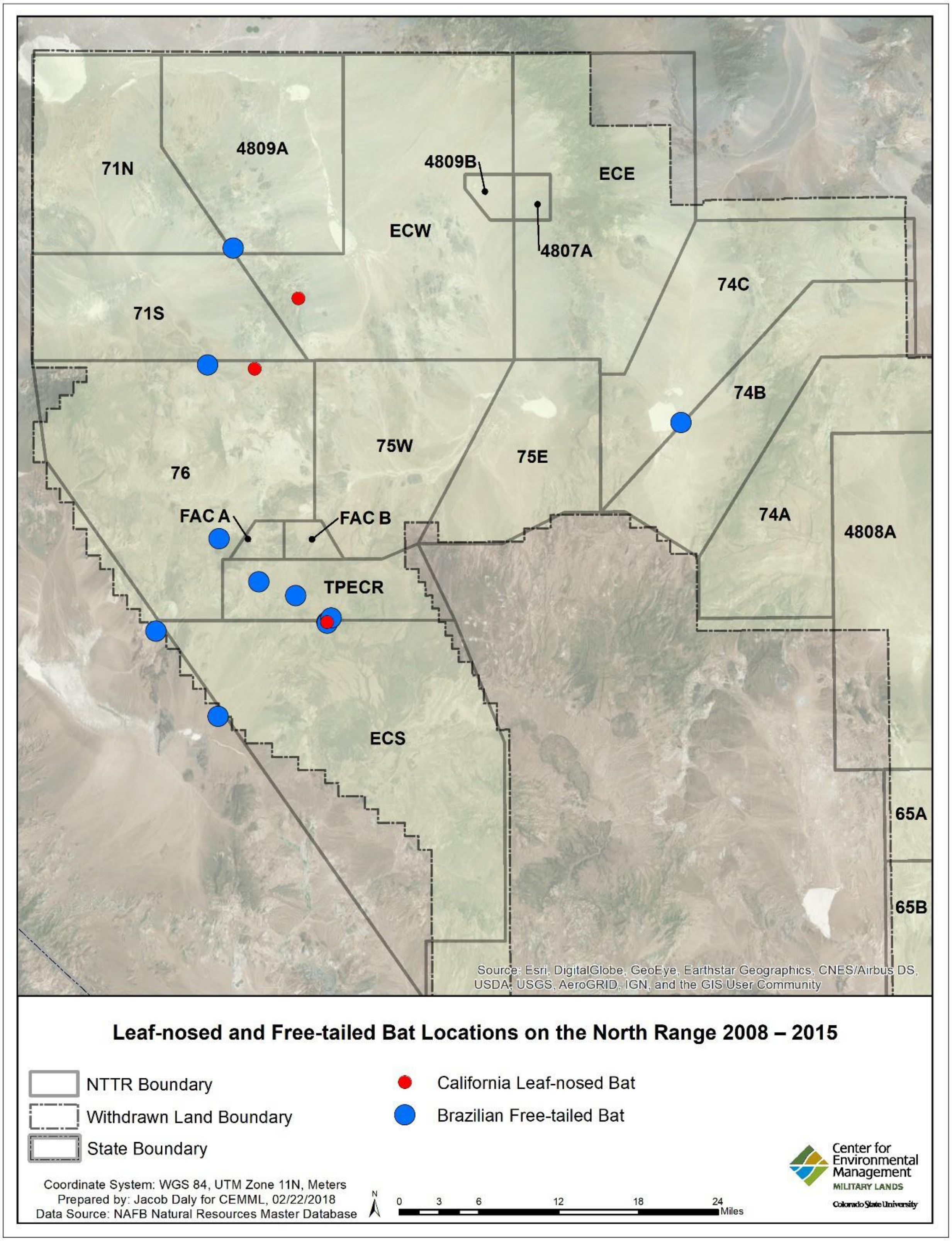

Figure 2-78. Locations of Sensitive phyllostomids and molossids detected by captures and acoustic monitoring on the North Range.

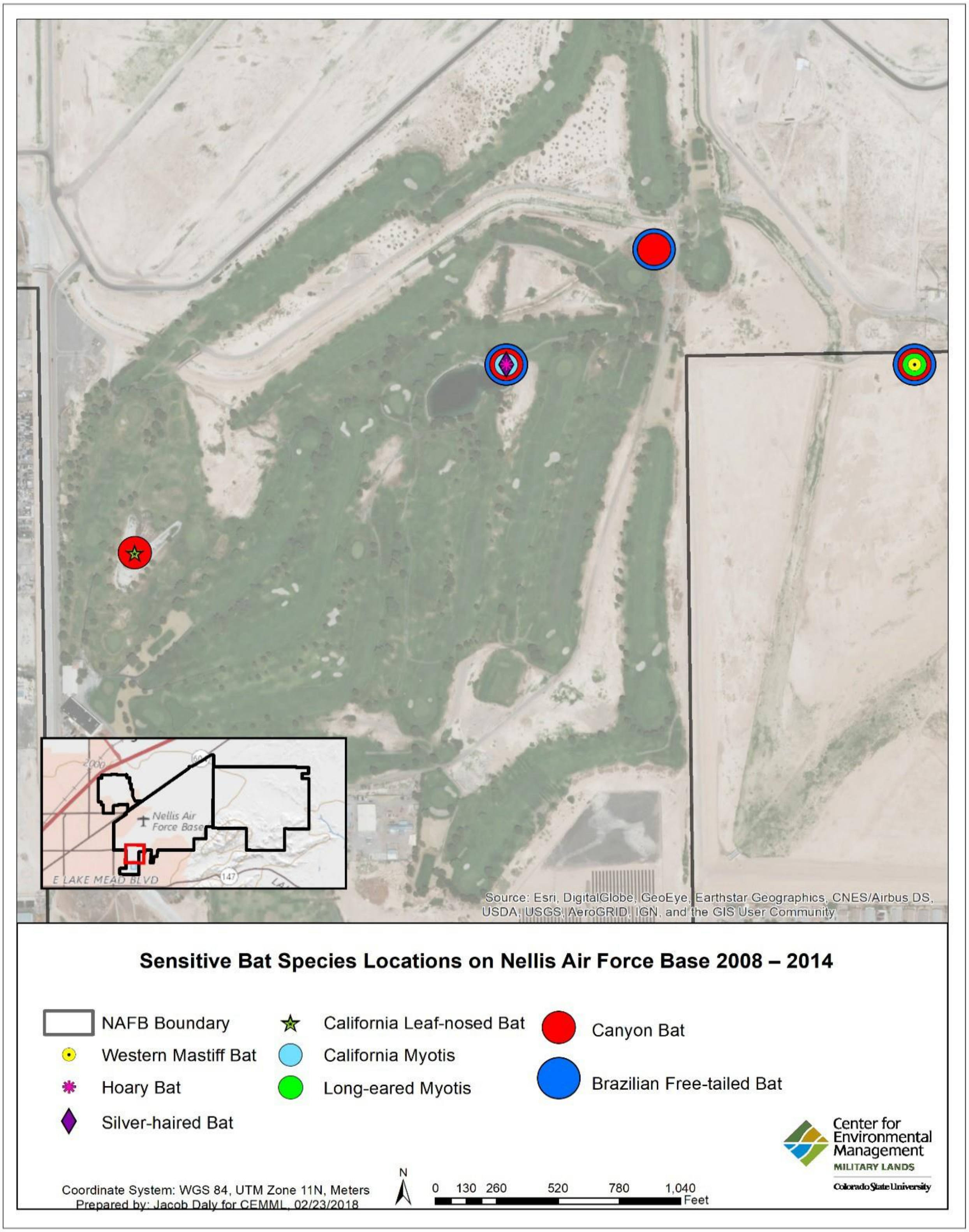

Figure 2-79. Mist net and acoustic monitoring results of Sensitive bat species on Nellis Air Force Base.

Brazilian free-tailed bats feed on a variety of flying insects, including many agricultural pests (Reid, 2006). The western mastiff bat (*Eumops perotis*) has been documented only from one acoustic record, recorded on NAFB (Figure 2-80). It prefers to roost in rock crevices on cliff faces, and it will use buildings in deserts. It is a large bat (4⅜ inches) and will travel as far as 15 miles or more to forage (Reid, 2006).

Three tree bats (Figures 2-79 and 2-80) with Special status have been documented on NAFB, CAFB, and the NTTR. All three bats prefer forested habitats or riparian zones and roost in loose bark or leaves, or on the ends of tree branches (Reid, 2006). All three have been documented only from acoustic recordings. The western red bat (*Lasiurus blossevillii*) is both a State Sensitive Mammal and a BLM Sensitive species. It has been documented in only nine acoustic recordings from the North Range of the NTTR (NAFB, 2017c). There are 46 records of hoary bat (*Lasiurus cinereus*), a BLM Sensitive species, on NAFB and the NTTR. Finally, there are 130 acoustic records of silver-haired bat (*Lasioncycteris noctivagans*), also a BLM Sensitive species, on NAFB and the NTTR (NAFB, 2017c).

Western vesper bats are tiny- to medium-sized, plain-nosed bats that occur throughout the western U.S. (Figures 2-79 and 2-81). Their tails are completely enclosed in a membrane, which is used as a scoop to capture flying insects (Reid, 2006). Five western vesper bats are considered special-status species and have been documented on NAFB, CAFB, and the NTTR. The California myotis has been documented on both NAFB and the NTTR from 6,886 acoustic records and 2 captures in mist nets (NAFB, 2017c). It is a BLM Sensitive species and can be found in desert scrub, riparian woodlands, canyons, and forests (Reid, 2006). The long-eared myotis (*Myotis evotis*) also has been documented on both NAFB, and the NTTR. There are 381 acoustic records and 1 mist-net capture of this bat (NAFB, 2017c). It pulls moths and beetles from vegetation and may rely on its hearing rather than echolocation to capture prey. The long-eared myotis is mainly found in forested areas up to 10,000 feet in elevation (Reid, 2006). The reproductive rate of this species is quite low, with up to just one pup born per year (WAPT, 2012).

The fringed myotis, a State Protected Mammal and a BLM Sensitive species, has been documented on the North Range. This species has been captured 12 times in mist nets, and there are over 260 acoustic records (NAFB, 2017c). The fringed myotis gets its name due to the presence of short, pale hair on the edge of its tail membrane. It can be found in both desert scrub and forested habitats from elevations of 4,000 to 9,000 feet (Reid, 2006). The southwestern cave myotis (*Myotis velifer brevis*) has been documented from one site on the North Range, through 11 acoustic records (NAFB, 2017c). It is a BLM Sensitive species and has a single known roosting site in all of Nevada, documented near Lake Mead. As the name suggests, this prefers caves and mines for roosting, although they have been known to use buildings. Also, the cave myotis is always found within a few miles of a water source (WAPT, 2012). The fifth western vesper bat is the canyon bat, a BLM Sensitive species. Formerly known as the western pipistrelle, many field guides still refer to is as such. It has been documented on both NAFB and the NTTR with over 5,800 acoustic records. This species is the smallest bat in the U.S. at only 1⅝ inches. It often becomes active before sunset, and its flight pattern looks similar to that of a large moth (Reid, 2006).

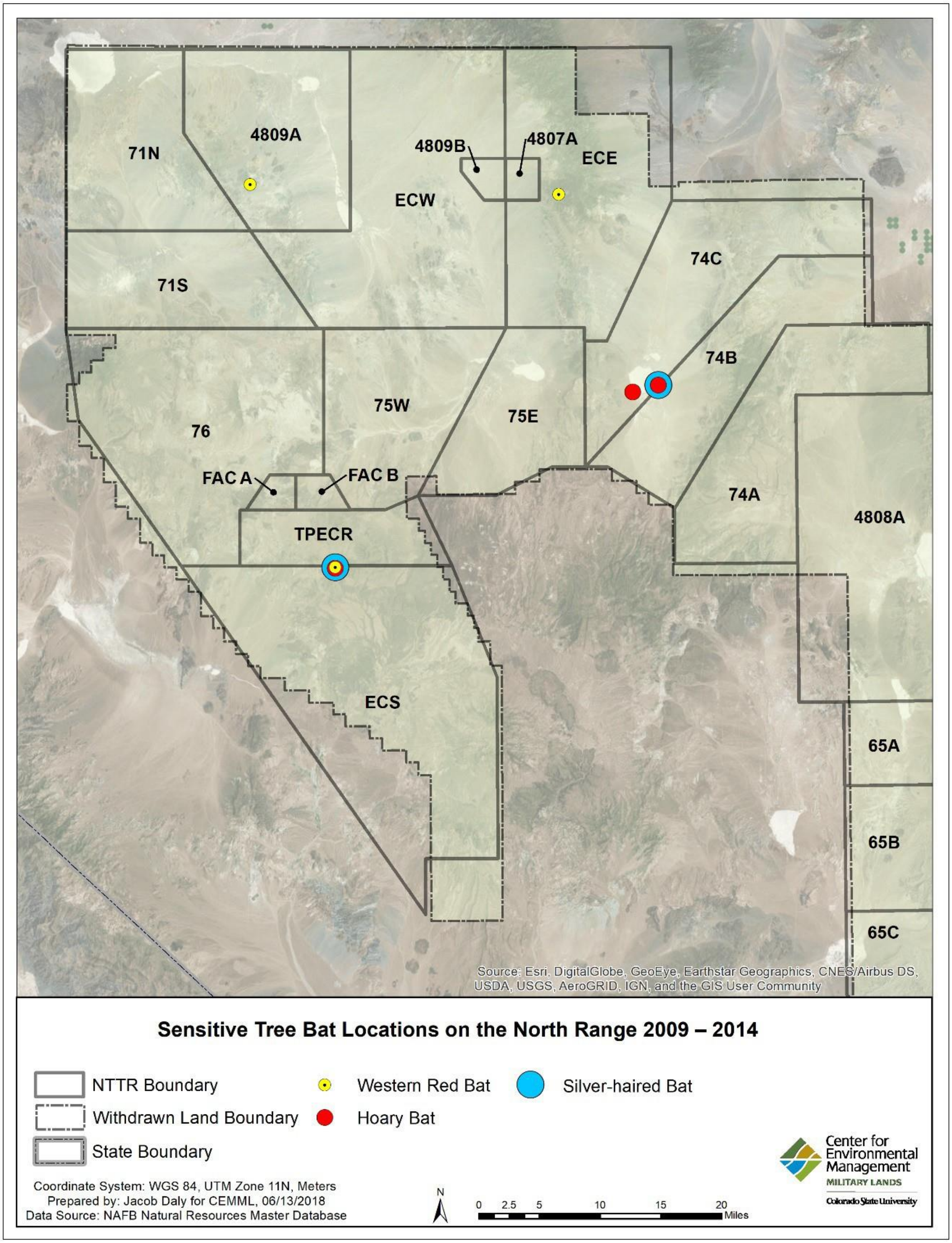

Figure 2-80. Locations of Sensitive tree bat species detected by captures and acoustic monitoring on the North Range, 2009–2014.

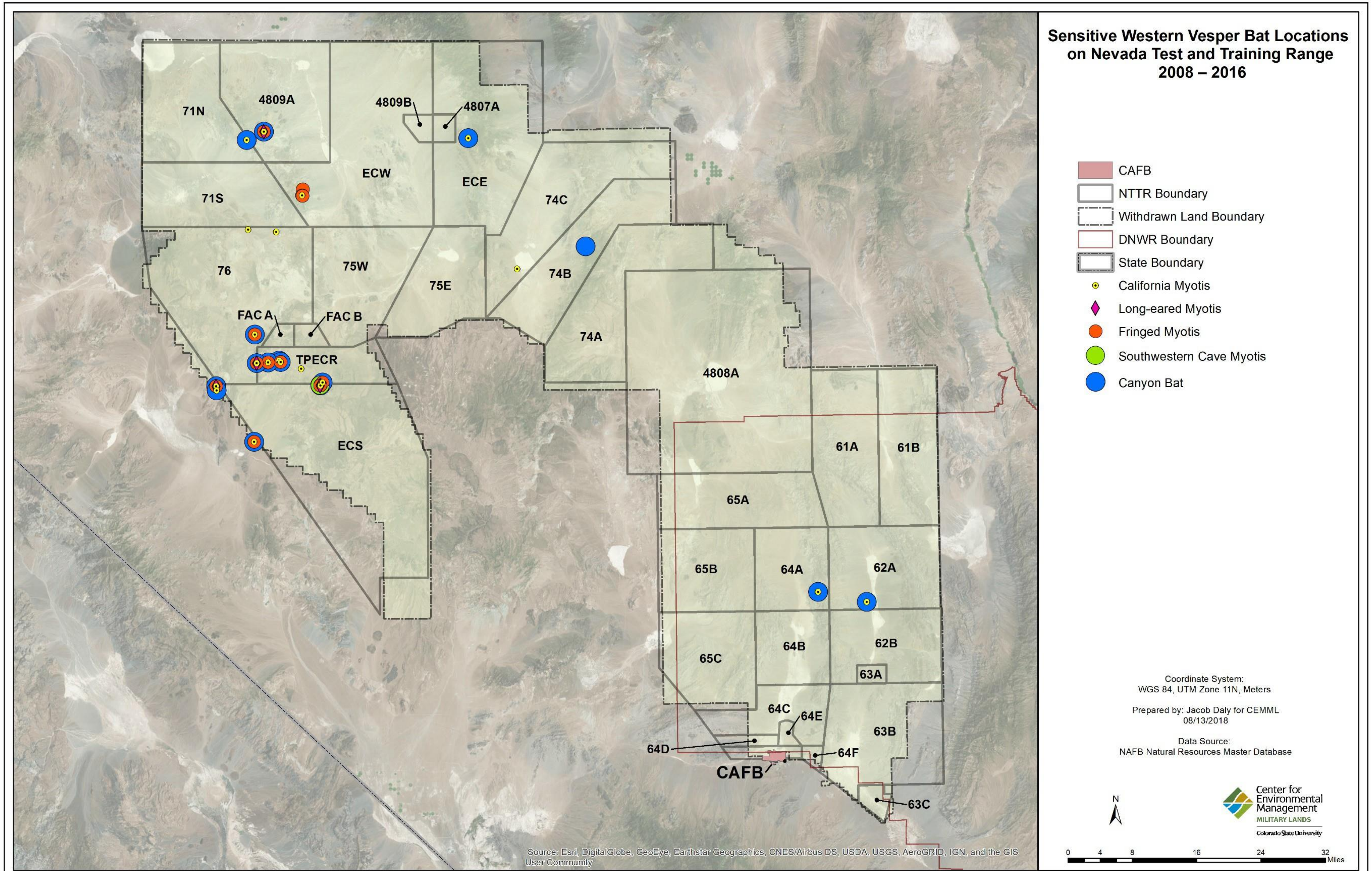

Figure 2-81. Locations of western vespertilionids detected by captures and acoustic monitoring on the Nevada Test and Training Range.

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2.3.4.14 Climate Impacts on Threatened and Endangered Species and Species of Concern

Habitat change and disruption to food availability are two major climate-related threats to all species at NAFB, CAFB, and the NTTR. Prey populations or forage abundance may be affected by the projected changes in temperature and precipitation under different climate scenarios. Seasonal cues for prey or forage emergence may change, resulting in a mismatch between food availability and food needs of threatened and endangered species. Populations of some threatened and endangered species are further imperiled by life stages that are sensitive to temperature and precipitation changes projected in the climate scenarios. Habitat requirements may change for some species as they employ behavioral adaptations. The desert tortoise, Gila monster, and prey base of ground-nesting birds and small mammals, could be adversely affected by the expansion of brome-dominated landscapes resulting from a changing climate.

2.3.5 Wetlands and Floodplains

2.3.5.1 Wetlands

Nellis Air Force Base

Field surveys to assess wetland occurrence have been conducted at NAFB and 1:250,000-scale National Wetlands Inventory maps have been prepared by the USFWS (NAFB, 2002a, 2002b, 2002c, 2002d). NAFB, the South Range, and portions of the North Range of the NTTR are included on these National Wetlands Inventory maps. Map coverage at the 1:24,000 scale is not available. It is important to note that these maps only show potential wetlands and surface waters based on aerial photography and few or no ground-truthed data. Acquiring more detailed information will facilitate compliance with the CWA.

The only potential wetlands on NAFB are the golf course ponds (NAFB, 2002a). The NAFB Natural Resource Specialist requested guidance regarding the wetland status of these manmade water sources from USACE, Sacramento District, Nevada State Office. The Sacramento USACE office indicated that the golf course ponds are not subject to wetlands protection under the provisions of Section 404 of the CWA because they are artificial impoundments and their water source is treated groundwater. The remainder of NAFB is arid scrubland or urban with no wetlands.

Creech Air Force Base and Nevada Test and Training Range

A surface water survey was conducted in 1996 to characterize, describe, catalog, and delimit the extent of water resources within the NTTR (Dames and Moore, 1997). The survey focused on alluvial floodplains, playas, and one creek. Current conditions of these water resources were characterized in terms of surface water, saturated soils, and value to wildlife, with the goal of identifying potential jurisdictional wetlands rather than conducting formal wetland delineations according to the methodology specified in the 1987 USACE Wetland Delineation Manual (Wetlands Training Institute, Inc., 1995). The functional definition used in the surveys was as follows.

> "The term 'wetlands' will be interpreted to mean those areas that are permanently or seasonally inundated and/or saturated to the ground surface for a duration that promotes the establishment of hydrophytes (wetland plants) under normal circumstances."

(Chg 1, 28 Apr 2020)
(Chg 2, 7 Apr 2021)

Not all wetlands, however, may be jurisdictional. Whereas a saturated area may apply to the definition above, it is only considered jurisdictional by the USACE if surface water flows and connects directly to navigable waters.

In the 1997 report, Dames and Moore visited sixty-five locations to determine the presence or absence of potential jurisdictional wetlands. The lack of soil inventories available from the National Resources Conservation Service, as well as obvious impacts by humans and wild horses, required Natural Resources staff to conduct case-by-case evaluations for each site. In an 8 November 1996 letter to 99 CES, the USACE agreed with the conclusion that none of the wetlands on the North Range are jurisdictional, with the potential exception of a small section of ECS that flows into the Amargosa Wash that eventually drains into the Los Angeles Basin. A copy of the jurisdictional letter is included with the 1997 report (NAFB, 1997c).

After the 1996 USACE letter and the 1997 report, the definition of jurisdictional wetlands was narrowed somewhat by the U.S. Supreme Court by Solid Waste Agency of Northern Cook County (SWANCC) v. USACE, 531 U.S. 159 (2001). In Rapanos v. United States, 547 U.S. 715 (2006) a challenge was posed to the SWANCC findings for jurisdictional waters, but a plurality vote left the definition still open to some interpretation. Subsequent cases have challenged the SWANCC findings, but the Rapanos decision, due to a plurality vote, allowed jurisdictional determinations to be interpreted either way, depending on which opinion is favored by the lower courts.

Although it is broad in scope, the USACE Waters of the United States (WOTUS) rule in 40 Code of Federal Regulations (CFR) 230.3 does not cover every water body or wetland. On 27 July 2017 (82 Federal Register 34899), the USACE and Environmental Protection Agency published a proposed rule, rescinding the current definition of WOTUS, and expressing an intent to return to the pre-2015 definition of WOTUS. The effect of this will be to further reduce the number of wetlands that are considered jurisdictional.

The determination that certain wetlands are not jurisdictional would eliminate the need to seek a USACE Section 404 permit when some wetlands are lost during ground-disturbing activities (Figure 2-82). It would not, however, affect NAFB responsibilities under EO 11990 (no net loss of wetlands) and AFI 32-7064 section 4.4 describing NEPA requirements, and the need to sign a Finding of No Practicable Alternative.

NNRP conducted a survey of seeps, springs, wetlands, and water collection on the NTTR (NAFB, 2014f). That 2014 report describes where protective barriers and alternative water access points for wildlife were installed. Many, if not most, wetland areas on the NTTR have now been protected from overgrazing, but some still remain to be protected, including Sumner Spring, and the area surrounding the surface water flowing out of Cliff Springs.

In 2017, the NNRP conducted a survey of seeps and identified 20 high-priority springs to sample for basic water parameters (pH, temperature, specific conductivity, sampling depth, dissolved oxygen, and salinity), 15 of which had surface water, hydrophytic vegetation, and/or a shallow water table with moist-soil conditions. It should be ascertained whether those are the only sites with perennial, or permanent surface water, to what extent wetland delineations have been performed, and to what extent that hydrophytic vegetation has been protected from damage from overgrazing.

(Chg 1, 28 Apr 2020)

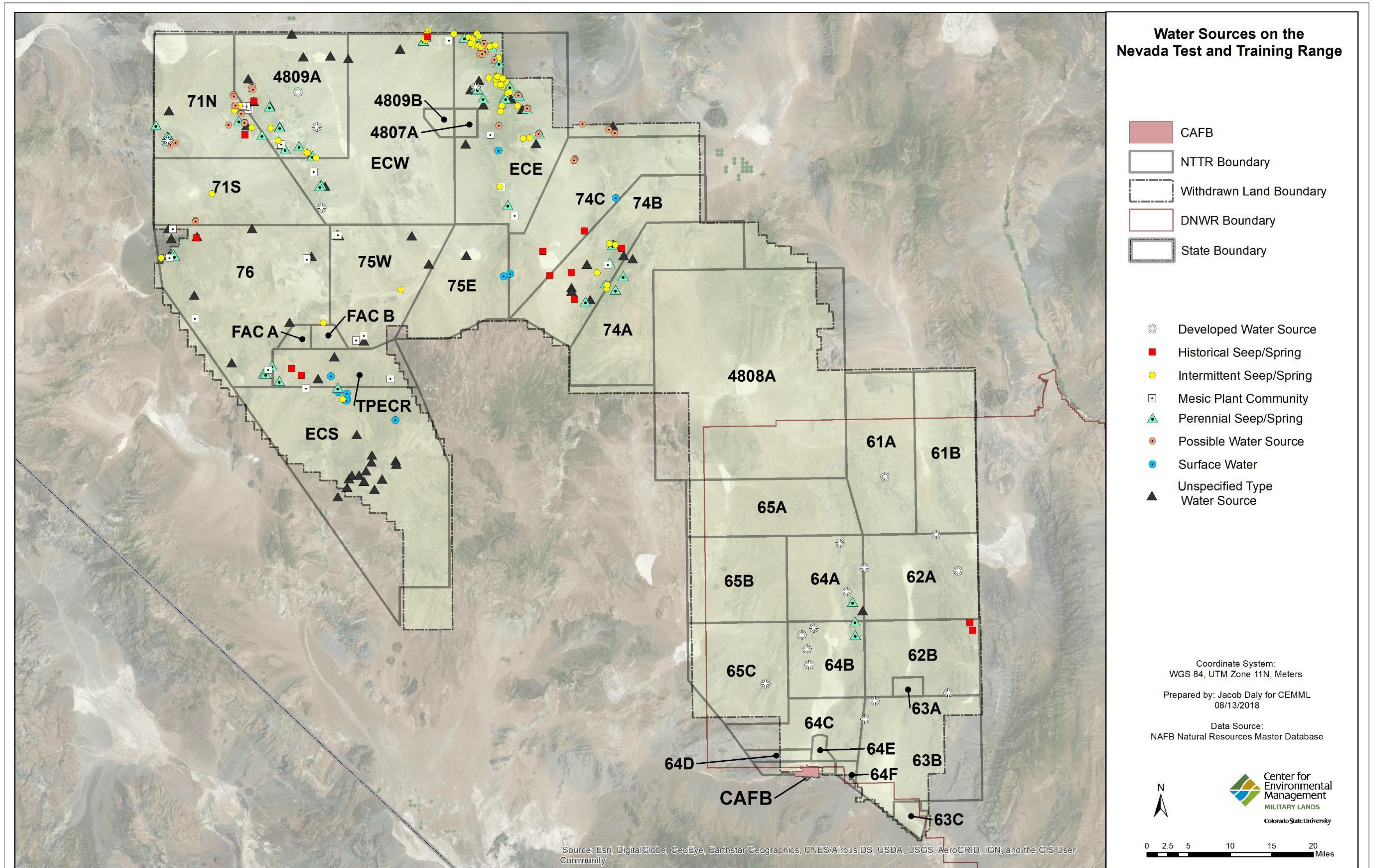

Figure 2-82. Water sources on the Nevada Test and Training Range.

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Although somewhat limited, surface waters on the North Range are more extensive than on the South Range. Four constructed water ponds and numerous smaller historical dugouts constructed in the past by ranchers are present on the North Range. Surface waters are extremely limited on the South Range. The largest water body in the area is 300 feet south of Range 65, the sewage treatment ponds for the Town of Indian Springs. Although the ponds are technically off the NTTR, those ponds are an important regional resource for wildlife, particularly birds and bats. Because this source is off the NTTR and used for sewage treatment, it is not considered jurisdictional and will not be addressed further in this report.

The limited surface water resources of the NTTR are unlikely to be designated as WOTUS by the USACE because most of them are part of closed-basin watersheds and are not connected to navigable waters; however, washes and arroyos on the NTTR in areas proposed for disturbance should be surveyed and assessed to determine whether they have a discernable, ordinary high-water mark or meet wetland criteria and whether they are connected to navigable waters of the U.S. Consultation with the USACE should be initiated if these criteria are met.

2.3.5.2 Floodplains

In 1996, a study was conducted for the NTTR to delineate hydrographic basins and floodplains (NAFB, 1997c). The report identified only alluvial floodplains, playas, and lakebeds, but it was used to provide the summary for the 2010 INRMP. Floodplains have been mapped by the Clark County Emergency Management Department for NAFB and the SAR and are currently available in shape files.

Rainstorms can cause flooding, especially when combined with snowmelt in the spring. Localized thunderstorms can produce high-intensity, short-duration, rainfall events that can result in flash flooding an average of 13 times per year at the NTTR. Following a storm event, water tends to accumulate as surface runoff for a short period. Water collected by these storm events is only temporarily present and usually collects in the low-permeability playas. Some channel flow from snowmelt and precipitation events may also occur.

Surface drainage on the NTTR generally collects in playas of the major valleys, but does not contribute to groundwater recharge because of low surface-infiltration potential. Most of the water that collects in the playas is lost through evaporation.

In general, the NTTR landscape consists of three broad categories for conveyance of storm water runoff.

- Mountains
- Piedmont plains
- Base-level plains or alluvial valleys

Mountain area runoff usually follows steep, scoured, and rocky channels with narrow or nonexistent floodplains. Runoff from mountain areas is relatively rapid and usually enters piedmont plains, which serve as a transitional area between the mountains and base-level plains. The slope of piedmont plains is much less than that of mountain areas and runoff is somewhat slower. Runoff on piedmont plains is usually conveyed by piedmonts (erosional surface cut on rock, usually covered with a thin layer of alluvium), alluvial fans, or old fan remnants across piedmont plains.

Base-level plains, or alluvial valleys, have very shallow land slope and usually end in a low topographic area or playa. Storm water passes through the base-level plains or alluvial valleys in defined channels that have floodplains that are generally wide and flat. These well-defined channels with adjacent floodplains are defined as valley collectors. The topographical low areas or playas ultimately impound storm water runoff. On the NTTR, most of the storm water runoff is confined in closed basins and does not flow beyond playas. Floodplains play an important role in natural resource management. Knowledge of the location of floodplains is important in determining sites for targets, roads, and structures. These areas should be avoided to minimize damage caused by flooding or high-velocity waters. Floodplains also provide temporary food and habitat for birds and other transient wildlife populations, especially migratory birds. In addition, many of the floodplain areas provide vernal pools, which are habitat for various seasonally reproducing invertebrates.

2.4 MISSION IMPACTS ON NATURAL RESOURCES

2.4.1 Natural Resources Constraints to Missions and Mission Planning

Ecosystem integrity is of primary importance to 99 CES when considering new projects. Planning for projects or changes requires knowledge of both the natural systems on NAFB, CAFB, and the NTTR and the required manmade infrastructure.

To facilitate effective ecosystem management, the NNRP seeks to survey natural resources to establish a baseline from which project reviews can proceed with the best available information. Biodiversity objectives will be integrated into these management strategies. If the locations are not mission essential, new construction/expansion projects on NAFB shall consider and avoid impacts to priority populations of resident plant and animal species in their planning and management designs. Landscaping at new construction areas and some existing facilities should use xeric, native species where possible, especially where development interfaces with native habitat. Sensitive species, such as the federally-listed Mojave Desert tortoise, the state-listed Las Vegas bearpoppy and the Las Vegas buckwheat, a major species of concern, must be considered during planning, site selection, and decision-making processes. Proactive management of the BASH issue must continue. Integrating additional resource information, as it becomes available, with sensitive biological area maps, will greatly enhance the decision-making process. Maintaining or promoting ecosystem integrity can be greatly enhanced by implementing centralized access to available databases, especially via GIS.

2.4.2 Land Use

The combined area of military, public domain, easement, in lease, and temporary use lands, for which NAFB, CAFB, and the NTTR maintains accountability records, totals 3,130,106 acres. It includes NAFB proper, CAFB, the NTTR, Nellis SAR, Sunrise Obstruction Lights Annex, Nellis Water System Annex, Apex Communications Annex, Nellis Communications Annex, Tonopah Air Force Station, Tonopah Auxiliary Airfield, Tonopah Auxiliary Airfield #1, Tonopah Auxiliary Airfield #2, Warm Springs Radio Relay Site, and Warm Springs Storage Site. Land usage details are presented in Table 2-14, as provided by NAFB Real Estate in a NAFB 7115 Information Sheet dated 4 August 2004, with 16 acres of additional land added to NAFB.

NAFB, CAFB, and the NTTR lands are classified and subsequently managed by using three land-use categories: improved land, semi-improved land, and unimproved land. Of the total area managed by NAFB, CAFB, and the NTTR, over 99% is unimproved land. Semi-improved lands account for about 0.1% of the total, and improved land accounts for about 0.03%. Most improved and semi-improved lands are on NAFB, CAFB, and the NTTR. The following characterizations can be made regarding the land types.

Table 2-14. Land classifications (in acres) of Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

NAFB, CAFB, or NTTR	Installation	Acres	Natural Resource Challenges?	Types of Challenges
NAFB	Apex Communication Annex	1	No	None
CAFB	Creech Air Force Base	2,300	Yes	DT; RP
NAFB	Nellis Communication Annex	2	No	None
NAFB	Mt. Sunrise Obstruction Lights Annex	11	No	None
NAFB	NAFB	14,147	Yes	DT; RP; SOC; JWUS
NTTR	NTTR	3,092,316	Yes	DT; RP; SOC; JWUS; WH; RH
NAFB	Nellis Small Arms Range Annex	10,623	Yes	DT; SOC; RP; JWUS
NAFB	Nellis Water System Annex	107	No	None
NTTR	Tonopah Air Force Station	47	No	None
NTTR	Tonopah Auxiliary Airfield	2,157	Yes	None
NTTR	Tonopah Auxiliary Airfield #1	1	No	None
NTTR	Tonopah Auxiliary Airfield #2	109	Yes	Unknown
NTTR	Warm Springs Radio Relay Site	265	Yes	Unknown
NTTR	Warm Springs Storage Site	336	Yes	Unknown
	TOTAL	3,130,106		

Abbreviations: DT (desert tortoise); SOC (Species of Concern); RP (rare plant); JWUS (Jurisdictional Waters of the U.S.); WH (wild horses); RH (riparian habitat).
Source: NAFB Real Estate in an NAFB 7115 Information Sheet dated 4 August 2004. NAFB real estate no longer classifies land used for the USAF; instead it uses only acreages of total land.

- Improved lands—This classification includes areas that have been developed for administration, housing, other building projects, and organized recreation (golf courses, ball fields, etc.). Vegetation on improved lands requires constant maintenance to ensure survival in the local arid climate. On NAFB, the major turf grass is a combination of Kentucky bluegrass, ryegrass, and fescue. Improved lands are regularly mowed and irrigated throughout the year and aerated twice a year. Weeds and brush are controlled with herbicides, as required. Trees and shrubs are pruned at least annually. Insecticides are applied in and around buildings as needed. Appropriate chemicals or traps are used for rodent control if rodents become a nuisance or impede the military mission.
- Semi-improved lands—Semi-improved lands on NAFB, CAFB, and the NTTR include areas located in proximity to runways, airfields, fence lines, parking ramps, and minimally developed spaces such as open storage areas. Most semi-improved lands are not grass-seeded; those areas with grass are irrigated and mowed during the growing season. Mowing also controls weeds and

brush, which is important for reducing fire hazard. Trees and shrubs are pruned when needed. Rodents are controlled near runways and open storage areas. Semi-improved lands are not aerated or scheduled for insect control.

- Unimproved lands—The majority of land within NAFB, CAFB, and the NTTR is unimproved. Since these areas are not currently scheduled for development or building sites, they are not included as a part of the NAFB Land Management Plan. These lands are not scheduled for mowing, irrigation, aeration, pruning, or insect control.

2.4.3 Current Major Impacts

At some point, the actions taken to meet the goals and objectives of the military mission will have impacts on natural resources. These impacts are discussed in detail in the March 1999 Legislative Environmental Impact Statement for the Renewal of the Nellis Air Force Rangeland Withdrawal. A summary of the findings is discussed in the paragraphs that follow.

2.4.3.1 Noise

Noise impacts on NAFB have been evaluated, and the results were presented in an AICUZ study under the direction of the Base Civil Engineer. Decibel contours were defined around the airfield as part of that study. Aircraft noise may be heard most weekdays on the NAFB, CAFB, and the NTTR. Relatively extensive noise models and studies were conducted to determine baseline noise levels at NAFB, CAFB, and the NTTR and to determine whether the noises emanating from mission activities could have a significant impact on the environment. Sources of noise specifically studied at the NTTR included subsonic noise, sonic booms, and noise from high explosives. It was concluded that mission activities did not significantly increase noise levels above baseline determinations. Additionally, none of the noise levels projected for the NTTR were sufficiently high to impact wildlife and other natural resources (NAFB, 1993b).

2.4.3.2 Fire

Certain military activities can result in brush fires, which, in turn, impact natural resources. Specific mission activities that can cause fire include functioning ordnance, aircraft crashes, and flares. The USAF has a responsibility under PL 106-65 to take the necessary precautions to suppress wildland fires caused by military operations. The 2012 Wildland Fire Management Plan (WFMP) prepared for NAFB, CAFB, and the NTTR has procedures for minimizing the potential for fires at the bases and installation. Those procedures include the following.

- Identify and map range assets at risk, including, but not limited to structures, infrastructure, natural resources, threatened and endangered species, cultural resources, and wildland/urban interface or intermix.
- Identify high wildland fire-hazard areas that surround assets at risk.
- Use viable fuel-treatment methods and techniques to mitigate the threat of wildfires to structures, infrastructure, natural resources, cultural resources, and nearby wildland/urban interface or intermix.
- Enhance and improve habitat by utilizing natural fire and fuel treatments.
- Use fire-management activities designed to minimize potential encroachment of invasive species into the natural environment.

- Provide fire rehabilitation and burned area emergency recovery for areas damaged by high-intensity wildfire and fire-suppression efforts.
- Where possible, implement Minimum Impact Suppression Tactics during wildfire suppression efforts.
- Monitor and evaluate fire effects.
- Prioritize, fund, and implement hazardous-fuel treatments for assets at risk.

Please see section 7.9 for more information about wildland fire management on NAFB, CAFB, and the NTTR.

2.4.3.3 Hazardous and Toxic Materials

NAFB, CAFB, and the NTTR personnel routinely use hazardous and toxic materials in their operations. These materials include paints, solvents, thinners, adhesives, aircraft fuel, diesel, gasoline, lubricants and oils, hydraulic fluids, cleaners, batteries, acids, refrigerants, herbicides, insecticides, rodenticides, and compressed gases. The AFI 32-7086 Hazardous Materials Management details how the USAF minimizes the potential impacts of hazardous and toxic materials on the environment. The mission also produces non-hazardous solid waste that is collected and disposed of properly, causing little or no impacts to natural resources.

2.4.3.4 Geology and Soils

Mission activities are not anticipated to impact the geology of the NTTR. The use of ordnance and vehicles on the NTTR results in ground disturbance, which exposes soil to wind erosion. Impacts to soil can be minimized by following best management practices currently enforced by the mission.

2.4.3.5 Water Resources

Surface waters on NAFB, CAFB, and the NTTR are limited due to low precipitation. Most of the surface water features are on the North Range and associated with springs or seeps. Mission activities are not expected to impact those surface waters associated with seeps and springs; however, many activities associated with the mission may impact ephemeral streams, which flow throughout NAFB, CAFB, and the NTTR. These streams are only periodically inundated by storm waters. Most of the ephemeral streams found on NAFB are connected to navigable waters of the U.S. and would be considered jurisdictional by the USACE. Most of the streams in the NTTR flow into closed basins and are not connected to navigable waters of the U.S., making them non-jurisdictional waters of the U.S. Some of the streams on the west and south side of the NTTR flow into navigable waters (the Amargosa River and Las Vegas Wash) and may be jurisdictional. Activities that may impact jurisdictional streams include road construction, pipeline and utility installation, target construction, and construction of buildings or other facilities. Similar mission activities may impact floodplains, but those impacts can be minimized if proper procedures are used. The military mission is not expected to impact groundwater.

2.4.3.6 Vegetation

Activities causing potential impacts to vegetation include maintenance and placement of targets and threat simulators, ground training, and the use and maintenance of roads and utility lines. These activities occur primarily in areas that have already been disturbed, with additional ground disturbance likely to occur only along the project boundaries. As most of this disturbance is concentrated on playas where biological resource values are low, the environmental impacts are minimal. In 2010, it was determined that mission activities directly impacted approximately 5% of the total land area of the NTTR. That number shall be updated in 2021, but is not expected to increase significantly due to the continued use of existing disturbed areas.

2.4.3.7 Wildlife

Impacts to wildlife on NAFB, CAFB, and the NTTR mostly result from on the ground activities, which include continuing use of range targets, ground facilities, training areas, and roads. The mission may cause significant impacts to isolated areas, and loss of some habitat resulting from mission activities is expected to continue. Impacts to isolated areas can result in negative impacts to populations of less mobile species, such as the desert tortoise, and species that require unique habitat for breeding or nesting, such as desert bighorn sheep, bats, raptors, waterfowl, sage grouse, and others.

The exclusion of non-military uses of this land is beneficial, as it precludes damage to landforms, sensitive species, and wildlife. There are some non-military uses, such as limited livestock grazing (only one small area in the north-central portion of the North Range is used for this purpose); however, there is no agricultural use, and off-road vehicles are not allowed. There is no private land development or any public use taking place. As such, the withdrawal of land for military use has the potential to continue bringing positive impacts to sensitive species, wetlands, biodiversity, cultural resources, and natural habitats. Table 2-15 provides information on the major activities of the military mission and their potential impact on natural resources.

Table 2-15. Military activities on the Nevada Test and Training Range that could potentially impact natural resources.

Activity	Effects	Remarks
Flight operations	Noise	No scientific studies have shown that subsonic or supersonic levels of jet noise significantly affect desert bighorn sheep populations.
Ground operations	Fuel spills	Personnel are trained in spill containment at NAFB, CAFB, and the NTTR facilities. Hazardous materials are collected and disposed of in compliance with the Resource Conservation and Recovery Act.
Air-to-ground attack training (including exploding ordnance, chaff and flares)	Soil disturbance, elimination of vegetation cover by fire, invasive species establishment	Disturbances, including fires, may reduce or eliminate vegetation. Target areas are usually located in playa lakes supporting low densities of vertebrate and plant populations, so impacts to wildlife and vegetation are minimal. Impact and detonation ordnance may injure, damage, reduce, and/or eliminate both vegetation and animals, with indirect effects being changes in long-term vegetative succession and associated reduced use of the site by animals until the habitat restores itself. Damaged target areas are cleaned up and restored, which in turn impacts the environment with excavation and clearing activities as well as disturbance caused by personnel, vehicles, and equipment.

Table 2-15. Military activities on the Nevada Test and Training Range that could potentially impact natural resources.

Activity	Effects	Remarks
Air-to-ground attack training	Contamination from explosives	Limited to target areas, which are usually located in playa lakes supporting low densities of vertebrate and plant populations, so impacts to wildlife and vegetation are minimal. There is minimal human exposure. Plant uptake of contaminants is not known and the impact to animals ingesting plants cannot be determined at this time. Animals are potentially impacted when dry lakebeds containing targets fill after rain.
Crash site and cleanup	Soil disturbance, contamination with explosives and fuels/lubrications, potential for fire, damage by explosions (aircraft/ordnance), elimination of some vegetation	Occasionally, aircraft, drones, and missiles may crash or land off-target. These incidences are uncommon, but can impact almost any area on the NTTR, including sensitive areas. Direct impacts from exploding ordnance and fires can occur. Crash sites are typically cleaned of contaminated material and aircraft or missile parts. Fuel spills from crash sites are usually allowed to naturally attenuate.
Surface activities	Soil disturbance, compaction, and crushing	Vehicle travel is mostly restricted to established roadways except in target areas where personnel, equipment, and vehicles may travel off road in proximity to a target for removal of ordnance. New road installations may impact the surrounding environment.
Facilities development and target construction	Soil disturbance and compaction, elimination of vegetation	Environmental impacts caused by the construction and operation of all facilities must be assessed prior to initiation of any work according to NEPA regulations. Cooperative environmental development planning is conducted to minimize impacts on natural resources.

2.4.4 Potential Future Impacts

The importance of NAFB, CAFB, and the NTTR to national security increased in the 1990s due to the closure of other USAF facilities in the U.S. The vast, largely undeveloped NTTR in the Nevada desert offers unique training opportunities to modern fighter pilots that are difficult, if not impossible, to reproduce elsewhere. Given that aircraft use will remain constant or increase in the future, it is unlikely that either ordnance use or aircraft noise will be reduced on NAFB, CAFB, or the NTTR.

Current policies regarding pollution, and the active involvement of the Environmental Management Directorate and other USAF organizations in these issues, have reduced the volume of wastes that were allowed to accumulate and will reduce levels in the future. Efforts to remediate contaminated areas are extensive and ongoing. New technological measures, such as use of pads and booms that absorb petroleum, are employed to control the spread of accidentally leaked or spilled petroleum products and solvents.

2.4.4.1 Installation Restoration Program Sites

In support of the military mission over the years, large volumes of petroleum products, solvents, and protective coatings have been used on NAFB, CAFB, and the NTTR, resulting in the generation of waste chemicals. Some of these materials are hazardous or toxic. Underground storage tanks are present on NAFB, CAFB, and the NTTR. The USAF established the Installation Restoration Program (IRP) to implement remedial actions to mitigate the effects of these materials. The IRP sites are described in the Management Action Plan (NAFB, 1997a) for NAFB, CAFB, and the NTTR. The types of sites addressed by the IRP include ordnance trenches, disposal pits, landfills, surface spills, storage terminals, fire training sites, waste ponds, and storm drains. Since 1982, 144 IRP sites have been identified: 46 on NAFB, 13 at CAFB, and 68 on the NTTR. The sites on the NTTR did not require remediation. On NAFB, 12 sites required remediation, and 9 of those are still being mediated. The two sites in remediation at CAFB are still active. Initial studies of potential NTTR target threats to environmental health are presented in the Range Contamination Report (NAFB, 1996b). The IRP sites are not expected to pose human health risks (NAFB, 1997a).

2.4.4.2 Ordnance

Because of the nature of the military mission of NAFB, CAFB, and the NTTR, ordnance delivered on the NTTR has very localized impacts to the environment. Since the majority of targets are located in playas, impacts to wildlife and plants are considered minimal. Wastes from ordnance explosions may be found on the surface, underground due to the force of the original delivery or from the physical actions of wind and water, or in burial pits where quantities of ordnance-related wastes were collected. All ordnance burial pits are presently IRP sites. These sites were closed in accordance with the environmental regulations of the State of Nevada in the mid-1980s.

USAF EOD personnel actively clear ordnance on the NTTR as part of the Coronet Clean program. Waste ordnance has little potential for spontaneous combustion or detonation from wildlife activities. Ordnance items do represent a safety hazard for personnel, and specific safety courses are required for persons working on the NTTR. It has been determined that surficial soil contaminants are not expected to move off the NTTR. Sampling programs at representative target complexes indicate that explosive and metal residues associated with expended ordnance appear to be restricted to the areas immediately around the target areas (NAFB, 1996b). These findings may need to be updated if further research indicates that ecological risks are associated with NTTR ordnance contamination.

2.4.4.3 Hazardous Wastes

NAFB, CAFB, and the NTTR personnel that may come in contact with hazardous wastes are given specific training for avoiding, handling, and disposing of such materials. An Initial Accumulation Point course is provided for managers, consistent with the federal Resource Conservation and Recovery Act. Introductory courses for technicians that focus on materials used on the flight line and refresher courses for personnel that are more senior are provided, as well. These courses direct personnel to limit handling of hazardous wastes, to gather the wastes in proper storage, and to assemble quantities larger than 55 gallons at designated accumulation points. A review of hazardous materials handling on the NTTR was conducted and a final report was issued in April 1996 (NAFB, 1996). In addition, a Storm Water Pollution Prevention Plan has been prepared by 99 CES personnel. This plan provides methods to eliminate or reduce pollution in local surface and groundwater sources, should any hazardous materials be inadvertently released.

An assessment of Point Bravo (a small facility that serves as a field office, staging area, and entry point into the South Range), and CAFB was conducted to address the potential for and impact of an aboveground storage tank release on drinking water intakes and sensitive fish and wildlife habitats. CAFB and the NTTR required this assessment for compliance with the 1 July 1994 Final Rule, which amended 40 CFR, Parts 9 and 112 of the Oil Pollution Act of 1990. Upon review of possible affected sensitive fish and wildlife areas, drinking water intakes, planning calculations, and current spill contingency plans, a Facility Response Plan was deemed unnecessary. A Certification of Substantial Harm Criteria will be completed and maintained with each of the facility Environmental Coordinators and with 99 CES. This certification is reviewed annually with the Base Facility Response Plan.

2.4.4.4 Infrastructure

Much of the land area on NAFB and CAFB, and a small portion of the NTTR, is occupied by roads, utility corridors, buildings, housing, and land used for aircraft operations and maintenance. The infrastructure causes direct losses of ground cover and disturbance to adjacent areas, an effect seen most directly on NAFB. Roads and utility corridors fragment habitats and can provide human access to previously undisturbed areas. Habitat fragmentation and disturbance of remote areas are important considerations in natural resource management (Noss and Cooperider, 1994), particularly of the NTTR. The 99 CES/CEIEA makes every effort to limit new construction that is not essential to the mission and to close unused infrastructure wherever possible.

2.4.4.5 Climate Impacts on Mission Planning

The large expanses of remote, undeveloped land that are needed to fulfill the NAFB, CAFB, and NTTR missions do not require specific habitat or vegetation types that may be an integral part of mission readiness at other installations.

Future impacts to the mission at NAFB, CAFB, and NTTR linked to climate change could include

- increases in temperature and wind velocity that could lead to unsafe environmental conditions for launching current and planned weapons and equipment, resulting in increased maintenance requirements, new equipment needs, or decreased launch capacity (DoD, 2014);
- increased dust generation that could affect equipment and visibility (DoD, 2014);
- increased wind velocities that may damage vital mission infrastructure (Sydeman et al., 2014);
- greater drought potential (Glick et al., 2011); and
- potential loss of future training areas that may be needed in light of a changing geopolitical landscape and base realignment.

2.4.5 Natural Resources Needed to Support the Military Mission

The military mission at NAFB, CAFB, and the NTTR requires large expanses of land that are remote and undeveloped or uninhabited by non-military personnel. Much of the area is used for target and warfare maneuvers practice. A large buffer between the public and target or practice areas is required for security and safety.

At times, topographic and vegetative features of the area mimic land features in other parts of the world where the military may be involved or potentially involved. These areas can be used as the setting for

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practicing military maneuvers that may be used in those places. Thus, the most important natural resource used by the military mission is the remoteness and the general physical and biotic character of the area.

2.4.5.1 Installation Restoration Program Sites

In support of the military mission over the years, large volumes of petroleum products, solvents, and protective coatings have been used on NAFB, CAFB, and the NTTR, resulting in the generation of waste chemicals. Some of these materials are hazardous or toxic. Underground storage tanks, spill sites, and landfills, are present on NAFB, CAFB, and the NTTR. The USAF established the Installation Restoration Program (IRP) to implement remedial actions to mitigate the effects of these materials. The IRP sites are described in the Management Action Plan (NAFB, 1997a) for NAFB, CAFB, and the NTTR. The types of sites addressed by the IRP include ordnance trenches, disposal pits, landfills, surface spills, storage terminals, fire training sites, waste ponds, and storm drains.

Since 1982, 144 IRP sites have been identified: 46 on NAFB, 13 at CAFB, and 68 on the NTTR. The sites on the NTTR did not require remediation. On NAFB, there are six landfills and six spill sites being monitored or under remediation. No issues have been identified at the landfills, and site cap and groundwater monitoring will continue (NAFB, 2016). No issues have been reported at any of the spill sites, and data show a reduction in contamination and there is no off-site mitigation of contamination plumes. Groundwater monitoring will continue at these spill locations. The two sites requiring remediation at CAFB are still active. Initial studies of potential NTTR target threats to environmental health are presented in the Range Contamination Report (NAFB, 1996b). The IRP sites are not expected to pose human health risks (NAFB, 1997a).

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System framework and it's Plan, Do, Check, Act cycle for ensuring mission success. EO 13693, Planning for Federal Sustainability in the Next Decade, U.S. Department of Defense Instruction (DoDI) 4715.17, AFI 32-7001, Environmental Management, and the International Organization for Standardization (ISO) 14001:2004, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the Environmental Management System framework.

The natural resources program employs Environmental Management System-based processes to achieve compliance with all legal obligations and current policy drivers, effectively managing associated risks, and instilling a culture of continuous improvement. The INRMP serves as an administrative operational control that defines compliance related activities and processes.

4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the Natural Resources Program are listed in Table 4-1. Specific natural resources management-related roles and responsibilities are described in appropriate sections of this plan.

At NAFB and CAFB, 99 CES/CEIEA is ultimately responsible for natural resource management and works to ensure that natural resources within the boundaries of both USAF bases are managed properly. Communication with state and federal agencies is ongoing throughout the year to discuss specific questions and coordinate activities such as hunts or surveys.

The roles and responsibilities of various agencies over the management of withdrawn lands and established wildlife ranges on the NTTR are complex. The 99 CES coordinates its responsibilities with state and federal stakeholders to ensure fulfillment of their obligations. NAFB, CAFB, the NTTR, the BLM, NDOW, and USFWS share the responsibility for the management of natural resources on the NTTR in accordance with PL 106-65, the Sikes Act, the National Wildlife Refuge Act, the ESA, the MBTA, and the BGEPA. Review and approval authority for the INRMP Component Management Plans and proposed actions rests with the 99 ABW. Figure 2-3 illustrates the command structure that includes 99 ABW and 99 CES/CEIEA. Any federal actions impacting the environment are subject to NEPA and may require consultation with federal, state, and local regulatory agencies, as well as the general public. Federal agencies, state agencies and other organizations must be consulted when plans potentially impact lands or resources jointly managed by the USAF and those agencies or organizations.

Under the Sikes Act, this INRMP is prepared by the USAF to specifically address the needs and activities of the military mission with respect to natural resource conservation at NAFB, CAFB, and the NTTR.

4.1 Bureau of Land Management Responsibilities

According to the MLWA of 1999 (PL 106-65), the BLM is responsible for the following on the withdrawn lands.

- Protection of wildlife and wildlife habitat
- Control of predatory and other animals
- Prevention and appropriate suppression of brush and range fires resulting from non-military activities

Additionally, the MLWA of 1999 (PL 106-65) states the following with respect to the Secretary of the Interior and the office's responsibility for non-military use of withdrawn land:

> *". . . shall be subject to such conditions and restrictions as may be necessary to permit military use of such lands for the purposes specified in or authorized pursuant to this subtitle. The Secretary of the Interior may issue a lease, easement, right-of-way, or other authorization with respect to non-military use of the lands, only with the concurrence of the Secretary of the military department concerned."*

Table 4-1. General roles and responsibilities.

Organization	Base	Range	Roles
99 CES/CEIEA	Yes	Yes	Overall responsibility for development and implementation of INRMP, Component Plans and related EA. Updates and revises the INRMP and Component Management Plans. Coordinates draft plans and projects with the NTTR prior to execution. Integrates the INRMP with Base Comprehensive Plan and Comprehensive NTTR Plan, BASH Reduction Plan, ICRMP, and IPMP. Develops and implements measurement and monitoring procedures. Coordinates consultation with other agencies and stakeholders. Ensures that NAFB, CAFB, and the NTTR adhere to state and federal regulations pertaining to natural resources. Coordinates natural resource management with Nellis EIAP Conservation Subcommittee, Nellis Environmental Safety and Occupational Health Leadership Council (ESOHLC), NTTR, 99 CES/CEIEA, 99th Air Base Wing/Combat Commander (99 ABW/CC), Headquarters (HQ) ACC Environmental Analysis Branch, USFWS, NDOW, BLM, 99th 99th Security Forces Squadron.
Nellis Public Affairs	Yes	Yes	Reviews EA associated with the INRMP. Conducts required NEPA public notifications and public meetings. Provides information about the INRMP to news media, elected officials, environmental groups, and interested members of the public.
Nellis EIAP Conservation Subcommittee	Yes	Yes	Review proposed projects/management actions for EIAP potential. Review EA associated with the INRMP.
Nellis ESOHLC	Yes	Yes	Review and initial approval authority of INRMP and subsequent additions and updates to Component Plans.
NTTR	Yes	Yes	Coordinate with 99 CES and facilitate Range-specific aspects of INRMP implementation. Schedule and coordinate logistics for any natural resource management activities on the NTTR. Review and coordinate with 99 CES on proposed INRMP projects to ensure that military mission
99 ABW/CC	Yes	Yes	Final approval authority for the INRMP.
HQ ACC/ A3A	Air Field Only	Yes	The single focal point for all issues dealing with airfield management, air traffic control, terminal instrument procedure, and the establishment, maintenance, modification, and disestablishment of airspace and ranges for air-to-air and air-to- ground operations in the continental U.S. Includes the environmental, legal, public relations, and operational aspects of range and airspace management, plus development of policy, planning, programming, requirement, and guidance. Reviews and concurs with all range-related documents. Final approval authority for the Range Comprehensive Plan.

Table 4-1. General roles and responsibilities.

Organization	Base	Range	Roles
USFWS	Yes	Yes	Review and concur with Component Management Plans and actions relating to DNWR lands within the NTTR. Provide data and management input regarding desert bighorn sheep, migratory birds, and species of concern to DNWR mission. Provide consultation with respect to federally-listed threatened or endangered species. Natural resources law enforcement. Management of desert bighorn sheep. Manages the desert bighorn sheep hunt on the South Range under the direction of the NTTR and in coordination with NDOW.
NDOW	Yes	Yes	Provide data and management input regarding wildlife management. Assist NAFB, CAFB, and the NTTR in conservation of state-listed species of concern. Control of predatory animals. Conserve and manage desert bighorn sheep. With the USFWS, coordinate the desert bighorn sheep hunt under the direction of the NTTR. Coordinate the desert bighorn sheep hunt on the North Range under the direction of the NTTR.
BLM	No	Yes	In the NTTR only: review INRMP and Component Management Plans; rangeland management; fire suppression and management; protection of wildlife habitat; protection of riparian areas and water sources for wild horses; wild horse management; and coordinate RMPs with 99 CES/CEIEA and the NTTR.
99th Services Squadron	Yes	No	Maintain recreation areas on NAFB.
99th Security Forces Squadron	Yes	No	Law enforcement; security on the NAFB and CAFB.

The 2004 Record of Decision for the Approved NTTR Resource Management Plan and Final Environmental Impact Statement clearly states the role of the BLM at the NTTR:

> *"The emphasis of the NTTR RMP is management of the wild horse, while protecting unique habitats for threatened, endangered, and special status species, unique military training opportunities, limited recreation, as well as other resource uses. Even though habitat is limited, the BLM is committed to provide the desert tortoise with the highest possible quality of habitat. However, it must be noted that management of specified natural resources is secondary to the military mission."* (BLM, 2004a).

For the NTTR, it was determined that the entire NTTR would be closed to non-military uses and the general public. The BLM may manage wildlife and wildlife habitat according to their RMP as long as resource management activities do not impact the military mission. In summary, the responsibilities of the BLM on the NTTR are as follows.

- Manage wild horses according to the BLM RMP Record of Decision.
- Protect unique habitats for endangered and threatened species, as well as the military mission.
- Protect the desert tortoise.
- Control any wildfires on the NTTR.
- All responsibilities are secondary to the military mission.

4.2 United States Fish and Wildlife Service Responsibilities

The 99 CES/CEIEA is responsible for advising military mission operators on provisions of the ESA and developing plans to minimize ESA effects on the mission.

The MLWA of 1999 (PL 106-65) defines DoI responsibilities as follows.

> *"DoI—Notwithstanding the Desert National Wildlife Refuge withdrawal and reservation made by Executive Order No. 7373, dated May 20, 1936, as amended by Public Land Order Number 4079, dated August 26, 1966, and Public Land Order Number 7070, dated August 4, 1994* [extended for an additional 20-year period on August 4, 2014 by Public Land Order 7828], *the lands depicted as impact areas on the map referred to in paragraph (4) are, upon completion of the transfers authorized in paragraph (5)(F)(ii), transferred to the primary jurisdiction of the Secretary of the Air Force, who shall manage the lands in accordance with the memorandum of understanding referred to in paragraph (5)(E). The Secretary of the Interior shall retain secondary jurisdiction over the lands for wildlife conservation purposes"*

The MOU between the USAF and USFWS defines the responsibilities of the USFWS on withdrawn lands in DNWR, as follows.

> *"The Service is the federal agency primarily responsible for the welfare and management of the land, wildlife habitat and other natural resources, and for protection of cultural and archeological resources, and for research thereon in the refuge. The service is also the federal agency with specific responsibilities for protection of threatened and endangered species and management of desert bighorn sheep, desert tortoises and migratory birds."* (USAF and USFWS, 1997).

Thus, responsibilities of the USFWS with respect to the NTTR are as follows.

- Manage natural, cultural and archeological resources on the DNWR.
- Conserve wildlife resources and preservation of the desert bighorn sheep within the DNWR.
- Protect federally-listed threatened and endangered species and their habitats according to the ESA.

- Manage the desert bighorn sheep hunt under the direction of the NTTR and in cooperation with NDOW.
- Under the provisions of the Sikes Act, assist NAFB, CAFB, and the NTTR in managing natural resources by providing expertise on issues related to endangered species, invasive species, migratory birds, law enforcement, wetlands, and environmental contaminants.

4.3 Nevada Department of Wildlife Responsibilities

NDOW also has responsibilities for management of various natural resources within NAFB, CAFB, and the NTTR. These responsibilities include the following.

- Control of predatory animals
- Management of wildlife
- Preservation of the desert bighorn sheep
- Assist the NTTR with the desert bighorn sheep hunt in coordination with the USFWS

In summary, each of the federal and state agencies having natural resource responsibilities within the boundaries of the NTTR continue to have those responsibilities, but only through the final approval of the NTTR to ensure that the military mission is not impacted and that the safety and security of the NTTR is not jeopardized. 99 CES/CEIEA implements provisions of the INRMP for the management of natural resources on the NTTR to assist the NTTR in ensuring that natural resources are properly managed within the constraints of the military mission and to ensure that the ecosystem is sustained for support of the military mission. See Table 4-1 for a summary of each organization's role in natural resources management and preparation and implementation of the INRMP at NAFB, CAFB, and the NTTR.

5.0 TRAINING

USAF installation Natural Resources Program Managers and other natural resources support personnel require specific education, training and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Natural resources management training is provided to ensure that base personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained in agreement with the Recordkeeping and Reporting section of this plan. Listed below are key natural resources management-related training requirements and programs.

- All Natural Resources Program Managers working on NAFB, CAFB, and the NTTR take the course, DoD Natural Resources Compliance, as this program provides policy, guidance, and oversight for management of natural resources. The three principles that guide the Natural Resources Program are stewardship, leadership, and partnership. Stewardship initiatives assist DoD in safeguarding its irreplaceable resources for future generations. By embracing a leadership role as part of the program, the DoD serves as a model for respectful use of natural and cultural resources. Through partnerships, the Natural Resources Program strives to access the knowledge and talents of organizations and individuals outside of the DoD.
- All biologists conducting desert tortoise surveys must receive training in field survey protocol implementation, as outlined in the desert tortoise Field Manual provided by the USFWS (USFWS, 2009a). Only biologists authorized by the USFWS are to conduct desert tortoise field work.

6.0 RECORDKEEPING AND REPORTING

6.1 RECORDKEEPING

The installation maintains records in accordance with Air Force Manual 33-363, Management of Records, and disposes of records in agreement with the USAF Records Management System records disposition schedule. Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook and in referenced documents.

6.2 REPORTING

The installation NRM is responsible for responding to natural resources-related data calls and reporting requirements. The NRM and supporting AFCEC Media Manager and Subject Matter Specialists should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

7.1 Fish and Wildlife Management

7.1.1 Hunting Programs

The Nevada Board of Wildlife Commissioners manages game hunting in Nevada and determines hunting dates, bag limits, fees, and other factors pertaining to hunting, for which NDOW makes recommendations. NDOW carries out the policies, laws, and regulations of the State of Nevada. NDOW, with cooperation from the USAF, operates four Hunt Units on the NTTR, one in the North Range in the Stonewall Mountain Area, and three in the South Range, which allows access for hunters throughout most of the South Range. For approximately two to three weeks in fall to early winter, areas on the North (Stonewall Mountain) and South Ranges are opened to small groups of permitted desert bighorn sheep hunters. After receiving Range Safety Training from the USAF, hunters who have been issued tags are permitted to hunt in select areas normally off limits to the public. Law enforcement issues associated with the hunts are the responsibility of NDOW. The only user fee activities on the NTTR are the desert bighorn sheep hunts and the fees are collected by NDOW.

7.1.2 Climate Impacts on Fish and Wildlife Management

There are no fish species at NAFB, CAFB, or NTTR and wildlife management on the installations is unlikely to need to change dramatically with respect to climate change. Many of the current issues for wildlife management (e.g., drought) are likely to persist in the future but could be exacerbated by the projected changes in climate. Management plans should be flexible enough to adapt to shifting conditions and possible changes in wildlife concerns (Hellmann et al., 2008).

Managers should continue conducting wildlife surveys on a regular basis to document potential spread of invasive species as habitats transition. Continued monitoring of bat populations, game species, and other native wildlife also will be important as habitats change. Monitoring changes in the abundance and diversity of insects also will be critical, as they provide an important food source for a substantial proportion of wildlife present on the installation.

Increasing temperatures could have a negative impact on amphibians and aquatic macroinvertebrate species. As water temperatures rise in lentic systems, dissolved oxygen content decreases, resulting in diminished habitat quality. Increasing water temperatures also will increase the chances of algal blooms, which would further deplete dissolved oxygen content and habitat suitability (Paerl et al., 2011). Maintaining and possibly establishing new wildlife guzzlers will continue to be an important aspect of wildlife management on NAFB, CAFB and NTTR, as water is already limited in this desert ecosystem and precipitation is projected to decrease.

Erosion also could have a negative impact on water quality, particularly if fire regimes change substantially. Wildland fire management will continue to be an important wildlife management tool, especially with regard to conserving aquatic macroinvertebrates and amphibians.

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7.2 Outdoor Recreation and Public Access to Natural Resources

The objective of an outdoor recreation program is to provide opportunities for the public and military personnel to use and observe natural resources. On NAFB, there are various outdoor recreational opportunities available to Active Duty Military, DoD Civilian, Military Dependents, Military Retirees, DoD Civilian Retirees, and Contractor Employees. Parks, tracks, and green spaces throughout NAFB offer opportunities for outdoor walking and jogging, sports, picnicking, and birdwatching. These recreational spaces on NAFB include Sunrise Vista Golf Course, Freedom Circle Park, and the Major General Billy McCoy Environmental Grove.

On CAFB and the NTTR, security and safety considerations preclude any opportunity for outdoor recreation except for the limited opportunities of bighorn sheep hunting. The NTTR was withdrawn from DoI's public lands for use by the USAF under PL 106-65, the MLWA of 1999. This legislation discusses non-military use of the withdrawn lands. In accordance with the MLWA of 1999, Section 3014, Management of Lands (a)(3) NONMILITARY USES (A) IN GENERAL, *"All non-military use of the lands referred to in paragraph (2), other than the uses described in that paragraph, shall be subject to such conditions and restrictions as may be necessary to permit the military use of such lands for the purposes specified in or authorized pursuant to this subtitle."*

In accordance with this referenced section, the NTTR lands are closed to non-military access for the following three reasons: (1) to protect the public from injury due to ordnance hazards; (2) to ensure that national security is not compromised; and (3) to ensure that military programs can be conducted without interruption.

Access can be granted to specific personnel who have been cleared for security through proper channels. With only a few exceptions, civilians not employed by the USAF or DoD cannot access CAFB and the NTTR without a military or government escort. Access for escorted civilians is limited on the NTTR by scheduling of mission operations. With proper planning, access for various surveys by state and government officials can be granted. For example, large game surveys using helicopters or fixed-wing aircraft can be scheduled but require that Range personnel are given a minimum of three weeks' notice.

7.2.1 Climate Impacts on Outdoor Recreation and Public Access to Natural Resources

Climate change is not expected to have substantial effects on outdoor recreation and public access to natural areas at NAFB, CAFB and NTTR. Because some hunting is permitted at the installation (see above), game populations will need to be monitored as habitat conditions are altered by shifting environmental conditions, and managers may need to adjust regulations and limits accordingly.

7.3 Conservation Law Enforcement

7.3.1 State and Federal Jurisdiction of Fish and Wildlife

The state of Nevada has jurisdiction over resident fish and wildlife throughout the state, including NAFB, CAFB, and the NTTR. The Nevada Board of Wildlife Commissioners is the governmental body responsible for the conservation of resident fish and wildlife. As such, it establishes rules, regulations and season dates governing the taking of resident fish and wildlife species, and NDOW enforces laws governing the annual bighorn sheep hunt on the NTTR.

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The USFWS has jurisdiction over migratory birds as well as federally-listed threatened and endangered species. NAFB, CAFB, and the NTTR are required to comply with federal fish and wildlife laws such as the ESA, which prohibits the unauthorized taking of a federally-listed threatened or endangered species. The ESA requires that federal agencies conserve these species and consult with the USFWS on actions that may affect them.

7.3.2 Nellis Air Force Base, Creech Air Force Base, and Nevada Test and Training Range Enforcement Program Overview

The 99th Security Forces Squadron is the sole entity tasked with law enforcement responsibility on NAFB and CAFB. The NTTR has a separate branch of law enforcement. Neither branch of Security Forces is tasked with enforcing conservation law; however, no such internal Conservation Law Enforcement program currently exists at NAFB, CAFB, or the NTTR. Please see Section 7.3.1 for the roles of NDOW and USFWS in enforcing conservation law at NAFB, CAFB, and the NTTR.

7.4 Management of Threatened and Endangered Species, Species of Concern, and Habitats

7.4.1 Current Species Status

Nevada's official state reptile, the desert tortoise (*Gopherus agassizii*), occurs on NAFB, the SAR, and the NTTR, and is the only ESA-listed species to occur on either NAFB, CAFB, or the NTTR. The Mojave population of the desert tortoise is currently listed by the USFWS as threatened (USFWS, 1990).

As desert tortoise numbers have declined throughout the Mojave Desert due to anthropogenic disturbance, areas with low tortoise density may become more important for long-term survival. Disease may spread more slowly between individuals due to less interaction in low-density populations. Individual desert tortoises may possibly obtain a resistance or tolerance to some diseases. Lower-density areas may act as locations for desert tortoise repopulation during favorable years (NAFB, 2015e).

Ongoing projects have been funded by NAFB, CAFB, and the NTTR to monitor, manage, and conserve the desert tortoise. These projects are supported by the 2015 Desert Tortoise Management Guidelines. This plan structures funds to prepare BAs for compliance with USFWS regulations regarding NAFB, CAFB, and the NTTR. Funds are provided to monitor desert tortoise populations in areas impacted by military activities or where various soil disturbances from military projects are proposed. This plan also delineates tortoise habitat to expedite processing of consultation with the USFWS and assist in limiting the impact of the military mission (NAFB, 2011c).

7.4.2 Ongoing Threatened and Endangered Monitoring Programs

Monitoring of the desert tortoise is the primary objective of the annual surveys. These studies support the development of a Tortoise Management Plan and provide funds to prepare BAs for compliance with the USFWS regulations on NAFB, CAFB, and the NTTR. Since 2011, the NNRP has conducted population/relative abundance surveys on the South Range in desert tortoise habitat. These studies determine desert tortoise density on the South Range.

The 2015 Desert Tortoise Management Guidelines Report has provided a viable framework for monitoring and managing the tortoise on NAFB and the NTTR (NAFB, 2016f). The plan was designed to implement and achieve objectives and goals directed by the USFWS BOs issued on 22 June 2012 (NAFB) and 17 June 2003 (NTTR). The report provides command elements in charge of NAFB and the NTTR with guidelines for performing military missions while ensuring long-term sustainability of desert tortoise populations (NAFB, 2016f). The objective of the 2015 Desert Tortoise Management Guidelines is to minimize disturbance to the desert tortoise and desert tortoise habitat while maximizing flexibility in the ability of the USAF to conduct mission training.

Focus on the management plan is not needed on CAFB, as the BO for NAFB and the NTTR does not include CAFB. CAFB has been surveyed, fenced, and almost entirely cleared of vegetation. This barrier between the South Range and the activities and vehicle traffic occurring within CAFB prevents any tortoise mortalities from occurring on CAFB. NAFB consists of four primary areas: Nellis Areas I, II, and III, and the SAR. Additional monitoring surveys on the SAR, Area II and Area III are needed for habitat health reporting. Commencement of continued monitoring and surveys is contingent on the BO for NAFB update (Figure 7-1).

In 1992, surveys were conducted to determine a comprehensive baseline estimate of desert tortoises on the NTTR. To re-evaluate suitable habitat modeling and population density estimates in accordance with the BO, USFWS requested active desert tortoise management, and in 2010 the NNRP began conducting desert tortoise surveys on the South Range of the NTTR in accordance with protocol issued by the USFWS Desert Tortoise Recovery Office (USFWS, 2011) (Figure 7-2).

From 2010 to 2016, 12 live desert tortoises were observed during relative abundance surveys and 8 incidental live tortoise observations were made on the South Range (Figure 7-3; NAFB, 2017g). Relative abundance surveys indicate that 88% of tortoise habitat on the South Range supports a low abundance of desert tortoises (NAFB, 2016f). Approximately 12% of the South Range supports moderate to high abundance of desert tortoises. Desert tortoise densities on the NTTR are comparable but slightly above estimates for the 2016 Eastern Mojave Recovery Unit (USFWS, 2011).

Recommendations have been extracted from numerous USFWS BOs issued for various projects at NAFB and the NTTR, and they are currently in place. The density of most desert tortoise populations at NAFB is low; however, conservation and mitigation measures are recommended to reduce potential impacts within the areas operated by the USAF (NAFB, 2016f; Figure 7-3).

7.4.3 Climate Impacts on Management of Threatened and Endangered Species and Species of Concern

Management actions needed to protect threatened and endangered species will depend on the speed at which the climate changes, the nature of the climatic changes, and the ability of the species to respond to those changes. Our understanding of species' responses to changing climate is not yet sufficient for predicting how individual species will respond. Moreover, sub-populations of a given species may exhibit unique responses to environmental conditions. Genetic variation within a species helps populations adapt to environmental conditions, but populations may not be able to undergo selection for preferred traits if environmental conditions change too rapidly (Hoffmann and Sgrò, 2011). Behavioral changes, such as switching host plants or food sources, have already been observed in some cases (Iwamura et al., 2013; Ozgul et al., 2010).

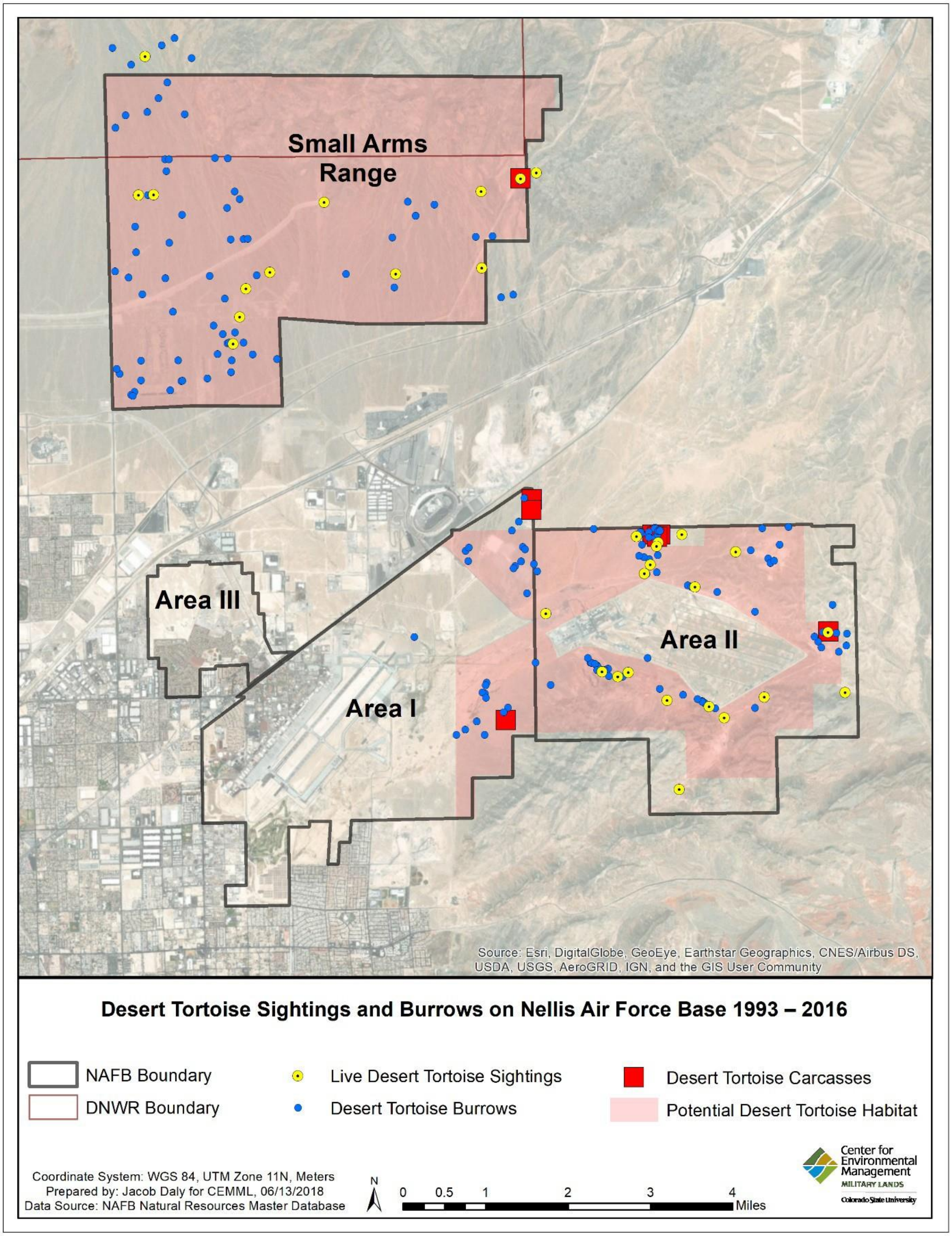

Figure 7-1. Desert tortoise sightings and burrows on Nellis Air Force Base.

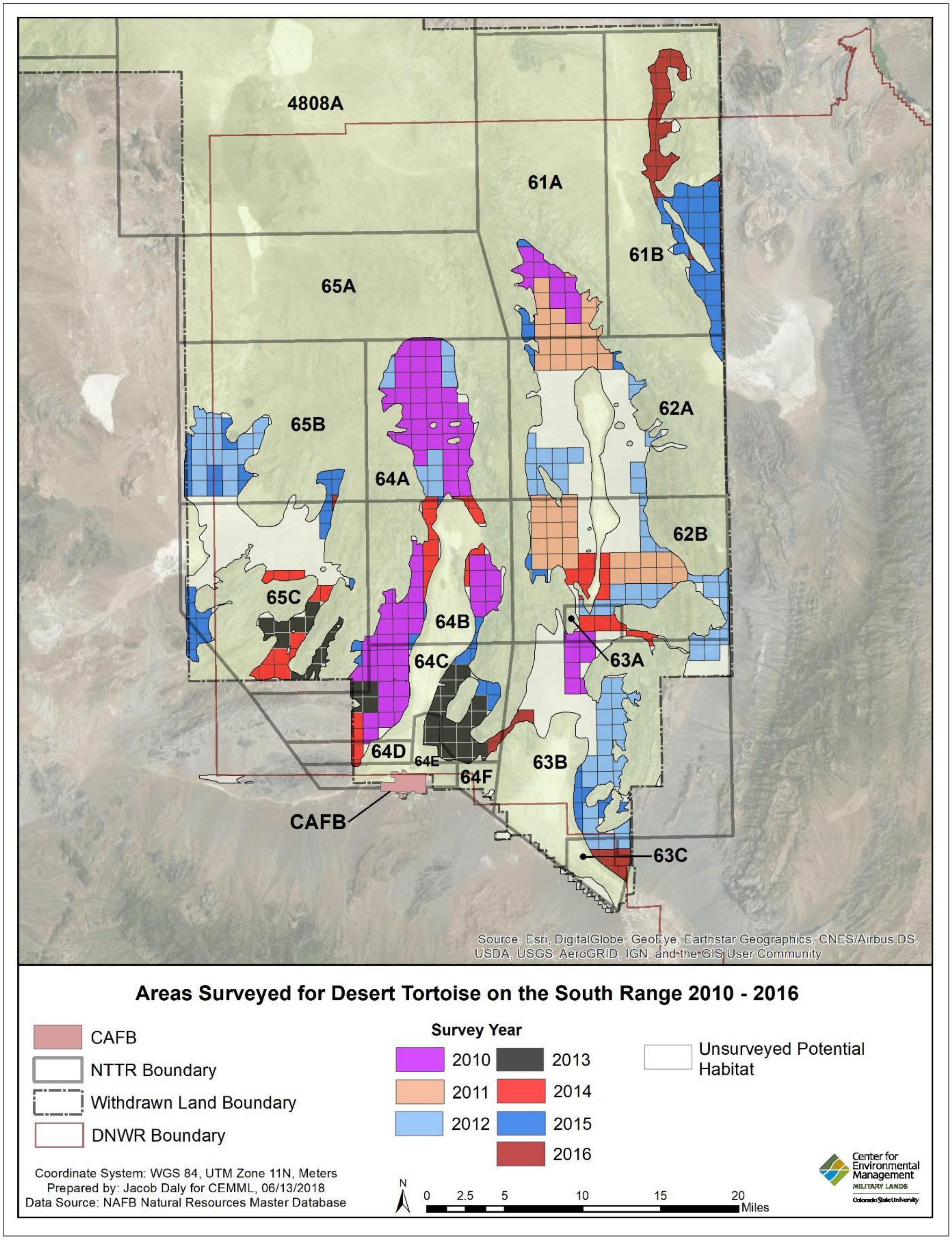

Figure 7-2. Areas surveyed for desert tortoise on the South Range. Unsurveyed potential habitat includes areas that are inaccessible due to hazards and security restrictions.

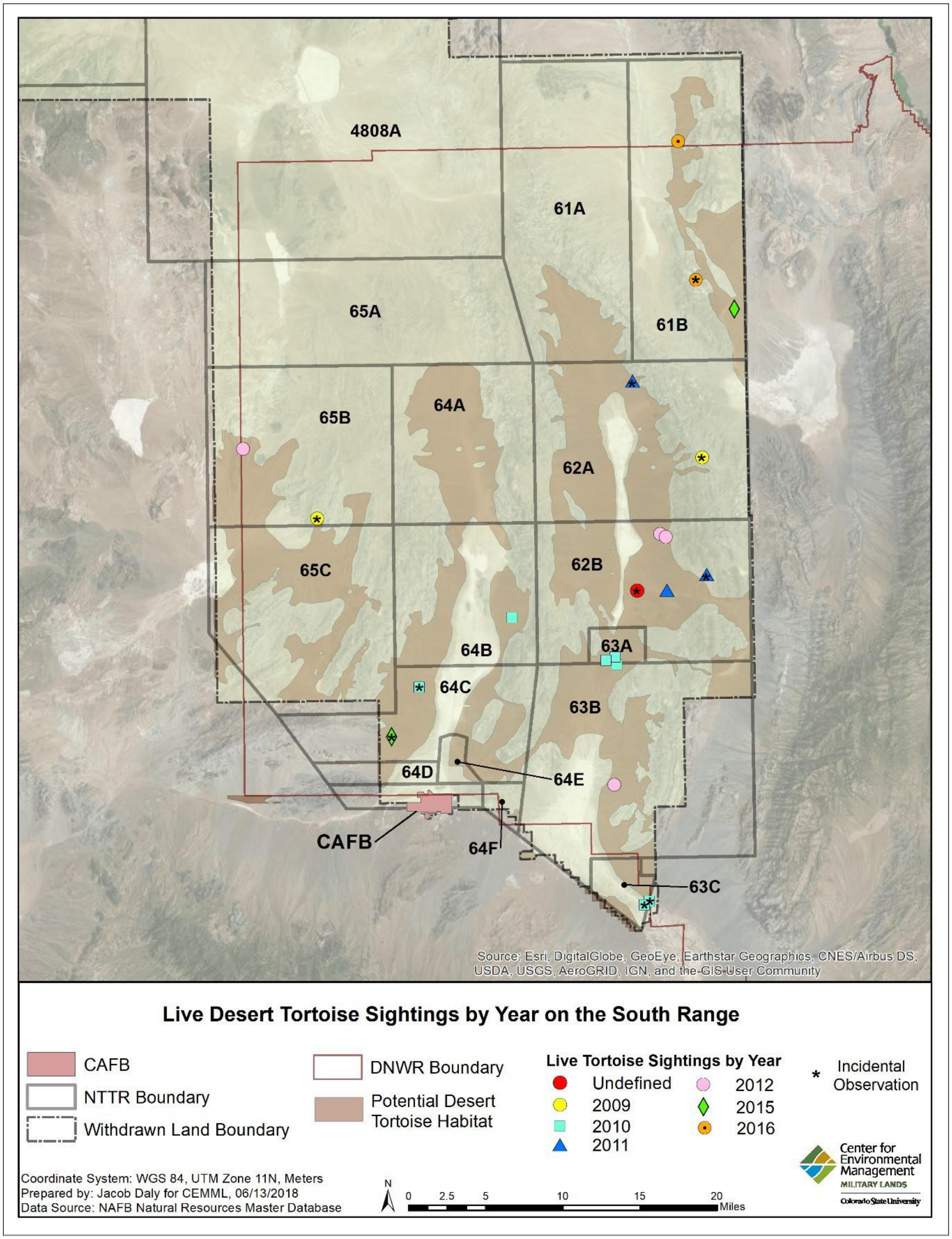

Figure 7-3. Live desert tortoise sightings, by year, on the South Range. Incidental observations are tortoise observations that did not occur during desert tortoise surveys. There were no live desert tortoise observations during 2013-2014 surveys.

Many current management activities for threatened or endangered species are appropriate for increasing species' resilience or facilitating adaptation to climate change. An ecosystem approach that prioritizes functional diversity and maintenance of habitats, habitat variability, and habitat connectivity will potentially help species adapt to changing conditions or migrate to more favorable habitats; however, when approaching the uncertainty inherent with managing species under changing environmental conditions, additional analysis and planning may be required.

Basing management decisions on historical patterns is likely to be insufficient for future management challenges (Bierbaum et al., 2013). Proactive approaches that account for change can help to extend the period over which species may adapt to changing climate and avoid catastrophic declines associated with stochastic events acting on an already stressed ecosystem (CEMML, 2019).

7.4.4 Current Consultations under the Endangered Species Act Section

NAFB and the NTTR have a current ongoing Section 7 consultation with USFWS. These annual formal and informal consultations provide an active framework and guidance regarding projects that could potentially impact the desert tortoise on NAFB and the NTTR.

Minimization measures resulting from consultations with the USFWS assist NAFB, CAFB, and the NTTR in determining whether a proposed action is likely to adversely impact federally-threatened and endangered species, through either direct contact or habitat modification.

Natural Resource Managers at NAFB and the NTTR are integrated and consistent with stewardship, including legal parameters associated with the Section 7 consultation between USAF and USFWS. BAs and programmatic BOs have been prepared for the current activities.

7.4.5 Current Biological Opinions for Threatened and Endangered Species—Terms and Conditions.

Programmatic Biological Opinion for Activities and Expansion of the NTTR. 16 August 2018. 08ENVS00-2018-F-0028.

Grants the USAF to continue current weapons systems testing and training on the existing NTTR and potentially acquire additional expansion areas as described in the USAF draft environmental impact statement. This Programmatic Biological Opinion (PBO) streamlines section 7 consultation for actions affecting desert tortoise using an established framework for actions requiring additional project-specific consultation that will be appended to this PBO.

Programmatic Biological Opinion for Implementation of Action Proposed on Nellis Air Force Base and the Small Arms Range. United States Fish and Wildlife Service File No I-5- 07-F-497, 22 June 2012.

Any desert tortoise found during clearance surveys should be relocated up to 1,000 feet from the area of impact. Following inspection for burrows in the area of impact, all burrows must be collapsed to prevent future use. Desert tortoises should be released onto undisturbed habitat and placed in the shade of a shrub or in a natural, unoccupied burrow. Desert tortoises moved during winter must be placed in an adequate burrow. If a burrow is not available, one should be constructed according to cited USFWS protocol.

10 August 2004. *Desert tortoise Survey Report for Area III at Nellis Air Force Base, Nevada.* In April 2004, a survey for desert tortoise was conducted prior to development on a tract of Area III in the city of North Las Vegas, Nevada. A previous desert tortoise survey was conducted for this area in 1991, and the

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results of the survey were outlined in an NAFB report (NAFB, 2006). The desert tortoise was identified in Area III. During the course of April 2004 survey activities, no sign of desert tortoise was identified on the project area. Results were based on a 100% survey of undeveloped land in Area III. The report concludes that the absence of desert tortoise in Area III is likely due to the marginal nature of the habitat and the lack of connection to other areas (NAFB, 2006).

AMD1; Amendment to the Programmatic Biological Opinion for Activities on the South Range of NAFB, NTTR, and the Nevada Training Initiative, Clark and Lincoln Counties, NV. 30 June 2004: File No. 1-5-02-F-522.
Grants the USAF permission to implement desert tortoise monitoring and clearing on NAFB, the NTTR, and Nevada Training Initiative in lieu of constructing and maintaining desert tortoise barriers. The reasoning behind this change in techniques is that desert tortoise barriers were being rendered ineffective by target range impacts. The USFWS determined that monitoring and clearing would be equally or more effective than desert tortoise barriers. The USFWS **acknowledged** and commended the USAF for their efforts to delineate and map all desert tortoise habitat on the NTTR and to develop desert tortoise management guidelines as part of the INRMP. Expires June 2017 (NAFB, 2016f).

7.4.6 Relationship of Any On-Installation Habitats of Concern with Similar Local and Regional Critical Habitat.

7.4.6.1 Nevada Test and Training Range

As of the end of 2016, approximately 73% of desert tortoise habitat on the South Range of the NTTR had been surveyed. The remaining desert tortoise habitat surveys were highly limited due to range restriction, security and safety hazards. Ongoing surveys will attempt to access areas that have restricted access in order to continue monitoring efforts (NAFB, 2017g; Figure 7-2). Monitoring efforts support the findings of past surveys conducted in 1991–1992. Together, these surveys indicate that most of the South Range of the NTTR supports low densities of desert tortoise (NAFB, 2017g).

7.4.6.2 Nellis Air Force Base

Northeast of the main base lies Area II, the Munitions Storage Area/Weapons Storage Area. Beginning in 2013, surveys were initiated in Area II of NAFB to update the data collected in 2004. Transect monitoring indicated that the western half of Area II supports very low densities of desert tortoise. These habitats are heavily impacted by human activities or are otherwise unsuitable for desert tortoise. The eastern half of Area II supports moderate densities of desert tortoise.

No take of desert tortoise was detected or reported in years 2010–2016 on NAFB, CAFB, or the NTTR. Additionally, no impacts to desert tortoise habitat occurred. It was not necessary to relocate any live desert tortoises during that period.

The EOD explosive area in Area II includes tortoise-proof fencing. NNRP inspected and restored the integrity of the fence in 2016 (NAFB, 2016f).

7.4.7 Health of Existing On-Installation Habitats of Concern

Species specific to particular habitats can be indicators determining whether an area has been adversely impacted by anthropogenic activities. Data collection of animal sign is an indicator of species presence within a given habitat. Use of these data contained in monitoring guidelines can be honed for better management decisions. For guidance on USAF-specific targeting, monitoring strategies under the Unique

Habitat Management Plan include individual species, suites of species, vegetation, or ecosystem types identified in monitoring activities.

7.4.7.1 Nellis Air Force Base

Under guidelines from NDOW, NNRP put together Unique Habitat Guidelines with formats, objectives, and goals. In the future, the Unique Guideline document will be a valuable resource used by the military mission to correctly manage and conserve natural resources in a manner that will minimize impacts and provide a sustainable training environment for USAF (NAFB, 2015f).

NNRP will conduct annual baseline surveys to identify key habitats and vegetation communities on NAFB. This ongoing monitoring project will include information and decisions that can be utilized for the management of ecosystems that will become available to amend and expedite mission orientation.

7.4.7.2 Nevada Test and Training Range

To avoid compromising ecosystem health and natural resource management, the INRMP provides the framework to sustain suitable landscapes for USAF mission activities.

Habitat classification allows environmental managers to help manage areas of critical habitat. Monitoring surveys in 2015 were conducted in ranges ECS, ECE, ECW 71S, 71N, 65C, 64A-C, and 65C. These surveys will be refined in the future with additional ground-truthing techniques. Complete mapping of vegetation and unique habitat may be completed by the end of 2020 (NAFB, 2015f; Figure 7-3).

7.5 Water Resource Protection

7.5.1 Surface Water

Water-parameter data assist in characterizing the overall surface water of seeps and springs located at the NTTR. Because water is so scarce on the NTTR, its presence is extremely important to support healthy plant and animal populations. Extensive surveys to identify and map springs and seeps have been conducted on the NTTR. These seeps and springs are monitored for surface water parameters on an ongoing basis to comply with the habitat requirements for sensitive and protected species, and to remain in compliance with section 404 of the CWA, especially in areas potentially impacted by mission operations. The data will be maintained and updated as necessary in the natural resources database.

Water-retention basins and drinkers (guzzlers) were installed on the South Range of the NTTR, where water resources can be scarce for wildlife. Cement retention ponds, water troughs, water-storage containers, and drinkers with plastic sheeting to collect rainwater were constructed to create more surface water features. Those resources will be monitored and maintained on a recurring basis to ensure that protected wildlife have access to water and to minimize the loss of protected species due to dehydration and lack of water resources. The USAF coordinated range access for the NDOW, USFWS, and the Fraternity of the Desert Bighorn Sheep to install guzzlers on the South Range (NAFB, 2014f). These guzzlers are checked and maintained throughout the year to monitor water levels and functionality.

During construction projects and any other activities that would result in removal of vegetation or disturbance to the soil surface, the following actions should be taken to conserve surface waters.

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- Where practical, best management practices, such as placement of hay bales and silt fences, should be used to minimize soil erosion and deposition of sediments in ephemeral streams, collection valleys, and playa lakes.
- The natural resource manager should be consulted before any action is taken that may impact streams, washes, or playas.
- The action may require consultation with the USACE if it places fill material in ephemeral streams, wetlands, or other surface waters connected to navigable waters of the U.S. Ephemeral streams include any natural drain that has a defined channel or shows features characteristic of flowing water. Streams flowing into playa lakes and other isolated basins are not jurisdictional because they are not connected to navigable waters of the U.S.; thus, they would not require consultation with the USACE, but the natural resource manager should be consulted to make the final determination of whether or not the USACE should be contacted.
- Actions that impact vegetation along streams, washes, or springs should be modified where possible to avoid or minimize impacts.
- Whenever possible, roads, pipelines, and any other linear construction projects located within 50 feet of any stream channel or drain should not be oriented parallel to the stream channel because of the potential for erosion and damage to the pipeline or road.
- Roads and pipelines crossing over streams should be oriented perpendicular to the stream channel.
- Mission maintenance and operation activities should consider the following prior to initiation.
  - Direct or indirect impacts to springs and associated wetlands or vegetation communities are avoided whenever possible.
  - Impacts to streams and drains are minimized.
  - Identify any sensitive recharge features potentially impacted by the action. Avoid or minimize impacts to these features.
  - All efforts are made to prevent any contamination to ground water in the area.

7.5.2 Groundwater

Sixty-two underground water sources have been identified on the NTTR. Geologic studies should include the identification of sensitive recharge structures that could provide conduits for potential contamination by various USAF activities at the NTTR.

Precautions should be taken to ensure that groundwater originating from NTTR recharge or located in aquifers located below the NTTR are protected from USAF activities. The natural resource database is to be updated with any new information on the location of recharge zones.

Mission actions involving functioning ordnance or potentially hazardous materials should not occur within 200 feet of any production well, monitoring well, or natural spring.

7.6 Wetland Protection

Wetlands and other water source areas are scarce in arid deserts. They are critical for many wildlife species and often support unique floral communities. Since the Dames and Moore (1997) report, wetland determinations have not been conducted on the NTTR. Because most of the wetlands occurring in the Great Basin ecoregion are contained and do not connect to navigable waters, they are unlikely to fall under strict jurisdictional wetland definitions. Many sensitive and protected species, however, rely on these wetlands, and are considered relict species due to the scarcity and limited distribution of wetland habitats. To comply with section 404 of the CWA and to protect sensitive and protected species, and because wetland habitats on the range are scarce and sensitive, wetlands potentially impacted by mission activities should be documented and wetland delineations should be conducted. Wetlands with positive determinations should be monitored periodically for significant changes to the water regime. Wetland delineations should be conducted wherever known water sources have not yet been delineated to establish a baseline inventory of current conditions of wetlands occurring on the range. The data should be updated whenever significant changes are suspected to monitor and mitigate potential alterations to wetland function and status. All wetland delineations should be documented and maintained in the NNRP database for future planning and monitoring.

7.6.1 Ongoing Impacts

Wild horses and burros cause disturbance to the NTTR wetland areas through foraging and trampling on vegetation. The BLM has jurisdiction over these animals, but it has few resources for water source protection, restoration, or development. The Water Resources Program was initiated in partnership with the BLM to include funding and personnel to install fencing for sensitive spring and wetlands habitat to exclude horses. The program takes into account the needs of an agreed-upon number of horses on the NWHR by making alternative water sources available at selected locations.

The BLM has determined that the appropriate carrying capacity of the Wild Horse Management Area of the NTTR is 300–500 animals. This is the maximum number of horses that the available resources will support without affecting other species. Wetland exclosures should be monitored on a regular and ongoing basis to prevent access and impacts from wild horses.

Any modifications in wild horse management must include methods of conserving wetlands on the NTTR. Wild horses, especially in large populations, cause extensive damage to wetlands, riparian areas, and sensitive vegetation associated with these environments. If wetlands are impacted by wild horses, 99 CES/CEIEA should coordinate with the BLM to ensure that the wetland areas are fenced to prevent encroachment by horses. Open water tanks should be placed outside of the wetland exclosure to allow horses to access water, while also conserving the wetlands. Open water basins should be physically separated from water in the wetlands to prevent damage to wetlands due to sediment accumulation and contamination by animal waste.

7.6.2 Impact Prevention

During the early planning and design phases of any mission project or action, the following steps should be taken to ensure the conservation of wetland areas.

- Project managers should review the natural resource database to determine whether any wetlands have been identified in the area of the proposed action.
- If wetlands are found to be impacted by the action, an alternative site should be selected for the project that avoids impacts to wetlands. If impacts cannot be avoided, methods of modifying the project to minimize impacts to wetlands should be considered.
- For projects that directly or indirectly impact wetlands, the following should be accomplished.
    - The boundaries of the wetlands should be delineated to obtain an accurate estimate of the area of wetlands that will be filled by the project.

- The NNRP should determine whether the wetland is potentially jurisdictional. If the wetland is found to be potentially jurisdictional, the natural resource manager should coordinate permit preparation with the USACE.
- Depending on the level of impact, permit approval may require from 30 days to one year. Project planning efforts should accommodate the time required for permit preparation and approval.
- The NNRP should be prepared to compensate for any loss of wetlands by creating new wetlands in another location or on the site.

7.6.3 Climate Impacts on Wetland Protection

As of the last published surveys, there are no natural wetlands on the installations. None of the seeps, springs, or ponds on NTTR are considered jurisdictional wetlands, but the water resources on the installation provide some habitat for wildlife (see Section 2.3.5). Wetland protection at NTTR in light of climate change should focus on continued monitoring of these areas and maintaining and adding fencing to exclude horses where needed to protect these habitats. More general protection methods include restoring wetlands that have been invaded by nonnative species and mitigating wetland losses associated with construction or military activities.

7.7 Grounds Maintenance

NAFB and CAFB are in the arid southwest where water conservation is a high priority. In the past, nonnative drought-tolerant trees and shrubs, evergreen trees and shrubs, perennials, ground covers, vines, and grasses have been planted throughout the base. Over the last several years, NAFB and CAFB have shifted to planting native vegetation. The authorized vegetation list used by NAFB and CAFB is the same as the Southern Nevada Water Authority’s Water Smart Landscapes Program Plant List. Projects listed in the base Capital Improvements Program EA (NAFB, 2013e) include upgrades to the water system, use of water-saving devices, and xeriscaping or landscaping with drought-tolerant species (NAFB, 2013e).

Turf disease and unwanted invasives are controlled through proper methods and management. The base housing office is responsible for monitoring housing to ensure that proper turf-management practices are followed. Weed control in improved areas (excluding CES common areas) are handled by a contractor. The inventory of base pesticides is included in the IPMP. A monthly reporting of all pesticides used is performed and forwarded to the Headquarters (HQ) ACC quarterly. All non-standard pesticides must be approved by the ACC Pest Management Professional. The pest-management facility uses a closed-loop system and all triple-rinse water is reused. All aerosol products are collected and turned into the 90-day site for disposal. Empty plastic pesticide bottles are recycled or disposed of as household waste.

7.8 Forest Management

Some of the higher elevations on the NTTR have pinyon-juniper habitat, and historical documents indicate that up to seven conifer species were identified in the mountains to the west of Groom Lake; however, there is no commercially viable forest present on the NTTR. Most of the documented species of conifer identified were in higher elevations in ranges 74A and 74B; however, due to restricted access, those forests will have little to no recent or foreseeable impacts. Since there is no viable or commercially harvested forest on the NTTR, this issue will not be addressed further in this document. See Section 7.9 for information regarding wildland fire management.

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7.9 Wildland Fire Management

This section applies to USAF installations with unimproved lands that present a wildfire hazard, as well as to installations that use prescribed burns as a land-management tool. As such, wildland fire management is mainly applicable only to the NTTR; however, the WFMP has been developed to provide guidance for preventing and suppressing wildland fires on all NAFB, CAFB, and NTTR lands and to implement ecosystem management and fuels-reduction goals using mechanical fuel treatments and prescribed fire in support of the INRMP. In support of this goal, the 2019 Nellis Nevada Test and Training Range WFMP (unsigned) lays out responsibilities and procedures for improved fire management at both NAFB and CAFB, in addition to the NTTR (NAFB, 2019). Most information found in this section is referencing information provided in the WFMP.

In 2019, NAFB began the process of standing up a Wildland Fire Module. The focus of the Air Force Wildland Fire Branch is to support wildland fire activity across USAF Real Property in the continental U.S. and Alaska. Having this module allows the USAF to stage firefighting related equipment on the NTTR. Primarily the equipment will be used for fire prevention to reduce the risk of catastrophic wildfires at areas with sensitive or high value equipment.

Wildfires on the NTTR occur due to natural ignition by lightning and human causes, including military training. Naturally occurring fire is the main cause of fires on the NTTR. In February 2008, helicopter surveys reported evidence of many unreported fires in remote areas of the NTTR. A significant number of these fires were most likely caused by lightning. Due to the non-comprehensive recording of wildfires in the past, it is unknown how many wildfires were caused by lightning. Public access is highly controlled on the NTTR; therefore, the potential for public caused fires there is very low. The greatest threat for a public fire is the potential for a wildfire to start on neighboring land and spread onto the NTTR. The causes of many wildfires in the past have not always been determined or recorded by the NTTR, so the number of public-caused fires is unknown. The inherent nature of military testing and training poses a high potential to ignite wildfires. These activities include bombing, aerial flares, ground forces training, and target maintenance. To reduce risk of fire, these activities are performed on/over playas where the potential for wildland fires is low.

Wildland fires pose a significant threat to the training mission, weapons testing, infrastructure, and natural and cultural resources on the NTTR. In addition, wildfires that start on the NTTR have a potential to reach private and public lands nearby, threatening homes in the wildland urban interface/intermix and causing damage to natural and cultural resources.

The desert tortoise is a federally-listed species found on the South Range of the NTTR. Many native shrubs and grasses are poorly adapted to fire and cannot survive frequent or high intensity fires. The Desert Tortoise Recovery Plan of 2011 identifies wildfires as a significant factor in habitat destruction, degradation, and fragmentation for desert tortoise populations (USFWS, 2011). The increasing incidence and severity of fires in the Mojave region has converted desert shrublands into ephemeral grasslands, often dominated by nonnative species (Brooks and Esque, 2002). The desert tortoise is poorly adapted to survive on the new, nonnative vegetation.

Fire and fuels-management activities must be consistent and comply with the NAFB ICRMP. The ICRMP is the primary document governing installation actions regarding compliance with various federal laws and

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regulations for the protection of cultural and archeological resources. The areas covered under the WFMP contain significant prehistorical and historical cultural resources. Seventeen Native American tribes have ancestral ties to NTTR-managed lands and have a combined stake in the management in many of these resources. Only 6% of the NTTR has been surveyed for cultural resources. These surveys have classified 35 eligible sites, 285 non-eligible sites, and more than 2,500 other sites.

Responsibility for the withdrawn lands is jointly shared by the BLM, USFWS, and AFWC (BLM, 2004b). The MLWA of 1999 (PL 106-65) delineates the responsibilities of each federal agency for control and management of brush and range fires on withdrawn lands. The law mandates that the USAF will take necessary precautions to prevent and suppress brush and range fires occurring due to military activities within and outside the withdrawn lands. The USAF may seek BLM assistance for suppressing a fire and will compensate the BLM for its actions. Both the BLM and USFWS have responsibility for nonmilitary-caused fires. If the source of the fire is unknown, the 99 ABW and BLM will integrate fire suppression operations and incident management using National Interagency Incident Management System and Unified Incident Command System.`

Management of the NTTR is the responsibility of the 99 ABW and the NTTR working through the AFWC, neither of which has trained or qualified personnel to protect the NTTR from damage or loss by wildfires. This means all wildfire suppression would require the assistance of other federal and state agencies. If a wildfire occurs on the NTTR, fire suppression will be requested from the BLM in accordance with the MLWA of 1999 and the MOU between NAFB and BLM. Currently there are no fire-suppression capabilities on the NTTR for first response activities. The AFWC has an established agreement with DoE that allows each agency to share personnel and assets in fighting brush and range fires. While this agreement is a positive, it must be understood that both agencies have severe limitations on the type and level of support that each can give at any time.

When a wildfire is reported, an Incident Commander (IC) will be assigned by the responsible agency through the execution of a written delegation of authority. The IC is responsible for implementing the agency's strategic direction for management of the incident. During larger wildfire incidents, a written delegation of authority is given to the IC. The agency that issues the written delegation is the agency that is responsible for the wildfire. The written delegation includes objectives, priorities, expectations, environmental constraints, public information directions, safety considerations, and other considerations or guidelines, as needed (USAF and BLM, 2010) A sample written delegation of authority is available in Attachment 3 of the WFMP.

In January 2017, staff from the NTTR and the 99 ABW worked with the BLM under a 2012 Interagency Agreement and a 2015 fuels reduction EA to conduct the first controlled burn on the NTTR (NAFB, 2012d, 2015j). This burn occurred at Cedar Peak on the North Range of the NTTR, which has an important military communications asset located at its summit and was determined to be particularly vulnerable to damage by wildland fire. To protect this asset from wildland fire, it was decided that the pinyon juniper woodland habitat surrounding Cedar Peak would be clear-cut within a 300-yard radius (60 acres) around the peak, and an additional area within a 100-yard radius (45 acres) around the clear-cut area would be thinned to minimize fire intensity as it nears the peak. All slash resulting from the clear-cutting and thinning would be piled and burned on site once cured under winter conditions to limit potential impacts to onsite soils, the canopies of nearby trees, and the military asset of concern. In 2015, it was stated in a Finding of No Significant Impact that implementation of the proposed controlled burn on Cedar Peak would result in no significant impacts on the quality of the human or natural environment, and the burn was carried out in January 2017 in accordance with proposed procedure.

Prior to the controlled burn on Cedar Peak, prescribed burning had never been conducted on the NTTR due to the rapid rates of fire spread associated with the fuels that dominate the NTTR. Instead, techniques that include mechanical treatments, non-mechanical treatments, and herbicide applications had been used. These methods are designed to remove or rearrange fuels to mitigate the negative consequences of wildland fire, and allow for efficient and safe management response to wildland fire ignitions. Both fire and non-fire treatments should be coordinated and jointly executed with BLM and should follow all environmental requirements.

7.9.1 Climate Impacts on Wildland Fire Management

Temperatures are expected to rise and annual precipitation is projected to drop under all climate scenarios but RCP 4.5 2030. Overall, these trends will be conducive to increasing the probability of wildland fire ignitions from any given heat source. For a given ignition source, the likelihood of wildfire ignition depends largely on receptivity of the fuel bed, which is a function of fuel abundance, physical characteristics of the fuels, such as surface area to volume ratio and chemical composition, and climatic factors, such as temperature and relative humidity. Assessment of the type, number, or location of ignition sources was beyond the scope of this assessment and these are assumed to remain constant.

In addition to the greater likelihood of ignitions based on climate projections, concomitant vegetation changes likely to occur also will promote an increase in ignition probabilities where those changes are manifested. Already, invasive cheatgrass and red brome grasses have invaded portions of the installations, and, where they are abundant, these highly fire-adapted, fire-promoting, invasive grasses will contribute to increased ignition probability and fire spread. Their characteristics often lead to a grass-fire cycle in which highly fire-adapted grass species promote greater fire frequencies. The disturbance created by these fires encourages further invasion by these disturbance-adapted species, which leads to a chronic cycle of fire and further invasion by these species. Eventually the native vegetation community is replaced with nonnative grassland.

Brooks et al. (2004) found that increased fall and winter precipitation, like that projected for NAFB, CAFB, and NTTR, can encourage the encroachment of cool-season invasive grasses into previously uninvaded areas. This would effectively increase the availability of fine fuels, increasing overall fire probability and spread, which further promotes a shift from native communities to invasive grasslands. Where these disturbance-adapted grass species do not invade or expand their ranges, however, ignitions are not likely to change noticeably because ignitions in those areas are not currently limited by climate—they are already hot and dry enough on almost any given day to ignite a wildfire.

Generally, ignitions on military installations are highly localized to where live-fire exercises are conducted. If those ignitions occur in locales where ignition probabilities are likely to increase or decrease, the overall ignition loads of the installations will increase or decrease, respectively. The net gain or loss in ignition load will depend on how much of the cover is converted to invasive grassland. If invaded areas overlap areas where training activities tend to promote fire, then the ignition loads will rise.

Traditionally, fire behavior has been described as being dependent on fuels, weather, and topography. Of these factors, however, only topography will remain constant under current projections of climate change.

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Given the assumptions about invasive grasses discussed above, fuel continuity can be expected to increase in invaded locations. This can create a cycle of ever-increasing fire size because these grasses easily invade and thrive in areas disturbed by fire, although more broad-scale invasions not preceded by fire are likely to occur as well. Where nonnative grasses invade new ground, fire activity is likely to increase and spread more rapidly in the contiguous fuel beds they create.

Despite the possible invasion scenarios, large portions of the NTTR are likely to remain uninvaded. As a result, they will lack the fuel continuity necessary for carrying fire except during the occasional years of high precipitation that produce a flush of herbaceous vegetation that can fill gaps in fuel continuity. Other areas of NTTR could burn under current conditions. Where invasions of nonnative grasses occur after fire in shrubland or grassland/shrubland, fire also eliminates the existing shrub component and converts it to nonnative grassland. In those cases, fire intensity will be lower relative to the fire intensity where shrubs remain. Where invasions occur without fire disturbance, the increase in biomass from invasive grasses will lead to increases in fire intensity and rates of fire spread. Given the projections for reduced precipitation and higher temperatures (which diminish the relative humidity), fire intensity in areas not converted to invasive grassland can be expected to increase even more.

As discussed in Section 2.3.2.3, climate change will drive most biomes upward in elevation. Presumably, this will lead to expansions in vegetation types currently occupying the lowest elevations, including barren areas, and contractions of vegetation types currently occupying the highest elevations. Although losses of vegetation are expected at lower elevations, this may not be manifested until after 2050. If vegetation cover does decline, the proportion of uninvaded, burnable landscape will diminish commensurate with losses in fuel continuity.

Based on the considerations discussed above, two diverging fire regimes are likely to occur at NAFB, CAFB, and the NTTR. One is defined by those portions of the installation where invasive grasses become heavily entrenched. In these locations, fire ignition probabilities are likely to increase. Where shrubs remain in these invaded landscapes, fire intensity will increase but, where shrubs are generally extirpated via the grass-fire cycle, fire intensity will decrease. It is highly unlikely, however, that the entirety of these installations will be occupied by invasive grasslands in 30 years. Where invasions do not occur, the decreasing fuel continuity at low elevations will reduce the proportion of the landscape where fires are able to burn. This is likely to be most apparent at NAFB and CAFB and at the lowest elevations of NTTR South; however, this shift may not occur until well after 2050.

7.10 Agricultural Outleasing

No agricultural outleasing programs are currently being administered on NAFB, CAFB, or the NTTR.

7.11 Integrated Pest Management Program

This section of the INRMP applies to NAFB, CAFB, and the NTTR installations, which perform pest management activities in support of natural resource management by controlling invasive species.

Invasive species management is guided by the National Invasive Species Management Plan, Federal Noxious Weed Act (7 U.S.C. 2814), NRS chapter 555 (NRS 555) for the Control of Insects, Pests, and Noxious Weeds (NRS 555.005 to 555.201), and NAFB IPMP (NISC, 2016).

The NISC Management Plan identifies the high-priority, interdepartmental actions that the federal government and its partners can take to prevent, eradicate, and control invasive species, and to recover ecosystems and restore other assets adversely impact by invasive species. Nonnative invasive species (NNIS) are defined as any species that is not indigenous to a given ecosystem, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (EO 13112, 1999). NNIS can impact the function of an ecological system by altering nutrient cycling, soil and water dynamics, and fire regimes. Invasive species have the capability to alter a natural ecosystem by diminishing the abundance of native species. Invasive plant infestation can impact both plant and animal communities (Olson, 1999). It is estimated that 42% of the species listed under the ESA are at risk primarily due to NNIS (Pimentel et.al, 2005).

The NNRP is charged with the management of invasive plant and animal species. The NNRP works with BLM, USFWS, Nevada Division of Forestry, and NDOW to establish goals and to implement projects to help fulfill these goals. These efforts also coincide with the goals of the base IPMP and the approaches set forth by the National Invasive Species Management Plan. The goals that have been established are listed in Chapter 8 of this plan.

As of the 2016 report, no federally listed noxious weeds have been found on any of the installations addressed in this INRMP; however, three state-listed weeds have been found on NAFB and the NTTR (Nevada Department of Agriculture, 2017). Salt cedar is the only state-listed species that has been found on all three installations. African mustard (*Brassica tournefortii*) and yellow starthistle (*Centaurea solstitialis*) have been recorded on NAFB. Other invasive species that are not federally- or state-listed but have been detected on NAFB, CAFB, and the NTTR include cheatgrass, red brome, salt lover (*Halogeton glomeratus*), and Russian thistle. These species have become well established; thus, attempts to eradicate them may now be impractical.

Pest species that are found around facilities include mosquitoes, ticks, fleas, bees, wasps, scorpions, spiders, venomous snakes, lice, mites, chiggers, ants, cockroaches, flies, termites, rodents, and powder post beetles. On NAFB, the Pest Management personnel are responsible for controlling pests in and around facilities, except in NAFB family housing, which uses a private contractor for pest control. The Pest Management Office uses five control strategies to control pest species: education, cultural, mechanical/physical, biological, and chemical. In the NAFB IPMP, each control strategy is specified in detail for the control of each pest.

The NAFB IPMP also describes management procedures for feral and domesticated animals. The contact for issues with these animals is the Pest Management Section, Security Forces, and the requestor. Clark County Animal Control may also be contacted. Feeding and harboring feral animals in USAF installations is prohibited.

It is important to note that NAFB properties do not hold cropland and grazing outgrants, therefore invasive species control plans for agricultural outgrants are not required.There is one grazing allotment, however, on the North Range of the NTTR that is managed by the BLM.

On NAFB, CAFB, and the NTTR, there are animals that can be considered a nuisance (Table 7-1). Nuisance species are not considered invasive but do have the ability to increase in number to the point where they can become a management problem.

Table 7-1. Animals that have the potential for becoming a nuisance on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

Common Name	Scientific Name	Species Status
Brown-headed Cowbird	*Molothrus ater*	Native, parasitic species
European Starling	*Sturnus vulgaris*	Nonnative, nuisance species
House Sparrow	*Passer domesticus*	Nonnative, nuisance species
Horned Lark	*Eremophila alpestris*	Native, nuisance species
Canada Goose	*Branta canadensis*	Native, nuisance species
Cliff Swallow	*Petrochelidon pyrrhonota*	Native, nuisance species
Coyote	*Canis latrans*	Native species
Wild Horse	*Equus ferus*	Nonnative species
Wild Burro	*Equus asinus*	Nonnative species
Feral Dog	*Canis familiaris*	Nonnative, nuisance species
Feral Cat	*Felis catus*	Nonnative, nuisance species
Mediterranean House Gecko	*Hemidactylus turcicus*	Nonnative species
Rough-tailed Bowfoot Gecko	*Cytropodian scabrum*	Nonnative species

Many projects have long been underway at NAFB, CAFB, and the NTTR, to fulfill the goals of the INRMP regarding invasive species. These projects are coordinated with the BLM, USFWS, Nevada Division of Forestry, NDOW, and the Tribes. Below in Table 7-2 is a list of current and past projects to help fulfill goals of the Natural Resource Management Office.

The NNRP supports the IPMP through their continued collaboration with government agencies and their incorporation of new methods for the fulfillment of the INRMP goals. Working with government agencies will help to ensure coordination of research projects and exchange of knowledge to better understand treatments of invasive species within the Mojave and Great Basin Desert landscapes. Best management practices will continue to be researched and developed to find the most cost-effective measures to fulfill the goals of this plan. The continuation of an Invasive Species Management Program is essential for the continued success of the military mission and natural resources management.

Table 7-2. Current and past projects supporting invasive species management goals.

Project Name	Description	Project Status
Tamarisk Detection and Removal NAFB	Map, eradicate, and monitor tamarisk on NAFB.	2009–present
Yellow Starthistle Detection and Removal NAFB	Map, eradicate, and monitor yellow star thistle on NAFB	2009–present

Table 7-2. Current and past projects supporting invasive species management goals.

Project Name	Description	Project Status
Helicopter Invasive Species Surveys NTTR	Map large areas of invasive species using helicopter surveys over the NTTR.	2013
High-Resolution Imagery Analysis	Use satellite imager to help identify large areas of invasive species, and then ground-truth areas to measure accuracy of analysis.	2014–present
Digital Sketch Mapping	Generated map depicting areas of disturbance. Field observations have shown that areas of disturbance are susceptible to invasive species.	2014

7.12 Bird/Wildlife Aircraft Strike Hazard

The NAFB, CAFB, and the NTTR BASH Plan 17, effective 31 January 2016, provides guidance for BASH reduction in areas of the installation in which flight operations are conducted.

Wildlife, particularly migratory birds and raptors, can present serious strike hazards to aircraft. Ongoing potential for aircraft collisions with wildlife exists because daily and seasonal movements of birds and bats can take them within flight paths of aircraft. Animals, such as deer and coyotes, cross runways and can pose strike risks for landing aircraft (NAFB, 2016h). On NAFB, one source of potential BASH issues is Sunrise Vista Golf Course. The facility is situated at the south end of the NAFB runway and encompasses ponds, watered turf, and trees that serve as attractants for many bird species. The proximity of this golf course and its bird-friendly habitat to the runway ensures continued potential for collisions between aircraft and birds. In addition, runways across the installation are not surrounded by full exclusionary fences, so animals such as black-tailed jackrabbits and desert cottontails (*Sylvilagus audubonii*), prey species that attract large raptors, have unrestricted access to the runway and adjacent areas (NAFB, 2016h).

On the NTTR, where raptor activity has the potential to impact aircraft operations, the NNRP surveys for and monitors the nests of golden eagles and other cliff-nesting raptors. On NAFB and CAFB, the NNRP works in cooperation with 57th Wing Flight Safety to conduct avian point-count surveys around the flight line and apply for state and federal depredation permits. The NNRP conducts bird surveys at locations around the flight lines at NAFB and CAFB in an effort to quantify seasonal trends in bird density and abundance in areas within and adjacent to the flight path. The NNRP has also conducted small mammal trapping around the flight lines at NAFB and CAFB to quantify the prey base for animals such as raptors and coyotes that could pose BASH issues.

In support of the BASH program, the USFWS issues a Depredation at Airports Permit for Migratory Birds to NAFB and CAFB annually. Additionally, NDOW issues four separate permits to NAFB and CAFB: Depredation of Migratory Birds, Depredation of Furbearing Mammals, Depredation of Game Mammals, and Depredation of Upland Game Birds. These permits are reviewed by the issuing agencies on an annual basis and must be applied for each year. Once granted, these permits allow for lawful take of designated wildlife to reduce safety risks to personnel and damage to aircraft (NAFB, 2016h).

7.13 Coastal Zone and Marine Resources Management

Neither NAFB, CAFB, nor the NTTR contain any coastal or marine areas.

7.14 Cultural Resources Protection

The management of cultural resources is covered by an ICRMP that has been recently prepared for NAFB, CAFB, and the NTTR. Please refer to this plan (available through 99 CES/CEIEA) for more information on cultural resources.

7.15 Public Outreach

The NNRP holds public outreach events and works with the NAFB Public Affairs office to publish posters and pamphlets for public outreach and personnel training. For example, NAFB participates in the Arbor Day Foundation's Tree City USA program and hosts Arbor Day and Earth Day celebrations each year. Education on the protection of sensitive species is another focus of the outreach program. The NNRP has produced several posters and pamphlets educating staff on how to avoid negative impacts on desert tortoises and burrowing owls while conducting mission activities. Other examples of Nellis Natural Resources Management (NNRM) outreach products include a printed field guide for the area's reptiles and amphibians and a public webpage on the environmental program (http://www.nellis.af.mil/About/Environment/).

7.16 Climate Vulnerability

Climate vulnerability in this case refers to the degree to which an installation and its natural resources are susceptible to climate change. At NAFB, CAFB, and the NTTR, the climate is projected to become warmer under several different emission scenarios. Furthermore, under most scenarios, precipitation is projected to decrease. In relation to these changing conditions, the installations may be susceptible to the following issues.

- Changes in vegetation, including reduced cover of native vegetation and expansion of invasive grasses (Section 2.3.2.3).
- Greater erosion due to loss of vegetative cover and changing precipitation patterns (Section 2.3.2.3).
- Threats to native wildlife populations that may occur directly through loss of water availability or indirectly via bottom-up losses in the food chain (Section 2.3.3.7).
- Increased stress on threatened and endangered species due to habitat change and reduced food availability (Section 2.3.4.15).
- Threats to the mission, including a greater need for equipment maintenance due to more wind/dust and more frequent drought at the installation (Section 2.4.4.5).
- Increased dust will have a negative effect on soil cryptogramic crust conditions, which will create a feedback loop creating more dust contributing to ecosystems more likely to be vulnerable to invasive species (e.g., brome grasses) establishment and expansion (Section 7.9.1).
- Shifts in wildfire ignition and intensity driven by change in temperature and precipitation in combination with vegetation changes (Section 7.9.1).

(Chg 2, 7 Apr 2021)

- Greater need for wildlife management activities, including surveys for native and invasive species, to monitor changes driven by shifting environmental conditions (Section 7.9.1).

The best available science was used to develop the global climate models from which the downscaled projections and related climate vulnerability assessments were derived; however, there are data gaps in the complex feedbacks in this system, which add to the uncertainty in the climate projections (IPCC, 2014). The projections provided in the climate change report and in this document are therefore intended to demonstrate the range of conditions to which a manager may need to adapt. Detailed climate change vulnerability assessments and more information on the methods used to develop climate models are described in the CEMML climate change report (CEMML, 2020).

7.17 Geographic Information Systems

GISs are an integral part of natural resources management. The NNRM team uses GIS in the management of NAFB, CAFB, and the NTTR. GIS resources are used to generate maps for planning field survey efforts and visualizing geospatial data. Furthermore, GIS resources are used in the analysis of natural resources datasets and the development of products such as outreach posters and technical reports. Natural resources datasets managed by the NNRM team include potential habitat layers for sensitive species, species observations records from surveys, vegetation community maps, and layers showing the coverage of ground and aerial surveys (NAFB, 2016g).

7.17.1 Geographic Information Systems Data Standards

Maintaining quality control of GIS resources is essential. The NNRP is working as part of a USAF-wide effort to standardize GIS data and ensure that GIS resources are in compliance with USAF GeoBase programmatic guidelines. GeoBase is the Air Force Installation Geospatial Information and Services program for GIS that was established to support management of installation infrastructure and environmental resources and maintain compliance with AFI 32-10112 (USAF, 2016). GeoBase is based on the Spatial Data Standards for Facilities, Infrastructure, and Environment Gold model and its purpose is to *". . . provide precise and reliable geospatial data that supports interoperability across the Air Force . . . "* (USAF, 2016).

8.0 MANAGEMENT GOALS AND OBJECTIVES

The NNRP has established long-term goals, objectives, and projects for management and protection of natural resource assets integral to carrying out the military mission. The goals described are purposeful, long-term ambitions for military mission support and are the primary focus of this INRMP. The objectives are focused and updated management strategies set to help achieve the goals. Finally, the projects are initiatives or actions taken by managers to complete the objectives. Projects identified may be ongoing or planned. While all projects are subject to funding and logistics, greater and timely access opportunities for implementing and completing meaningful projects is required. Because the INRMP's implementation supports the overall military mission, the primary military mission takes precedence over the guidance provided by the INRMP; however, execution of the primary military mission may be modified where appropriate and possible to meet the goals and objectives of the INRMP. Detailed information regarding survey effort is provided as a guide; however, actual field effort must take into account other mission requirements, staffing and escort availability, weather conditions, and funding. The NNRP will coordinate and share data of established protocols and results of surveys with appropriate external agencies (BLM, NDOW, USFWS, and USGS) for projects related to monitoring wildlife and habitat on the NTTR. Many entities vie for time on the NTTR, but the NNRP works hard to plan ahead, create backup plans, and adjust as necessary to accomplish its own natural resource mission.

GOAL 1— ENSURE LONG-TERM WILDLIFE AND ECOSYTEM VIABILITY ON NAFB, CAFB, AND THE NTTR

OBJECTIVE 1.1—Ensure Long-Term Viability of Natural Resources in Support of the Military Mission.

PROJECTS

1.1.1 Conduct targeted surveys and monitoring for threatened, endangered, and sensitive species listed by federal, state, and local enforcement agencies and regulations.

1.1.1.A Continue to survey and monitor for the Mojave desert tortoise populations using the existing methods approved by the USFWS and existing BOs.

- Conduct 50 field days of surveys for Mojave desert tortoise on the NTTR, including 8 days of helicopter use for accessing remote areas that cannot be reached by road.
- Develop BA for NAFB PBO by 2022 expiration of current PBO.

1.1.2 Conduct wildlife and vegetation surveys according to recognized national standards and appropriate detection techniques and methodologies to monitor and document diversity, population metrics, and viability.

1.1.2.A Conduct golden eagle surveys and monitor nesting golden eagles.

- Conduct 2 days of thorough cliff surveys for nests on North and South Ranges.
- Conduct up to 8 days of helicopter surveys for nesting golden eagles—two days on the South Range, and four days on the North Range.
- Conduct up to 8 days of prey-base surveys on NTTR such that each survey route is covered twice in the course of the year, once in the spring and once in the fall.

1.1.2.B Conduct large mammal surveys.

- Conduct up to 4 days of helicopter surveys for pronghorn in the summer on the North and South Range.
- Conduct vegetation utilization surveys, which may be done in conjunction with other annual surveys.
- Conduct up to 3 days of helicopter surveys for bighorn sheep in the fall on the South Range every other year.
- Plan and implement bighorn sheep collaring projects.

1.1.2.C Install and maintain wildlife motion sensor cameras at water sources to monitor and document species occurrences and use.

- Place up to 15 wildlife cameras at water sources throughout the NTTR, requiring a total of 8 helicopter days to check these cameras.

1.1.2.D Conduct vegetation classification and ground-truthing surveys during appropriate blooming and species-detection periods according to nationally recognized standards to improve accuracy of vegetation and habitat maps.

- Conduct 32 days of vegetation classification on the NTTR, 8 of which will require the use of a helicopter to access remote sites. The first half of the spring vegetation classification season will focus on a single range on the South Range each year, and the second half will focus on a single range in the North Range.

1.1.2.E Monitor the water quality and hydrological status of seep and spring locations on the installation to assess presence/absence of water at historical springs, document field conditions, and assess forage opportunities and water availability for wildlife.

- Conduct 8 days of surveys using a helicopter over a seven-year cycle to complete testing of water parameters (pH, temperature, conductivity, sampling depth, dissolved oxygen, salinity) and wetlands delineation at 360 seeps and springs on the NTTR.
- Hire a hydrological firm to conduct a hydrological study of water sources on the NTTR North Range to quantify the water availability of natural springs for wildlife.

1.1.2.F Inventory invasive species populations and continue to monitor for early detection and eradication.

- Conduct up to 8 days of surveys for invasive species, covering approximately 400 acres on the NTTR.
- Conduct up to 4 days of surveys for invasive species, covering approximately 250 acres on NAFB.
- Apply pre-emergent herbicide on up to 15,000 acres of *Bromus* species infestations on NTTR.
- Apply herbicides to the road network between Tolicha Peak and Black Mountain to reduce invasive annual grass.
- Eradicate 250 acres of invasive Sahara mustard and other species on NAFB Area II.

1.1.2.G Inventory and monitor populations of reptiles and amphibians.

- Conduct up to 25 days of diurnal visual encounter surveys, snake den checks, and cover board checks.
- Conduct up to 10 nights of nocturnal visual-encounter surveys.
- Conduct up to 35 nights of road cruising.
- Conduct up to five days of equipment setup/take down for cover boards, song meters, passive integrated transponder (PIT) tag readers, etc.
- Deploy up to six acoustic recording devices at different water sources on the NTTR to document amphibians.

1.1.2.H Survey and monitor migratory birds.

- Conduct 2 half days of avian point-count surveys on CAFB, particularly in areas surrounding the flight lines in support of the BASH program.
- Conduct up to 10 GBBO surveys on the NTTR.
- Conduct up to 30 Stationary Point Counts on NAFB, CAFB, and the NTTR.
- Survey up to 3 days for winter raptors on the North Range.
- Conduct up to 4 days of helicopter surveys for nesting raptors.

(Chg 2, 7 Apr 2021)

- Conduct up to 8 call-playback surveys for owls or other sensitive bird species.
- Conduct up to 20 days of nest surveys for NAFB tree-removal projects to ensure compliance with MBTA.

1.1.2.I Survey and monitor bat community.

- Conduct up to 7 mist-netting sessions on NAFB when allowable.
- Deploy and monitor up to 10 acoustic recording devices at various locations around NAFB and the SAR. Recorders will be left out year-round in order to monitor changes in bat populations, activity levels, and diversity.
- Conduct up to 7 mist-netting sessions at various water sources on the NTTR when allowable.
- Deploy and monitor up to 10 acoustic recording devices at different water sources across the NTTR. Recording devices will be deployed year-round to monitor changes in bat populations, activity levels, and diversity.
- Conduct up to 15 nights of bat point-count surveys on NTTR and NAFB.

1.1.2.J Candidate species

- Focused survey efforts will be undertaken each year for federal and state sensitive wildlife species.
- Conduct 30 surveys of established transects for Mojave fringed-toed lizard and collect genetic samples from PIT- or visible implant elastomer (VIE)-tagged lizards.
- Test genetics of newly identified species of fringe-toed lizards in collaboration with NDOW.
- 50 half days to monitor nesting burrowing owls on NAFB.
- Four days for Call playback surveys for burrowing owl on NAFB.
- Four days for Call playback surveys for owls on the NTTR.
- Initially, up to 10 days for color banding owls on NAFB in the first 2years of banding efforts. Subsequent years' banding efforts will be 2–4 days to capture and band new birds and birds not banded in initial effort. Banding will allow for identification of individual owls and year to year monitoring.
- Survey known populations of Las Vegas bearpoppy for Mojave poppy bee, a potential candidate species.
- Initiate localized survey of insect diversity and abundance on the SAR.

1.1.2.K Species at risk/small mammals.

- Conduct up to 4 sessions of small mammal live trapping, where one session is 3 nights/4 days with 135 traps open each night, on NAFB and the NTTR.
- Conduct up to 4 sessions of live trapping mesocarnivores, where one session is 3nights/4 days on NAFB and the NTTR.

(Chg 2, 7 Apr 2012)
(Chg 1, 28 Apr 2020)

OBJECTIVE 1.2—Sustain Healthy Populations of Mojave Desert Tortoises.

PROJECTS

Project 1.2.1 Maintain desert tortoise distribution and density in light of their association with areas of the range and with military activities.

1.2.1.A Coordinate with the USFWS to establish USFWS-approved monitoring programs by designating areas that encompass all accessible tortoise habitat on NAFB and the NTTR, and initiate a schedule for surveys designed to describe changes in density and distribution within these areas. Before military activities are implemented, develop protocols to describe local impacts to tortoise populations. Restore populations that are shown to decrease in number or extent due to military activities, and implement said plan as needed to restore the population.

- Conduct monitoring and tortoise education for military activities and personnel as needed or requested.

1.2.1.B Coordinate with the USFWS to establish USFWS-approved monitoring programs that designate areas that encompass all accessible tortoise habitat on NAFB and the NTTR, and schedule surveys designed to describe changes to status of tortoise populations within these areas.

1.2.1.C Identify areas of the NTTR with no further plans for active use, such as roads and two-tracks, burn scars, and areas infested with invasive species that will be restored to desert tortoise habitat.

- Reseed up to 100 acres annually with native seed to restore desert tortoise habitat.

OBJECTIVE 1.3 —Continue to monitor and conserve bighorn sheep populations on NAFB and the NTTR.

PROJECTS

1.3.1 Use photos taken by remote cameras at different sites across the NTTR in order to determine the presence or absence of bighorn sheep at those sites, as well as to perform a cursory determination of population size and demographics. Photos can also be used as a means of disease detection.

1.3.2 Collaborate with outside partner agencies (USFWS, BLM, NDOW, USGS) on a GPS collar study in order to determine the basic ecology, movements, and level of connectivity between different subpopulations.

- Collar Desert Range herd (possibly two herds north and south) to include collar refurbishment, satellite service, monthly data download and analysis, and report.
- USGS will analyze data for all South Range collaring efforts, including movement analysis, seasonal/daily usage, health assessments, lambing areas, habitat connectivity, etc., to develop posters, presentations, and reports.

(Chg 1, 28 Apr 2020)

OBJECTIVE 1.4—Sustain and Protect Sensitive Plant Species and Natural Habitats to Preserve Biodiversity.

PROJECTS

1.4.1 Maintain plant community composition and distribution in light of military activities.

1.4.1.A Assess and mitigate impact of disturbance on vegetation communities, demonstrating effectiveness of mitigation (including restoration) over short, medium, and long time periods.

- Delineate and classify up to 50,000 acres in the South Range.
- Focus on ranges 61B, 62A, 63B, and 65B, as access allows.

OBJECTIVE 1.5—Mitigate impacts to habitats and wildlife caused by military activities.

PROJECTS

1.5.1 Conduct USFWS-approved survey protocol for sensitive and protected species, particularly Mojave desert tortoise and nesting birds, before any construction activities, or anticipated impacts to an area. Establish appropriate buffer zones in accordance with federal, state, and local regulations around sensitive and protected species and habitat in or near construction zones to ensure compliance with environmental regulations.

- Budget 20 days for pre-project surveys to detect Mojave desert tortoise, nesting birds, burrowing owls, and construction monitoring for Mojave desert tortoise on NAFB.
- Budget 10 days for pre-project surveys to detect Mojave desert tortoise, nesting birds, burrowing owls, and construction monitoring on the NTTR.

1.5.2 Ensure that various commands are inspecting their exterior boundary desert tortoise fence integrity in accordance with the BO.

OBJECTIVE 1.6—Restore Degraded Ecologically Sensitive Areas.

PROJECTS

1.6.1 Conduct cleanup and remediation of areas that are critical to protected species habitat, wildlife corridors, and water-quality issues.

- Vegetation restoration will occur on a case-by-case basis after events, such as wildland fires, crash incidents, and discontinued active use of sites.
- See Project 1.2.1 C
- In coordination with the USFWS and NDOW, conduct up to one week of goldfish removal from ponds on the North Range (O&M pond, Site 22 pond). Once nonnative fish are removed, consult with the USFWS and NDOW for possible introduction of native amphibians (northern leopard frog or Columbia spotted frog).
- Survey up to 400 acres for invasive species on NTTR.

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- Resurvey areas of previous invasive species treatment in order to plan for future removal projects in case of regrowth (~20 acres).
- Survey roadsides and borrow pits for yellow star thistle on NAFB (~250 acres).

OBJECTIVE 1.7—Conserve Natural Resources.

PROJECTS

1.7.1 Install and monitor exclusionary fences around sensitive springs that have shown signs of overuse and trampling by wild horses and burros.

1.7.2 Work with the BLM to collect and conserve native seed collections.

GOAL 2—MAINTAIN COMPLIANCE WITH FEDERAL, STATE, LOCAL, AND MILITARY REGULATIONS

OBJECTIVE 2.1—Ensure Compliance with All Applicable Environmental Laws.

OBJECTIVE 2.2—Maintain Required Federal, State, and Local Plans and Permits, such as the INRMP, WMP, IPMP, and BASH Plan, and Associated Permits.

OBJECTIVE 2.3—Maintain Interdepartmental and Interagency Cooperation (Planning, Meeting, Data Sharing) to Ensure Protocols are Followed and to Avoid Work Redundancy.

PROJECTS

2.3.1 Collaborate with 57th Wing Flight Safety to share avian point-count data and species identifications of bird fatalities following BASH incidents, to provide information regarding which species and locations pose the greatest BASH risks and to inform management decisions.

2.3.2 Collaborate with the NDOW (and USFWS on the South Range) for annual bighorn sheep surveys.

2.3.3 Collaborate with external agencies (BLM, NDOW, USFWS, and USGS) for complex monitoring projects of desert bighorn sheep to verify and characterize environmental relationships interior and exterior to the NTTR regarding population and habitat connectivity, establishing and maintaining population health profiles, population trends, and finalizing a robust predictive habitat-use model, based in part on spatial and temporal habitat-use patterns. Collaborate with the USFWS on management activities for bighorn sheep on the South Range so that management activities are as compatible as is practical and possible with the DNWR Comprehensive Conservation Plan.

2.3.4 Collaborate with the BLM on surveys for wild horses and vegetation utilization, which may be done in conjunction with other annual surveys.

2.3.5 Consult the BLM invasive species specialist before initiating any invasive species control projects on the NTTR. Coordinate with the USFWS before initiating any invasive species-control projects in Mojave Desert tortoise habitat. Any herbicides used on joint DNWR/NTTR land will be pre-approved by the USFWS. Records of herbicide type, target species, and treatment effectiveness will be kept.

2.3.6 Develop and maintain collaborative relationships with federal and state agencies, as well as non-governmental organizations, such as PIF and GBBO, to standardize avian surveying and monitoring protocols, contribute to the greater knowledge of bird species occurring on the installation, and to increase the capacity for effective habitat management and good stewardship of these bird species across their ranges.

2.3.7 Coordinate with the BLM's Seeds of Success program to collect representative seed samples of NTTR plant species in order to stabilize, rehabilitate, and restore degraded land.

2.3.8 Support the Wildfire Management Plan by annual update and review MOU with cooperators for fire suppression assistance.

(Chg 1, 28 Apr 2020)

GOAL 3—SUSTAIN MILITARY MISSION WHILE IMPLEMENTING ECOSYSTEM MANAGEMENT

OBJECTIVE 3.1—Avoid Impacts to Threatened, Endangered, and Sensitive Species and Communities and Protect the Habitats of Threatened, Endangered, and Sensitive Species and Communities.

PROJECTS

3.1.1 Maintain comprehensive species lists depicting and describing species locations, population status, native status, regulatory status, rarity, and historical documentation to assist land managers in identification of species occurring on the range and to assist the USAF in identification of sensitive and protected species, habitats, and communities and directives for conforming to environmental regulations governing those resources.

3.1.2 Monitor and maintain the protected Area III Conservation Area on NAFB to continue to protect critical populations of Las Vegas bearpoppy and Las Vegas buckwheat.

- Assess up to 10 potential locations of Las Vegas buckwheat and Las Vegas bear poppy based on species-distribution models of projected suitable habitat on NAFB.

3.1.3 Monitor for sensitive plant species on the NTTR.

- Record GPS points of sensitive plant species, as incidentals are discovered, to help focus future survey areas on the NTTR.
- Survey and monitor locations of sensitive plant species on the NTTR.

3.1.4 Establish a conservation area that is usable by the public and benefits the long-term protection of rare plants and other species. This conservation area will provide public access by construction of an elevated boardwalk that protects soils and vegetation but provides walking/jogging and biking opportunities. This will be enhanced with railings and benches for seating.

OBJECTIVE 3.2—Perform Educational Outreach for Community Awareness of Sensitive Species and Ecological Communities.

PROJECTS

3.2.1 Continue to update and distribute brochures and booklets to educate USAF personnel and contractors on how to identify sensitive and protected species and communities occurring on the installation, and what actions to take, if any, when those taxa and communities are observed. Continue to conduct desert tortoise awareness training in accordance with BOs by authorized desert tortoise biologists.

- Design and install 2 interpretive signs at BUOW locations.
- Design and install 5 signs to promote awareness about Mojave desert tortoise habitat.
- Install interpretive signs in the Conservation Area upon completion of construction of the boardwalk.

OBJECTIVE 3.3 —Protect life, property, and resources from wildland fire at costs commensurate with values at risk.

PROJECTS

3.3.1 Utilize hazardous fuels reduction around critical infrastructure and in strategic locations to reduce the potential impact of wildland fire

- Reduce the threat of wild fire to the Cedar Peak power line infrastructure by treating 209 acres of hazardous fuel accumulation.
- Reduce the threat of wild fire to Black Mountain by treating 205 acres of hazardous fuel accumulation.
- Reduce the threat of wild fire to Stonewall by treating 20 acres of hazardous fuel accumulation.
- Reduce the threat of wild fire to Belted Peak by treating 20 acres of hazardous fuel accumulation.
- Use herbicides to treat roadsides with invasive grasses.

3.3.2 Coordinate Wildland Fire and Invasive Species initiatives to reduce large-scale infestations of *Bromus* species to decrease wildfire risks, especially in TPECR and ECS.

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GOAL 4—UPDATE NATURAL RESOURCES MANAGEMENT DATABASE

OBJECTIVE 4.1—Enhance Data Utility and Quality.

PROJECTS

4.1.1 Create and compile environmental GIS layers and maps for biological and non-biological resources including, and not limited to, species populations, vegetative communities, soils, water, climate variables, topography, landscape, geology, etc., occurring across the installation.

4.1.2 Update and acquire high-resolution aerial imagery every 5 years or as needed to monitor and document biological and non-biological resource expansions, reductions, and changes over time. Imagery shall be shared upon request with partner agencies once the NTTR Office has reviewed it.

4.1.3 Maintain a comprehensive record of all wildland fire starts and report them to the Air Force Wildland Fire Center.

OBJECTIVE 4.2— Maintain Quality Control on Data Collection, Data Entry, and Database Management.

PROJECTS

4.2.1 Maintain spatial databases in compliance with USAF GeoBase Program (under AFI 32-10112) to ensure proper metadata record keeping and standardization of geographic coordinate systems and projections.

OBJECTIVE 4.3—Maintain Standardized Protocols for Data Collection, Quality Assurance and Quality Control of Data Entry Across Natural Resources Projects.

PROJECTS

4.3.1 Coordinate and collaborate with federal and state agencies, as well as non-governmental organizations, periodically where appropriate and possible to ensure that standardized protocols for data collection and analysis are up-to-date with the best available science.

OBJECTIVE 4.4 —Maintain Spatial Databases in Compliance with the USAF Geobase Program (Under AFI 32-10112) to Ensure Proper Metadata Record Keeping and Standardization of Geographic Coordinate Systems and Projections.

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GOAL 5—SUSTAIN AND PROTECT SENSITIVE PLANT SPECIES AND NATURAL HABITATS TO PRESERVE BIODIVERSITY

OBJECTIVE 5.1—Maintain plant community composition and distribution in light of military activities.

PROJECTS

5.1.1 Assess and mitigate impact of disturbance on vegetation communities, demonstrating mitigation effectiveness (including restoration) in short, medium, and longer time periods.

- Delineate and classify up to 50,000 acres in the South Range of the NTTR.
- Focus on ranges 61B, 62A, 63B, and 65B, as access allows.
- Summarize and update up to 21 unique habitats known to occur on the range based on the 27 unique habitats described in the NDOW Nevada Wildlife Action Plan.
- Update and refine GIS and maps, and address data gaps that have been filled over this year's sampling efforts on up to 21 unique habitats.
- Rare Plant Surveys—Access and assess up to 10 potential locations of Las Vegas buckwheat and Las Vegas bear poppy based on species-distribution models of projected suitable habitat on NAFB.

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9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

9.1.1 Implementation

This INRMP is dynamic and has, as one objective, the integration of natural resources management with the installation's mission. For INRMP goals and objectives to be effectively implemented, guidelines provided in the INRMP should be considered early in the planning and budget processes for proposed projects and mission changes on the installation. GIS database and modeling tools recommended as part of the INRMP should be used to assist managers in the decision-making process.

The INRMP describes management of a living, dynamic system, and therefore will require occasional modification to reflect changes in the system. At the same time, the military mission changes with the needs of national defense, and the INRMP must be sufficiently flexible to accommodate those changes. Because the INRMP is based on guidance documents that may be periodically modified or replaced, and natural resources, which undergo constant cycling and change, periodic review and modification of the INRMP is required by AFI 32-7064 (Section 3.6.1-3.6.2), 18 November 2014. According to those regulations, installations, in cooperation with the USFWS and NDOW, must update the INRMP at least once every five years. Updates may also be required in shorter periods of time where changes in the military mission and changes in environmental compliance requirements significantly affect the ability of the installation to implement the INRMP. An annual review of the INRMP should be conducted by NAFB in coordination with the USFWS and NDOW in order to verify that

- all “must fund” projects and activities have been budgeted for and implementation is on schedule; sufficient numbers of professionally trained natural resources management and law enforcement personnel are available and assigned responsibility to perform tasks associated with the preparation and implementation of the INRMP per the Sikes Act, Section 107;
- projects and activities for the upcoming year have been identified and included in the INRMP;
- all required coordination with the USFWS and NDOW has occurred; and
- any significant changes to the installation’s mission requirements or natural resources have been identified.

The overall function of the INRMP is to implement ecosystem management at NAFB, CAFB, and the NTTR by setting goals for attaining desired land conditions. According to AFI 32-7064, the USAF principles for eco-management include the following.

- Maintenance or restoration of native ecosystem types across their natural range where practical and consistent with the military mission.
- Maintenance or restoration of ecological processes, such as fire and other disturbance regimes, where practical and consistent with the military mission.
- Maintenance and restoration of the hydrological processes in streams, floodplains, and wetlands when feasible.
- Use of regional approaches to implement ecosystem management on the installation by collaboration with other DoD components, as well as other state, federal, and local agencies and adjoining property owners.

- Allowance for outdoor recreation, agricultural production, harvesting of forest products, and other practical utilization of the land and its resources if such use does not inflict long-term ecosystem damage or negatively impact the USAF mission. Because of security issues and mission goals at the NTTR, public use of land is highly restricted.

Implementation of the INRMP will be subject to NEPA requirements. An EA is prepared for INRMPs undergoing a revision. As this is an update, no new NEPA review was conducted. A new NEPA analysis will be conducted after 2021, the expiration of the current land withdrawal. All relevant environmental compliance documents and historical reports or opinions will be provided in pdf format on compact disks included with the INRMP.

USAF environmental compliance review is initiated with the submittal of Air Force Form 813, the Request for Environmental Impact Analysis. Project proponents generally submit a Description of Proposed Action and Alternatives in support of their submittal, enabling decision-makers to have sufficient information on which to base their review and conclusions. Form 813 is completed by 99 CES, which uses the conclusions to determine the documentation necessary, if any, to fully comply with NEPA. The INRMP provides information on existing conditions and potential impacts to use in support of completing Form 813.

The following resources, listed as potential issues by ACC, are not found on the NAFB, CAFB, or the NTTR.

- Commercial Forestry—No commercially viable forest is present.
- Coastal Zone Management—NAFB, CAFB, and the NTTR are inland installations.
- Agricultural Outleasing—The Bald Mountain limited grazing allotment on the Groom Range administered by the BLM is the only agricultural outleasing opportunity that exists on NAFB, CAFB, and the NTTR.
- Hazardous materials are contained and emergency response protocols are in place to prevent environmental damage resulting from flash floods.

9.1.2 Natural Resources Management Staffing

Currently, NAFB, CAFB, and the NTTR have the following positions devoted either full time or part time to natural resources management.

- Natural Resources Program Manager—Devoted full time to the management of natural resources on NAFB, CAFB, and the NTTR. Given the size of the installation, there are two Natural Resources Managers assigned to NAFB, CAFB, and the NTTR. Natural Resource Program Managers coordinate all activities at all locations (1) to ensure that natural resources are conserved without significantly impacting the goals and objectives of the military mission; (2) to coordinate mission activities with appropriate federal and state regulatory agencies when required; and (3) to ensure that NAFB, CAFB, and the NTTR fully comply with the goals, objectives, and management guidelines stated in the INRMP.
- NEPA Manager—Coordinates all activities potentially impacting the environment and requiring preparation of EAs or EISs. Coordinates these activities with the Natural Resources Managers, as necessary.

Presently, most of the responsibility for resource management falls on the Natural Resources Program Managers, who spends most of their time addressing USAF activities potentially impacting natural resources and coordinating the activities of contractors and regulatory agencies involving natural resources management. Most of the surveys, reports, and monitoring being conducted at NAFB, CAFB, and the NTTR are accomplished on a contractual basis with independent consultants.

9.1.3 The Integrated Natural Resource Management Plan

At the direction of the ACC, the NAFB 99 ABW, Base Civil Engineer (99 CES), 99 CES/CEIEA has prepared this INRMP to serve as a practical management guideline for the natural resources on NAFB, CAFB, and the NTTR. The INRMP incorporates statutory and regulatory requirements, presidential directives and EOs, DoD and USAF natural resources management policies, available regulatory guidance documents, and current natural resource data for NAFB, CAFB, and the NTTR to produce a practical guidance document that recognizes and respects the goals and objectives of the Nellis mission while conserving the natural resources of these areas. Natural resources management, as outlined by the INRMP, is intended to provide and sustain suitable landscapes for military activities without compromising ecosystem health. To meet that end, the INRMP provides base personnel with past and present natural resource information on NAFB, CAFB, and the NTTR through a GIS database, directs the user to additional background information, and recommends guidance to assist the user in making decisions that allow for proper ecosystem management.

The INRMP was prepared by 99 CES, but it involved contributions from other sources. Extensive time and effort was provided by various groups within NAFB, CAFB, and the NTTR. Other important contributors to the INRMP outside of the USAF include the USACE, BLM, USFWS, NDOW, NDOF, The Nature Conservancy, and the general public.

9.1.3.1 Monitoring and Evaluating Attainment of Goals and Objectives

The primary ecosystem management goal of scientific data collection and ecosystem monitoring will be to develop a working understanding of the structure, composition, and health of regional and installation ecosystems. Data will be collected and evaluated to support the IC with the conservation and rehabilitation of natural resources consistent with the use of the installation and its mission.

Due to the ecological diversity encompassed by NAFB, CAFB, and the NTTR, which includes portions of two desert ecoregions, natural resource management initiatives require careful planning. Data collection and monitoring activities must focus on useful information for environmental managers. Data in the past have been assembled in files, reports, and maps. With this INRMP, the NNRP will begin presenting the findings in a GIS format. This allows military and environmental personnel to analyze, visualize and query the data. As more data are collected and as the military mission changes or expands, the 99 CES will continue to refine and develop GIS databases and models to use as tools to make sound management decisions.

The need for additional data regarding natural resources is evident. Natural resource management requires obtaining focused data sets to understand how components of the ecosystem interact with and affect each other. Indicator species within specific plant communities can be selected and periodically monitored to assess the overall health of those communities. Existing data from previous and ongoing studies and research efforts will be augmented with carefully designed surveys that will provide the most pertinent information in the most cost-effective manner. Staff from 99 CES is collecting and compiling environmental management information from sources in a broad variety of disciplines to help achieve this goal. As more elements of the natural resources found on NAFB, CAFB, and the NTTR are described and catalogued in GIS, management decisions for the military mission will be more informed.

To achieve effective ecosystem management, other monitoring efforts will be needed. These include periodically surveying for rare or sensitive vertebrate and plant populations and documenting shifts in the distribution of vegetation and animal communities. Monitoring allows managers to evaluate the health of an ecosystem before, during, and after management activities, thus meeting the goal of conservation of biodiversity within the constraints of the NAFB, CAFB, and the NTTR mission.

9.1.3.2 Management Guidelines

To meet the goals and objectives of the INRMP, natural resource management guidelines have been prepared. The guidelines section for resource management offers recommendations, suggestions, and other information that will allow resource managers and other planners to minimize or avoid impacts to natural resources, identify environmental permitting issues, and allow for judicious management of natural resources at NAFB, CAFB, and the NTTR.

9.2 Monitoring INRMP Implementation

A spreadsheet will be developed as a tracking tool to follow the completion of projects proposed by the INRMP for the five years following INRMP approval. The NNRP annually prepares a report describing accomplishments of that year's projects. The annual report should also include a discussion of problems and issues encountered in the implementation of the INRMP, as well as methods to improve implementation of the INRMP. As previously discussed, the INRMP update will be approved by ACC and provided to the USFWS, BLM, and NDOW for their files. Methods to improve implementation of the INRMP to meet its goals and objectives should be discussed with these agencies.

9.3 Annual Integrated Natural Resources Management Plan Review and Update Requirements

The preliminary draft of this INRMP was reviewed by the 99 CES, the installation Environmental Safety and Occupational Health Leadership Council (ESOHLC), the NTTR, the HQ ACC Asset Management Division (AMD), and other reviewers, including the USFWS, NDOW, and BLM. Recently, HQ ACC/AMD conducted a cross-functional team review of the INRMP at ACC to ascertain the review and comments from ACC range operations and planning, environmental planning, pest management, and grounds maintenance staff. The draft plan was distributed for public comment and no significant comments were received. The final plan will be presented to the ESOHLC and to ACC Environmental Analysis Branch for concurrence; final approval will be obtained from the 99 ABW/CC, USFWS, and NDOW. Component Management Plans will be approved by 99 ABW/CC and will be revised every two years or as needed. The INRMP will be revised every five years, coordinated with the USFWS and NDOW.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans for NAFB, CAFB, and the NTTR are included in this section (Table 10-1). These projects are listed by Office of Primary Responsibility and fiscal year, including the current year and four succeeding years, during which time projects and priorities are subject to change. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source and implementation priority. The work plans provide all the necessary information for building a budget within the USAF framework. Priorities are defined as follows.

High—The INRMP signatories assert that if the project is not funded the INRMP is not being implemented and the USAF is non-compliant with the Sikes Act.

Medium—Project supports a specific INRMP goal and objective and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112 on Invasive Species. INRMP signatories, however, would not contend that the INRMP is not implemented if not accomplished within the programmed year because of other priorities.

Low—Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or supports long-term compliance with specific requirements within natural resources law, but it is not directly tied to specific compliance within the proposed year of execution.

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Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 1.1.1 Conduct targeted surveys and monitoring for threatened, endangered, sensitive, and protected species listed by federal, state, and local enforcement agencies and regulations.	CEIEA, Natural Resources	MGT, SPECIES, REPTILES AND AMPHIBIANS MGT, SPECIES, WILDHORSE & LARGE MAMMAL MGT, SPECIES, SPECIES AT RISK MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD MGT, SPECIES, GOLDEN EAGLE MGT, SPECIES, MOJAVE DESERT TORTOISE MGT, SPECIES, CANDIDATE SPECIES MGT, SPECIES, BATS MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS MGT, INVASIVE SPECIES MONITOR WETLANDS	High	All
Project 1.1.1.A Continue to survey and monitor for the Mojave Desert tortoise populations using the existing methods approved by USFWS and existing BOs.	CEIEA, Natural Resources	MGT, SPECIES, MOJAVE DESERT TORTOISE	High	All

Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 1.1.2 Conduct wildlife and vegetation surveys according to recognized national standards and appropriate detection techniques and methodologies to monitor and document diversity, population metrics, and viability over time.	CEIEA, Natural Resources	MGT, SPECIES, REPTILES AND AMPHIBIANS MGT, SPECIES, WILDHORSE & LARGE MAMMAL MGT, SPECIES, SPECIES AT RISK MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD MGT, SPECIES, GOLDEN EAGLE MGT, SPECIES, MOJAVE DESERT TORTOISE MGT, SPECIES, CANDIDATE SPECIES MGT, SPECIES, BATS MGT, INVASIVE SPECIES MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS MONITOR WETLANDS	High	All
Project 1.1.2.A. Conduct golden eagle surveys and monitor nesting golden eagles.	CEIEA, Natural Resources	MGT, SPECIES, GOLDEN EAGLE	High	All
Project 1.1.2.B. Conduct surveys for both pronghorn and bighorn sheep.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL	High	All
Project 1.1.2.C. Install and maintain wildlife motion-sensor cameras at water sources to monitor and document species occurrences and use.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL MGT, SPECIES, SPECIES AT RISK MGT, SPECIES, CANDIDATE SPECIES	High	All
Project 1.1.2.D. Conduct vegetation classification and ground-truthing surveys during appropriate blooming and species-detection periods according to nationally recognized standards to improve accuracy of vegetation and habitat maps.	CEIEA, Natural Resources	MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR	High	All

Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 1.1.2.E. Monitor the water quality and hydrological status of seep and spring locations on the installation.	CEIEA, Natural Resources	MONITOR WETLANDS	High	All
Project 1.1.2.F. Inventory invasive species populations and continue to monitor for early detection and eradication.	CEIEA, Natural Resources	MGT, INVASIVE SPECIES	Medium	All
Project 1.1.2.G. Inventory and monitor populations of reptiles and amphibians.	CEIEA, Natural Resources	MGT, SPECIES, REPTILES AND AMPHIBIANS	High	All
Project 1.1.2.H. Survey and monitor migratory birds.	CEIEA, Natural Resources	MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD	High	All
Project 1.1.2.I. Survey and monitor bat community.	CEIEA, Natural Resources	MGT, SPECIES, BATS	High	All
Project 1.1.2.J. Survey and monitor Candidate species.	CEIEA, Natural Resources	MGT, SPECIES, CANDIDATE SPECIES	High	All
Project 1.1.2.K. Survey and monitor species at risk/small mammals.	CEIEA, Natural Resources	MGT, SPECIES, SPECIES AT RISK	High	All
Project 1.2.1 Maintain desert tortoise distribution and density in light of their association with areas of the range and with military activities.	CEIEA, Natural Resources	MGT, SPECIES, MOJAVE DESERT TORTOISE	High	All

Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 1.2.1.A. Coordinate with the USFWS to establish approved monitoring programs by designating areas that encompass all accessible tortoise habitat on NAFB and the NTTR, and initiate a schedule for surveys designed to describe changes in density and distribution within these areas, if applicable. Before military activities are implemented, develop protocols to describe local impacts to tortoise populations. Restore populations that are shown to decrease in number or extent due to military activities, and implement said plan as needed to restore populations.	CEIEA, Natural Resources	MGT, SPECIES, MOJAVE DESERT TORTOISE	High	All
Project 1.2.1.B. Coordinate with the USFWS to establish USFWS-approved monitoring programs that designate areas that encompass all accessible tortoise habitat on NAFB and the NTTR, and schedule surveys designed to describe changes of tortoise populations within these areas.	CEIEA, Natural Resources	MGT, SPECIES, MOJAVE DESERT TORTOISE	High	All
Project 1.2.1.C. Identify areas of the NTTR with no further plans for active use, such as roads and two- tracks that will be restored to desert tortoise habitat.	CEIEA, Natural Resources	MGT, SPECIES, MOJAVE DESERT TORTOISE	High	All

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Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 1.3.1 Use photos taken by remote cameras at different sites across the NTTR to determine the presence or absence of bighorn sheep at those sites, as well as to conduct a cursory determination of population size and demographics. Photos can also be used as a means of disease detection.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL	High	All
Project 1.3.2 Collaborate with outside partner agencies (USFWS, BLM, NDOW, USGS) on a GPS collar study to determine the basic ecology, movements, and level of connectivity between different subpopulations.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL	High	All
Project 1.4.1 Maintain plant community composition and distribution in light of military activities.	CEIEA, Natural Resources	MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	High	All
Project 1.4.1.A. Assess and mitigate impact of disturbance on vegetation communities, demonstrating effectiveness of mitigation (including restoration) over short, medium, and long time periods.	CEIEA, Natural Resources	MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	Medium	All

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Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 1.5.1 Conduct pre-clearance surveys for sensitive and protected species, particularly for Mojave desert tortoise and nesting birds, before any construction activities, or anticipated impacts to an area. Establish appropriate buffer zones in accordance with federal, state, and local regulations around sensitive and protected species and habitat in or near construction zones to ensure compliance with environmental regulations.	CEIEA, Natural Resources	MGT, SPECIES, MOJAVE DESERT TORTOISE MGT, SPECIES, SPECIES AT RISK MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD MGT, SPECIES, CANDIDATE SPECIES	High	All
Project 1.5.2 Inspect desert tortoise fencing to guarantee fence integrity, in accordance with the PBO.	CEIEA, Natural Resources	MGT, SPECIES, MOJAVE DESERT TORTOISE	High	All
Project 1.6.1 Perform cleanup and remediation of areas that are critical to protected species habitat, wildlife corridors, and water-quality issues	CEIEA, Natural Resources	MGT, INVASIVE SPECIES	Medium	All
Project 1.7.1 Install and monitor exclusionary fences around sensitive springs that have shown signs of overuse and trampling by wild horses and burros.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL MONITOR WETLANDS MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	High	All
Project 1.7.2 Work with the BLM to collect and conserve native seed collections.	CEIEA, Natural Resources	MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR	Low	All

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Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 2.3.1 Collaborate with 57th Wing Flight Safety to share avian point-count data and species identifications of bird fatalities following BASH incidents to provide information regarding which species and locations pose the greatest BASH risks and to inform management decisions.	CEIEA, Natural Resources; 57th Wing Flight Safety	MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD	High	All
Project 2.3.2 Collaborate with NDOW and USFWS for annual bighorn sheep surveys.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL	High	All
Project 2.3.3 Collaborate with external agencies (BLM, NDOW, USFWS, USGS) for complex monitoring projects of desert bighorn sheep to verify and characterize environmental relationships interior and exterior to the NTTR for population and habitat connectivity, establish and maintain population health profiles and population trends, and finalize a robust predictive habitat-use model based in part on spatial and temporal habitat-use patterns. Collaborate with the USFWS for bighorn sheep management activities on the South Range so that management activities are as compatible as practical and possible with the DNWR Comprehensive Conservation Plan.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL	High	All
Project 2.3.4 Collaborate with the BLM for surveys of wild horses and vegetation utilization, which may be done in conjunction with other annual surveys.	CEIEA, Natural Resources	MGT, SPECIES, WILDHORSE & LARGE MAMMAL	High	

Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 2.3.5 Consult the BLM invasive species specialist before initiating any invasive species-control projects on the NTTR. Coordinate with the USFWS before initiating any invasive species-control projects in Mojave Desert tortoise habitat. Any herbicides used on joint DNWR/NTTR land will be pre-approved by the USFWS. Records of herbicide type, target species, and treatment effectiveness will be kept.	CEIEA, Natural Resources	MGT, INVASIVE SPECIES	Medium	All
Project 2.3.6 Develop and maintain collaborative relationships with federal and state agencies, as well as non-governmental organizations, such as PIF and GBBO, to standardize avian survey and monitoring protocols, contribute to the greater knowledge of bird species occurring on the installation, and increase the capacity for effective habitat management and good stewardship of these bird species across their ranges.	CEIEA, Natural Resources	MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD	Low	All
Project 2.3.7 Coordinate with the BLM's Seeds of Success program to collect representative seed samples of NTTR plant species to stabilize, rehabilitate, and restore degraded land.	CEIEA, Natural Resources	MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR	Low	All
Project 2.3.8 Support the Wildland Fire Management Plan by annual update and review MOUs with cooperators for fire suppression assistance.	CEIEA, Natural Resources	AIR FORCE WILDLAND FIRE CENTER	Medium	All

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Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 3.1.1 Maintain comprehensive species lists depicting and describing species locations, population status, native status, regulatory status, rarity, and historical documentation to assist land managers with identification of species occurring on the range and to assist the USAF in identification of sensitive and protected species, habitats, and communities and directives for conforming to environmental regulations governing those resources.	CEIEA, Natural Resources	MGT, SPECIES, REPTILES AND AMPHIBIANS MGT, SPECIES, WILDHORSE & LARGE MAMMAL MGT, SPECIES, SPECIES AT RISK MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD MGT, SPECIES, GOLDEN EAGLE MGT, SPECIES, DESERT TORTOISE MGT, SPECIES, CANDIDATE SPECIES MGT, SPECIES, BATS MGT, INVASIVE SPECIES MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	High	All
Project 3.1.2 Monitor and maintain the protected Area III Conservation Area on NAFB to continue to protect critical populations of Las Vegas bearpoppy and Las Vegas buckwheat.	CEIEA, Natural Resources	MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	High	All
Project 3.1.3 Monitor sensitive plant species on the NTTR.	CEIEA, Natural Resources	MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	High	All
Project 3.2.1 Continue to update and distribute brochures and booklets to educate USAF personnel and contractors on how to identify sensitive and protected species and communities occurring on the installation, and what actions to take, if any, when those taxa and communities are observed. Continue to conduct desert tortoise awareness training in accordance with BOs by authorized desert tortoise biologists.	CEIEA, Natural Resources	MGT, SPECIES, DESERT TORTOISE	High	All

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Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 3.3.1 Utilize hazardous fuel reduction methods around critical infrastructure and in other strategic locations to reduce the potential impact of wildland fire.	CEIEA, Natural Resources	Air Force Wildland Fire Center	High	All
Project 3.3.2 Coordinate Wildland Fire and Invasive Species initiatives to reduce large-scale *Bromus* species infestations to decrease wildfire risks, especially in TPECR and ECS.	CEIEA, Natural Resources	Air Force Wildland Fire Center Mgt, Invasive Species	High	All
Project 4.1.1 Create and compile environmental GIS layers and maps for biological and non-biological resources, including but not limited to species populations, vegetative communities, soils, water, climate variables, topography, landscape, geology, etc., occurring across the installation.	CEIEA, Natural Resources	Monitor Wetlands Mgt, Species, Reptiles And Amphibians Mgt, Species, Wildhorse & Large Mammal Mgt, Species, Species At Risk Mgt, Species, Migratory/Neotropical Bird Mgt, Species, Golden Eagle Mgt, Species, Desert Tortoise Mgt, Species, Candidate Species Mgt, Species, Bats Mgt, Invasive Species Mgt, Habitat, Vegetation Classification, Sr Mgt, Habitat, Vegetation Classification, Nr Mgt, Habitat, Unique Habitats & Rare Plants	High	All

(Chg 1, 28 Apr 2020)

Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 4.1.2 Update and acquire high-resolution aerial imagery every five years, or as needed, to monitor and document biological and non-biological resource expansions, reductions, and changes over time. Imagery shall be shared upon request with partner agencies once the NTTR Office has reviewed it.	CEIEA, Natural Resources	MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR	Medium	All
Project 4.1.3 Maintain a comprehensive record of all wildland fire ignitions and report them to the Air Force Wildland Fire Center.	CEIEA, Natural Resources	AIR FORCE WILDLAND FIRE CENTER	High	All
Project 4.2.1 Maintain spatial databases in compliance with USAF GeoBase Program (under AFI 32-10112) to ensure proper metadata record keeping and standardization of geographic coordinate systems and projections.	CEIEA, Natural Resources	MONITOR WETLANDS MGT, SPECIES, REPTILES AND AMPHIBIANS MGT, SPECIES, WILDHORSE & LARGE MAMMAL MGT, SPECIES, SPECIES AT RISK MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD MGT, SPECIES, GOLDEN EAGLE MGT, SPECIES, DESERT TORTOISE MGT, SPECIES, CANDIDATE SPECIES MGT, SPECIES, BATS MGT, INVASIVE SPECIES MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	High	All

(Chg 1, 8 Jan 20220)

Table 10-1. FY 2018–2022 Annual Work Plan.

Project	Office of Primary Responsibility	Funding Source	Priority Level	FY
Project 4.3.1 Coordinate and collaborate with federal and state agencies, and periodically with non-governmental organizations, where appropriate and possible to ensure that standardized protocols for data collection and analysis are up-to-date with the best available science.	CEIEA, Natural Resources	MONITOR WETLANDS MGT, SPECIES, REPTILES AND AMPHIBIANS MGT, SPECIES, WILDHORSE & LARGE MAMMAL MGT, SPECIES, SPECIES AT RISK MGT, SPECIES, MIGRATORY/NEOTROPICAL BIRD MGT, SPECIES, GOLDEN EAGLE MGT, SPECIES, DESERT TORTOISE MGT, SPECIES, CANDIDATE SPECIES MGT, SPECIES, BATS MGT, INVASIVE SPECIES MGT, HABITAT, VEGETATION CLASSIFICATION, SR MGT, HABITAT, VEGETATION CLASSIFICATION, NR MGT, HABITAT, UNIQUE HABITATS & RARE PLANTS	High	All
Project 5.1.1 Assess and mitigate impact of disturbance on vegetation communities, demonstrating effectiveness of mitigation (including restoration) in short, medium, and longer time periods.	CEIEA, Natural Resources	MGT, HABITAT, VEGETATION CLASSIFICATION, SOUTH RANGE	Medium	All

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to All USAF Installations)

eDASH Acronym Library
Natural Resources Playbook – Acronym
Section U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

53 WG	53rd Wing
99 ABW	99th Air Base Wing
99 ABW/CC	99th Air Base Wing Commander
99 CES	99th Civil Engineering Squadron
99 CES/CEIEA	99th Civil Engineering Squadron, Installation Management Flight, Environmental Element, Environmental Assessments Section (previously 99th Civil Engineering Squadron, Asset Management Flight, Environmental Section, Conservation Element)
ACC	Air Combat Command
AFCEC	U.S. Air Force Civil Engineer Center
AFI	Air Force Instruction
AFWC	Air Force Warfare Center
AICUZ	Air Installation Compatible Use Zone
AMD	Asset Management Division
AML	Appropriate Management Level
ATKS	Attack Squadron
BA	Biological Assessment
BASH	Bird Aircraft Strike Hazard
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BO	Biological Opinion
CAFB	Creech Air Force Base, formerly Indian Springs Air Force Auxiliary Field
CAS	Cooperative Agreement and Strategies
CCSM4	Community Climate System Model 4
CEMML	Center for Environmental Management of Military Lands
CFR	Code of Federal Regulations
CRP	Comprehensive Range Plan
CWA	Clean Water Act
DNWR	Desert National Wildlife Range
DoD	Department of Defense
DoDM	Department of Defense Manual
DoE	Department of Energy
DoI	Department of Interior
EA	Environmental Assessment
ECE	Electronic Combat East

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ECS	Electronic Combat South
ECW	Electronic Combat West
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act of 1973
ESOHLC	Environmental Safety and Occupational Health Leadership Council
GBBO	Great Basin Bird Observatory
GP	Base General Plan
GIS	Geographic Information System
GPS	Global Positioning System
HQ	Headquarters
IC	Incident Commander
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPCC	Intergovernmental Panel on Climate Change
IPMP	Integrated Pest Management Plan
IRP	Installation Restoration Program
IVC	International Vegetation Classification
km	kilometer
LMNRA	Lake Mead National Recreation Area
MBTA	Migratory Bird Treaty Act of 1918
MLWA	Military Lands Withdrawal Act of 1999
MOU	Memorandum of Understanding
MSL	mean sea level
MSHCP	Multiple Species Habitat Conservation Plan
NAC	Nevada Administrative Code
NAFB	Nellis Air Force Base
NBMG	Nevada Bureau of Mining and Geology
NDOF	Nevada Division of Forestry
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NISC	National Invasive Species Council
NM	National Monument
NNHP	Nevada Natural Heritage Program
NNIS	nonnative invasive species
NNRP	Nellis Natural Resources Program
NNRM	Nellis Natural Resources Management
NRM	Natural Resources Manager
NRS	Nevada Revised Statutes
NTTR	Nevada Test and Training Range
NTS	Nevada Test Site (now known as the Nevada National Security Site)

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NWAP	Nevada Wildlife Action Plan
NWHR	Nevada Wild Horse Range
NWR	National Wildlife Refuge
OG	Operations Group
PBO	Programmatic Biological Opinion
PIF	Partners in Flight
PL	Public Law
PRECIP	average annual precipitation
RCP	Representative Concentration Pathway
RMP	Resource Management Plan
RPA	Remotely Piloted Aircraft
SAR	Small Arms Range
SOCP	Species of Conservation Priority
SWANCC	Solid Waste Agency of Northern Cook County
TAVE	average annual temperature
TPECR	Tolicha Peak Electronic Combat Range
U.S.	United States
US-95	U.S. Highway 95
USACE	Unites States Army Corps of Engineers
USAF	United States Air Force
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USNVC	United States National Vegetation Classification
WAPT	Wildlife Action Plan Team
WFMP	Wildland Fire Management Plan
WOTUS	Waters of the United States
WSA	Wilderness Study Area

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13.0 DEFINITIONS

13.1 Standard Definitions (Applicable To All USAF Installations)

Natural Resources Playbook – Definitions Section

14.0 APPENDICES

14.1 Appendix A. Annotated Summary of Key Legislation Related to INRMP Design and Implementation

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, PL 101-189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, PL 101-511; Legacy Resource Management Program	Establishes the "Legacy Resource Management Program" for natural and cultural resources. Program emphasis is on inventory and stewardship responsibilities of biological, geophysical, cultural, and historical resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, Protection and Enhancement of Environmental Quality	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, Protection and Enhancement of the Cultural Environment	All federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, Exotic Organisms	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters that they administer.
EO 11988, Floodplain Management	Provides direction regarding actions of federal agencies in floodplains, and requires permits from state, territory and federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of federal lands and facilities.
EO 11989, Off-Road vehicles on Public Lands	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historical resources are observed.
EO 11990, Protection of Wetlands	Requires federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands have been implemented; also requires federal agencies to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of federal lands and facilities; and (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

EO 12088, Federal Compliance With Pollution Control Standards	Delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. Gives the U.S. Environmental Protection Agency (US EPA) authority to conduct reviews and inspections to monitor federal facility compliance with pollution control standards.
EO 12898, Environmental Justice	Requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, Exotic and Invasive Species	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	The U.S. Fish and Wildlife Service (USFWS) has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act; 7 U.S.C. § 426-426b, 47 Stat. 1468	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16U.S.C. 668-668c	Provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act; 42 U.S.C. § 7401– 7671q, 14 July 1955, as amended	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish federal standards for air pollutants. It is designed to improve air quality in areas of the country that do not meet federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as Amended (Superfund); 26 U.S.C. § 4611–4682, PL 96-510, 94 Stat. 2797	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up standards, assign liability, and other efforts to address environmental contaminants. IRP guides cleanups at DoD installations.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Endangered Species Act (ESA) of 1973, as amended; PL 93-205, 16 U.S.C. § 1531 et seq.	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service, and preparation of a biological evaluation or a Biological Assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937; 16 U.S.C. § 669–669i; 50 Stat. 917 (Pittman-Robertson Act)	Provides federal aid to states and territories for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities, and hunter education.
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only in accordance with their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Policy and Management Act of 1976, as amended; 43 U.S.C. § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values, and to preserve and protect certain lands in their natural condition for fish and wildlife habitat. Also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 2814 of 7 U.S.C.	Provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Federal Water Pollution Control Act (Clean Water Act [CWA]); 33 U.S.C. §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the US EPA.
Fish and Wildlife Conservation Act; 16 U.S.C. § 2901–2911; 94 Stat. 1322, PL 96-366	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act; 16 U.S.C. § 661 et seq.	Directs installations to consult with the USFWS, or state or territorial agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.
Lacey Act of 1900; 16 U.S.C. § 701, 702, 32 Stat. 187, 32 Stat. 285	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 U.S.C. § 2667, as amended	Authorizes the DoD to lease to commercial enterprises federal land not currently needed for public use. Covers agricultural outleasing program.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Migratory Bird Treaty Act 16 U.S.C. § 703–712	Implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.
National Environmental Policy Act of 1969 (NEPA), as amended; PL 91-190, 42 U.S.C. § 4321 et seq.	Requires federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality (CEQ) created Regulations for Implementing the National Environmental Policy Act [40 Code of Federal Regulations (CFR) Parts 1500– 1508], which provide regulations applicable to and binding on all federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act; 54 U.S.C. § 300101 et seq.	Requires federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act; 16 U.S.C. § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.
National Wildlife Refuge System Administration Act of 1966; 16 U.S.C. § 668dd–668ee	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990; 25 U.S.C. § 3001–13; 104 Stat. 3042, as amended	Establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on federal lands. Includes requirements on inventory and notification.
Rivers and Harbors Act of 1899; 33 U.S.C. § 401 et seq.	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the U.S. without a federal permit. Installations should coordinate with the U.S. Army Corps of Engineers (USACE) to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken, as permitted by the USACE.
Sale of certain interests in land, 10 U.S.C. § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

Soil and Water Conservation Act; 16 U.S.C. § 2001, PL 95-193	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other federal and local programs.
Sikes Act; 16 U.S.C. § 670a–670l, 74 Stat. 1052, as amended	Provides for the cooperation of DoD, the Departments of the Interior (USFWS), and the state fish and game department in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an Integrated Natural Resources Management Plan and public access to natural resources, and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 U.S.C. § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, 4 August 1983 (Revised 29 May 2003) does not apply to the development, implementation, and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for the conservation and management of natural resources.
Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV), dated 29 January 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.
DoD Policy, Directives, and Instructions	
DoDI 4150.07 DoD Pest Management Program, dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoDI 4715.03, Natural Resources Conservation Program	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.

Appendix A. Annotated summary of key legislation related to design and implementation of the INRMP.

DoDM 4715.03	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP. Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review. Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process (EIAP).	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an EA or an EIS.
AFI 32-7062, Air Force Comprehensive Planning	Provides guidance and responsibilities related to the USAF comprehensive planning process on all USAF-controlled lands.
AFI 32-7064, Integrated Natural Resources Management	Implements AFPD 32-70, Environmental Quality; DoDI 4715.03, Natural Resources Conservation Program; and DoDI 7310.5, Accounting for Sale of Forest Products. It explains how to manage natural resources on USAF property in compliance with federal, state, territorial, and local standards.
AFI 32-7065, Cultural Resources Management	This instruction implements AFPD 32-70 and DoDI 4710.1, Archaeological and Historic Resources Management. It explains how to manage cultural resources on USAF property in compliance with federal, state, territorial, and local standards.
AFPD 32-70, Environmental Quality	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly for the irreplaceable natural and cultural resources it holds in public trust, and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.

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14.2 Appendix B. Fauna of NAFB, CAFB, and NTTR

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Great Basin Spadefoot Toad	*Spea intermontana*	Scaphiopodidae	Anura
Woodhouse's Toad	*Anaxyrus woodhousii*	Bufonidae	Anura
Desert Tortoise	*Gopherus agassizii*	Testudinidae	Testudines
Great Basin Collared Lizard	*Crotaphytus bicintores*	Crotaphytidae	Squamata
Long-nosed Leopard Lizard	*Gambelia wislizenii*	Crotaphytidae	Squamata
Coachwhip	*Coluber flagellum*	Colubridae	Squamata
Glossy Snake	*Arizona elegans*	Colubridae	Squamata
Western Long-nosed Snake	*Rhinocheilus lecontei*	Colubridae	Squamata
Spotted Leaf-nosed Snake	*Phyllorhynchus decurtatus*	Colubridae	Squamata
Desert Night Snake	*Hypsiglena chlorophaea*	Colubridae	Squamata
California Kingsnake	*Lampropeltis california*	Colubridae	Squamata
Great Basin Gopher Snake	*Pituophis catenifer*	Colubridae	Squamata
Striped Whipsnake	*Coluber taeniatus*	Colubridae	Squamata
Mojave Patch-nosed Snake	*Salvadora hexalepis mojavensis*	Colubridae	Squamata
Western Banded Gecko	*Coleonyx variegatus*	Eublepharidae	Squamata
Mediterranean Gecko	*Hemidactylus turcicus*	Gekkonidae	Squamata
Rough-tailed Bowfoot Gecko	*Cyrtopodion scabrum*	Gekkonidae	Squamata
Banded Gila Monster	*Heloderma suspectum cinctum*	Helodermatidae	Squamata
Chuckwalla	*Sauromalus ater*	Iguanidae	Squamata
Desert Iguana	*Dipsosaurus dorsalis*	Iguanidae	Squamata
Desert Horned Lizard	*Phrynosoma platyrhinos*	Phrynosomatidae	Squamata
Zebra-tailed Lizard	*Callisaurus draconoides*	Phrynosomatidae	Squamata
Sagebrush Lizard	*Sceloporus graciosus*	Phrynosomatidae	Squamata
Side-blotched lizard	*Uta stansburiana*	Phrynosomatidae	Squamata
Yellow-backed Spiny Lizard	*Sceloporus uniformis*	Phrynosomatidae	Squamata
Great Basin Fence Lizard	*Sceloporus occidentalis longipes*	Phrynosomatidae	Squamata

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Western Skink	*Plestiodon skiltonianus*	Scincidae	Squamata
Western Red-tailed Skink	*Plestiodon gilberti rubricaudatus*	Scincidae	Squamata
Great Basin Whiptail	*Aspidoscelis tigris*	Teiidae	Squamata
Great Basin Rattlesnake	*Crotalus oreganus lutosus*	Viperidae	Squamata
Panamint Rattlesnake	*Crotalus stephensi*	Viperidae	Squamata
Sidewinder Rattlesnake	*Crotalus cerastes*	Viperidae	Squamata
Southwestern Speckled Rattlesnake	*Crotalus pyrrhus*	Viperidae	Squamata
Desert Night Lizard	*Xantusia vigilis*	Xantusiidae	Squamata
Cooper's Hawk	*Accipiter cooperii*	Accipitridae	Accipitriformes
Sharp-shinned Hawk	*Accipiter striatus*	Accipitridae	Accipitriformes
Northern Goshawk	*Accipiter gentilis*	Accipitridae	Accipitriformes
Golden Eagle	*Aquila chrysaetos*	Accipitridae	Accipitriformes
Red-tailed Hawk	*Buteo jamaicensis*	Accipitridae	Accipitriformes
Rough-legged Hawk	*Buteo lagopus*	Accipitridae	Accipitriformes
Ferruginous Hawk	*Buteo regalis*	Accipitridae	Accipitriformes
Swainson's Hawk	*Buteo swainsoni*	Accipitridae	Accipitriformes
Northern Harrier	*Circus cyaneus*	Accipitridae	Accipitriformes
Turkey Vulture	*Cathartes aura*	Cathartidae	Accipitriformes
Merlin	*Falco columbarius*	Falconidae	Accipitriformes
Prairie Falcon	*Falco mexicanus*	Falconidae	Accipitriformes
Peregrine Falcon	*Falco peregrinus*	Falconidae	Accipitriformes
American Kestrel	*Falco sparverius*	Falconidae	Accipitriformes
American Wigeon	*Anas americana*	Anatidae	Anseriformes
Blue-winged Teal	*Anas discors*	Anatidae	Anseriformes
Bufflehead	*Bucephala albeola*	Anatidae	Anseriformes
Canada Goose	*Branta canadensis*	Anatidae	Anseriformes
Cinnamon Teal	*Anas cyanoptera*	Anatidae	Anseriformes
Common Goldeneye	*Bucephala clangula*	Anatidae	Anseriformes
Common Merganser	*Mergus merganser*	Anatidae	Anseriformes

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Gadwall	*Anas strepera*	Anatidae	Anseriformes
Green-winged Teal	*Anas crecca*	Anatidae	Anseriformes
Lesser Scaup	*Aythya affinis*	Anatidae	Anseriformes
Mallard	*Anas platyrhynchos*	Anatidae	Anseriformes
Northern Pintail	*Anas acuta*	Anatidae	Anseriformes
Northern Shoveler	*Anas clypeata*	Anatidae	Anseriformes
Redhead	*Aythya americana*	Anatidae	Anseriformes
Ring-necked Duck	*Aythya collaris*	Anatidae	Anseriformes
Ruddy Duck	*Oxyura jamaicensis*	Anatidae	Anseriformes
Snow Goose	*Chen caerulescens*	Anatidae	Anseriformes
White-throated Swift	*Aeronautes saxatalis*	Apdodidae	Apodiformes
Anna's Hummingbird	*Calypte anna*	Trochilidae	Apodiformes
Black-chinned Hummingbird	*Archilochus alexandri*	Trochilidae	Apodiformes
Broad-tailed Hummingbird	*Selasphorus platycerus*	Trochilidae	Apodiformes
Costa's Hummingbird	*Calypte costae*	Trochilidae	Apodiformes
Rufous Hummingbird	*Selasphorus rufus*	Trochilidae	Apodiformes
Common Nighthawk	*Chordeiles minor*	Caprimuligiade	Caprimuligiformes
Lesser Nighthawk	*Chordeiles acutipennis*	Caprimuligiade	Caprimuligiformes
Killdeer	*Charadrius vociferus*	Charadriidae	Charadriiformes
California Gull	*Larus californicus*	Laridae	Charadriiformes
Ring-billed Gull	*Larus delawarensis*	Laridae	Charadriiformes
American Avocet	*Recurvirostra americana*	Recurvirostridae	Charadriiformes
Black-necked Stilt	*Himantopus mexicanus*	Recurvirostridae	Charadriiformes
Greater Yellowlegs	*Tringa melanoleuca*	Scolopacidae	Charadriiformes
Least Sandpiper	*Calidris minutilla*	Scolopacidae	Charadriiformes
Lesser Yellowlegs	*Tringa flavipes*	Scolopacidae	Charadriiformes
Red-necked Phalarope	*Phalaropus lobatus*	Scolopacidae	Charadriiformes
Short-billed Dowitcher	*Limnodromus griseus*	Scolopacidae	Charadriiformes
Spotted Sandpiper	*Actitis macularius*	Scolopacidae	Charadriiformes

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Western Sandpiper	*Calidris mauri*	Scolopacidae	Charadriiformes
Wilson's Phalarope	*Phalaropus tricolor*	Scolopacidae	Charadriiformes
Wilson's Snipe	*Gallinago delicata*	Scolopacidae	Charadriiformes
Eurasian Collared-Dove	*Streptopelia decaocto*	Columbidae	Columbiformes
Inca Dove	*Columbina inca*	Columbidae	Columbiformes
Mourning Dove	*Zenaida macroura*	Columbidae	Columbiformes
Rock Pigeon	*Columba livia*	Columbidae	Columbiformes
White-winged Dove	*Zenaida asiatica*	Columbidae	Columbiformes
Belted Kingfisher	*Megaceryle alcyon*	Alcedinidae	Coraciformes
Greater Roadrunner	*Geococcyx californianus*	Cuculidae	Cuculiformes
California Quail	*Callipepla californica*	Odoontophoridae	Galliformes
Gambel's Quail	*Callipepla gambelii*	Odoontophoridae	Galliformes
Chukar	*Alectoris chukar*	Phasianidae	Galliformes
Greater Sage-grouse	*Centrocerus urophasianus*	Phasianidae	Galliformes
Common Moorhen	*Gallinula chloropus*	Rallidae	Galliformes
American Coot	*Fulica americana*	Rallidae	Galliformes
Sora	*Porzana carolina*	Rallidae	Galliformes
Bushtit	*Psaltriparus minimus*	Aegithalidae	Passeriformes
Horned Lark	*Eremophila alpestris*	Alaudidae	Passeriformes
Cedar Waxwing	*Bombycilla cedrorum*	Bombycillidae	Passeriformes
Summer Tanager	*Piranga rubra*	Cardinalidae	Passeriformes
Western Tanager	*Piranga ludoviciana*	Cardinalidae	Passeriformes
Black-headed Grosbeak	*Pheucticus melanocephalus*	Cardinalidae	Passeriformes
Pine Grosbeak	*Pinicola enucleator*	Cardinalidae	Passeriformes
Clark's Nutcracker	*Nucifraga columbiana*	Corvidae	Passeriformes
Common Raven	*Corvus corax*	Corvidae	Passeriformes
Pinyon Jay	*Gymnorhinus cyanocephalus*	Corvidae	Passeriformes
Steller's Jay	*Cyanocitta stelleri*	Corvidae	Passeriformes
Woodhouse's Scrub-jay	*Aphelocoma woodhouseii*	Corvidae	Passeriformes

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Black-throated Sparrow	*Amphispiza bilineata*	Emberizidae	Passeriformes
Brewer's Sparrow	*Spizella breweri*	Emberizidae	Passeriformes
Chipping Sparrow	*Spizella passerina*	Emberizidae	Passeriformes
Clay-colored Sparrow	*Spizella pallida*	Emberizidae	Passeriformes
Dark-eyed Junco	*Junco hyemalis*	Emberizidae	Passeriformes
Green-tailed Towhee	*Pipilo chlorurus*	Emberizidae	Passeriformes
Lark Bunting	*Calamospiza melanocorys*	Emberizidae	Passeriformes
Lark Sparrow	*Chondestes grammacus*	Emberizidae	Passeriformes
Lazuli Bunting	*Passerina amoena*	Emberizidae	Passeriformes
Lincoln's Sparrow	*Melospiza lincolnii*	Emberizidae	Passeriformes
Sagebrush Sparrow	*Artemisiospiza nevadensis*	Emberizidae	Passeriformes
Savannah Sparrow	*Passerculus sandwichensis*	Emberizidae	Passeriformes
Song Sparrow	*Melospiza melodia*	Emberizidae	Passeriformes
Spotted Towhee	*Pipilo maculatus*	Emberizidae	Passeriformes
Vesper Sparrow	*Pooecetes gramineus*	Emberizidae	Passeriformes
White-crowned Sparrow	*Zonotrichia leucophrys*	Emberizidae	Passeriformes
Black-chinned Sparrow	*Spizella atrogularis*	Emberizidae	Passeriformes
Abert's Towhee	*Melozone aberti*	Emberizidae	Passeriformes
Cassin's Finch	*Haemorhous cassinii*	Fringillidae	Passeriformes
Evening Grosbeak	*Hesperiphona vespertina*	Fringillidae	Passeriformes
House Finch	*Haemorhous mexicanus*	Fringillidae	Passeriformes
American Goldfinch	*Spinus tristis*	Fringillidae	Passeriformes
Lesser Goldfinch	*Spinus psaitria*	Fringillidae	Passeriformes
Pine Siskin	*Spinus pinus*	Fringillidae	Passeriformes
Bank Swallow	*Riparia*	Hirundinidae	Passeriformes
Barn Swallow	*Hirundo rustica*	Hirundinidae	Passeriformes
Cliff Swallow	*Petrochelidon pyrrhonota*	Hirundinidae	Passeriformes
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Hirundinidae	Passeriformes
Tree Swallow	*Tachycineta bicolor*	Hirundinidae	Passeriformes

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Violet-green Swallow	*Tachycineta thalassina*	Hirundinidae	Passeriformes
Brewer's Blackbird	*Euphagus cyanocephalus*	Icteridae	Passeriformes
Brown-headed Cowbird	*Molothrus ater*	Icteridae	Passeriformes
Bullock's Oriole	*Icterus bullockii*	Icteridae	Passeriformes
Great-tailed Grackle	*Quiscalus mexicanus*	Icteridae	Passeriformes
Hooded Oriole	*Icterus cucullatus*	Icteridae	Passeriformes
Red-winged Blackbird	*Agelaius phoeniceus*	Icteridae	Passeriformes
Scott's Oriole	*Icterus parisorum*	Icteridae	Passeriformes
Yellow-headed Blackbird	*Xanthocephalus*	Icteridae	Passeriformes
Western Meadowlark	*Sturnella neglecta*	Icteridae	Passeriformes
Loggerhead Shrike	*Lanius ludovicianus*	Laniidae	Passeriformes
Crissal Thrasher	*Toxostoma crissale*	Mimidae	Passeriformes
Sage Thrasher	*Oreoscoptes montanus*	Mimidae	Passeriformes
Le Conte’s Thrasher	*Toxostoma lecontei*	Mimidae	Passeriformes
Gray Catbird	*Dumetella carolinensis*	Mimidae	Passeriformes
Northern Mockingbird	*Mimus polyglottos*	Mimidae	Passeriformes
American Pipit	*Anthus rubescens*	Motacillidae	Passeriformes
Juniper Titmouse	*Baeolophus ridgwayi*	Paridae	Passeriformes
Mountain Chickadee	*Poecile gambeli*	Paridae	Passeriformes
Black-throated Gray Warbler	*Setophaga nigrescens*	Parulidae	Passeriformes
Lucy's Warbler	*Leiothlypis luciae*	Parulidae	Passeriformes
MacGillivray's Warbler	*Geothlypis tolmiei*	Parulidae	Passeriformes
Palm Warbler	*Setophaga palmarum*	Parulidae	Passeriformes
Townsend's Warbler	*Setophaga townsendi*	Parulidae	Passeriformes
Wilson's Warbler	*Cardellina pusilla*	Parulidae	Passeriformes
Yellow Warbler	*Setophaga petechia*	Parulidae	Passeriformes
Yellow-breasted Chat	*Icteria virens*	Parulidae	Passeriformes
Yellow-rumped Warbler	*Setophaga coronata*	Parulidae	Passeriformes
Orange-crowned Warbler	*Leiothlypis celata*	Parulidae	Passeriformes

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Common Name	Scientific Name	Family	Order
Common Yellowthroat	*Geothlypis trichas*	Parulidae	Passeriformes
Louisiana Waterthrush	*Parkesia motacilla*	Parulidae	Passeriformes
House Sparrow	*Passer domesticus*	Passeridae	Passeriformes
Black-tailed Gnatcatcher	*Polioptila melanura*	Polioptilidae	Passeriformes
Blue-gray Gnatcatcher	*Polioptila caerulea*	Polioptilidae	Passeriformes
Phainopepla	*Phainopepla nitens*	Ptilogonatidae	Passeriformes
Ruby-crowned Kinglet	*Regulus calendula*	Regulidae	Passeriformes
Verdin	*Auriparus flaviceps*	Remizidae	Passeriformes
Red-breasted Nuthatch	*Sitta canadensis*	Sittidae	Passeriformes
White-breasted Nuthatch	*Sitta carolinensis*	Sittidae	Passeriformes
European Starling	*Sturnus vulgaris*	Sturnidae	Passeriformes
Bewick's Wren	*Thryomanes bewickii*	Troglodytidae	Passeriformes
Cactus Wren	*Campylorhynchus brunneicapillus*	Troglodytidae	Passeriformes
Canyon Wren	*Catherpes mexicanus*	Troglodytidae	Passeriformes
House Wren	*Troglodytes aedon*	Troglodytidae	Passeriformes
Rock Wren	*Salpinctes obsoletus*	Troglodytidae	Passeriformes
Townsend's Solitaire	*Myadestes townsendi*	Turdidae	Passeriformes
Hermit Thrush	*Catharus guttatus*	Turdidae	Passeriformes
American Robin	*Turdus migratorius*	Turdidae	Passeriformes
Mountain Bluebird	*Sialia currucoides*	Turdidae	Passeriformes
Western Bluebird	*Sialia mexicana*	Turdidae	Passeriformes
Ash-throated Flycatcher	*Myiarchus cinerascens*	Tyrannidae	Passeriformes
Black Phoebe	*Sayornis nigricans*	Tyrannidae	Passeriformes
Dusky Flycatcher	*Empidonax oberholseri*	Tyrannidae	Passeriformes
Gray Flycatcher	*Empidonax wrightii*	Tyrannidae	Passeriformes
Least Flycatcher	*Empidonax minimus*	Tyrannidae	Passeriformes
Say's Phoebe	*Sayornis saya*	Tyrannidae	Passeriformes
Vermilion Flycatcher	*Pyrocephalus rubinus*	Tyrannidae	Passeriformes
Western Kingbird	*Tyrannus verticalis*	Tyrannidae	Passeriformes

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Western Wood-Pewee	*Contopus sordidulus*	Tyrannidae	Passeriformes
Willow Flycatcher	*Empidonax traillii*	Tyrannidae	Passeriformes
Plumbeous Vireo	*Vireo plumbeus*	Vireonidae	Passeriformes
Bell's Vireo	*Vireo bellii*	Vireonidae	Passeriformes
Cassin's Vireo	*Vireo cassinii*	Vireonidae	Passeriformes
Gray Vireo	*Vireo vicinior*	Vireonidae	Passeriformes
Black-crowned Night- Heron	*Nycticorax*	Ardeidae	Pelecaniformes
Great Blue Heron	*Ardea herodias*	Ardeidae	Pelecaniformes
Snowy Egret	*Egretta thula*	Ardeidae	Pelecaniformes
Great Egret	*Ardea alba*	Ardeidae	Pelecaniformes
White-faced Ibis	*Plegadis chihi*	Threskiornithidae	Pelecaniformes
Hairy Woodpecker	*Picoides villosus*	Picidae	Piciformes
Ladder-backed Woodpecker	*Picoides scalaris*	Picidae	Piciformes
Lewis's Woodpecker	*Melanerpes lewis*	Picidae	Piciformes
Northern Flicker	*Colaptes auratus*	Picidae	Piciformes
Red-breasted Sapsucker	*Sphyrapicus ruber*	Picidae	Piciformes
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Picidae	Piciformes
Eared Grebe	*Podiceps nigricollis*	Podicipedidae	Podicipediformes
Pied-billed Grebe	*Podilymbus podiceps*	Podicipedidae	Podicipediformes
Western Grebe	*Aechmophorus occidentalis*	Podicipedidae	Podicipediformes
Great Horned Owl	*Bubo virginianus*	Strigidae	Strigiformes
Long-eared Owl	*Asio otus*	Strigidae	Strigiformes
Short-eared Owl	*Asio flammeus*	Strigidae	Strigiformes
Western Burrowing Owl	*Athene cunicularia hypugea*	Strigidae	Strigiformes
Western Screech-Owl	*Megascops kennicottii*	Strigidae	Strigiformes
Northern Saw-whet Owl	*Aegolius acadicus*	Strigidae	Strigiformes
Double-crested Cormorant	*Phalacrocorax auritus*	Phalacrocoracidae	Suliformes
Pronghorn	*Antilocapra americana*	Antilocapridae	Artiodactyla
Elk	*Cervus canadensis*	Cervidae	Artiodactyla

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Mule Deer	*Odocoileus hemionus*	Cervidae	Artiodactyla
Bobcat	*Lynx rufus*	Felidae	Carnivora
Mountain Lion	*Puma concolor*	Felidae	Carnivora
Badger	*Taxadea taxus*	Mustelidae	Carnivora
Long-tailed Weasel	*Mustela frenata*	Mustelidae	Carnivora
Spotted skunk	*Spilogale gracilis*	Mustelidae	Carnivora
Ringtail	*Bassariscus astutus*	Procyonidae	Carnivora
Brazilian Free-tailed Bat	*Tadarida brasiliensis*	Molossidae	Chiroptera
Big Free-tailed Bat	*Nyctinomops macrotis*	Molossidae	Chiroptera
Western Mastiff Bat	*Eumops perotis*	Molossidae	Chiroptera
Spotted Bat	*Euderma maculatum*	Vespertilionidae	Chiroptera
Silver-haired Bat	*Lasionycteris noctivagans*	Vespertilionidae	Chiroptera
Western Red Bat	*Lasiurus blossevillii*	Vespertilionidae	Chiroptera
Hoary Bat	*Lasiurus cinereus*	Vespertilionidae	Chiroptera
Big Brown Bat	*Eptesicus fuscus*	Vespertilionidae	Chiroptera
Pallid Bat	*Antrozous pallidus*	Vespertilionidae	Chiroptera
Townsend’s Big-eared Bat	*Corynorhinus townsendii*	Vespertilionidae	Chiroptera
Southwestern Myotis	*Myotis auriculus*	Vespertilionidae	Chiroptera
California Myotis	*Myotis californicus*	Vespertilionidae	Chiroptera
Western Small-footed Myotis	*Myotis ciliolabrum*	Vespertilionidae	Chiroptera
Long-eared Myotis	*Myotis evotis*	Vespertilionidae	Chiroptera
Little Brown Myotis	*Myotis lucifugus*	Vespertilionidae	Chiroptera
Fringed Myotis	*Myotis thysanodes*	Vespertilionidae	Chiroptera
Southwest Cave Myotis	*Myotis velifer brevis*	Vespertilionidae	Chiroptera
Long-legged Myotis	*Myotis volans*	Vespertilionidae	Chiroptera
Yuma Myotis	*Myotis yumanensis*	Vespertilionidae	Chiroptera
Canyon Bat	*Parastrellus hesperus*	Vespertilionidae	Chiroptera
California leaf-nosed Bat	*Macrotus californicus*	Phyllostomidae	Chiroptera
Merriam’s Shrew	*Sorex merriami*	Soricidae	Insectivora

Appendix B. Fauna of NAFB, CAFB, and NTTR.

Common Name	Scientific Name	Family	Order
Black-tailed Jackrabbit	*Lepus californicus*	Leporidae	Lagomorpha
Desert Cottontail	*Sylvilagus audubonii*	Leporidae	Lagomorpha
Mountain Cottontail	*Sylvilagus nuttallii*	Leporidae	Lagomorpha
Pygmy Rabbit	*Brachylagus idahoensis*	Leporidae	Lagomorpha
Wild Horse	*Equus caballus*	Equidae	Perissodactyla
Burro	*Equus asinus*	Equidae	Perissodactyla
Valley Pocket Gopher	*Thomomys bottae*	Geomyidae	Rodentia
Long-tailed Pocket Mouse	*Chaetodipus formosus*	Heteromyidae	Rodentia
Desert Pocket Mouse	*Chaetodipus penicillatus*	Heteromyidae	Rodentia
Desert Kangaroo Rat	*Dipodomys deserti*	Heteromyidae	Rodentia
Merriam's Kangaroo Rat	*Dipodomys merriami*	Heteromyidae	Rodentia
Chisel-toothed Kangaroo Rat	*Dipodomys microps*	Heteromyidae	Rodentia
Ord's Kangaroo Rat	*Dipodomys ordii*	Heteromyidae	Rodentia
Dark Kangaroo Mouse	*Microdipodops megacephalus*	Heteromyidae	Rodentia
Pale Kangaroo Mouse	*Microdipodops pallidus*	Heteromyidae	Rodentia
Little Pocket Mouse	*Perognathus longimembris*	Heteromyidae	Rodentia
Great Basin Pocket Mouse	*Perognathus parvus*	Heteromyidae	Rodentia
Southern Grasshopper Mouse	*Onychomys torridus*	Muridae	Rodentia
Northern Grasshopper Mouse	*Onychomys leucogaster*	Muridae	Rodentia
Deer Mouse	*Peromyscus maniculatus*	Muridae	Rodentia
House Mouse	*Mus musculus*	Muridae	Rodentia
Desert Woodrat	*Neotoma lepida*	Muridae	Rodentia
Canyon Mouse	*Peromyscus crinitus*	Muridae	Rodentia
Pinyon Deer Mouse	*Peromyscus truei*	Muridae	Rodentia
White-tailed Antelope Squirrel	*Ammospermophilus leucurus*	Sciuridae	Rodentia
Round-tailed Ground Squirrel	*Xerospermophilus tereticaudus*	Sciuridae	Rodentia
Cliff Chipmunk	*Tamias dorsalis*	Sciuridae	Rodentia

14.3 Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
ABNAC	*Abronia nana var. covillei*	Coville's Dwarf Sand Verbena	North Range	Nyctaginaceae	Native	Y
ABVI	*Abronia villosa*	Desert Sand Verbena	North Range	Nyctaginaceae	Native	N
ACHY	*Achnatherum hymenoides*	Indian Ricegrass	South Range	Poaceae	Native	N
ACHY	*Achnatherum hymenoides*	Indian Ricegrass	North Range	Poaceae	Native	N
ACHY	*Achnatherum hymenoides*	Indian Ricegrass	NAFB	Asteraceae	Native	N
ACPA13	*Achnatherum parishii*	Parish's Needlegrass	South Range	Poaceae	Native	N
ACSH	*Acamptopappus shockleyi*	Shockley's Goldenhead	South Range	Asteraceae	Native	N
ACSH	*Acamptopappus shockleyi*	Shockley's Goldenhead	North Range	Asteraceae	Native	N
ACSP	*Acamptopappus sphaerocephalus*	Rayless Goldenhead	North Range	Asteraceae	Native	N
ACSP12	*Achnatherum speciosum*	Desert Needlegrass	North Range	Poaceae	Native	N
ACSP12	*Achnatherum speciosum*	Desert Needlegrass	South Range	Poaceae	Native	N
ADCO2	*Adenophyllum cooperi*	Cooper's Dogweed	South Range	Asteraceae	Native	N
AGEX	*Agrostis exarata*	Spike Bentgrass	North Range	Poaceae	Native	N
AGGL	*Agoseris glauca*	Pale Agoseris	North Range	Asteraceae	Native	N
AGUT	*Agave utahensis*	Utah Agave	South Range	Agavaceae	Native	N
AGUTE	*Agave utahensis var. eborispina*	Ivory-Spined Agave	South Range	Agavaceae	Native	Y
ALHE3	*Aliciella heterostyla*	Cactus Flat Gilia	North Range	Polemoniaceae	Native	Y
ALIN	*Allionia incarnata*	Trailing Windmills	South Range	Nyctaginaceae	Native	N
ALJU	*Albizia julibrissin*	Silktree	NAFB	Fabaceae	Introduced	N
ALLIU	*Allium sp.*	Onion	South Range	Liliaceae	Native	N
ALLIU	*Allium sp.*	Onion	North Range	Liliaceae	Native	N
ALNY2	*Aliciella nyensis*	Nye Gilia	North Range	Polemoniaceae	Native	Y
ALRI3	*Aliciella ripleyi*	Ripley's Gilia	South Range	Polemoniaceae	Native	Y
ALRI3	*Aliciella ripleyi*	Ripley's Gilia	South Range	Polemoniaceae	Native	Y
AMAC2	*Ambrosia acanthicarpa*	Flatspine Bur Ragweed	South Range	Asteraceae	Native	N
AMCA7	*Ambrosia canescens*	Hairy Ragweed	North Range	Asteraceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
AMDU2	*Ambrosia dumosa*	Burrobush	South Range	Asteraceae	Native	N
AMDU2	*Ambrosia dumosa*	Burrobush	North Range	Asteraceae	Native	N
AMDU2	*Ambrosia dumosa*	Burrobush	NAFB	Asteraceae	Native	N
AMER	*Ambrosia eriocentra*	Woolly Fruit Bur Ragweed	North Range	Asteraceae	Native	N
AMFI	*Amaranthus fimbriatus*	Fringed Amaranth	North Range	Amaranthaceae	Native	N
AMFR2	*Amphipappus fremontii*	Fremont's Chaffbush	South Range	Asteraceae	Native	N
AMFR2	*Amphipappus fremontii*	Fremont's Chaffbush	NAFB	Asteraceae	Native	N
AMSP	*Amaranthus spinosus*	Spiny Amaranth	South Range	Amaranthaceae	Native	N
AMTE3	*Amsinckia tessellata*	Bristly Fiddleneck	North Range	Boraginaceae	Native	N
AMTE3	*Amsinckia tessellata*	Bristly Fiddleneck	South Range	Boraginaceae	Native	N
AMTE3	*Amsinckia tessellata*	Bristly Fiddleneck	NAFB	Boraginaceae	Native	N
AMTO2	*Amsonia tomentosa*	Woolly Bluestar	South Range	Apocynaceae	Native	N
ANLA7	*Antheropeas lanosum*	White Easterbonnets	North Range	Asteraceae	Native	N
ANLA7	*Antheropeas lanosum*	White Easterbonnets	NAFB	Asteraceae	Native	N
ARAR8	*Artemisia arbuscula*	Little Sagebrush	South Range	Asteraceae	Native	N
ARAR8	*Artemisia arbuscula*	Little Sagebrush	North Range	Asteraceae	Native	N
ARBI3	*Artemisia bigelovii*	Bigelow Sage	South Range	Asteraceae	Native	N
ARCA4	*Arctomecon californica*	California Bearpoppy	South Range	Papaveraceae	Native	Y
ARCA4	*Arctomecon californica*	California Bearpoppy	NAFB	Papaveraceae	Native	Y
ARCY2	*Arceuthobium cyanocarpum*	Limber Pine Dwarf Mistletoe	North Range	Viscaceae	Native	N
ARKI	*Arenaria kingii*	King's Sandwort	South Range	Caryophyllaceae	Native	N
ARKI	*Arenaria kingii*	King's Sandwort	North Range	Caryophyllaceae	Native	N
ARLU	*Artemisia ludoviciana*	White Sagebrush	South Range	Asteraceae	Native	N
ARLU	*Artemisia ludoviciana*	White Sagebrush	North Range	Asteraceae	Native	N
ARMA3	*Arenaria macradenia*	Mojave Sandwort	South Range	Caryophyllaceae	Native	N
ARME2	*Arctomecon merriamii*	Desert Bearpoppy	South Range	Papaveraceae	Native	Y
ARME2	*Arctomecon merriamii*	Desert Bearpoppy	NAFB	Papaveraceae	Native	Y
ARMU	*Argemone munita*	Flatbud Pricklypoppy	South Range	Papaveraceae	Native	N
ARMU	*Argemone munita*	Flatbud Pricklypoppy	NAFB	Papaveraceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
ARNO4	*Artemisia nova*	Black Sagebrush	South Range	Asteraceae	Native	N
ARNO4	*Artemisia nova*	Black Sagebrush	North Range	Asteraceae	Native	N
ARPU9	*Aristida purpurea*	Purple Threeawn	South Range	Poaceae	Native	N
ARPU9	*Aristida purpurea*	Purple Threeawn	North Range	Poaceae	Native	N
ARPU9	*Aristida purpurea*	Purple Threeawn	NAFB	Poaceae	Native	N
ARSH	*Arabis shockleyi*	Shockley's Rockcress	South Range	Brassicaceae	Native	Y
ARTR2	*Artemisia tridentata*	Big Sagebrush	South Range	Asteraceae	Native	N
ARTR2	*Artemisia tridentata*	Big Sagebrush	North Range	Asteraceae	Native	N
ASAC5	*Astragalus ackermanii*	Ackerman's Milkvetch	South Range	Fabaceae	Native	Y
ASAMM2	*Astragalus amphioxys var.*	Crescent Milkvetch	South Range	Fabaceae	Native	Y
ASBE5	*Astragalus beatleyae*	Beatley's Milkvetch	North Range	Fabaceae	Native	Y
ASFU3	*Astragalus funereus*	Funeral Mountain Milkvetch	South Range	Fabaceae	Native	Y
ASFU3	*Astragalus funereus*	Funeral Mountain Milkvetch	North Range	Fabaceae	Native	Y
ASGI4	*Astragalus gilmanii*	Gilman's Milkvetch	North Range	Fabaceae	Native	Y
ASIN8	*Astragalus inyoensis*	Inyo Milkvetch	North Range	Fabaceae	Native	Y
ASLE8	*Astragalus lentiginosus*	Freckled Milkvetch	North Range	Fabaceae	Native	N
ASMO5	*Astragalus mohavensis*	Mojave Milkvetch	South Range	Fabaceae	Native	N
ASMOH	*Astragalus mohavensis var. hemigyrus*	Mojave Milkvetch	South Range	Fabaceae	Native	Y
ASNY2	*Astragalus nyensis*	Nye Milkvetch	South Range	Fabaceae	Native	Y
ASOOC2	*Astragalus oophorus var. clokeyanus*	Egg Milkvetch	North Range	Fabaceae	Native	Y
ASPU9	*Astragalus purshii*	Woollypod Milkvetch	North Range	Fabaceae	Native	N
ASSU	*Asclepias subulata*	Rush Milkweed	North Range	Asclepiadaceae	Native	N
ASUNR	*Asclepias uncialis spp. ruthiae*	Ruth's Milkweed	North Range	Asclepiadaceae	Native	Y
ATCA2	*Atriplex canescens*	Fourwing Saltbush	South Range	Chenopodiaceae	Native	N
ATCA2	*Atriplex canescens*	Fourwing Saltbush	North Range	Chenopodiaceae	Native	N
ATCA2	*Atriplex canescens*	Fourwing Saltbush	NAFB	Chenopodiaceae	Native	N
ATCO	*Atriplex confertifolia*	Shadscale Saltbush	South Range	Chenopodiaceae	Native	N
ATCO	*Atriplex confertifolia*	Shadscale Saltbush	North Range	Chenopodiaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
ATCO	*Atriplex confertifolia*	Shadscale Saltbush	NAFB	Chenopodiaceae	Native	N
ATHY	*Atriplex hymenelytra*	Desertholly	South Range	Chenopodiaceae	Native	N
ATHY	*Atriplex hymenelytra*	Desertholly	NAFB	Chenopodiaceae	Native	N
ATPA3	*Atriplex parryi*	Parry's Saltbush	North Range	Chenopodiaceae	Native	N
ATPA3	*Atriplex parryi*	Parry's Saltbush	NAFB	Chenopodiaceae	Native	N
ATPL	*Atrichoseris platyphylla*	Parachute Plant	South Range	Asteraceae	Native	N
ATPL	*Atrichoseris platyphylla*	Parachute Plant	NAFB	Asteraceae	Native	N
ATPO	*Atriplex polycarpa*	Cattle Saltbush	South Range	Chenopodiaceae	Native	N
ATPO	*Atriplex polycarpa*	Cattle Saltbush	North Range	Chenopodiaceae	Native	N
ATSP	*Atriplex spinifera*	Spinescale Saltbush	South Range	Chenopodiaceae	Native	N
ATSP	*Atriplex spinifera*	Spinescale Saltbush	North Range	Chenopodiaceae	Native	N
BAAM4	*Bassia americana*	Green Molly	South Range	Chenopodiaceae	Native	N
BAAM4	*Bassia americana*	Green Molly	North Range	Chenopodiaceae	Native	N
BACA21	*Bassia californica*	Rusty Molly	North Range	Chenopodiaceae	Native	N
BAMU	*Baileya multiradiata*	Desert Marigold	South Range	Asteraceae	Native	N
BAMU	*Baileya multiradiata*	Desert Marigold	North Range	Asteraceae	Native	N
BAMU	*Baileya multiradiata*	Desert Marigold	NAFB	Asteraceae	Native	N
BAPL3	*Baileya pleniradiata*	Woolly Desert Marigold	South Range	Asteraceae	Native	N
BAPL3	*Baileya pleniradiata*	Woolly Desert Marigold	North Range	Asteraceae	Native	N
BASA2	*Baccharis sarothroides*	Desertbroom	South Range	Asteraceae	Native	N
BASA4	*Baccharis salicifolia*	Mule-Fat	South Range	Asteraceae	Native	N
BEJU	*Bebbia juncea*	Sweetbush	South Range	Asteraceae	Native	N
BEJU	*Bebbia juncea*	Sweetbush	NAFB	Asteraceae	Native	N
BLKI	*Blepharidachne kingii*	King's Eyelashgrass	South Range	Poaceae	Native	N
BOBA2	*Bouteloua barbata*	Sixweeks Grama	North Range	Poaceae	Native	N
BOGR2	*Bouteloua gracilis*	Blue Grama	South Range	Poaceae	Native	N
BOGR3	*Bouteloua gracilis*	Blue Grama	North Range	Poaceae	Native	N
BOGR4	*Bouteloua gracilis*	Blue Grama	North Range	Poaceae	Native	N
BOGR5	*Bouteloua gracilis*	Blue Grama	North Range	Poaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
BOGR6	*Bouteloua gracilis*	Blue Grama	North Range	Poaceae	Native	N
BOGR7	*Bouteloua gracilis*	Blue Grama	North Range	Poaceae	Native	N
BOGR8	*Bouteloua gracilis*	Blue Grama	North Range	Poaceae	Native	N
BOGR9	*Bouteloua gracilis*	Blue Grama	North Range	Poaceae	Native	N
BRAR2	*Brickellia arguta*	Pungent Brickellbush	South Range	Asteraceae	Native	N
BRAT	*Brickellia atractyloides*	Spearleaf Brickellbush	South Range	Asteraceae	Native	N
BRCA3	*Brickellia californica*	California Brickellbush	North Range	Asteraceae	Native	N
BRCA5	*Bromus carinatus*	California Brome	North Range	Poaceae	Native	N
BRHO2	*Bromus hordeaceus*	Soft Brome	South Range	Poaceae	Native	N
BRIN2	*Bromus inermis*	Smooth Brome	North Range	Poaceae	Native	N
BRMAM3	*Bromus madritensis ssp. madritensis*	Compact Brome	South Range	Poaceae	Introduced	N
BRMAM3	*Bromus madritensis ssp. madritensis*	Compact Brome	North Range	Poaceae	Introduced	N
BRMAR	*Bromus madritensis ssp. rubens*	Red Brome	South Range	Poaceae	Introduced	N
BRMAR	*Bromus madritensis ssp. rubens*	Red Brome	North Range	Poaceae	Introduced	N
BRMAR	*Bromus madritensis ssp. rubens*	Red Brome	NAFB	Poaceae	Introduced	N
BRMI	*Brickellia microphylla*	Littleleaf Brickellbush	North Range	Asteraceae	Native	N
BRTE	*Bromus tectorum*	Cheatgrass	South Range	Poaceae	Introduced	N
BRTE	*Bromus tectorum*	Cheatgrass	North Range	Poaceae	Introduced	N
BRTE	*Bromus tectorum*	Cheatgrass	NAFB	Poaceae	Introduced	N
BRTO	*Brassica tournefortii*	Asian Mustard	NAFB	Brassicaceae	Introduced	N
BUUT	*Buddleja utahensis*	Utah Butterflybush	South Range	Buddlejaceae	Native	N
CAAN7	*Castilleja angustifolia*	Northwestern Indian	South Range	Scrophulariaceae	Native	N
CAAN7	*Castilleja angustifolia*	Northwestern Indian	North Range	Scrophulariaceae	Native	N
CAAND	*Castilleja angustifolia var. dubia*	Northwestern Indian	South Range	Scrophulariaceae	Native	N
CAAND	*Castilleja angustifolia var. dubia*	Northwestern Indian	North Range	Scrophulariaceae	Native	N
CAAPM	*Castilleja applegatei ssp. martinii*	Wavyleaf Indian Paintbrush	South Range	Scrophulariaceae	Native	N
CAAPM	*Castilleja applegatei ssp. martinii*	Wavyleaf Indian Paintbrush	North Range	Scrophulariaceae	Native	N
CABO7	*Camissonia boothii*	Booth's Evening Primrose	South Range	Onagraceae	Native	N
CABR23	*Camissonia brevipes*	Yellow Cups	South Range	Onagraceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
CACH12	*Camissonia chamaenerioides*	Longcapsule Suncup	North Range	Onagraceae	Native	N
CACH42	*Cardaria chalepensis*	Lenspod Whitetop	North Range	Brassicaceae	Native	N
CACL4	*Camissonia claviformis*	Browneyes	North Range	Onagraceae	Native	N
CACO18	*Caulanthus cooperi*	Cooper's Wild Cabbage	North Range	Brassicaceae	Native	N
CACR11	*Caulanthus crassicaulis*	Thickstem Wild Cabbage	North Range	Brassicaceae	Native	N
CADE9	*Carex deweyana*	Dewey Sedge	North Range	Cyperaceae	Native	N
CAFL	*Calochortus flexuosus*	Winding Mariposa Lily	NAFB	Liliaceae	Native	N
CAIN15	*Caulanthus inflatus*	Desert Candle	North Range	Brassicaceae	Native	N
CALI4	*Castilleja linariifolia*	Wyoming Indian Paintbrush	North Range	Scrophulariaceae	Native	N
CALLI12	*Callistemon sp.*	Bottlebrush	NAFB	Myrtaceae	Introduced	N
CALOC	*Calochortus sp.*	Mariposa Lily	South Range	Liliaceae	Native	N
CALOC	*Calochortus sp.*	Mariposa Lily	North Range	Liliaceae	Native	N
CAME16	*Camissonia megalantha*	Largeflower Suncup	North Range	Onagraceae	Native	Y
CAME16	*Camissonia megalantha*	Largeflower Suncup	South Range	Onagraceae	Native	Y
CAMIS	*Camissonia sp.*	Suncup	NAFB	Onagraceae	Native	N
CAPI14	*Caulanthus pilosus*	Hairy Wild Cabbage	North Range	Brassicaceae	Native	N
CAWA3	*Camissonia walkeri*	Walker's Suncup	South Range	Onagraceae	Native	N
CAWR	*Calycoseris wrightii*	White Tackstem	South Range	Asteraceae	Native	N
CAWR	*Calycoseris wrightii*	White Tackstem	North Range	Asteraceae	Native	N
CELE3	*Cercocarpus ledifolius*	Curl-Leaf Mountain Mahogany	South Range	Rosaceae	Native	N
CELE3	*Cercocarpus ledifolius*	Curl-Leaf Mountain Mahogany	North Range	Rosaceae	Native	N
CESI3	*Ceratonia siliqua*	St. John's Bread	NAFB	Fabaceae	Introduced	N
CETH3	*Centrostegia thurberi*	Red Triangles	North Range	Polygonaceae	Native	N
CHAL11	*Chamaesyce albomarginata*	Whitemargin Sandmat	South Range	Euphorbiaceae	Native	N
CHAL11	*Chamaesyce albomarginata*	Whitemargin Sandmat	North Range	Euphorbiaceae	Native	N
CHBR	*Chorizanthe brevicornu*	Brittle Spineflower	South Range	Polygonaceae	Native	N
CHBR	*Chorizanthe brevicornu*	Brittle Spineflower	North Range	Polygonaceae	Native	N

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CHBR	*Chorizanthe brevicornu*	Brittle Spineflower	NAFB	Polygonaceae	Native	N
CHCA	*Chaenactis carphoclinia*	Pebble Pincushion	South Range	Asteraceae	Native	N
CHCA	*Chaenactis carphoclinia*	Pebble Pincushion	NAFB	Asteraceae	Native	N
CHDO	*Chaenactis douglasii*	Douglas' Dustymaiden	North Range	Asteraceae	Native	N
CHENO	*Chenopodium sp.*	Goosefoot	North Range	Chenopodiaceae	Native	N
CHER2	*Chaetopappa ericoides*	Rose Heath	North Range	Asteraceae	Native	N
CHER3	*Chrysothamnus eremobius*	Pintwater Rabbitbrush	South Range	Asteraceae	Native	Y
CHFR	*Chaenactis fremontii*	Pincushion Flower	South Range	Asteraceae	Native	N
CHFR	*Chaenactis fremontii*	Pincushion Flower	North Range	Asteraceae	Native	N
CHGR6	*Chrysothamnus greenei*	Greene's Rabbitbrush	North Range	Asteraceae	Native	N
CHHU7	*Chamaerops humilis*	European Fan Palm	NAFB	Arecaceae	Unknown	N
CHLI2	*Chilopsis linearis*	Desert Willow	NAFB	Bignoniaceae	Native	N
CHRI	*Chorizanthe rigida*	Devil's Spineflower	South Range	Polygonaceae	Native	N
CHRI	*Chorizanthe rigida*	Devil's Spineflower	North Range	Polygonaceae	Native	N
CHRI	*Chorizanthe rigida*	Devil's Spineflower	NAFB	Polygonaceae	Native	N
CHST	*Chaenactis stevioides*	Esteve's Pincushion	South Range	Asteraceae	Native	N
CHST	*Chaenactis stevioides*	Esteve's Pincushion	North Range	Asteraceae	Native	N
CHVI8	*Chrysothamnus viscidiflorus*	Yellow Rabbitbrush	South Range	Asteraceae	Native	N
CHVI8	*Chrysothamnus viscidiflorus*	Yellow Rabbitbrush	North Range	Asteraceae	Native	N
CINE	*Cirsium neomexicanum*	New Mexico Thistle	South Range	Asteraceae	Native	N
CINE	*Cirsium neomexicanum*	New Mexico Thistle	North Range	Asteraceae	Native	N
CIVU	*Cirsium vulgare*	Bull Thistle	South Range	Asteraceae	Native	N
CIVU	*Cirsium vulgare*	Bull Thistle	North Range	Asteraceae	Native	N
CLEOM2	*Cleomella sp.*	Stinkweed	North Range	Capparaceae	Native	N
CORA	*Coleogyne ramosissima*	Blackbrush	South Range	Rosaceae	Native	N
CORA	*Coleogyne ramosissima*	Blackbrush	North Range	Rosaceae	Native	N
CRAN4	*Cryptantha angustifolia*	Panamint Cryptantha	South Range	Boraginaceae	Native	N
CRBA5	*Cryptantha barbigera*	Bearded Cryptantha	North Range	Boraginaceae	Native	N
CRBI2	*Crossosoma bigelovii*	Ragged Rockflower	South Range	Crossosomatace	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
CRCA5	*Croton californicus*	California Croton	South Range	Euphorbiaceae	Native	N
CRCI2	*Cryptantha circumscissa*	Cushion Cryptantha	South Range	Boraginaceae	Native	N
CRCI2	*Cryptantha circumscissa*	Cushion Cryptantha	North Range	Boraginaceae	Native	N
CRCO12	*Cryptantha confertiflora*	Basin Yellow Cryptantha	South Range	Boraginaceae	Native	N
CRCO12	*Cryptantha confertiflora*	Basin Yellow Cryptantha	North Range	Boraginaceae	Native	N
CRFU	*Cryptantha fulvocanescens*	Tawny Cryptantha	North Range	Boraginaceae	Native	N
CRGR3	*Cryptantha gracilis*	Narrowstem Cryptantha	NAFB	Boraginaceae	Native	N
CRMI	*Cryptantha micrantha*	Redroot Cryptantha	North Range	Boraginaceae	Native	N
CRNE2	*Cryptantha nevadensis*	Nevada Cryptantha	South Range	Boraginaceae	Native	N
CRNE2	*Cryptantha nevadensis*	Nevada Cryptantha	North Range	Boraginaceae	Native	N
CRNE2	*Cryptantha nevadensis*	Nevada Cryptantha	NAFB	Boraginaceae	Native	N
CRPT	*Cryptantha pterocarya*	Wingnut Cryptantha	South Range	Boraginaceae	Native	N
CRPT	*Cryptantha pterocarya*	Wingnut Cryptantha	North Range	Boraginaceae	Native	N
CRRA2	*Cryptantha racemosa*	Bushy Cryptantha	South Range	Boraginaceae	Native	N
CRRE5	*Cryptantha recurvata*	Curvenut Cryptantha	South Range	Boraginaceae	Native	N
CRRE5	*Cryptantha recurvata*	Curvenut Cryptantha	North Range	Boraginaceae	Native	N
CRUT	*Cryptantha utahensis*	Scented Cryptantha	South Range	Boraginaceae	Native	N
CRUT	*Cryptantha utahensis*	Scented Cryptantha	NAFB	Boraginaceae	Native	N
CRVI5	*Cryptantha virginensis*	Virgin River Cryptantha	South Range	Boraginaceae	Native	N
CRVI5	*Cryptantha virginensis*	Virgin River Cryptantha	North Range	Boraginaceae	Native	N
CUPA	*Cucurbita palmata*	Coyote Gourd	South Range	Cucurbitaceae	Native	N
CUSCU	*Cuscuta sp.*	Dodder	South Range	Cuscutaceae	Native	N
CUSE2	*Cupressus sempervirens*	Italian Cypress	NAFB	Cupressaceae	Unknown	N
CYAC8	*Cylindropuntia acanthocarpa*	Buck-Horn Cholla	South Range	Cactaceae	Native	N
CYAC8	*Cylindropuntia acanthocarpa*	Buck-Horn Cholla	North Range	Cactaceae	Native	N
CYEC3	*Cylindropuntia echinocarpa*	Wiggins' Cholla	South Range	Cactaceae	Native	N
CYEC3	*Cylindropuntia echinocarpa*	Wiggins' Cholla	North Range	Cactaceae	Native	N
CYEC3	*Cylindropuntia echinocarpa*	Wiggins' Cholla	NAFB	Cactaceae	Native	N
CYGI	*Cymopterus gilmanii*	Gilman's Springparsley	South Range	Apiaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
CYMU2	*Cymopterus multinervatus*	Purplenerve Springparsley	South Range	Apiaceae	Native	N
CYRA9	*Cylindropuntia ramosissima*	Branched Pencil Cholla	South Range	Cactaceae	Native	N
CYRA9	*Cylindropuntia ramosissima*	Branched Pencil Cholla	North Range	Cactaceae	Native	N
CYRE11	*Cycas revoluta*	Sago Palm	NAFB	Cycadaceae	Introduced	N
CYRI2	*Cymopterus ripleyi*	Ripley's Springparsley	North Range	Apiaceae	Native	N
CYRI2	*Cymopterus ripleyi*	Ripley's Springparsley	South Range	Apiaceae	Native	N
CYRIS	*Cymopterus ripleyi var. saniculoides*	Ripley's Springparsley	North Range	Apiaceae	Native	Y
DAPU7	*Dasyochloa pulchella*	Low Woollygrass	South Range	Poaceae	Native	N
DAPU7	*Dasyochloa pulchella*	Low Woollygrass	North Range	Poaceae	Native	N
DAPU7	*Dasyochloa pulchella*	Low Woollygrass	NAFB	Poaceae	Native	N
DAWR2	*Datura wrightii*	Sacred Thorn-Apple	South Range	Solanaceae	Native	N
DEPA	*Delphinium parishii*	Desert Larkspur	South Range	Ranunculaceae	Native	N
DEPA	*Delphinium parishii*	Desert Larkspur	North Range	Ranunculaceae	Native	N
DEPI	*Descurainia pinnata*	Western Tansymustard	South Range	Brassicaceae	Native	N
DEPI	*Descurainia pinnata*	Western Tansymustard	North Range	Brassicaceae	Native	N
DESCU	*Descurainia sp.*	Tansy Mustard	NAFB	Brassicaceae	Introduced	N
DESO2	*Descurainia sophia*	Herb Sophia	North Range	Brassicaceae	Introduced	N
DICA14	*Dichelostemma capitatum*	Bluedicks	South Range	Liliaceae	Native	N
DICA14	*Dichelostemma capitatum*	Bluedicks	North Range	Liliaceae	Native	N
DICA4	*Dicoria canescens*	Desert Twinbugs	South Range	Asteraceae	Native	N
DISP	*Distichlis spicata*	Saltgrass	North Range	Poaceae	Native	N
DODEC	*Dodecatheon sp.*	Shootingstar	North Range	Primulaceae	Native	N
EBEB	*Ebenopsis ebano*	Texas Ebony	NAFB	Fabaceae	Unknown	N
ECCO5	*Echinocereus coccineus*	Scarlet Hedgehog Cactus	North Range	Cactaceae	Native	N
ECEN	*Echinocereus engelmannii*	Engelmann's Hedgehog	South Range	Cactaceae	Native	N
ECEN	*Echinocereus engelmannii*	Engelmann's Hedgehog	North Range	Cactaceae	Native	N
ECEN	*Echinocereus engelmannii*	Engelmann's Hedgehog	NAFB	Cactaceae	Native	N
ECJO3	*Echinomastus johnsonii*	Johnson's Fishhook Cactus	North Range	Cactaceae	Native	N
ECJO3	*Echinomastus johnsonii*	Johnson's Fishhook Cactus	NAFB	Cactaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
ECMO	*Echinocereus mojavensis*	Mojave Kingcup Cactus	North Range	Cactaceae	Native	N
ECPO2	*Echinocactus polycephalus*	Cottontop Cactus	South Range	Cactaceae	Native	N
ECPO2	*Echinocactus polycephalus*	Cottontop Cactus	North Range	Cactaceae	Native	N
ECPO2	*Echinocactus polycephalus*	Cottontop Cactus	NAFB	Cactaceae	Native	N
ELEL5	*Elymus elymoides*	Squirreltail	South Range	Poaceae	Native	N
ELEL5	*Elymus elymoides*	Squirreltail	North Range	Poaceae	Native	N
ELEL5	*Elymus elymoides*	Squirreltail	NAFB	Poaceae	Native	N
ELEOC	*Eleocharis sp.*	Spikerush	North Range	Cyperaceae	Native	N
ELMU3	*Elymus multisetus*	Big Squirreltail	North Range	Poaceae	Native	N
ELTR7	*Elymus trachycaulus*	Slender Wheatgrass	North Range	Poaceae	Native	N
ENAC	*Encelia actonii*	Acton's Brittlebush	South Range	Asteraceae	Native	N
ENAC	*Encelia actonii*	Acton's Brittlebush	North Range	Asteraceae	Native	N
ENCO	*Enceliopsis covillei*	Panamint Daisy	South Range	Asteraceae	Native	N
ENFA	*Encelia farinosa*	Brittlebush	South Range	Asteraceae	Native	N
ENFA	*Encelia farinosa*	Brittlebush	North Range	Asteraceae	Native	N
ENFA	*Encelia farinosa*	Brittlebush	NAFB	Asteraceae	Native	N
ENFR	*Encelia frutescens*	Button Brittlebush	South Range	Asteraceae	Native	N
ENFR	*Encelia frutescens*	Button Brittlebush	NAFB	Asteraceae	Native	N
ENNU	*Enceliopsis nudicaulis*	Nakedstem Sunray	South Range	Asteraceae	Native	N
ENVI	*Encelia virginensis*	Virgin River Brittlebush	South Range	Asteraceae	Native	N
ENVI	*Encelia virginensis*	Virgin River Brittlebush	North Range	Asteraceae	Native	N
EPCA2	*Ephedra californica*	California Jointfir	South Range	Ephedraceae	Native	N
EPCI	*Epilobium ciliatum*	Fringed Willowherb	North Range	Onagraceae	Native	N
EPFU	*Ephedra funerea*	Death Valley Jointfir	South Range	Ephedraceae	Native	N
EPFU	*Ephedra funerea*	Death Valley Jointfir	NAFB	Ephedraceae	Native	N
EPNE	*Ephedra nevadensis*	Nevada Jointfir	South Range	Ephedraceae	Native	N
EPNE	*Ephedra nevadensis*	Nevada Jointfir	North Range	Ephedraceae	Native	N
EPNE	*Ephedra nevadensis*	Nevada Jointfir	NAFB	Ephedraceae	Native	N
EPTO	*Ephedra torreyana*	Torrey's Jointfir	South Range	Ephedraceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
EPTR	*Ephedra trifurca*	Longleaf Jointfir	South Range	Ephedraceae	Native	N
EPTR	*Ephedra trifurca*	Longleaf Jointfir	NAFB	Ephedraceae	Native	N
EPVI	*Ephedra viridis*	Mormon Tea	South Range	Ephedraceae	Native	N
EPVI	*Ephedra viridis*	Mormon Tea	North Range	Ephedraceae	Native	N
EPVI	*Ephedra viridis*	Mormon Tea	NAFB	Ephedraceae	Native	N
ERAGR	*Eragrostis sp.*	Lovegrass	North Range	Poaceae	Native	N
ERAN8	*Eriogonum anemophilum*	West Humboldt Buckwheat	South Range	Polygonaceae	Native	N
ERAN8	*Eriogonum anemophilum*	West Humboldt Buckwheat	North Range	Polygonaceae	Native	N
ERAP	*Erigeron aphanactis*	Rayless Shaggy Fleabane	North Range	Asteraceae	Native	N
ERCA8	*Eriogonum caespitosum*	Matted Buckwheat	North Range	Polygonaceae	Native	N
ERCE3	*Ericameria cervina*	Deer Goldenbush	North Range	Asteraceae	Native	Y
ERCI6	*Erodium cicutarium*	Redstem Stork's Bill	South Range	Geraniaceae	Native	N
ERCI6	*Erodium cicutarium*	Redstem Stork's Bill	North Range	Geraniaceae	Native	N
ERCO18	*Eriogonum concinnum*	Mourning Buckwheat	North Range	Polygonaceae	Native	Y
ERCO23	*Ericameria cooperi*	Cooper's Goldenbush	South Range	Asteraceae	Native	N
ERCO23	*Ericameria cooperi*	Cooper's Goldenbush	North Range	Asteraceae	Native	N
ERCO23	*Ericameria cooperi*	Cooper's Goldenbush	NAFB	Asteraceae	Native	N
ERCON	*Eriogonum corymbosum var. nilesii*	Las Vegas Wild Buckwheat	NAFB	Polygonaceae	Native	Y
ERDA	*Eriogonum darrovii*	Darrow's Buckwheat	North Range	Polygonaceae	Native	Y
ERDE6	*Eriogonum deflexum*	Flatcrown Buckwheat	South Range	Polygonaceae	Native	N
ERDE6	*Eriogonum deflexum*	Flatcrown Buckwheat	North Range	Polygonaceae	Native	N
ERDE6	*Eriogonum deflexum*	Flatcrown Buckwheat	NAFB	Polygonaceae	Native	N
ERDI14	*Ericameria discoidea*	Whitestem Goldenbush	North Range	Asteraceae	Native	N
ERDI2	*Eriastrum diffusum*	Miniature Woollystar	North Range	Asteraceae	Native	N
ERFA2	*Eriogonum fasciculatum*	Eastern Mojave Buckwheat	South Range	Polygonaceae	Native	N
ERFA2	*Eriogonum fasciculatum*	Eastern Mojave Buckwheat	North Range	Polygonaceae	Native	N
ERFA2	*Eriogonum fasciculatum*	Eastern Mojave Buckwheat	NAFB	Polygonaceae	Native	N
ERHE	*Eriogonum heermannii*	Heermann's Buckwheat	South Range	Polygonaceae	Native	N
ERHE	*Eriogonum heermannii*	Heermann's Buckwheat	North Range	Polygonaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
ERHEC	*Eriogonum heermannii var. clokeyi*	Clokey's Buckwheat	South Range	Polygonaceae	Native	Y
ERIN4	*Eriogonum inflatum*	Desert Trumpet	South Range	Polygonaceae	Native	N
ERIN4	*Eriogonum inflatum*	Desert Trumpet	North Range	Polygonaceae	Native	N
ERIN4	*Eriogonum inflatum*	Desert Trumpet	NAFB	Polygonaceae	Native	N
ERMI4	*Eriogonum microthecum*	Slender Buckwheat	South Range	Polygonaceae	Native	N
ERMI4	*Eriogonum microthecum*	Slender Buckwheat	North Range	Polygonaceae	Native	N
ERNA10	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNA10	*Ericameria nauseosa*	Rubber Rabbitbrush	South Range	Asteraceae	Native	N
ERNA10	*Ericameria nauseosa*	Rubber Rabbitbrush	North Range	Asteraceae	Native	N
ERNA11	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNA12	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNA13	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNA14	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNA7	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNA8	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNA9	*Ericameria nana*	Dwarf Goldenbush	North Range	Asteraceae	Native	N
ERNI4	*Eriogonum nidularium*	Birdnest Buckwheat	North Range	Polygonaceae	Native	N
EROV	*Eriogonum ovalifolium*	Cushion Buckwheat	North Range	Polygonaceae	Native	N
EROV2	*Erigeron ovinus*	Sheep Fleabane	North Range	Asteraceae	Native	Y
ERPA11	*Eriogonum palmerianum*	Palmer's Buckwheat	North Range	Polygonaceae	Native	N
ERPA29	*Ericameria paniculata*	Mojave Rabbitbrush	South Range	Asteraceae	Native	N
ERPA29	*Ericameria paniculata*	Mojave Rabbitbrush	North Range	Asteraceae	Native	N
ERPR4	*Eriophyllum pringlei*	Pringle's Woolly Sunflower	North Range	Asteraceae	Native	N
ERPU2	*Erigeron pumilus*	Shaggy Fleabane	South Range	Asteraceae	Native	N
ERPU2	*Erigeron pumilus*	Shaggy Fleabane	North Range	Asteraceae	Native	N
ERRU3	*Eriogonum rupinum*	Wyman Creek Buckwheat	North Range	Polygonaceae	Native	N
ERTE18	*Ericameria teretifolia*	Green Rabbitbrush	South Range	Asteraceae	Native	N
ERTE18	*Ericameria teretifolia*	Green Rabbitbrush	North Range	Asteraceae	Native	N
ERTR8	*Eriogonum trichopes*	Little Deserttrumpet	South Range	Polygonaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
ERTR8	*Eriogonum trichopes*	Little Deserttrumpet	North Range	Polygonaceae	Native	N
ERUM	*Eriogonum umbellatum*	Sulphur-Flower Buckwheat	North Range	Polygonaceae	Native	N
ERWA8	*Ericameria watsonii*	Watson's Goldenbush	North Range	Asteraceae	Native	Y
ERWR	*Eriogonum wrightii*	Bastardsage	North Range	Polygonaceae	Native	N
ESGL	*Eschscholzia glyptosperma*	Desert Poppy	South Range	Papaveraceae	Native	N
ESGL	*Eschscholzia glyptosperma*	Desert Poppy	NAFB	Papaveraceae	Native	N
ESVI2	*Escobaria vivipara*	Spinystar	South Range	Cactaceae	Native	N
ESVI2	*Escobaria vivipara*	Spinystar	North Range	Cactaceae	Native	N
ESVIR2	*Escobaria vivipara var. rosea*	Spinystar	South Range	Cactaceae	Native	Y
ESVIR2	*Escobaria vivipara var. rosea*	Spinystar	North Range	Cactaceae	Native	Y
EUMI16	*Eucalyptus microtheca*	Coolabah	NAFB	Myrtaceae	Unknown	N
EUUR	*Eucnide urens*	Desert Stingbush	South Range	Loasaceae	Native	N
EUUR	*Eucnide urens*	Desert Stingbush	NAFB	Loasaceae	Native	N
FAPA	*Fallugia paradoxa*	Apache Plume	South Range	Rosaceae	Native	N
FAPA	*Fallugia paradoxa*	Apache Plume	North Range	Rosaceae	Native	N
FECY	*Ferocactus cylindraceus*	California Barrel Cactus	South Range	Cactaceae	Native	N
FECY	*Ferocactus cylindraceus*	California Barrel Cactus	NAFB	Cactaceae	Native	N
FEID	*Festuca idahoensis*	Idaho Fescue	North Range	Poaceae	Native	N
FICA	*Ficus carica*	Edible Fig	NAFB	Moraceae	Introduced	N
FRAL2	*Frasera albicaulis*	Whitestem Frasera	North Range	Gentianaceae	Native	N
FRAN2	*Fraxinus anomala*	Singleleaf Ash	South Range	Oleaceae	Native	N
FRUH	*Fraxinus uhdei*	Shamel Ash	NAFB	Oleaceae	Introduced	N
FRVE2	*Fraxinus velutina*	Velvet Ash	NAFB	Oleaceae	Native	N
GAHIK	*Galium hilendiae ssp. kingstonense*	Kingston Mountain Bedstraw	South Range	Rubiaceae	Native	Y
GAHIK	*Galium hilendiae ssp. kingstonense*	Kingston Mountain Bedstraw	North Range	Rubiaceae	Native	Y
GICA3	*Gilia cana*	Showy Gilia	North Range	Polemoniaceae	Native	N
GILA	*Gilia latiflora*	Hollyleaf Gilia	North Range	Polemoniaceae	Native	N
GILA	*Gilia latiflora*	Hollyleaf Gilia	NAFB	Polemoniaceae	Native	N
GISC	*Gilia scopulorum*	Rock Gilia	South Range	Polemoniaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
GLMA2	*Glyptopleura marginata*	Carveseed	North Range	Asteraceae	Native	N
GLSP	*Glossopetalon spinescens*	Spiny Greasebush	North Range	Crossosomatace	Native	N
GRPU3	*Grusonia pulchella*	Sagebrush Cholla	North Range	Cactaceae	Native	N
GRPU4	*Grusonia pulchella*	Sagebrush Cholla	North Range	Cactaceae	Native	N
GRPU5	*Grusonia pulchella*	Sagebrush Cholla	North Range	Cactaceae	Native	N
GRPU6	*Grusonia pulchella*	Sagebrush Cholla	North Range	Cactaceae	Native	N
GRPU7	*Grusonia pulchella*	Sagebrush Cholla	North Range	Cactaceae	Native	N
GRPU8	*Grusonia pulchella*	Sagebrush Cholla	North Range	Cactaceae	Native	N
GRSP	*Grayia spinosa*	Spiny Hopsage	South Range	Chenopodiaceae	Native	N
GRSP	*Grayia spinosa*	Spiny Hopsage	North Range	Chenopodiaceae	Native	N
GUCA	*Gutierrezia californica*	San Joaquin Snakeweed	South Range	Asteraceae	Native	N
GUCA	*Gutierrezia californica*	San Joaquin Snakeweed	North Range	Asteraceae	Native	N
GUMI	*Gutierrezia microcephala*	Threadleaf Snakeweed	South Range	Asteraceae	Native	N
GUMI	*Gutierrezia microcephala*	Threadleaf Snakeweed	North Range	Asteraceae	Native	N
GUMI	*Gutierrezia microcephala*	Threadleaf Snakeweed	NAFB	Asteraceae	Native	N
GUSA2	*Gutierrezia sarothrae*	Broom Snakeweed	South Range	Asteraceae	Native	N
GUSA2	*Gutierrezia sarothrae*	Broom Snakeweed	North Range	Asteraceae	Native	N
GUSA2	*Gutierrezia sarothrae*	Broom Snakeweed	NAFB	Asteraceae	Native	N
HABR3	*Hazardia brickellioides*	Brickellbush Goldenweed	South Range	Asteraceae	Native	N
HAGL	*Halogeton glomeratus*	Saltlover	South Range	Chenopodiaceae	Introduced	N
HAGL	*Halogeton glomeratus*	Saltlover	North Range	Chenopodiaceae	Introduced	N
HEAR22	*Hesperocyparis arizonica*	Arizona Cypress	NAFB	Cupressaceae	Native	N
HECO26	*Hesperostipa comata*	Needle And Thread	South Range	Poaceae	Native	N
HECO26	*Hesperostipa comata*	Needle And Thread	North Range	Poaceae	Native	N
HECO26	*Hesperostipa comata*	Needle And Thread	NAFB	Poaceae	Native	N
HECU3	*Heliotropium curassavicum*	Salt Heliotrope	South Range	Boraginaceae	Native	N
HENA	*Hedeoma nana*	Dwarf False Pennyroyal	South Range	Lamiaceae	Native	N
HESH	*Hecastocleis shockleyi*	Prickleleaf	South Range	Asteraceae	Native	N
HOBR2	*Hordeum brachyantherum*	Meadow Barley	North Range	Poaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
HODU	*Holodiscus dumosus*	Rockspirea	North Range	Rosaceae	Native	N
HOMU	*Hordeum murinum*	Mouse Barley	South Range	Poaceae	Native	N
HUVEI	*Hulsea vestita ssp. inyoensis*	Pumice Alpinegold	North Range	Asteraceae	Native	Y
HYSA	*Hymenoclea salsola*	Burrobrush	South Range	Asteraceae	Native	N
HYSA	*Hymenoclea salsola*	Burrobrush	North Range	Asteraceae	Native	N
HYSA	*Hymenoclea salsola*	Burrobrush	NAFB	Asteraceae	Native	N
IPPO2	*Ipomopsis polycladon*	Manybranched Ipomopsis	North Range	Polemoniaceae	Native	N
ISAC2	*Isocoma acradenia*	Alkali Goldenbush	North Range	Asteraceae	Native	N
IVARS	*Ivesia arizonica var. saxosa*	Rock Whitefeather	North Range	Rosaceae	Native	Y
JUAR2	*Juncus arcticus*	Arctic Rush	North Range	Juncaceae	Native	N
JUME2	*Juncus mexicanus*	Mexican Rush	North Range	Juncaceae	Native	N
JUNI	*Juglans nigra*	Black Walnut	NAFB	Juglandaceae	Unknown	N
JUOS	*Juniperus osteosperma*	Utah Juniper	North Range	Cupressaceae	Native	N
JUOS	*Juniperus osteosperma*	Utah Juniper	South Range	Cupressaceae	Native	N
KOMA	*Koeleria macrantha*	Prairie Junegrass	North Range	Poaceae	Native	N
KRER	*Krameria erecta*	Littleaf Ratany	South Range	Krameriaceae	Native	N
KRER	*Krameria erecta*	Littleaf Ratany	North Range	Krameriaceae	Native	N
KRER	*Krameria erecta*	Littleaf Ratany	NAFB	Krameriaceae	Native	N
KRGR	*Krameria grayi*	White Ratany	South Range	Krameriaceae	Native	N
KRLA2	*Krascheninnikovia lanata*	Winterfat	South Range	Chenopodiaceae	Native	N
KRLA2	*Krascheninnikovia lanata*	Winterfat	North Range	Chenopodiaceae	Native	N
KRLA2	*Krascheninnikovia lanata*	Winterfat	NAFB	Chenopodiaceae	Native	N
LAHI4	*Lathyrus hitchcockianus*	Bullfrog Mountain Pea	North Range	Fabaceae	Native	Y
LAIN	*Lagerstroemia indica*	Crapemyrtle	NAFB	Lythraceae	Introduced	N
LAOC3	*Lappula occidentalis*	Flatpine Stickseed	South Range	Boraginaceae	Native	N
LAOC3	*Lappula occidentalis*	Flatpine Stickseed	North Range	Boraginaceae	Native	N
LASE3	*Langloisia setosissima*	Great Basin Langloisia	South Range	Polemoniaceae	Native	N
LASE3	*Langloisia setosissima*	Great Basin Langloisia	North Range	Polemoniaceae	Native	N
LATR2	*Larrea tridentata*	Creosote Bush	South Range	Zygophyllaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
LATR2	*Larrea tridentata*	Creosote Bush	North Range	Zygophyllaceae	Native	N
LATR2	*Larrea tridentata*	Creosote Bush	NAFB	Zygophyllaceae	Native	N
LAYIA	*Layia sp.*	Tidytips	North Range	Asteraceae	Native	N
LECI4	*Leymus cinereus*	Basin Wildrye	North Range	Poaceae	Native	N
LECI4	*Leymus triticoides*	Basin Wildrye	North Range	Poaceae	Native	N
LEFL2	*Lepidium flavum*	Yellow Pepperweed	South Range	Brassicaceae	Native	N
LEFR2	*Lepidium fremontii*	Desert Pepperweed	South Range	Brassicaceae	Native	N
LEFR2	*Lepidium fremontii*	Desert Pepperweed	North Range	Brassicaceae	Native	N
LEFR2	*Lepidium fremontii*	Desert Pepperweed	NAFB	Brassicaceae	Native	N
LELA	*Lepidium lasiocarpum*	Shaggyfruit Pepperweed	South Range	Brassicaceae	Native	N
LELA	*Lepidium lasiocarpum*	Shaggyfruit Pepperweed	North Range	Brassicaceae	Native	N
LENU8	*Leptosiphon nuttallii*	Nuttall's Linanthus	North Range	Polemoniaceae	Native	N
LEPTO2	*Leptodactylon sp.*	Pricklyphlox	North Range	Polemoniaceae	Native	N
LESSI	*Lessingia sp.*	Lessingia	North Range	Asteraceae	Native	N
LETE3	*Lesquerella tenella*	Moapa Bladderpod	South Range	Brassicaceae	Native	N
LETE3	*Lesquerella tenella*	Moapa Bladderpod	NAFB	Brassicaceae	Native	N
LEVI3	*Lepidium virginicum*	Virginia Pepperweed	South Range	Brassicaceae	Native	N
LEVI3	*Lepidium virginicum*	Virginia Pepperweed	North Range	Brassicaceae	Native	N
LIBI2	*Linanthus bigelovii*	Bigelow's Linanthus	North Range	Polemoniaceae	Native	N
LIDE2	*Linanthus demissus*	Desertsnow	South Range	Polemoniaceae	Native	N
LIDI2	*Linanthus dichotomus*	Eveningsnow	North Range	Polemoniaceae	Native	N
LILE3	*Linum lewisii*	Lewis Flax	North Range	Linaceae	Native	N
LILU2	*Ligustrum lucidum*	Glossy Privet	NAFB	Oleaceae	Introduced	N
LIPU11	*Linanthus pungens*	Granite Prickly Phlox	South Range	Polemoniaceae	Native	N
LIPU11	*Linanthus pungens*	Granite Prickly Phlox	North Range	Polemoniaceae	Native	N
LODE9	*Logfia depressa*	Dwarf Cottonrose	North Range	Asteraceae	Native	N
LOGR	*Lomatium grayi*	Gray's Biscuitroot	South Range	Apiaceae	Native	N
LOMO	*Lomatium mohavense*	Mojave Desertparsley	North Range	Apiaceae	Native	N
LOSC6	*Loeseliastrum schottii*	Schott's Calico	North Range	Polemoniaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
LOSH	*Lomatium shevockii*	Owens Peak Desertparsley	North Range	Apiaceae	Native	N
LUAR3	*Lupinus argenteus*	Silvery Lupine	North Range	Fabaceae	Native	N
LUCO	*Lupinus concinnus*	Bajada Lupine	North Range	Fabaceae	Native	N
LUFL	*Lupinus flavoculatus*	Yelloweyes	North Range	Fabaceae	Native	N
LYAN	*Lycium andersonii*	Water Jacket	South Range	Solanaceae	Native	N
LYAN	*Lycium andersonii*	Water Jacket	North Range	Solanaceae	Native	N
LYAN	*Lycium andersonii*	Water Jacket	NAFB	Solanaceae	Native	N
LYCO2	*Lycium cooperi*	Peach Thorn	South Range	Solanaceae	Native	N
LYCO2	*Lycium cooperi*	Peach Thorn	North Range	Solanaceae	Native	N
LYFR	*Lycium fremontii*	Fremont's Desert-Thorn	South Range	Solanaceae	Native	N
LYPA	*Lycium pallidum*	Pale Desert-Thorn	South Range	Solanaceae	Native	N
LYPA	*Lycium pallidum*	Pale Desert-Thorn	North Range	Solanaceae	Native	N
LYPA	*Lycium pallidum*	Pale Desert-Thorn	NAFB	Solanaceae	Native	N
LYSH	*Lycium shockleyi*	Shockley's Desert-Thorn	South Range	Solanaceae	Native	N
MACA2	*Machaeranthera canescens*	Hoary Tansyaster	South Range	Asteraceae	Native	N
MACA2	*Machaeranthera canescens*	Hoary Tansyaster	North Range	Asteraceae	Native	N
MAGL3	*Malacothrix glabrata*	Smooth Desertdandelion	North Range	Asteraceae	Native	N
MAGR9	*Mammillaria grahamii*	Graham's Nipple Cactus	South Range	Cactaceae	Native	N
MAGRD	*Machaeranthera grindelioides var. depressa*	Rayless Tansyaster	South Range	Asteraceae	Native	N
MAGRD	*Machaeranthera grindelioides var. depressa*	Rayless Tansyaster	North Range	Asteraceae	Native	N
MASO	*Malacothrix sonchoides*	Sowthistle Desertdandelion	North Range	Asteraceae	Native	N
MATE4	*Mammillaria tetrancistra*	Common Fishhook Cactus	South Range	Cactaceae	Native	N
MATE4	*Mammillaria tetrancistra*	Common Fishhook Cactus	North Range	Cactaceae	Native	N
MATE4	*Mammillaria tetrancistra*	Common Fishhook Cactus	NAFB	Cactaceae	Native	N
MATO2	*Malacothrix torreyi*	Torrey's Desertdandelion	North Range	Asteraceae	Native	N
MEAL6	*Mentzelia albicaulis*	Whitestem Blazingstar	South Range	Loasaceae	Native	N
MEAL6	*Mentzelia albicaulis*	Whitestem Blazingstar	North Range	Loasaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
MEAL6	*Mentzelia albicaulis*	Whitestem Blazingstar	NAFB	Loasaceae	Native	N
MEAR4	*Mentha arvensis*	Wild Mint	North Range	Lamiaceae	Native	N
MEAZ	*Melia azedarach*	Chinaberrytree	NAFB	Meliaceae	Introduced	N
MELA2	*Mentzelia laevicaulis*	Smoothstem Blazingstar	North Range	Loasaceae	Native	N
MESA	*Medicago sativa*	Alfalfa	North Range	Fabaceae	Introduced	N
MESP2	*Menodora spinescens*	Spiny Menodora	South Range	Oleaceae	Native	N
MESP2	*Menodora spinescens*	Spiny Menodora	North Range	Oleaceae	Native	N
METR4	*Mentzelia tridentata*	Threetooth Blazingstar	South Range	Loasaceae	Native	N
MIAL5	*Mirabilis alipes*	Winged Four O'clock	South Range	Nyctaginaceae	Native	N
MIAL5	*Mirabilis alipes*	Winged Four O'clock	North Range	Nyctaginaceae	Native	N
MIBI6	*Mimulus bigelovii*	Bigelow's Monkeyflower	South Range	Scrophulariaceae	Native	N
MIBI6	*Mimulus bigelovii*	Bigelow's Monkeyflower	North Range	Scrophulariaceae	Native	N
MICO15	*Mirabilis comata*	Hairy-Tuft Four O'clock	North Range	Nyctaginaceae	Native	N
MIGU	*Mimulus guttatus*	Seep Monkeyflower	North Range	Scrophulariaceae	Native	N
MILA6	*Mirabilis laevis*	Desert Wishbone-Bush	North Range	Nyctaginaceae	Native	N
MILAV	*Mirabilis laevis var. villosa*	Wishbone-Bush	South Range	Nyctaginaceae	Native	N
MILAV	*Mirabilis laevis var. villosa*	Wishbone-Bush	North Range	Nyctaginaceae	Native	N
MINAM2	*Mimulus nanus var. mephiticus*	Foul Odor Monkeyflower	North Range	Scrophulariaceae	Native	N
MIPU5	*Mirabilis pudica*	Bashful Four O'clock	South Range	Nyctaginaceae	Native	Y
MOAL	*Morus alba*	White Mulberry	NAFB	Moraceae	Introduced	N
MOBE	*Monoptilon bellidiforme*	Daisy Desertstar	NAFB	Asteraceae	Native	N
MOUT	*Mortonia utahensis*	Utah Mortonia	NAFB	Celastraceae	Native	N
MUPO2	*Muhlenbergia porteri*	Bush Muhly	South Range	Poaceae	Native	N
NADE	*Nama demissum*	Purplemat	South Range	Hydrophyllaceae	Native	N
NADE	*Nama demissum*	Purplemat	North Range	Hydrophyllaceae	Native	N
NIOB	*Nicotiana obtusifolia*	Desert Tobacco	South Range	Solanaceae	Native	N
NIOB	*Nicotiana obtusifolia*	Desert Tobacco	North Range	Solanaceae	Native	N
NIOB	*Nicotiana obtusifolia*	Desert Tobacco	NAFB	Solanaceae	Native	N
NIOBO	*Nicotiana obtusifolia var. obtusifolia*	Desert Tobacco	South Range	Solanaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
Not in USDA	*Glossopetalon pungens var. pungens*	Not In Usda Plants	North Range	Crossosomatace	Native	Y?
Not in USDA	*Fraxinus velutina var. modesto*	Modesto Ash	NAFB	Oleaceae	Unknown	?
Not in USDA	*Parkinsonia praecox*	Palo Brea	NAFB	Fabaceae	Unknown	?
OECA10	*Oenothera caespitosa*	Tufted Evening Primrose	South Range	Onagraceae	Native	N
OECA10	*Oenothera caespitosa*	Tufted Evening Primrose	North Range	Onagraceae	Native	N
OECA2	*Oenothera californica*	California Evening Primrose	South Range	Onagraceae	Native	N
OECA2	*Oenothera californica*	California Evening Primrose	North Range	Onagraceae	Native	N
OEDE2	*Oenothera deltoides*	Birdcage Evening Primrose	South Range	Onagraceae	Native	N
OEDE2	*Oenothera deltoides*	Birdcage Evening Primrose	North Range	Onagraceae	Native	N
OEPR	*Oenothera primiveris*	Desert Evening Primrose	North Range	Onagraceae	Native	N
OESU3	*Oenothera suffrutescens*	Scarlet Beeblossom	South Range	Onagraceae	Native	N
OLEU	*Olea europaea*	European Olive	NAFB	Oleaceae	Introduced	N
OPBA2	*Opuntia basilaris*	Beavertail Pricklypear	South Range	Cactaceae	Native	N
OPBA2	*Opuntia basilaris*	Beavertail Pricklypear	North Range	Cactaceae	Native	N
OPBA2	*Opuntia basilaris*	Beavertail Pricklypear	NAFB	Cactaceae	Native	N
OPEN3	*Opuntia engelmannii*	Cactus Apple	North Range	Cactaceae	Native	N
OPPOE	*Opuntia polyacantha var. erinacea*	Grizzlybear Pricklypear	South Range	Cactaceae	Native	N
OPPOE	*Opuntia polyacantha var. erinacea*	Grizzlybear Pricklypear	North Range	Cactaceae	Native	N
OREOC	*Oreocarya sp.*	Cryptantha	North Range	Boraginaceae	Native	N
OROBA	*Orobanche sp.*	Broomrape	South Range	Orobanchaceae	Native	N
OXPE2	*Oxytheca perfoliata*	Roundleaf Oxytheca	North Range	Polygonaceae	Native	N
PAAR8	*Palafoxia arida*	Desert Palafox	North Range	Asteraceae	Native	N
PAFL6	*Cercidium floridum*	Blue Paloverde	NAFB	Fabaceae	Unknown	N
PAMI5	*Parkinsonia microphylla*	Yellow Paloverde	NAFB	Fabaceae	Native	N
PEEA	*Penstemon eatonii*	Firecracker Penstemon	North Range	Scrophulariaceae	Native	N
PEFL3	*Penstemon floridus*	Panamint Beardtongue	North Range	Scrophulariaceae	Native	N
PEIN12	*Perityle intricata*	Narrowleaf Laphamia	South Range	Asteraceae	Native	Y
PENE3	*Penstemon newberryi*	Mountain Pride	South Range	Scrophulariaceae	Native	N
PEPA23	*Penstemon pahutensis*	Paiute Beardtongue	North Range	Scrophulariaceae	Native	Y

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
PEPA8	*Penstemon palmeri*	Palmer's Penstemon	South Range	Scrophulariaceae	Native	N
PEPE13	*Penstemon petiolatus*	Petiolate Beardtongue	South Range	Scrophulariaceae	Native	N
PEPE26	*Pectocarya penicillata*	Sleeping Combseed	South Range	Boraginaceae	Native	N
PEPL	*Pectocarya platycarpa*	Broadfruit Combseed	NAFB	Boraginaceae	Native	N
PEPS	*Penstemon pseudospectabilis*	Desert Penstemon	North Range	Scrophulariaceae	Native	N
PEPS	*Penstemon pseudospectabilis*	Desert Penstemon	NAFB	Scrophulariaceae	Native	N
PERE	*Pectocarya recurvata*	Curvenut Combseed	South Range	Boraginaceae	Native	N
PERO	*Penstemon rostriflorus*	Bridge Penstemon	North Range	Scrophulariaceae	Native	N
PESC4	*Peucephyllum schottii*	Schott's Pygmycedar	South Range	Asteraceae	Native	N
PESC4	*Peucephyllum schottii*	Schott's Pygmycedar	North Range	Asteraceae	Native	N
PESC4	*Peucephyllum schottii*	Schott's Pygmycedar	NAFB	Asteraceae	Native	N
PESE	*Pectocarya setosa*	Moth Combseed	North Range	Boraginaceae	Native	N
PESI	*Pediocactus simpsonii*	Mountain Ball Cactus	South Range	Cactaceae	Native	N
PESI	*Pediocactus simpsonii*	Mountain Ball Cactus	North Range	Cactaceae	Native	N
PETAL	*Petalonyx sp.*	Sandpaper Plant	South Range	Loasaceae	Native	N
PHBE3	*Phacelia beatleyae*	Beatley's Phacelia	South Range	Hydrophyllaceae	Native	Y
PHBE3	*Phacelia beatleyae*	Beatley's Phacelia	North Range	Hydrophyllaceae	Native	Y
PHCA13	*Phoenix canariensis*	Canary Island Date Palm	NAFB	Arecaceae	Introduced	N
PHCO11	*Phlox condensata*	Dwarf Phlox	North Range	Polemoniaceae	Native	N
PHCR	*Phacelia crenulata*	Cleftleaf Wildheliotrope	South Range	Hydrophyllaceae	Native	N
PHCR	*Phacelia crenulata*	Cleftleaf Wildheliotrope	North Range	Hydrophyllaceae	Native	N
PHCR	*Phacelia crenulata*	Cleftleaf Wildheliotrope	NAFB	Hydrophyllaceae	Native	N
PHCR4	*Physalis crassifolia*	Yellow Nightshade	South Range	Solanaceae	Native	N
PHCR4	*Physalis crassifolia*	Yellow Nightshade	North Range	Solanaceae	Native	N
PHFR2	*Phacelia fremontii*	Fremont's Phacelia	South Range	Hydrophyllaceae	Native	N
PHFR2	*Phacelia fremontii*	Fremont's Phacelia	North Range	Hydrophyllaceae	Native	N
PHLO2	*Phlox longifolia*	Longleaf Phlox	North Range	Polemoniaceae	Native	N
PHMI4	*Philadelphus microphyllus*	Littleleaf Mock Orange	North Range	Hydrangeaceae	Native	N
PHMU	*Phacelia mustelina*	Weasel Phacelia	North Range	Hydrophyllaceae	Native	Y

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
PHPA2	*Phacelia parishii*	Parish's Phacelia	South Range	Hydrophyllaceae	Native	Y
PHPA2	*Phacelia parishii*	Parish's Phacelia	North Range	Hydrophyllaceae	Native	Y
PHST11	*Phlox stansburyi*	Cold-Desert Phlox	South Range	Polemoniaceae	Native	N
PHST11	*Phlox stansburyi*	Cold-Desert Phlox	North Range	Polemoniaceae	Native	N
PHVI	*Phacelia viscida*	Tacky Phacelia	North Range	Hydrophyllaceae	Native	N
PIBRE	*Pinus brutia var. eldarica*	Afghan Pine	NAFB	Pinaceae	Unknown	N
PICH4	*Pistacia chinensis*	Chinese Pistache	NAFB	Anacardiaceae	Introduced	N
PIDE4	*Picrothamnus desertorum*	Bud Sagebrush	South Range	Asteraceae	Native	N
PIDE4	*Picrothamnus desertorum*	Bud Sagebrush	North Range	Asteraceae	Native	N
PIMO	*Pinus monophylla*	Singleleaf Pinyon	North Range	Pinaceae	Native	N
PISH2	*Piptatheropsis shoshoneana*	Shoshone Ricegrass	North Range	Poaceae	Native	N
PISH2	*Piptatherum shoshoneanum*	Shoshone Ricegrass	North Range	Poaceae	Native	Y
PITH2	*Pinus thunbergiana*	Japanese Black Pine	NAFB	Pinaceae	Introduced	N
PLAGI	*Plagiobothrys sp.*	Popcornflower	South Range	Boraginaceae	Native	N
PLAGI	*Plagiobothrys sp.*	Popcornflower	North Range	Boraginaceae	Native	N
PLJA	*Pleuraphis jamesii*	James' Galleta	South Range	Poaceae	Native	N
PLJA	*Pleuraphis jamesii*	James' Galleta	North Range	Poaceae	Native	N
PLJA	*Pleuraphis jamesii*	James' Galleta	NAFB	Poaceae	Native	N
PLOV	*Plantago ovata*	Desert Indianwheat	South Range	Plantaginaceae	Native	N
PLOV	*Plantago ovata*	Desert Indianwheat	NAFB	Plantaginaceae	Native	N
PLPL	*Pleurocoronis pluriseta*	Bush Arrowleaf	NAFB	Asteraceae	Native	N
PLRI3	*Pleuraphis rigida*	Big Galleta	South Range	Poaceae	Native	N
PLRI3	*Pleuraphis rigida*	Big Galleta	North Range	Poaceae	Native	N
PLRI3	*Pleuraphis rigida*	Big Galleta	NAFB	Poaceae	Native	N
PLSP7	*Pleiacanthus spinosus*	Thorn Skeletonweed	South Range	Asteraceae	Native	N
PLSP7	*Pleiacanthus spinosus*	Thorn Skeletonweed	North Range	Asteraceae	Native	N
POAB	*Poa abbreviata*	Short Bluegrass	North Range	Poaceae	Native	N
POCO	*Poa compressa*	Canada Bluegrass	North Range	Poaceae	Native	N
POFE	*Poa fendleriana*	Muttongrass	North Range	Poaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
POGR5	*Porophyllum gracile*	Slender Poreleaf	South Range	Asteraceae	Native	N
POHE	*Polygala heterorhyncha*	Beaked Spiny Polygala	North Range	Polygalaceae	Native	Y
POMO5	*Polypogon monspeliensis*	Annual Rabbitsfoot Grass	North Range	Poaceae	Native	N
POPUL	*Populus sp.*	Cottonwood	North Range	Salicaceae	Native	N
POPUL	*Populus sp.*	Cottonwood	NAFB	Salicaceae	Native	N
POPY	*Porophyllum pygmaeum*	Dwarf Poreleaf	South Range	asteraceae	Native	Y
POSE	*Poa secunda*	Sandberg Bluegrass	North Range	Poaceae	Native	N
POVI9	*Polypogon viridis*	Beardless Rabbitsfoot Grass	North Range	Poaceae	Native	N
PRCE2	*Prunus cerasifera*	Cherry Plum	NAFB	Rosaceae	Introduced	N
PRCH2	*Prosopis chilensis*	Algarrobo	NAFB	Fabaceae	Unknown	N
PRFA	*Prunus fasciculata*	Desert Almond	South Range	Rosaceae	Native	N
PRFA	*Prunus fasciculata*	Desert Almond	North Range	Rosaceae	Native	N
PRGL2	*Prosopis glandulosa*	Honey Mesquite	South Range	Fabaceae	Native	N
PRGL2	*Prosopis glandulosa*	Honey Mesquite	NAFB	Fabaceae	Native	N
PRGLT	*Prosopis glandulosa var. torreyana*	Western Honey Mesquite	South Range	Fabaceae	Native	N
PRGLT	*Prosopis glandulosa var. torreyana*	Western Honey Mesquite	NAFB	Fabaceae	Native	N
PRPU	*Prosopis pubescens*	Screwbean Mesquite	NAFB	Fabaceae	Native	N
PSAR4	*Psorothamnus arborescens*	Mojave Indigobush	South Range	Fabaceae	Native	N
PSAR4	*Psorothamnus arborescens*	Mojave Indigobush	North Range	Fabaceae	Native	N
PSCO2	*Psilostrophe cooperi*	Whitestem Paperflower	South Range	Asteraceae	Native	N
PSEM	*Psorothamnus emoryi*	Dyebush	South Range	Fabaceae	Native	N
PSEM	*Psorothamnus emoryi*	Dyebush	North Range	Fabaceae	Native	N
PSFR	*Psorothamnus fremontii*	Fremon'ts Dalea	South Range	Fabaceae	Native	N
PSFR	*Psorothamnus fremontii*	Fremon'ts Dalea	North Range	Fabaceae	Native	N
PSFR	*Psorothamnus fremontii*	Fremon'ts Dalea	NAFB	Fabaceae	Native	N
PSPO	*Psorothamnus polydenius*	Nevada Dalea	South Range	Fabaceae	Native	N
PSPO	*Psorothamnus polydenius*	Nevada Dalea	North Range	Fabaceae	Native	N
PTPE	*Pteryxia petraea*	Rockloving Wavewing	South Range	Apiaceae	Native	N
PUME	*Purshia mexicana*	Mexican Cliffrose	South Range	Rosaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
PUME	*Purshia mexicana*	Mexican Cliffrose	North Range	Rosaceae	Native	N
PUST	*Purshia stansburiana*	Stansbury Cliffrose	South Range	Rosaceae	Native	N
PUST	*Purshia stansburiana*	Stansbury Cliffrose	North Range	Rosaceae	Native	N
PUTR2	*Purshia tridentata*	Antelope Bitterbrush	North Range	Rosaceae	Native	N
PUTR2	*Purshia tridentata*	Antelope Bitterbrush	South Range	Rosaceae	Native	N
QUERC	*Quercus sp.*	Oak	North Range	Fagaceae	Native	N
QUFU	*Quercus fusiformis*	Texas Live Oak	NAFB	Fagaceae	Unknown	N
QUGA	*Quercus gambelii*	Gambel Oak	NAFB	Fagaceae	Native	N
QUIL2	*Quercus ilex*	Holly Oak	NAFB	Fagaceae	Introduced	N
QUVI	*Quercus virginiana*	Live Oak	NAFB	Fagaceae	Unknown	N
RANE	*Rafinesquia neomexicana*	New Mexico Plumeseed	South Range	Asteraceae	Native	N
RANE	*Rafinesquia neomexicana*	New Mexico Plumeseed	North Range	Asteraceae	Native	N
RANE	*Ranunculus eschscholtzii*	New Mexico Plumeseed	North Range	Asteraceae	Native	N
RANE	*Rafinesquia neomexicana*	New Mexico Plumeseed	NAFB	Asteraceae	Native	N
rare/at risk	*Phacelia filiae*	Clarke Phacelia	South Range	Hydrophyllaceae	Native	Y
RHAR4	*Rhus aromatica*	Fragrant Sumac	North Range	Anacardiaceae	Native	N
RHTR	*Rhus trilobata*	Skunkbush Sumac	South Range	Anacardiaceae	Native	N
RHTR	*Rhus trilobata*	Skunkbush Sumac	North Range	Anacardiaceae	Native	N
RICE	*Ribes cereum*	Wax Currant	South Range	Grossulariaceae	Native	N
RICE	*Ribes cereum*	Wax Currant	North Range	Grossulariaceae	Native	N
RIVE	*Ribes velutinum*	Desert Gooseberry	North Range	Grossulariaceae	Native	N
ROWO	*Rosa woodsii*	Woods' Rose	North Range	Rosaceae	Native	N
SABA	*Salix babylonica*	Weeping Willow	NAFB	Salicaceae	Introduced	N
SABA14	*Sarcobatus baileyi*	Bailey's Greasewood	South Range	Chenopodiaceae	Native	N
SABA14	*Sarcobatus baileyi*	Bailey's Greasewood	North Range	Chenopodiaceae	Native	N
SACO6	*Salvia columbariae*	Chia	North Range	Lamiaceae	Native	N
SADO4	*Salvia dorrii*	Purple Sage	South Range	Lamiaceae	Native	N
SADO4	*Salvia dorrii*	Purple Sage	North Range	Lamiaceae	Native	N
SAEX	*Salix exigua*	Narrowleaf Willow	North Range	Saliaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
SAGE2	*Salix geyeriana*	Geyer Willow	North Range	Saliaceae	Native	N
SAKI	*Sairocarpus kingii*	Least Snapdragon	South Range	Scrophulariaceae	Native	N
SAME	*Salazaria mexicana*	Mexican Bladdersage	South Range	Lamiaceae	Native	N
SAME	*Salazaria mexicana*	Mexican Bladdersage	North Range	Lamiaceae	Native	N
SAMO3	*Salvia mohavensis*	Mojave Sage	South Range	Lamiaceae	Native	N
SATR12	*Salsola tragus*	Prickly Russian Thistle	South Range	Chenopodiaceae	Introduced	N
SATR12	*Salsola tragus*	Prickly Russian Thistle	North Range	Chenopodiaceae	Introduced	N
SATR12	*Salsola tragus*	Prickly Russian Thistle	NAFB	Chenopodiaceae	Introduced	N
SAVE4	*Sarcobatus vermiculatus*	Greasewood	South Range	Chenopodiaceae	Native	N
SAVE4	*Sarcobatus vermiculatus*	Greasewood	North Range	Chenopodiaceae	Native	N
SAXIF	*Saxifraga sp.*	Saxifrage	South Range	Saxifragaceae	Native	N
SCAR	*Schismus arabicus*	Arabian Schismus	South Range	Poaceae	Introduced	N
SCAR	*Schismus arabicus*	Arabian Schismus	North Range	Poaceae	Introduced	N
SCAR	*Schismus arabicus*	Arabian Schismus	NAFB	Poaceae	Introduced	N
SCBA	*Schismus barbatus*	Common Mediterranean	South Range	Poaceae	Introduced	N
SCBA	*Schismus barbatus*	Common Mediterranean	North Range	Poaceae	Introduced	N
SCBR2	*Scleropogon brevifolius*	Burrograss	North Range	Poaceae	Native	N
SCIRP	*Scirpus sp.*	Bulrush	North Range	Cyperaceae	Native	N
SCPO4	*Sclerocactus polyancistrus*	Redspined Fishhook Cactus	South Range	Cactaceae	Native	Y
SCPO4	*Sclerocactus polyancistrus*	Redspined Fishhook Cactus	North Range	Cactaceae	Native	Y
SEFLD	*Senecio flaccidus var. douglasii*	Douglas' Ragwort	South Range	Asteraceae	Native	N
SEGR4	*Senegalia greggii*	Catlaw Acacia	NAFB	Fabaceae	Native	N
SELA10	*Searsia lancea*	African Sumac	NAFB	Anacardiaceae	Unknown	N
SIIR	*Sisymbrium irio*	London Rocket	North Range	Brassicaceae	Introduced	N
SILEN	*Silene sp.*	Catchfly	South Range	Caryophyllaceae	Native	N
SILEN	*Silene sp.*	Catchfly	North Range	Caryophyllaceae	Native	N
SIOR4	*Sisymbrium orientale*	Indian Hedgemustard	North Range	Brassicaceae	Introduced	N
SODU2	*Sorbus dumosa*	Arizona Mountain Ash	NAFB	Rosaceae	Native	N
SOLAN	*Solanum sp.*	Nightshade	South Range	Solanaceae	Native	N

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USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
SOOL	*Sonchus oleraceus*	Common Sowthistle	North Range	Asteraceae	Native	N
SOSE3	*Sophora secundiflora*	Mescal Bean	NAFB	Fabaceae	Unknown	N
SPAM2	*Sphaeralcea ambigua*	Desert Globemallow	South Range	Malvaceae	Native	N
SPAM2	*Sphaeralcea ambigua*	Desert Globemallow	North Range	Malvaceae	Native	N
SPAM2	*Sphaeralcea ambigua*	Desert Globemallow	NAFB	Malvaceae	Native	N
SPCO4	*Sporobolus contractus*	Spike Dropseed	North Range	Poaceae	Native	N
SPCR	*Sporobolus cryptandrus*	Sand Dropseed	North Range	Poaceae	Native	N
SPFL2	*Sporobolus flexuosus*	Mesa Dropseed	North Range	Poaceae	Native	N
SPGR2	*Sphaeralcea grossulariifolia*	Gooseberryleaf Globemallow	South Range	Malvaceae	Native	N
SPGR2	*Sphaeralcea grossulariifolia*	Gooseberryleaf Globemallow	North Range	Malvaceae	Native	N
SPRU2	*Sphaeralcea rusbyi*	Rusby's Globemallow	South Range	Malvaceae	Native	N
SPRU2	*Sphaeralcea rusbyi*	Rusby's Globemallow	North Range	Malvaceae	Native	N
STEL	*Stanleya elata*	Panamint Princesplume	South Range	Brassicacieae	Native	N
STEL	*Stanleya elata*	Panamint Princesplume	North Range	Brassicacieae	Native	N
STEX	*Stephanomeria exigua*	Small Wirelettuce	North Range	Asteraceae	Native	N
STLO4	*Streptanthella longirostris*	Longbeak Streptanthella	South Range	Brassicaceae	Native	N
STLO4	*Streptanthella longirostris*	Longbeak Streptanthella	North Range	Brassicaceae	Native	N
STPA3	*Stephanomeria parryi*	Parry's Wirelettuce	South Range	Asteraceae	Native	N
STPA3	*Stephanomeria parryi*	Parry's Wirelettuce	North Range	Asteraceae	Native	N
STPA4	*Stephanomeria pauciflora*	Brownplume Wirelettuce	South Range	Asteraceae	Native	N
STPA4	*Stephanomeria pauciflora*	Brownplume Wirelettuce	North Range	Asteraceae	Native	N
STPA4	*Stephanomeria pauciflora*	Brownplume Wirelettuce	NAFB	Asteraceae	Native	N
STPI	*Stanleya pinnata*	Desert Princesplume	South Range	Brassicaceae	Native	N
STPI	*Stanleya pinnata*	Desert Princesplume	North Range	Brassicaceae	Native	N
SUMO	*Suaeda moquinii*	Mojave Seablite	South Range	Chenopodiaceae	Native	N
SUMO	*Suaeda moquinii*	Mojave Seablite	North Range	Chenopodiaceae	Native	N
SYLO	*Symphoricarpos longiflorus*	Desert Snowberry	South Range	Caprifoliaceae	Native	N
SYLO	*Symphoricarpos longiflorus*	Desert Snowberry	North Range	Caprifoliaceae	Native	N
TAMAR2	*Tamarix sp.*		North Range	Tamaricaceae	Introduced	N

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TAMAR2	*Tamarix sp.*	Tamarisk	South Range	Tamaricaceae	Introduced	N
TAMAR2	*Tamarix sp.*	Tamarisk	NAFB	Tamaricaceae	Introduced	N
TEAX	*Tetradymia axillaris*	Longspine Horsebrush	South Range	Asteraceae	Native	N
TEAX	*Tetradymia axillaris*	Longspine Horsebrush	North Range	Asteraceae	Native	N
TECA2	*Tetradymia canescens*	Spineless Horsebrush	North Range	Asteraceae	Native	N
TEGL	*Tetradymia glabrata*	Littleleaf Horsebrush	South Range	Asteraceae	Native	N
TEGL	*Tetradymia glabrata*	Littleleaf Horsebrush	North Range	Asteraceae	Native	N
TESP2	*Tetradymia spinosa*	Shortspine Horsebrush	South Range	Asteraceae	Native	N
TESP2	*Tetradymia spinosa*	Shortspine Horsebrush	North Range	Asteraceae	Native	N
THELY	*Thelypodium sp.*	Thelypody	North Range	Bassicaceae	Native	N
THMO	*Thamnosma montana*	Turpentinebroom	South Range	Rutaceae	Native	N
THMO	*Thamnosma montana*	Turpentinebroom	North Range	Rutaceae	Native	N
THMO	*Thamnosma montana*	Turpentinebroom	NAFB	Rutaceae	Native	N
THPE4	*Thymophylla pentachaeta*	Fiveneedle Pricklyleaf	South Range	Asteraceae	Native	N
THPE4	*Thymophylla pentachaeta*	Fiveneedle Pricklyleaf	NAFB	Asteraceae	Native	N
TICA3	*Tiquilia canescens*	Woody Crinklemat	South Range	Boraginaceae	Native	N
TINU2	*Tiquilia nuttalli*	Nuttall's Crinklemat	North Range	Boraginaceae	Native	N
TIPL2	*Tiquilia plicata*	Fanleaf Crinklemat	South Range	Boraginaceae	Native	N
TIPL2	*Tiquilia plicata*	Fanleaf Crinklemat	North Range	Boraginaceae	Native	N
TRISE	*Trisetum sp.*	Oatgrass	North Range	Poaceae	Native	N
TRMU	*Tridens muticus*	Slim Tridens	South Range	Poaceae	Native	N
TYAN	*Typha angustifolia*	Narrowleaf Cattail	North Range	Typhaceae	Native	N
ULPA	*Ulmus parvifolia*	Chinese Elm	NAFB	Ulmaceae	Introduced	N
ULPU	*Ulmus pumila*	Siberian Elm	NAFB	Ulmaceae	Introduced	N
VACO9	*Vachellia constricta*	Whitethorn Acacia	NAFB	Fabaceae	Unknown	N
VIAG	*Vitex agnus-castus*	Lilac Chastetree	NAFB	Verbenaceae	Introduced	N
VICIA	*Vicia sp.*	Vetch	North Range	Fabaceae	Native	N
VIPA14	*Viguiera parishii*	Parish's Goldeneye	South Range	Asteraceae	Native	N
VUOC	*Vulpia octoflora*	Sixweeks Fescue	South Range	Poaceae	Native	N

Appendix C. Complete floristics list for NAFB and the NTTR compiled from the NNRP geodatabase.

USDA Plants Acronym	Scientific Name	Common Name	Location	Family	Native Status	Sensitive
VUOC	*Vulpia octoflora*	Sixweeks Fescue	North Range	Poaceae	Native	N
WAFI	*Washingtonia filifera*	California Fan Palm	NAFB	Arecaceae	Native	N
WARO	*Washingtonia robusta*	Washington Fan Palm	NAFB	Arecaceae	Introduced	N
XAGY	*Xanthocephalum gymnospermoides*	San Pedro Matchweed	South Range	Asteraceae	Native	N
XAGY	*Xanthocephalum gymnospermoides*	San Pedro Matchweed	North Range	Asteraceae	Native	N
XAGY	*Xanthocephalum gymnospermoides*	San Pedro Matchweed	NAFB	Asteraceae	Native	N
XYTO2	*Xylorhiza tortifolia*	Mojave Woodyaster	South Range	Asteraceae	Native	N
XYTO2	*Xylorhiza tortifolia*	Mojave Woodyaster	North Range	Asteraceae	Native	N
XYTO2	*Xylorhiza tortifolia*	Mojave Woodyaster	NAFB	Asteraceae	Native	N
YUBA	*Yucca baccata*	Banana Yucca	South Range	Agavaceae	Native	N
YUBA	*Yucca baccata*	Banana Yucca	North Range	Agavaceae	Native	N
YUBA	*Yucca baccata*	Banana Yucca	NAFB	Agavaceae	Native	N
YUBR	*Yucca brevifolia*	Joshua Tree	South Range	Agavaceae	Native	N
YUBR	*Yucca brevifolia*	Joshua Tree	North Range	Agavaceae	Native	N
YUBR	*Yucca brevifolia*	Joshua Tree	NAFB	Agavaceae	Native	N
YUEL	*Yucca elata*	Soaptree Yucca	South Range	Agavaceae	Native	N
YUEL	*Yucca elata*	Soaptree Yucca	North Range	Agavaceae	Native	N
YUSC2	*Yucca schidigera*	Mojave Yucca	South Range	Agavaceae	Native	N
YUSC2	*Yucca schidigera*	Mojave Yucca	NAFB	Agavaceae	Native	N

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14.4 Appendix D: Current and historical seeps and springs on NAFB, CAFB, and NTTR

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
Alkali Spring	71N	Historical Spring
Antelope Spring 1	ECW	Perennial Seep/Spring
Antelope Spring 2	ECW	Perennial Seep/Spring
Antelope Spring 3	ECW	Perennial Seep/Spring
Antelope Spring 4	ECW	Unspecified Water Source
Beck Spring	74A	Unspecified Water Source
Blackhawk Spring	ECE	Intermittent Seep/Spring
Breen Creek Spring	ECW	Perennial Seep/Spring
Brent's Seep	61A	Developed Water Source
Cactus Roadside Seep	4809A	Intermittent Seep/Spring
Cactus Rock Spring	71N	Perennial Seep/Spring
Cactus Spring 1	4809A	Perennial Seep/Spring
Cactus Spring 2	4809A	Perennial Seep/Spring
Cactus West Seep	71N	Intermittent Seep/Spring
Camp's Well	ECE	Perennial Seep/Spring
Cathedral Spring	ECE	Perennial Seep/Spring
Cedar Spring	ECE	Perennial Seep/Spring
Cedar Well Complex	ECE	Intermittent Seep/Spring
Chalk Spring	74A	Unspecified Water Source
Chicken Pete's	71N	Perennial Seep/Spring
Chuckwalla	62A	Developed Water Source
Cliff Spring	74B	Perennial Seep/Spring
Coffers Ranch Spring	ECS	Unspecified Water Source
Construction Pond 1 and 2	4809A	Developed Water Source
Cooper's Meadow Complex	ECE	Intermittent Seep/Spring
Corral Spring	ECE	Perennial Seep/Spring
Cottonwood Seep	76	Intermittent Seep/Spring
Cow Camp Spring	63B	Unspecified Water Source
Coyote Pond	74C	Historical Spring
Dacite Seep	4809A	Perennial Seep/Spring
Dain Peak	63B	Developed Water Source
De Jesus	64A	Perennial Seep/Spring
Desert Well	71S	Intermittent Seep/Spring
East Kawich Spring	ECE	Perennial Seep/Spring
East Saucer Dugout	74C	Surface Water
Falcon Spring	74B	Intermittent Seep/Spring
Foggy	64B	Developed Water Source
Fork Spring	ECW	Unspecified Water Source
Former Pony Spring	74B	Unspecified Water Source
George's Water	ECE	Perennial Seep/Spring

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
Gold Spring	74A	Perennial Seep/Spring
Gravel	64A	Developed Water Source
Heaven's Well	63B	Developed Water Source
Horse Spring	74B	Historical Spring
Horse Trough Spring	4809A	Unspecified Water Source
Indian	62A	Developed Water Source
Indian Spring 1	74A	Intermittent Seep/Spring
Indian Spring 2	74B	Intermittent Seep/Spring
Indian Spring 3	74B	Intermittent Seep/Spring
Indian Spring 4	74B	Perennial Seep/Spring
Jerome Spring	76	Perennial Seep/Spring
Johnnie's Water	74A	Perennial Seep/Spring
Juniper Pass Dugout	74C	Surface Water
Kawich Peak Spring	ECE	Intermittent Seep/Spring
Kawich Seep 1	ECE	Perennial Seep/Spring
Kawich Seep 10	ECE	Intermittent Seep/Spring
Kawich Seep 11	ECE	Intermittent Seep/Spring
Kawich Seep 12	ECE	Intermittent Seep/Spring
Kawich Seep 13	ECE	Intermittent Seep/Spring
Kawich Seep 14	ECE	Intermittent Seep/Spring
Kawich Seep 15	ECE	Intermittent Seep/Spring
Kawich Seep 16	ECE	Perennial Seep/Spring
Kawich Seep 17	ECE	Intermittent Seep/Spring
Kawich Seep 18	ECE	Intermittent Seep/Spring
Kawich Seep 2	ECE	Perennial Seep/Spring
Kawich Seep 3	ECE	Intermittent Seep/Spring
Kawich Seep 4	ECE	Intermittent Seep/Spring
Kawich Seep 5	ECE	Intermittent Seep/Spring
Kawich Seep 6	ECE	Intermittent Seep/Spring
Kawich Seep 7	ECE	Unspecified Water Source
Kawich Seep 8	ECE	Intermittent Seep/Spring
Kawich Valley Wash	74C	Historical Spring
Larry's Seep	76	Intermittent Seep/Spring
Log Spring	ECE	Unspecified Water Source
Log Spring	ECE	Perennial Seep/Spring
Lower Chicken Pete's	71N	Perennial Seep/Spring
Lower Pillar Spring	ECS	Intermittent Seep/Spring
Mesic 1	76	Mesic Plant Community
Mesic 10	71N	Mesic Plant Community
Mesic 11	4809A	Mesic Plant Community
Mesic 117	75W	Mesic Plant Community
Mesic 118	75W	Mesic Plant Community

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
Mesic 12	4809A	Mesic Plant Community
Mesic 120	75W	Mesic Plant Community
Mesic 121	75W	Mesic Plant Community
Mesic 122	ECS	Mesic Plant Community
Mesic 126	ECE	Mesic Plant Community
Mesic 131	ECE	Mesic Plant Community
Mesic 134	76	Mesic Plant Community
Mesic 15	4809A	Mesic Plant Community
Mesic 16	71N	Mesic Plant Community
Mesic 19	4809A	Mesic Plant Community
Mesic 2	4809A	Mesic Plant Community
Mesic 3	ECW	Mesic Plant Community
Mesic 41	76	Mesic Plant Community
Mesic 49	74B	Mesic Plant Community
Mesic 5	ECE	Mesic Plant Community
Mesic 50	76	Mesic Plant Community
Mesic 73	TPECR	Mesic Plant Community
Mesic 77	76	Mesic Plant Community
Mesic 78	76	Mesic Plant Community
Mesic 79	76	Mesic Plant Community
Mesic 8	ECW	Mesic Plant Community
Monte Cristo	76	Perennial Seep/Spring
Nixon #1	75W	Intermittent Seep/Spring
Nixon #2	75W	Unspecified Water Source
Old Silverbow Spring	ECW	Intermittent Seep/Spring
Patches	64B	Developed Water Source
Phantom Spring	ECE	Perennial Seep/Spring
Pillar Springs	ECS	Perennial Seep/Spring
Pony Spring	74B	Perennial Seep/Spring
Quartz Mountain Tank #1	TPECR	Historical Spring
Quartz Spring	ECE	Intermittent Seep/Spring
Quartz Spring South	64A	Developed Water Source
Rock Spring	TPECR	Historical Spring
Roller Coaster Construction Pond	4809A	Developed Water Source
Roller Coaster Seep #1	4809A	Intermittent Seep/Spring
Roller Coaster Seep #2	4809A	Perennial Seep/Spring
Roller Coaster Seep #3	4809A	Intermittent Seep/Spring
Roller Coaster Seep #4	4809A	Intermittent Seep/Spring
Roller Coaster Seep #5	4809A	Intermittent Seep/Spring
Rose Spring	ECE	Intermittent Seep/Spring
Sailor's Spring	71N	Perennial Seep/Spring
Sand Spring	64B	Perennial Seep/Spring

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
Seep 17	TPECR	Unspecified Water Source
Seep 18	74B	Unspecified Water Source
Seep 21	76	Unspecified Water Source
Seep 22	62B	Unspecified Water Source
Seep 5	ECS	Surface Water
Seep 6	76	Unspecified Water Source
Seep 7	76	Unspecified Water Source
Seep 9	71N	Unspecified Water Source
Shale Cut Spring	62B	Historical Spring
Shirley Spring	74B	Historical Spring
Silverbow Seep	ECW	Intermittent Seep/Spring
Silverbow Spring	ECW	Perennial Seep/Spring
Sleeping Column Spring	71N	Perennial Seep/Spring
South Kawich Spring	ECE	Perennial Seep/Spring
Spotted 1	64B	Developed Water Source
Spotted 2	64B	Developed Water Source
Spotted 6	65C	Developed Water Source
Spring 100	4809A	Unspecified Water Source
Spring 102	4809A	Unspecified Water Source
Spring 103	4809A	Unspecified Water Source
Spring 104	75E	Unspecified Water Source
Spring 105	74B	Unspecified Water Source
Spring 107	76	Unspecified Water Source
Spring 108	76	Unspecified Water Source
Spring 11	ECS	Unspecified Water Source
Spring 110	ECE	Unspecified Water Source
Spring 111	74B	Unspecified Water Source
Spring 112	ECS	Unspecified Water Source
Spring 113	ECE	Unspecified Water Source
Spring 115	75W	Unspecified Water Source
Spring 119	TPECR	Unspecified Water Source
Spring 125	ECW	Unspecified Water Source
Spring 127	75W	Unspecified Water Source
Spring 129	71N	Unspecified Water Source
Spring 130	71N	Unspecified Water Source
Spring 132	ECE	Unspecified Water Source
Spring 16	74B	Unspecified Water Source
Spring 5	ECE	Unspecified Water Source
Spring 52	4809A	Unspecified Water Source
Spring 55	63B	Unspecified Water Source
Spring 65	64A	Unspecified Water Source
Spring 72	TPECR	Unspecified Water Source

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
Spring 74	TPECR	Unspecified Water Source
Spring 75	76	Unspecified Water Source
Spring 76	76	Unspecified Water Source
Spring 80	76	Unspecified Water Source
Spring 81	76	Unspecified Water Source
Spring 82	76	Unspecified Water Source
Spring 83	76	Unspecified Water Source
Spring 84	76	Unspecified Water Source
Spring 85	74A	Unspecified Water Source
Spring 90	ECE	Unspecified Water Source
Spring 91	ECE	Unspecified Water Source
Spring 92	71N	Unspecified Water Source
Spring 93	ECE	Unspecified Water Source
Spring 96	4809A	Unspecified Water Source
Spring 98	4809A	Unspecified Water Source
Spring 99	ECE	Unspecified Water Source
Stealth Seep	4809A	Perennial Seep/Spring
Stonewall Spring	76	Unspecified Water Source
Sulphide Well	ECW	Developed Water Source
Sumner Spring	ECE	Perennial Seep/Spring
Sundown Reservoir	74B	Historical Spring
Sundown Spring	74B	Perennial Seep/Spring
Surface Water 1	ECS	Surface Water
Surface Water 13	ECE	Surface Water
Surface Water 47	TPECR	Surface Water
Surface Water 48	ECS	Surface Water
Surface Water 70	ECS	Surface Water
Surface Water 71	ECS	Surface Water
Thirsty Canyon #1	ECS	Unspecified Water Source
Thirsty Canyon #10	ECS	Unspecified Water Source
Thirsty Canyon #11	ECS	Unspecified Water Source
Thirsty Canyon #12	ECS	Unspecified Water Source
Thirsty Canyon #2	ECS	Unspecified Water Source
Thirsty Canyon #3	ECS	Unspecified Water Source
Thirsty Canyon #4	ECS	Unspecified Water Source
Thirsty Canyon #5	ECS	Unspecified Water Source
Thirsty Canyon #6	ECS	Unspecified Water Source
Thirsty Canyon #7	ECS	Unspecified Water Source
Thirsty Canyon #8	ECS	Unspecified Water Source
Thirsty Canyon #9	ECS	Unspecified Water Source
Thunderbird Spring	ECE	Perennial Seep/Spring
Tim Spring	64B	Perennial Seep/Spring

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
Tommy	62A	Developed Water Source
Trappman Springs A	76	Perennial Seep/Spring
Trappman Springs B	76	Perennial Seep/Spring
Trappman Springs C	76	Perennial Seep/Spring
Tule George Spring	TPECR	Perennial Seep/Spring
Tunnel Spring	ECE	Unspecified Water Source
Tunnel Spring	ECE	Perennial Seep/Spring
Unnamed #2	4809A	Unspecified Water Source
Unnamed Spring 1	74B	Unspecified Water Source
Unnamed Spring 2	74A	Unspecified Water Source
Unnamed Spring 3	74B	Unspecified Water Source
Upper Cliff Spring	74B	Intermittent Seep/Spring
Upper George's Spring	ECE	Intermittent Seep/Spring
Upper Silverbow Spring	ECW	Historical Spring
Urania Mine Spring	4809A	Intermittent Seep/Spring
Vitovitch Spring	76	Perennial Seep/Spring
West Dacite Spring	4809A	Perennial Seep/Spring
West Kawich Spring	ECE	Intermittent Seep/Spring
West Saucer Dugout	75E	Surface Water
White Patch Spring	71N	Intermittent Seep/Spring
White Ridge Spring	ECE	Intermittent Seep/Spring
White Rock Spring	62B	Historical Spring
White Sage Gap	62B	Developed Water Source
Wild Horse Spring	71N	Perennial Seep/Spring
Wild Rose Spring	ECE	Intermittent Seep/Spring
Wildcat Spring	74B	Intermittent Seep/Spring
10	ECE	Intermittent Seep/Spring
100	71N	Possible Water Source
101	71N	Unspecified Water Source
102	71N	Unspecified Water Source
103	71N	Unspecified Water Source
104	71N	Unspecified Water Source
105	71N	Unspecified Water Source
106	71N	Unspecified Water Source
107	71N	Developed Water Source
108	71N	Developed Water Source
109	71N	Unspecified Water Source
11	ECE	Intermittent Seep/Spring
110	71N	Unspecified Water Source
111	4809A	Intermittent Seep/Spring
112	71S	Unspecified Water Source
113	71S	Unspecified Water Source

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
114	71S	Unspecified Water Source
115	76	Unspecified Water Source
116	76	Unspecified Water Source
117	76	Unspecified Water Source
118	76	Unspecified Water Source
119	76	Unspecified Water Source
12	ECE	Unspecified Water Source
120	76	Unspecified Water Source
121	76	Unspecified Water Source
122	76	Unspecified Water Source
123	76	Possible Water Source
124	76	Unspecified Water Source
125	75W	Unspecified Water Source
126	75W	Unspecified Water Source
127	75W	Unspecified Water Source
128	75W	Unspecified Water Source
129	76	Unspecified Water Source
13	ECE	Possible Water Source
14	ECE	Possible Water Source
15	ECE	Intermittent Seep/Spring
16	ECE	Intermittent Seep/Spring
17	ECE	Possible Water Source
18	ECE	Unspecified Water Source
19	ECE	Unspecified Water Source
20	ECE	Unspecified Water Source
21	ECE	Possible Water Source
22	ECE	Possible Water Source
23	ECE	Possible Water Source
24	ECE	Intermittent Seep/Spring
25	ECE	Unspecified Water Source
26	ECE	Perennial Seep/Spring
27	ECE	Possible Water Source
28	ECE	Intermittent Seep/Spring
29	ECE	Intermittent Seep/Spring
30	ECE	Intermittent Seep/Spring
31	ECE	Intermittent Seep/Spring
32	ECE	Possible Water Source
33	ECE	Possible Water Source
34	ECE	Possible Water Source
35	ECE	Intermittent Seep/Spring
36	ECE	Intermittent Seep/Spring
37	ECE	Intermittent Seep/Spring

Appendix D: Current and historical seeps and springs on NAFB, CAFB, and the NTTR.

Water Source Name	Location	Type
38	ECE	Intermittent Seep/Spring
39	ECE	Intermittent Seep/Spring
45	ECW	Intermittent Seep/Spring
46	ECW	Intermittent Seep/Spring
47	ECE	Intermittent Seep/Spring
48	ECE	Intermittent Seep/Spring
49	ECE	Unspecified Water Source
50	ECE	Surface Water
51	ECE	Intermittent Seep/Spring
52	ECE	Intermittent Seep/Spring
53	ECE	Unspecified Water Source
54	ECE	Unspecified Water Source
55	ECE	Unspecified Water Source
56	ECE	Unspecified Water Source
57	4809B	Unspecified Water Source
58	ECE	Surface Water
6	ECE	Intermittent Seep/Spring
62	ECE	Perennial Seep/Spring
63	ECE	Developed Water Source
64	74C	Possible Water Source
65	74C	Unspecified Water Source
66	74C	Unspecified Water Source
67	74C	Unspecified Water Source
68	74C	Unspecified Water Source
69	74C	Unspecified Water Source
7	ECE	Intermittent Seep/Spring
8	ECE	Intermittent Seep/Spring
88	4809A	Unspecified Water Source
89	4809A	Unspecified Water Source
9	ECE	Intermittent Seep/Spring
90	71N	Unspecified Water Source
91	71N	Unspecified Water Source
92	71N	Unspecified Water Source
93	71N	Unspecified Water Source
94	71N	Intermittent Seep/Spring
95	71N	Possible Water Source
96	71N	Possible Water Source
97	71N	Possible Water Source
98	71N	Possible Water Source
99	71N	Possible Water Source

14.5 Appendix E. Threatened, Endangered, and Sensitive species known or having the potential to occur on NAFB, CAFB, and NTTR.

Appendix E. Threatened, Endangered, and Sensitive species known or having the potential to occur on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

Common Name	Scientific Name	Federal Status	State Status	Documented on NAFB, CAFB, or NTTR?
Amphibians				
Amargosa Toad	*Anaxyrus nelsoni*	BLM-sensitive	Protected	No
Northern Leopard Frog	*Lithobates pipiens*	BLM-sensitive	Protected	No
Reptiles				
Desert Tortoise	*Gopherus agassizii*	Threatened	Threatened	Yes
Gila Monster	*Heloderma suspectum*	BLM-sensitive	Protected	Yes
Sonoran Mountain Kingsnake	*Lampropeltis pyromelana*	BLM-sensitive	Protected	No
Rosy Boa	*Lichanura orcutti*	None	Protected	No
Birds				
Northern Goshawk	*Accipiter gentilis*	BLM-sensitive	Sensitive	Yes
Golden Eagle	*Aquila chrysaetos*	BLM-sensitive	SOCP	Yes
Western Burrowing Owl	*Athene cunicularia hypugaea*	BLM-sensitive	SOCP	Yes
Ferruginous Hawk	*Buteo regalis*	BLM-sensitive	SOCP	Yes
Swainson's Hawk	*Buteo swainsoni*	BLM-sensitive	SOCP	Yes
Greater Sage-grouse	*Centrocercus urophasianus*	BLM-sensitive	Game Bird	Yes
Western Snowy Plover, interior population	*Charadrius alexandrinus nivosus*	BLM-sensitive	SOCP	No
Peregrine Falcon	*Peregrine Falcon (Falco peregrinus)*	BLM-sensitive	Endangered	Yes
Pinyon Jay	*Gymnorhinus cyanocephalus*	BLM-sensitive	SOCP	Yes
Bald Eagle	*Haliaeetus leucocephalus*	BLM-sensitive	Endangered	No
Loggerhead Shrike	*Lanius ludovicianus*	BLM-sensitive	Sensitive	Yes
Black Rosy-fine	*Leucosticte atrata*	BLM-sensitive	SOCP	No
Lewis's Woodpecker	*Melanerpes lewis*	BLM-sensitive	SOCP	Yes
Sage Thrasher	*Oreoscoptes montanus*	BLM-sensitive	Sensitive	Yes
Brewer's Sparrow	*Spizella breweri*	BLM-sensitive	Sensitive	Yes
Bendire's Thrasher	*Toxostoma bendirei*	BLM-sensitive	SOCP	No
Le Conte's Thrasher	*Toxostoma lecontei*	BLM-sensitive	SOCP	Yes
Mammals				
Pallid Bat	*Antrozous pallidus*	BLM-sensitive	Protected	Yes
Spotted Bat	*Euderma maculatum*	BLM-sensitive	Threatened	Yes
Western Mastiff Bat	*Eumops perotis*	BLM-sensitive	Sensitive	Yes
Allen's Big-eared Bat	*Idionycteris phyllotis*	BLM-sensitive	Protected	No
Silver-haired Bat	*Lasionycteris noctivagans*	BLM-sensitive	SOCP*	Yes
Western Red Bat	*Lasiurus blossevillii*	BLM-sensitive	Sensitive	Yes
Hoary Bat	*Lasiurus cinererus*	BLM-sensitive	SOCP	Yes

Appendix E. Threatened, Endangered, and Sensitive species known or having the potential to occur on Nellis Air Force Base, Creech Air Force Base, and the Nevada Test and Training Range.

Common Name	Scientific Name	Federal Status	State Status	Documented on NAFB, CAFB, or NTTR?
California Leaf-nosed Bat	*Macrotis californicus*	BLM-sensitive	Sensitive	Yes
California Myotis	*Myotis californicus*	BLM-sensitive	SOCP	Yes
Long-eared Myotis	*Myotis evotis*	BLM-sensitive	SOCP	Yes
Fringed Myotis	*Myotis thysanodes*	BLM-sensitive	Protected	Yes
Southwest Cave Myotis	*Myotis velifer brevis*	BLM-sensitive	SOCP	Yes
Dark Kangaroo Mouse	*Microdipodops megacephalus*	BLM-sensitive	Protected	Yes
Pale Kangaroo Mouse	*Microdipodops pallidus*	BLM-sensitive	Protected	Yes
Canyon Bat	*Parastrellus hesperus*	BLM-sensitive	SOCP	Yes
Townsend's Big-eared Bat	*Plecotus townsendii*	BLM-sensitive	Sensitive	Yes
Brazilian Free-tailed Bat	*Tadarida brasiliensis*	BLM-sensitive	Protected	Yes
Botta's Pocket Gopher	*Thomomys bottae*	BLM-sensitive	SOCP	Yes
Desert kangaroo Rat	*Dipodomys deserti*	BLM-sensitive	SOCP	Yes
Pygmy Rabbit	*Brachylagus idahoensis*	BLM-sensitive	Game, SOCP	Yes
Invertebrates				
Mojave Poppy Bee	*Perdita meconis*	BLM-sensitive	Critically imperiled	No
Plants				
Las Vegas Bearpoppy	*Arctomecon californica*	none	Endangered	Yes
Threecorner Milkvetch	*Astragalus geyeri var. triquetrus*	none	Endangered	Yes
Ash Meadows Milkvetch	*Astragalus phoenix*	none	Endangered	No
Spring-Loving Centaury	*Centaurium namophilum*	none	Endangered	No
Unusual Catseye	*Cryptantha insolita*	none	Endangered	No
Ash Meadows Sunray	*Enceliopsisnudicaulis var. corrugata*	none	Endangered	No
Sticky Buckwheat	*Eriogonum viscidulum*	none	Endangered	Yes
Sunnyside Green Gentian	*Frasera gypsicola*	none	Endangered	No
Ash Meadows Gumplant	*Grindelia fraxino-pratensis*	none	Endangered	No
Ash Meadows Ivesia	*Ivesia kingii var. eremica*	none	Endangered	No
Ash Meadows Blazingstar	*Mentzelia leucophylla*	none	Endangered	No
Blue Diamond Cholla	*Opuntiawhipplei var. multigeniculata*	none	Endangered	No
Williams Combleaf	*Polyctenium williamsiae*	none	Endangered	No

*SOCP refers to NDOW's designation of Species of Conservation Priority.

(Chg 2, 7 Apr 2021)

15.0 ASSOCIATED PLANS

Tab 1 – Wildland Fire Management Plan

Located in File Folder: ASSOCIATED PLANS

Tab 2 – Golf Environmental Management (GEM) Plan

Located in File Folder: ASSOCIATED PLANS

Tab 3 – Integrated Pest Management Plan

Located in File Folder: ASSOCIATED PLANS