FINAL

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN 2019–2023

HAWTHORNE ARMY DEPOT, NEVADA

December 2018

***Prepared by*:** **Tetra Tech, Inc.**
Fairfax, VA

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HAWTHORNE ARMY DEPOT, NEVADA
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
2019–2023

This Integrated Natural Resources Management Plan has been developed on behalf of Hawthorne Army Depot in cooperation with the U.S. Fish and Wildlife Service and the Nevada Department of Wildlife. The signature below indicates the approval of the signing party concerning the conservation, protection, and management of fish and wildlife resources as presented in the plan.

PLAN APPROVAL

SCOTT M. BISHOP
Lieutenant Colonel
Commander
Hawthorne Army Depot, NV

_____
Signature

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Date

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AGENCY AGREEMENT

PAUL SOUZA
Regional Director
Pacific Southwest Region
U.S. Fish and Wildlife Service
Sacramento, CA

_____
Signature

_____
Date

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AGENCY AGREEMENT

TONY WASLEY
Director
Nevada Department of Wildlife
Reno, NV

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ABBREVIATIONS AND ACRONYMS

ºF	degrees Fahrenheit
AMC	U.S. Army Materiel Command
amsl	above mean sea level
AR	U.S. Army Regulation
BGEPA	Bald and Golden Eagle Protection Act
BLM	U.S. Bureau of Land Management
BMP	best management practice
BSAP	Bi-State Action Plan
CFR	Code of Federal Regulations
CWA	Clean Water Act
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
DoDI	Department of Defense Instruction
DoDM	Department of Defense Manual
DOE	U.S. Department of Energy
EO	Executive Order
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GIS	geographic information system
GOCO	government-owned contractor-operated
HWAD	Hawthorne Army Depot
IAP	Installation Action Plan
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IPM	integrated pest management
IRP	Installation Restoration Program
ISMP	Invasive Species Management Plan
ISO	International Standards Organization
LCT	Lahontan cutthroat trout
LWG	local working group
MACOM	Major Command
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NAC	Nevada Administrative Code
NAGPRA	Native American Graves Protection and Repatriation Act
NDOW	Nevada Department of Wildlife

NEPA	National Environmental Policy Act
NFA	no further action
NHPA	National Historic Preservation Act
NNHP	Nevada Natural Heritage Program
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PCPI	per capita personal income
PLS	Planning Level Survey
PMP	Pest Management Plan
PMU	Population Management Unit
RPMP	Real Property Master Plan
SHPO	State Historic Preservation Office
SOC	SOC Nevada LLC
SOP	standard operating procedure
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project
T&E	threatened and endangered
TCP	traditional cultural property
TDS	total dissolved solids
TNC	The Nature Conservancy
U.S.	United States
U.S.C.	United States Code
UC	University of California
UNR	University of Nevada, Reno
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	unexploded ordnance
WADF	Western Area Demilitarization Facility
WAP	Wildlife Action Plan
WBRP	Walker Basin Restoration Program
WRPT	Walker River Paiute Tribe

EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) addresses natural resources and their management on all lands over which Hawthorne Army Depot (HWAD) has jurisdiction and control. HWAD is a government-owned, contractor-operated installation of the U.S. Army Materiel Command located in western Nevada. HWAD encompasses 147,236 acres, including much of the land around the town of Hawthorne, Nevada, and the southern portion of Walker Lake.

The purpose of this INRMP is to guide the natural resources management program at HWAD from 2019 to 2023 and provide a solid foundation on which to continue building the program beyond 2023.

The INRMP has been prepared in accordance with Army Regulation 200-1, *Environmental Protection and Enhancement*, and Department of Defense Manual 4715.03, *Integrated Natural Resources Management Plan (INRMP) Implementation Manual*. It reflects HWAD's commitment to conserve, protect, and enhance natural resources while achieving no net loss in the capability of installation lands to support the military mission.

The INRMP provides the guidance necessary for HWAD to maintain compliance with the Natural Resource Management on Military Lands Act of 1960 (Title 16 of the *United States Code* [U.S.C.] § 670 *et seq*.), commonly known as the Sikes Act; Department of Defense Instruction 4715.03, *Natural Resources Conservation Program*; the Endangered Species Act (16 U.S.C. § 1531 *et seq*.); the Migratory Bird Treaty Act (16 U.S.C. § 703 *et seq*.); the Bald and Golden Eagle Protection Act (16 U.S.C. § 668); Executive Order 11990, *Protection of Wetlands*; and other applicable regulations, policies, guidance, and agreements related to natural resources management.

The INRMP provides the U.S. Army and HWAD with a single document that describes the depot's natural resources. It contains goals and objectives to guide management of natural resources on the depot as well as specific management measures and projects HWAD personnel can implement to achieve measurable progress toward conserving its natural resources and ensuring the long-term sustainability of its lands to support the military mission. HWAD will initiate and complete the identified projects in accordance with current mission requirements and funding.

The INRMP is not intended as a stand-alone document, but is designed to document the current condition and management of HWAD's natural resource assets and to assist in integrating management of those assets into other programs and activities across the depot. This INRMP should be used in conjunction with the Installation Master Plan, Integrated Cultural Resources Management Plan, Integrated Pest Management Plan, Installation Action Plan, and other appropriate plans and activities.

HWAD natural resources management personnel review the INRMP annually and update it at least once every 5 years to ensure that HWAD's natural resources management program is being successfully implemented. All reviews are conducted in coordination with the U.S. Fish and Wildlife Service and the Nevada Department of Wildlife. This INRMP updates HWAD's 2013 INRMP.

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SECTION 1.0 INTRODUCTION

Hawthorne Army Depot (HWAD) is a government-owned, contractor-operated (GOCO) installation of the U.S. Army Materiel Command (AMC) located in western Nevada near the town of Hawthorne, NV. HWAD encompasses 147,236 acres, most of which is in one contiguous parcel; however, the New Bomb Area is a separate parcel of approximately 3,000 acres located 21 miles south of the larger parcel. The southern portion of Walker Lake is part of HWAD, as is Mount Grant, which occupies approximately 45,000 acres and is Nevada's third highest peak at an elevation of 11,239 feet.

Maintaining the Mount Grant area in ecologically sound condition is an important priority for natural resources management personnel at HWAD because streams on Mount Grant supply much of HWAD's potable water. To preserve water quality, HWAD has prohibited grazing and restricted human activity in the Mount Grant area for many years. As a result, natural resources in the Mount Grant area are relatively undisturbed compared to many other sites in the region.

1.1 PURPOSE

1.1.1 Purpose and Scope

This Integrated Natural Resources Management Plan (INRMP) addresses natural resources and their management on all lands over which HWAD has jurisdiction and control, including lands occupied by tenants or lessees and land being used by others pursuant to a permit, license, right-of-way, or any other form of permission. The purpose of this INRMP is to guide the natural resources management program at HWAD from 2019 to 2023 and provide a solid foundation on which to continue building the program beyond 2023.

This INRMP updates HWAD's 2013 INRMP. Implementing this INRMP will allow HWAD to conduct its military mission while maintaining ecosystem viability. In addition, complying with this INRMP ensures that natural resources management measures and mission activities on HWAD land are integrated and consistent with federal stewardship requirements.

1.1.2 Support of the Army Mission

It is the policy of the U.S. Department of Defense (DoD) to implement and maintain natural resources conservation programs to ensure access to land, air, and water resources for realistic military training and testing while ensuring that the natural resources under military stewardship and control are managed to support and be consistent with the military mission (DoD 2013).

The INRMP fulfills natural resource stewardship requirements while enabling military preparedness and providing for no net loss in the capability of military land to support the military mission, pursuant to section 670a(b)(1)(I) of the Natural Resource Management on Military Lands Act of 1960 (Title 16 of the *United States Code* [U.S.C.] § 670 *et seq.*), commonly known as the Sikes Act. Implementing this INRMP will help HWAD achieve its mission to store conventional munitions; demilitarize and dispose of unserviceable, obsolete, and surplus munitions; and maintain serviceability through inspection and renovation to ensure munitions readiness.

1.1.3 Benefits

The INRMP provides the U.S. Army and HWAD with a single document that describes the depot's natural resources. It contains goals and objectives to guide management of natural resources on the depot as well as specific management measures and projects HWAD personnel can implement to achieve measurable progress toward conserving its natural resources and ensuring the long-term sustainability of its lands to support the military mission. HWAD will initiate and complete the identified projects in accordance with current mission requirements and funding.

1.2 GOALS AND MANAGEMENT PRACTICES

1.2.1 Natural Resources Management Goals

This INRMP provides a comprehensive, coordinated framework for long-term and cost-effective management of natural resources at HWAD in accordance with the Sikes Act and DoD policy. This framework enables HWAD to achieve the following:

- Ensure the long-term sustainability of its lands to support the military mission
- Conserve natural and cultural resources
- Accommodate multiple uses of the land
- Accommodate public access to and use of military lands within the limits of safety and military security requirements
- Ensure that natural resources conservation measures and Army activities on HWAD land are integrated and consistent with federal stewardship requirements

HWAD has developed the following goals for managing its natural resources that reflect the framework of the management program, the current state of natural resources at the depot, and current needs for sustaining natural resources:

- Goal 1: Identify, protect, and conserve water resources.
- Goal 2: Identify, preserve, and restore special status species.
- Goal 3: Identify, preserve, and restore wildlife species and their habitats.
- Goal 4: Identify, preserve, and restore native plants and terrestrial habitats.
- Goal 5: Manage natural resources to minimize the potential for wildfire loss.
- Goal 6: Assess the potential impacts of climate change on natural resources and the mission.
- Goal 7: Maintain natural resources program data.

Section 9.0 presents these goals and the objectives and projects that will be implemented to enable HWAD to make measurable progress toward achieving them. HWAD will initiate and complete the identified projects in accordance with current mission requirements and funding. Table 20 (at the end of this document) contains additional project detail such as cost, timeframe, and responsibility.

1.2.2 Relationship to Current Management Practices

The management goals, objectives, projects, and management measures this plan contains have been updated to reflect the current condition of the natural resources and anticipated military mission-related activities that will occur at HWAD. These plan elements have been designed to reflect the goals of long-term sustainability of HWAD's ecosystems and the balance between natural resources and the depot's military mission.

The natural resources management program must remain flexible if it is to achieve long-term success. Incorporating adaptive management techniques into the program will enable it to achieve and maintain that flexibility. *Adaptive management* is a process by which new information from monitoring data, special studies, and scientific literature is used to evaluate the success of the management measures in place. That information is then used to determine the changes in the management approach necessary to ensure the continued success of the program. The natural resources management program might also be required to adapt to unforeseen changes in military mission and legal requirements.

1.3 RELATIONSHIP TO OTHER PLANS

The INRMP is not intended as a stand-alone document, but is designed to document the condition and management of HWAD's natural resource assets and to assist in integrating management of those assets into other programs and activities across the depot. This INRMP is integrated with and should be used in conjunction with related plans. Related plans and survey documents, including the following, which are hereby incorporated by reference into the INRMP, are available by contacting the Environmental Division:

- Real Property Master Plan (RPMP)
- Integrated Cultural Resources Management Plan (ICRMP)
- Pest Management Plan (PMP)
- Installation Action Plan (IAP)
- Rare Plant Survey
- Invasive Species Survey Report
- Vegetation Communities Planning Level Survey (PLS)
- Emergency Operations Plan (EOP)
- Oil Removal Contingency Plan
- Spill Prevention Control and Countermeasure Plan
- Stormwater Pollution Prevention Plan (SWPPP)

1.4 ENVIRONMENTAL COMPLIANCE

As stated in Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*, "the Army is committed to environmental stewardship in all actions as an integral part of its mission and to ensure sustainability" and will "sustain the environment to enable the Army mission and secure the future."

The INRMP has been prepared in accordance with AR 200-1 and Department of Defense Manual (DoDM) 4715.03, *Integrated Natural Resources Management Plan (INRMP) Implementation Manual* (DoD 2013). It reflects HWAD's commitment to conserve, protect, and enhance natural resources while achieving no net loss in the capability of installation lands to support the military mission.

The INRMP provides the guidance necessary for HWAD to maintain compliance with Sikes Act; Department of Defense Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*; the Endangered Species Act (ESA) (16 U.S.C. § 1531 *et seq.*); the Migratory Bird Treaty Act (MBTA) (16 U.S.C. § 703 *et seq.*); the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. § 668); Executive Order (EO) 11990, *Protection of Wetlands*; and other applicable regulations, policies, guidance, and agreements related to natural resources management.

1.5 USE, SCOPE, AND FUNCTION OF THE INRMP

1.5.1 Use of the INRMP to Guide Natural Resources Management

This INRMP is intended to serve as an effective tool for HWAD personnel to use in managing natural resources consistent with mission activities and requirements. Implementing this adaptive plan will support consistency with the military mission while protecting natural resources for multiple use, sustainable yield, and ecosystem sustainability and will ensure that natural resources conservation activities on mission land are integrated into and consistent with federal stewardship requirements.

1.5.2 Scope of the INRMP

This INRMP addresses natural resources and their management throughout HWAD. While it does not address managing natural resources on properties beyond the boundaries of the depot, management activities are coordinated with adjacent landowners and other property managers for activities that involve resources management planning on a landscape scale.

1.5.3 Function of the INRMP

This INRMP helps ensure that environmental considerations continue to be an integral part of planning activities at HWAD and that natural resources are protected in accordance with applicable regulations and policies. It represents a review and update of the 2013–2018 HWAD INRMP, reflecting the natural resources activities undertaken at HWAD over the intervening years and proposing updated goals, objectives, projects, and management measures to be implemented in 2019 through 2023 and beyond.

1.6 MANAGEMENT PHILOSOPHY

1.6.1 How this INRMP Supports the Army Military Mission

Maintaining sustainable environmental conditions on military lands is essential for the success of the military mission at HWAD. The management measures in this INRMP have been developed on the basis of the existing conditions of HWAD's natural resources and the military mission and current and anticipated mission activities. Implementing this INRMP will help HWAD achieve its mission to store conventional munitions; demilitarize and dispose of

unserviceable, obsolete, and surplus munitions; and maintain serviceability through inspection and renovation to ensure munitions readiness.

1.6.2 How this INRMP Was Developed

This INRMP was updated by an interdisciplinary team of biologists, environmental scientists, and natural resources personnel. Its preparation involved review and analysis of past natural resources management practices, ongoing programs, and current conditions of natural resources at HWAD. The team interviewed personnel from HWAD, the U.S. Fish and Wildlife Service (USFWS), the Nevada Department of Wildlife (NDOW), and other interested parties; collected and analyzed existing environmental documentation; and conducted a field reconnaissance of the installation. Under a separate task order, the team conducted a Vegetation Communities PLS to update information about flora and vegetation in the INRMP.

1.6.3 How this INRMP Implements the Army Principles for Ecosystem Management

In accordance with DoD policy, this INRMP uses an ecosystem management approach to natural resources management. Each element of the ecosystem is managed in relationship to other parts of the ecosystem, so that natural biological integrity is maintained to the maximum extent feasible. Stewardship of natural resources on an ecosystem scale addresses requirements of water quality, soil productivity, biological diversity of native flora and fauna, and compliance concerns.

The need for an ecosystem-based approach to natural resources management is evident from the complexity of relationships among water quality, biological diversity, ecological resilience, and other factors. For example, the Mount Grant watershed supports the military mission by providing a source of clean potable water and serves as a valuable training area. The area also provides public recreational opportunities such as hunting, fishing, and camping. In addition to being essential to supporting the military mission, the condition of Mount Grant and Walker Lake directly influences the quality of wildlife habitat and abundance and diversity of wildlife at HWAD. The condition of natural resources at HWAD directly influences water quality and the health of fisheries, vegetation communities, and sensitive habitats such as wetlands.

Managing Mount Grant, Walker Lake, and other habitats using an ecosystem approach will maintain, protect, and enhance natural resources. Results from surveys at HWAD serve as indicators of the overall ecological health of installation property. Degradation of these areas would result in degraded water quality, which would adversely affect the mission as well as the loss of ecological integrity and biodiversity.

The management measures and projects envisioned by this INRMP would improve the health of both small areas and conditions over the larger ecological scale.

1.6.4 How this INRMP Supports the Installation Planning Process

This INRMP supports HWAD's planning process by identifying and prioritizing natural resources management goals and objectives, identifying projects to support those goals and objectives, and identifying the schedule and resources (labor and funding) required to perform those projects. These functions help guide the larger planning process, including budgeting, hiring, and acquisition.

SECTION 2.0 REGULATORY FRAMEWORK

This section provides an overview of regulations, policies, and guidance related to the development, review, and implementation of INRMPs.

2.1 THE SIKES ACT

The Sikes Act requires DoD to develop comprehensive INRMPs that are fully coordinated with USFWS and the appropriate state agency. The INRMPs will assist DoD in carrying out a program that will provide for (1) the conservation and rehabilitation of natural resources on military installations; (2) the sustainable multipurpose use of those resources, including hunting, fishing, trapping, and nonconsumptive uses; and (3) public access to military installations to facilitate sustainable use subject to safety requirements and military security.

In accordance with the Sikes Act, an INRMP shall address the following:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation
- Fish and wildlife habitat enhancement or modifications
- Wetland protection, enhancement, and restoration, where necessary, to support fish, wildlife, or plants
- Integration of, and consistency among, the various activities conducted under the plan
- Establishment of specific natural resources management goals and objectives and time frames for proposed actions
- Sustainable use by the public of natural resources to the extent that the use is consistent with the needs of fish and wildlife resources
- Public access to the military installation necessary or appropriate for the use described above, subject to requirements necessary to ensure safety, military security, and fulfillment of the military mission
- Enforcement of applicable natural resources laws (including regulations)
- No net loss in the capability of military installation lands to support the military mission of the installation
- Such other activities as the Secretary of the military department determines appropriate

2.2 SIKES ACT TRIPARTITE MEMORANDUM OF UNDERSTANDING

The Sikes Act Tripartite Memorandum of Understanding (MOU) established a cooperative relationship between the DoD, USFWS, and state fish and wildlife agencies (represented by the Association of Fish and Wildlife Agencies) for preparing, reviewing, and implementing INRMPs (DoD et al. 2013).

2.3 DODI 4715.03, NATURAL RESOURCES CONSERVATION PROGRAM

DoDI 4715.03 provides policy and procedures for developing, implementing, and evaluating effective integrated natural resources management programs on DoD lands, including preparing an INRMP as required by the Sikes Act. DoDI 4715.03 states that INRMPs shall (1) incorporate the principles of ecosystem-based management, (2) contain information needed to support

natural resources decision-making, (3) contain flora and fauna species lists, (4) ensure that significant or sensitive natural resources are monitored and managed for long-term sustainability, and (5) ensure no net loss to the installation's training and testing capabilities and enhance those capabilities to the maximum extent practicable (DoD 2011).

2.4 DoDM 4715.03, Integrated Natural Resources Management Plan (INRMP) Implementation Manual

DoDM 4715.03 provides procedures to prepare, review, update, and implement INRMPs in compliance with the Sikes Act (DoD 2013). This revised INRMP was prepared in accordance with DoDM 4715.03.

2.5 AR 200-1, Environmental Protection and Enhancement

AR 200-1 reflects the Army's commitment to the conservation of its natural resources. It requires the preparation of INRMPs and provides guidance on their preparation, implementation, review, and approval. AR 200-1 requires that INRMPs include specific goals and measurable objectives and be consistent with other installation management plans.

2.6 32 CFR Part 651, Environmental Effects of Army Actions

Title 32 of the *Code of Federal Regulations* (CFR) part 651 "… implements the National Environmental Policy Act of 1969 (NEPA), setting forth the Army's policies and responsibilities for the early integration of environmental considerations into planning and decision-making."

NEPA requires federal agencies to consider the environmental consequences of major proposed actions such as implementing this INRMP. When the plan was originally prepared, HWAD assessed the expected consequences of implementing it in accordance with NEPA and 32 CFR part 651.

2.7 Headquarters, Department of the Army INRMP Policy Memorandum, March 21, 1997

The Headquarters, Department of the Army INRMP policy memorandum dated March 21, 1997, and titled *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys and Integrated Natural Resources Management Plan*, states that the purpose for completing the INRMP and PLSs is "to ensure that natural resource conservation measures and Army activities on mission land are integrated and are consistent with federal stewardship requirements" (HQDA 1997).

SECTION 3.0 RESPONSIBLE AND INTERESTED PARTIES

This section describes the parties that contribute to natural resources management at HWAD.

3.1 HAWTHORNE ARMY DEPOT

HWAD's Commander is directly responsible for operating and maintaining HWAD, including implementing and enforcing this INRMP. The Commander is responsible for fish and wildlife management and outdoor recreation activities at HWAD and has the authority to delegate all or portions of the management of these activities to members of his command. The Commander retains the exclusive approval authority for use of normally restricted areas for recreational purposes.

The INRMP is implemented through HWAD's Environmental Division, which is under the Directorate of Risk Management. The Environmental Division is responsible for environmental programs at HWAD and manages compliance with laws and regulations that govern natural resources such as the ESA, MBTA, and BGEPA (16 U.S.C. § 668).

HWAD is a GOCO facility and its operating contractor is SOC Nevada LLC (SOC). Implementation of the INRMP is coordinated through the operating contractor and other HWAD organizations such as Contract Administration, Facilities Management, Maintenance, Police, Real Property, and Security as their services and cooperation are needed or as their programs impact natural resources.

3.2 OTHER DEFENSE ORGANIZATIONS

3.2.1 U.S. Army Materiel Command

HWAD is under the administration of the Joint Munitions Command, which is a major subordinate command of the AMC. As HWAD's major command (MACOM), AMC is responsible for requesting and distributing budget for all organizations and installations under its command. The MACOM is the decision-making authority tasked with prioritizing the operational, organizational, material, and environmental needs of these organizations and providing the funds and higher-level support for required equipment and activities. AMC reviews budget requests and disburses funding to HWAD to administer and implement many of the projects and programs described in this INRMP.

3.2.2 U.S. Army Corps of Engineers, Mobile and Sacramento Districts

The U.S. Army Corps of Engineers (USACE), Mobile District provides contractor support for preparing and updating the INRMP. HWAD is within the USACE, Sacramento District's geographic area. USACE serves in an administrative capacity and in a quality assurance role.

3.3 OTHER FEDERAL AGENCIES

In addition to DoD, other federal agencies have an interest or role in managing natural resources at HWAD. The basis of those agencies' involvement includes signatory responsibilities, cooperative agreements, regulatory authority, and technical assistance as required by federal laws and regulations. This section describes the agencies and their roles.

U.S. Department of the Interior, U.S. Fish and Wildlife Service. USFWS provides signatory agreement on the fish and wildlife components of the INRMP. It is the primary federal agency responsible for addressing issues regarding fish and wildlife management and the regulatory authority for the ESA, MBTA, BGEPA, and Fish and Wildlife Coordination Act (16 U.S.C. § 661-667e). Coordination between HWAD's environmental personnel and USFWS occurs as needed.

U.S. Bureau of Land Management (BLM). BLM is responsible for managing more than 260 million acres of public land, including land bordering HWAD. At HWAD, BLM manages feral horses as needed. HWAD has a cooperative agreement with BLM for fire protection responsibilities, including wildland fires (SOC 2017a).

U.S. Forest Service (USFS). HWAD's New Bomb Area is adjacent to USFS's Humboldt-Toiyabe National Forest. HWAD has a cooperative agreement with USFS for fire protection responsibilities, including wildland fires (SOC 2017a).

U.S. Geological Survey (USGS). In cooperation with HWAD, USGS biologists have conducted surveys at Mount Grant since the mid-1990s. Dr. Erik Beever has conducted research on the American pika (*Ochotona princeps*) as part of pika research across the hydrographic Great Basin (Beever 2013, personal communication). In addition, USGS has conducted surveys of greater sage-grouse (*Centrocercus urophasianus*).

3.4 STATE AGENCIES

Nevada Department of Wildlife (NDOW). NDOW provides signatory agreement concerning the fish and wildlife aspects of the INRMP. It is the primary state agency in Nevada responsible for issues regarding fish and wildlife management, as well as the regulatory and enforcement authority for hunting, fishing, and trapping. NDOW is also a consulting agency under the Fish and Wildlife Coordination Act. In cooperation with HWAD, NDOW biologists frequently conduct surveys and other natural resources management efforts at the installation. Recent efforts have included surveys for bats and bighorn sheep and stocking Cottonwood Creek with Lahontan cutthroat trout (LCT) (*Oncorhynchus clarkii henshawi*). NDOW manages regulated fisheries and the stocking program for the threatened LCT, tui chub (*Gila bicolor*), and sport fish at HWAD. NDOW also works with HWAD and USGS to collar and track greater sage-grouse on Mount Grant, promotes management practices for improving sage-grouse habitat, and manages bighorn sheep in Nevada (Freese 2018, personal communication).

Nevada State Historic Preservation Office (SHPO). The SHPO assists HWAD in complying with section 106 of the National Historic Preservation Act (NHPA) and other federal and state regulations related to cultural resources and historic properties.

3.5 NATIVE AMERICAN TRIBES

The Walker River Paiute Tribe (WRPT), a federally recognized tribe of the Northern Paiute people, has notified HWAD that it has interests in the region, including Walker River, Walker Lake, and the Wassuk Mountain Range, specifically on Mount Grant. HWAD's ICRMP (Earth Tech 2002) includes processes for consulting with the WRPT and other Native American groups as appropriate. The HWAD Cultural Resources Manager coordinates consultation efforts.

3.6 UNIVERSITIES

Multiple universities have conducted natural resources research projects at HWAD. These mutually beneficial projects expose students to a field work environment while the depot benefits from the results of the students' projects and studies. HWAD's Natural Resources Manager responds to project requests from universities. Examples of university projects include the following:

- University of Nevada, Reno (UNR) research on Walker Lake, in collaboration with Desert Research Institute, to determine the ecological condition of Walker Lake to assess the importance of water rights acquisitions for improving river and lake health (UNR 2018).
- University of California at Berkeley (UC Berkeley) limnology research on Walker Lake.
- University of California at Davis (UC Davis) bird survey at HWAD (UC Davis 2012).
- San Francisco State University Department of Biology research on desert scorpions at HWAD.

3.7 CONTRACTORS

Contractors provide HWAD with technical support for natural resources and environmental management projects. That technical support includes updating the INRMP, preparing NEPA analyses and documentation, conducting cultural and biological resource surveys, and providing other natural resources management support.

3.8 OTHER INTERESTED PARTIES

Other interested parties, including the Great Basin Bird Observatory and the Nevada Working Group of Partners in Flight, which survey birds at Walker Lake, collect natural resource data in the area. The Bi-State Technical Advisory Committee, Nevada and California is working with state and federal agencies, universities, landowners, and other interested parties to conserve the greater sage-grouse. An independent researcher, Erica Fleishman, has conducted bird, butterfly, and vegetation structure surveys at HWAD (Fleishman 2018, personal communication). The Boy Scouts of America contributed to natural resources management at HWAD by constructing bat boxes and refurbishing the Rose Creek cabin (Peterson 2018, personal communication; Engebresten 2015).

SECTION 4.0 DEPOT AND SURROUNDING AREAS

4.1 LOCATION AND SURROUNDINGS

HWAD is located in western Nevada in a rural portion of Mineral County (Figure 1). HWAD is about 135 miles southeast of Reno, Nevada, on U.S. Route 95 and about 30 miles east of the California-Nevada border. HWAD encompasses 147,236 acres in two noncontiguous areas (Figure 2). The main parcel is about 144,000 acres and includes the Main Base; Mount Grant; the southern portion of Walker Lake; the North, Central, and South Magazine areas; and the Old Bomb Area/Carter Test Range. The New Bomb Area, 21 miles south of the main parcel, is about 3,000 acres (Michael Baker 2009).

HWAD is located in a high desert valley at the south end of Walker Lake and nearly surrounds the town of Hawthorne, Nevada. Surrounding HWAD are the Wassuk Mountain Range to the west, Walker Lake to the north, the Gillis Mountain Range to the northeast, the Garfield Hills to the east and southeast, and the Excelsior Mountains to the south. BLM, USFS, and the town of Hawthorne own or manage property adjacent to HWAD.

4.2 HISTORY

The town of Hawthorne was established in 1879 by gold prospectors and miners. Hawthorne's population was about 244 residents in 1928, prior to the construction of the installation. The HWAD area was historically part of the Northern Paiute territory. The Walker River and Pyramid Lake reservations were formally established in 1874 (Earth Tech 2002).

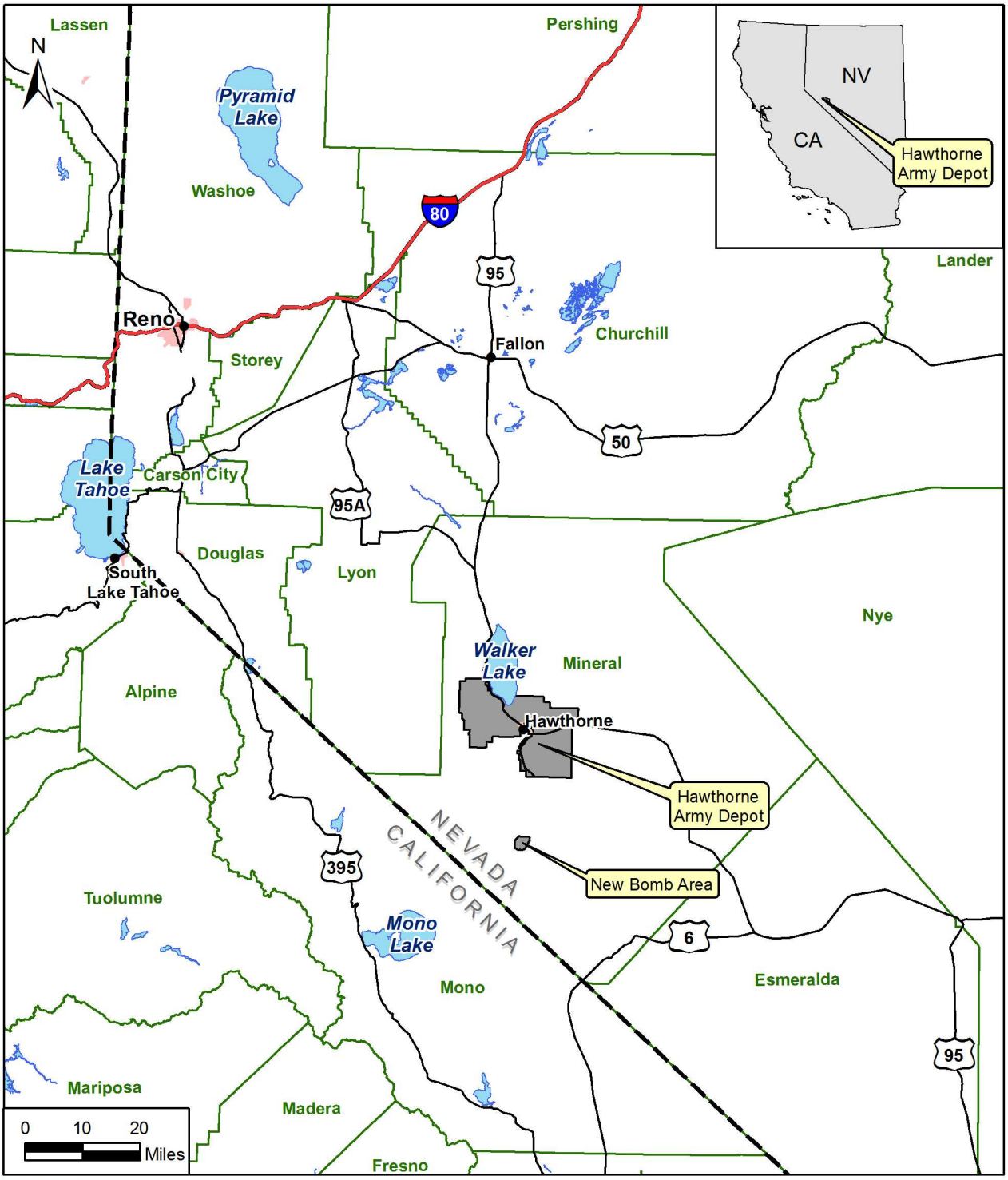
The installation was commissioned as the Hawthorne Naval Ammunition Depot, a U.S. Navy ammunition storage and manufacturing plant, after explosions at the Lake Denmark Naval Ammunitions Depot in New Jersey in 1926. HWAD's remote location surrounded by mountain ranges with nearby railroad tracks made it well-suited for an ammunition storage facility. The installation occupied 104 square miles owned by the U.S. Navy, and nearly 6,000 people worked at the installation in 1945 (Military Bases 1998).

The installation passed into Army ownership in 1977 and was redesignated Hawthorne Army Ammunition Plant. In 1980, the installation became a GOCO facility and, in 1994, its name was changed to Hawthorne Army Depot (Panamerican 2016).

4.3 MILITARY MISSION

HWAD's military mission is to store conventional munitions; demilitarize and dispose of unserviceable, obsolete, and surplus munitions; and maintain serviceability through inspection and renovation to ensure munitions readiness. HWAD's capabilities include the following (U.S. Army JMC 2018):

- Storage of conventional ammunition
- Demilitarization of munitions
- International Standards Organization (ISO) container maintenance repair
- Range scrap processing
- Storage of DoD elemental mercury



LEGEND

- Installation Property
- State Boundary
- County Boundary
- Urban Area
- Surface Water
- Interstate Highway
- U.S. Route

HWAD Location

Figure 1

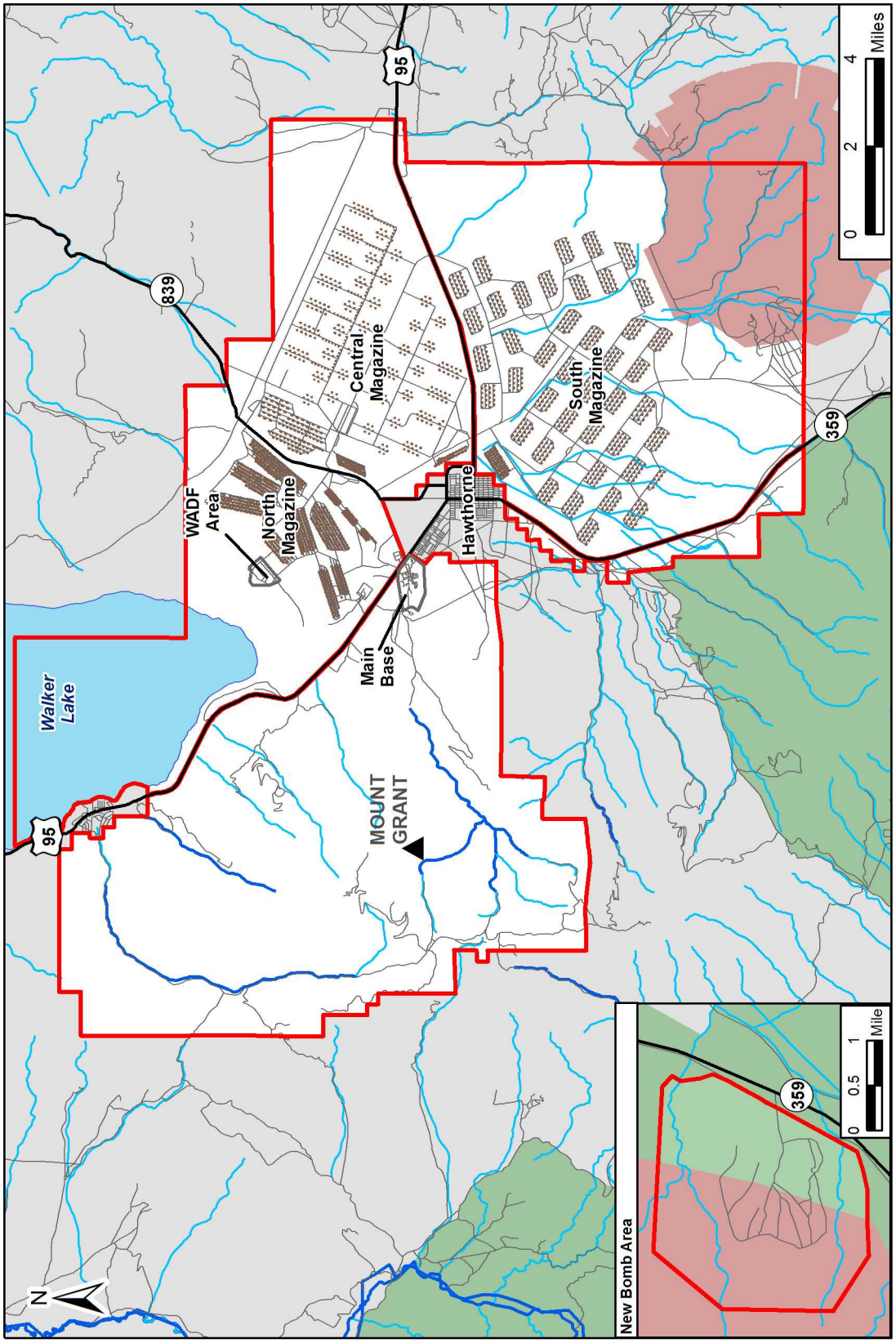

HWAD Layout
Walker Lake
WADF Area
North Magazine
Central Magazine
South Magazine
Hawthorne
Main Base
MOUNT GRANT
95
839
359
New Bomb Area
0 2 4 Miles
0 0.5 1 Mile
N
LEGEND
Installation Boundary
Highway
Road
Surface Water
Permanent Stream
Intermittent Stream
Ammunition Storage
Live Fire Restricted Area
Toiyabe National Forest
Source: HWAD GIS 2012.

Figure 2

- Ammunition renovation
- Quality assurance
- Desert training for military units

HWAD is the largest ammunition storage facility in the United States. HWAD receives, stores, rewarehouses, preserves, packages, monitors, renovates, demilitarizes, and disposes of conventional ammunition; issues conventional munitions; ensures the capability to ship and receive containerized munitions; operates a calibration lab; maintains an ISO container maintenance and repair facility; and maintains an ammunition maintenance capability (Michael Baker 2009).

HWAD hosts multiple tenant organizations that may change over time. HWAD might expand tenant operations in the future to enhance space utilization at the depot (Peterson 2017, personal communication). The U.S. Navy is one of HWAD's long-term tenants and maintains a Naval Undersea Warfare Center Detachment at HWAD whose mission includes storing and maintaining naval mines, mine components, and test and support equipment (NAVSEA 2018).

HWAD is a training location for Special Forces. The mountainous, high-desert environment provides a realistic simulation of Afghanistan and DoD troops schedule training at HWAD year-round. Golden Cargo training operations at HWAD provide government, contractor, and military troops with the opportunity to execute high Operations Tempo ammunition operations in support of the warfighter (U.S. Army JMC 2018).

HWAD also provides long-term storage of elemental mercury generated in the United States. The mercury stockpile consists of approximately 4,436 metric tons of mercury stored in Area 110 in HWAD's Central Magazine Area. A 2006 Memorandum of Agreement (MOA) between the Defense National Stockpile Center and the Army's Joint Munitions Command outlines the handling and military support required for the mercury (DNSC and U.S. Army JMC 2006). The Defense Logistics Agency—Strategic Materials, which is responsible for stewardship of the stockpile, received a 25-year permit beginning on August 15, 2013, for repacking and storage of mercury at HWAD. A 15-year workload is projected for the repackaging project (U.S. Army JMC 2018).

4.4 DEPOT AND LOCAL FACILITIES

HWAD's developed areas are concentrated on the Main Base and in the three magazine areas. Facilities include administrative buildings, buildings for tenant operations, storage buildings, industrial operations buildings, and demilitarization and disposal facilities. The depot has 414 administrative and storage buildings, and 2,094 ammunition storage structures with an explosives storage capacity of 7,685,000 square feet (U.S. Army JMC 2018).

HWAD includes Nevada's third largest peak, Mount Grant, which rises to an elevation of 11,329 feet above mean sea level. The Mount Grant area covers about 45,000 acres, or 30 percent, of HWAD's total acreage. Streams on Mount Grant supply much of HWAD's potable water; therefore, limiting human disturbance and maintaining the area in an ecologically sound manner is an important priority. Due in part to efforts to protect the water supply, the Mount Grant area is relatively undisturbed and offers a valuable research arena for scientists seeking baseline data about the ecology of the region.

The southern third of Walker Lake is within HWAD's boundaries. Over time, the volume of water in Walker Lake has decreased and salinity levels have risen significantly, affecting the ecology of the lake and surrounding area. Changes include extirpation of fish and other aquatic species, reduced bird populations, and reduced recreational use. Unexploded ordnance (UXO) may also be present in the lake and on land along its southern shore.

HWAD has no agricultural or grazing leases. Agriculture and grazing are incompatible with the installation's mission activities, installation security, and strict water quality controls. HWAD has no merchantable timber and thus has no timber program. HWAD provides opportunities for hunting, fishing, and nonconsumptive recreation to the maximum extent compatible with mission activities, installation security, and environmental stewardship needs. These programs are further described in section 8.8.

HWAD owns and operates a public water system that draws surface water from the Mount Grant watershed and groundwater from wells located on the depot. Following are the operations and the associated permits for the drinking water system (SOC 2017b):

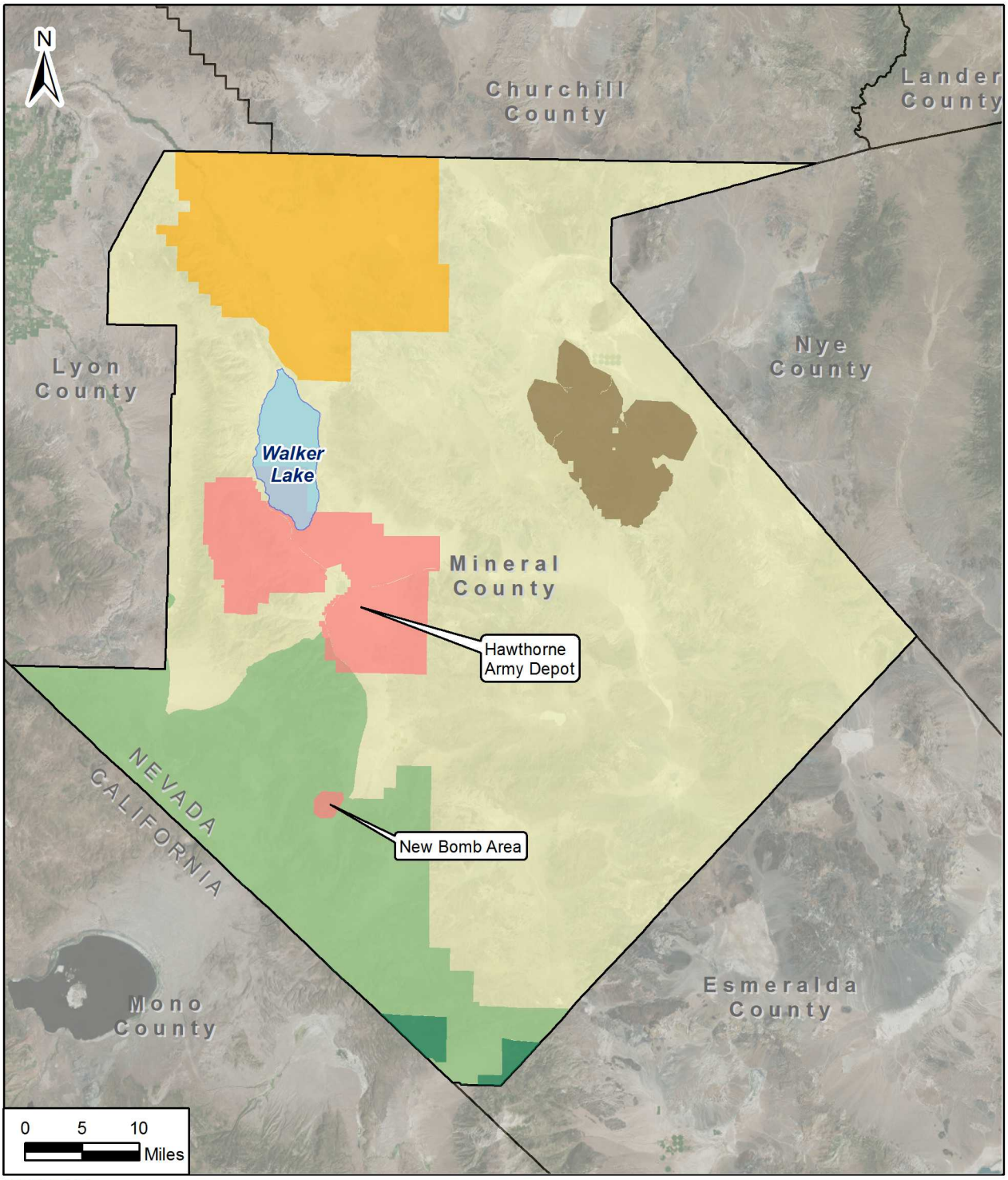
- Black Beauty Water Treatment Plant, which operates under permit SW-0375-TPS1-12C, receives, treats, and filters surface water from Mount Grant.
- Arsenic and Fluoride Groundwater Treatment Plant, which operates under permit MI-0375-TPAS, treats groundwater to meet arsenic requirements for drinking water.
- Potable Water Distribution System, which operates under permit SW-0357-TPSI-12C, covers requirements under the Safe Drinking Water Act (42 U.S.C. §§ 300f-300j-26) for HWAD's water distribution system.

HWAD publishes an annual Consumer Confidence Report describing potable water compliance with drinking water quality standards (SOC 2017b).

4.5 Regional Land Ownership and Natural Areas

Figure 3 shows regional land ownership. Much of the land in the region is managed by the BLM and USFS in accordance with each agency's mission and policies. Privately owned land is located in the town of Hawthorne and in small scattered communities, typically adjacent to area roads. The Walker River Indian Reservation, owned by the WRPT, is located north of Walker Lake.

Figure 4 shows natural areas in the region. The Toiyabe National Forest is located south and west of HWAD. The forest is contiguous with the Humboldt-Toiyabe National Forest in California, which itself is contiguous with the Lake Tahoe Basin Management unit to the north, Eldorado National Forest to the northwest, Stanislaus National Forest to the west, and Inyo and Sierra National Forests to the south. The Gabbs Valley Range Wilderness Study Area, managed by BLM, is northeast of HWAD. Other natural areas located in the region are the Stillwater Wildlife Refuge, about 60 miles north of HWAD; Mason Valley Wildlife Refuge, about 40 miles northwest the depot; and Yosemite National Park, about 60 miles southwest of the depot.

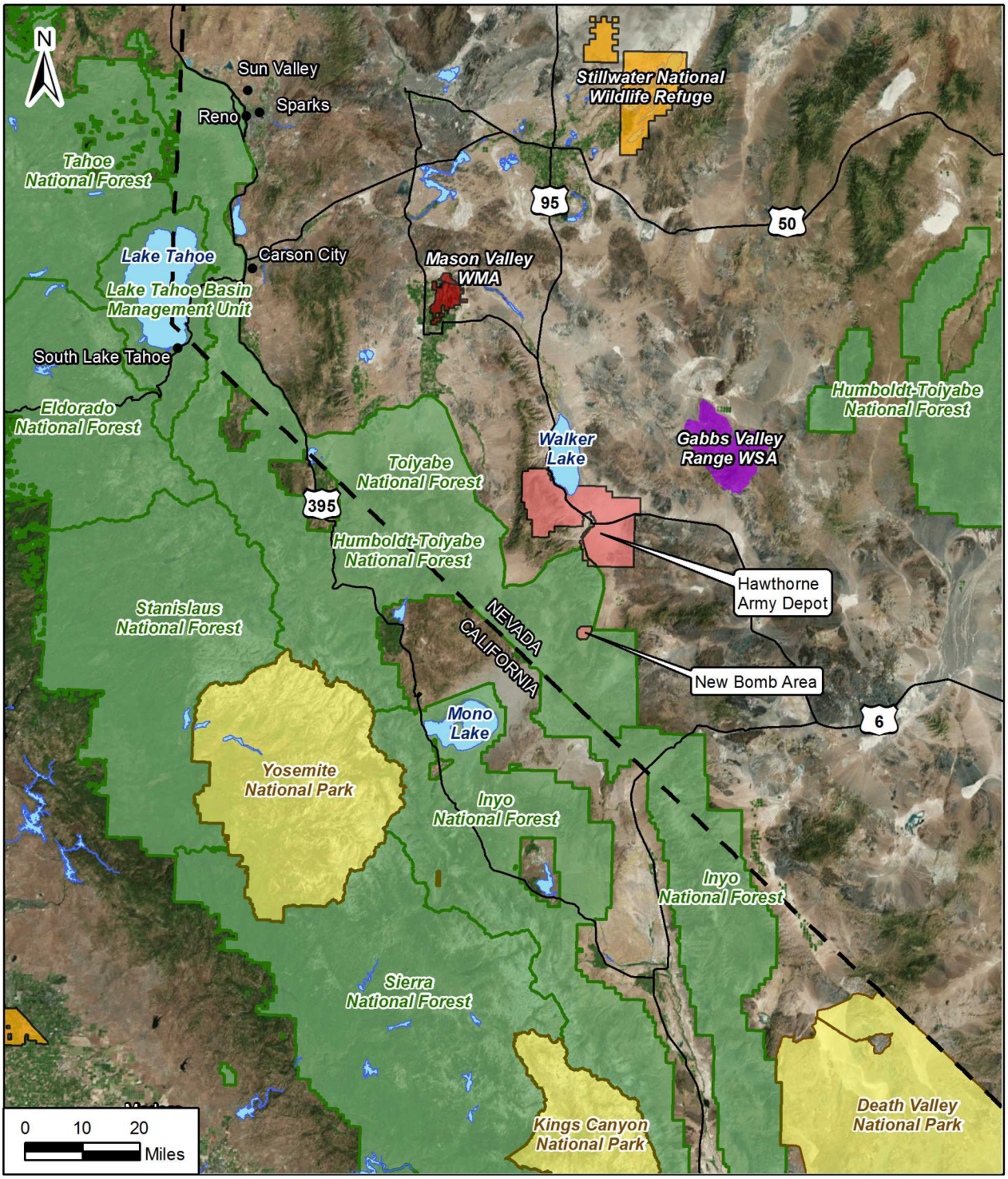


LEGEND

- HWAD
- Gabbs Valley Range Wilderness Study Area
- Inyo National Forest
- Public Domain Land BLM
- Toiyabe National Forest
- Walker River Indian Reservation

Regional Land Ownership

Figure 3



LEGEND

- HWAD
- State Boundary
- National Forest
- National Park
- Wildlife Refuge
- Wildlife Management Area
- Wilderness Study Area

Regional Natural Areas

Figure 4

4.6 REGIONAL SOCIOECONOMICS

The principal mechanisms affecting socioeconomics of a region in which an Army installation is located are Army expenditures and changes in the population or employment level at the installation. Regions affected by the location of HWAD that are considered in this section are census tract 9707, which includes HWAD and the town of Hawthorne, and Mineral County. Data for the state of Nevada and the United States are presented for comparison.

4.6.1 Population

Population in the local area declined between 2010 and 2016. In 2016, the estimated population of census tract 9707 decreased by 25 percent to 2,833; and Mineral County's population decreased by about 7 percent to 4,449. In contrast, the populations of Nevada and of the United States grew by about 9 percent and 5 percent, respectively, during the same period (U.S. Census Bureau 2018a, 2018b, 2018c).

The percent of the population of minority races or ethnicities increased between 2010 and 2016 for census tract 9707, Mineral County, the state of Nevada, and the United States. In 2016, minorities accounted for about 27 percent of the population in census tract 9707 and 41 percent in Mineral County, compared to 49 percent for the state and 38 percent for the nation (U.S. Census Bureau 2018b, 2018c). Employment and Income

As of 2016, the annual average size of the labor force in Mineral County was approximately 1,970, with approximately 1,840 people, or 93 percent of the labor force, employed (BLS 2018). Currently, the top five employers in Mineral County, in descending order, are HWAD, Mineral County School District, Mount Grant General Hospital, Mineral County, and El Capitan Lodge and Casino (Nevada Workforce 2018).

Consistent with the national trend, unemployment declined in the county and state from 2010 to 2016. Mineral County's unemployment dropped from 14.4 percent in 2010 to 6.6 percent in 2016 (BLS 2018).

Median household income is $37,054 in census tract 9707 and $37,750 in Mineral County, both of which are lower than the state level of $53,094 and the national level of $55,322. The per-capita personal income (PCPI) is $27,010 in census tract 9707 and $24,146 in Mineral County. These PCPIs are 99 percent and 89 percent, respectively, of the state PCPI of $27,253, and 91 percent and 81 percent, respectively, of the national PCPI of $29,829 (U.S. Census Bureau 2018c).

4.6.2 Housing

In comparison to the state of Nevada and the United States, Mineral County has lower housing values, lower housing costs (mortgage or rent), and higher homeowner and rental vacancy rates. The county has about 2,775 housing units, of which 74 percent (2,065 units) are occupied; the remaining 26 percent (710 units) are vacant. Of the occupied units, 66 percent (1,353 units) are owner-occupied and 34 percent (712 units) are renter-occupied. Approximately 2 percent of the county's housing units were built before 1939, and about 5 percent of the housing units were built after 2000 (U.S. Census Bureau 2018c).

SECTION 5.0 PHYSICAL ENVIRONMENT

5.1 CLIMATE

HWAD has a desert climate with high average temperatures and low annual precipitation. Weather data for the HWAD area used in this section were taken from the National Weather Service recording locations in the northwestern portion of Nevada from 2000 to 2017. The average annual temperature in the area is 51 degrees Fahrenheit (ºF), with an average low temperature of 36 ºF and an average high temperature of 66 ºF. The hottest months are July and August, with average high temperatures of 78 ºF and 75 ºF, respectively. The coolest months are December and January, with average low temperatures of 11 ºF and 13 ºF, respectively (NWS 2018).

Mean annual precipitation in the northwestern portion of Nevada is 7 inches. The driest months are July and September, with average rainfall amounts of 0.18 inch and 0.1 inch, respectively. The wettest months are December and January, with an average rainfall amount of about 1.2 inches each month. Snow falls in the HWAD region generally from October to April, with the least snow falling in October (0.1 inch) and April (0.4 inch) and the most snow falling in December (5.8 inches) and January (5.4 inches). The area gets an average of 18.3 inches of snowfall annually (NWS 2018).

Table 1 provides average temperature and precipitation data for northwest Nevada, Nevada state, and the United States.

Table 1.
Climate Averages in Northwest Nevada, Nevada, and the United States

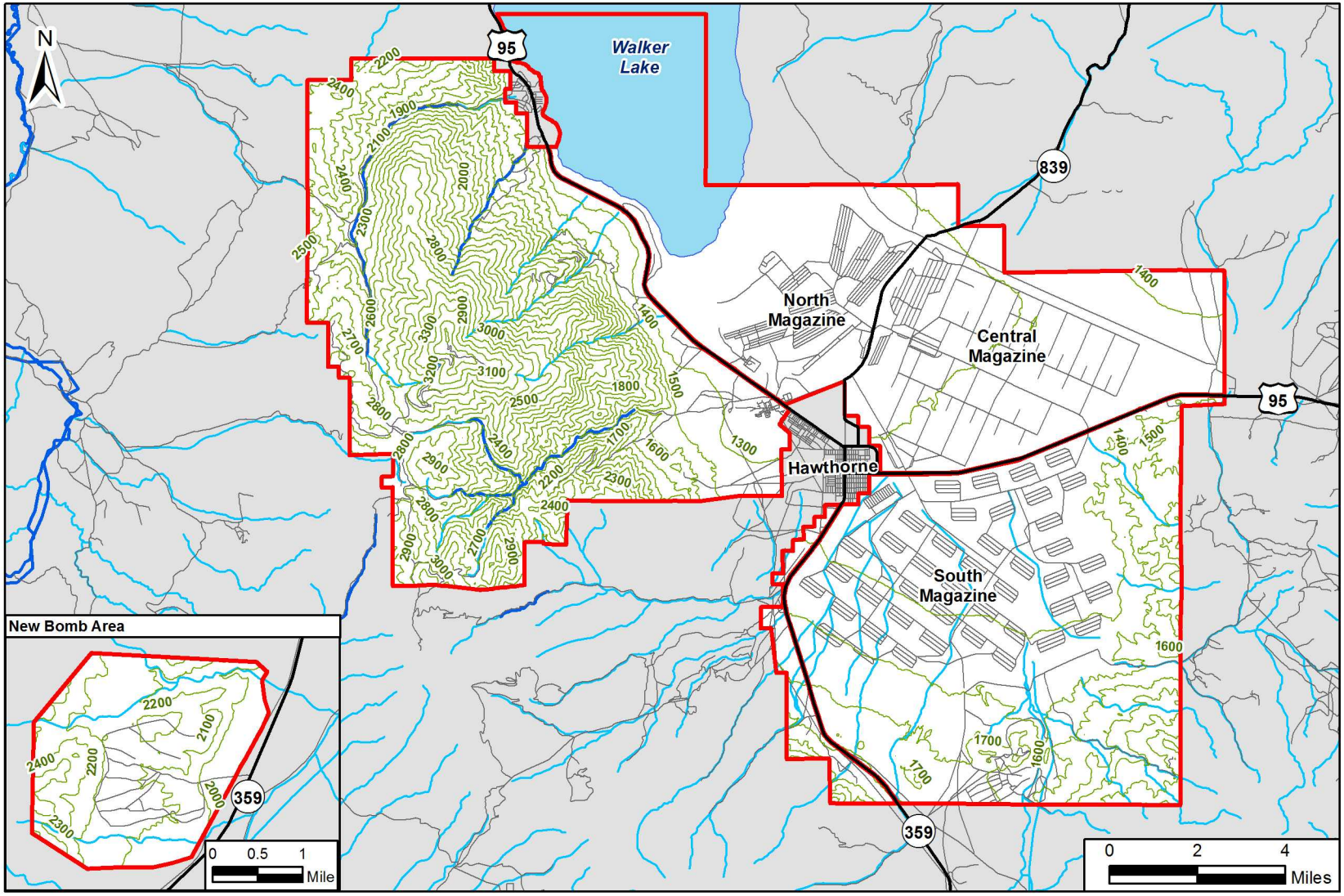
Climate Measurement	Northwest Nevada	Nevada	United States
Average annual temperature (ºF)	55	51	53
Average high temperature (ºF)	69	66	63
Average low temperature (ºF)	41	36	49
Average precipitation (inches)	7	9	35

Source: NWS 2018.

5.2 GEOLOGY AND TOPOGRAPHY

HWAD is located in the Great Basin section of the Basin and Range physiographic province. Most of HWAD is in the Whiskey-Flat-Hawthorne subarea of Walker Lake Valley. Walker Lake Valley is a high-desert valley that trends north-northwesterly and is bordered by the Wassuk Range to the west and southwest, the Gillis Mountain Range to the northeast, and the Garfield Hills to the east and southeast. Walker Lake occupies the topographic low point in Walker Lake Valley. Walker Lake is a remnant of a glacial lake that once covered much of the northwestern Great Basin.

The physiography of the Great Basin is comprised of a repeating pattern of fault block mountains and intervening valleys (Bryce et al. 2003). Valleys in the area are generally broad and nearly level to rolling and can be flats, playas, alluvial fans, plains, terraces, or dunes and hills. Elevations at HWAD range from 11,239 feet above mean seal level (amsl) at the top of Mount Grant to about 3,960 feet amsl along the shoreline of Walker Lake. Along the valley floor, where the Main Base and magazine areas are located, the topography is gently sloping (DOE 2010). Figure 5 shows HWAD's topography.



LEGEND

- Installation Boundary
- Highway
- Road
- Permanent Stream
- Intermittent Stream
- Elevation Contour (100 meter interval)

HWAD Topography

Figure 5

Source: HWAD GIS 2012.

The east face of the Wassuk Range is an active fault scarp that has down-dropped the west side of Walker Lake Valley relative to the east side. The fault is part of the regional Walker Lake fault zone. This fault roughly bisects HWAD. Faulting has occurred in the foothills bordering the depot (DOE 2010). Figure 6 shows HWAD's geology and faults.

Geologic strata of the Walker Lake Basin and Walker Lake Valley consist of unconsolidated alluvium (basin fill) that includes alluvial fan, floodplain, windblown channel, and lake deposits; and terrace gravels and evaporates. While the maximum depth of the basin fill to bedrock is unknown, it is at least 1,008 feet, according to well completion records for Hawthorne Well No. 5. Rocks of the Wassuk Range are principally composed of granitic rock dominated by quartz monzonite. Rocks of the Excelsior formation, which unconformably overlie the rocks of the Wassuk Range, are composed of metamorphosed volcanic rocks (e.g., flows, tuffs, breccias, basalt, and rhyolite) and sedimentary interbeds. The Excelsior formation is also exposed in the Garfield Hills to the southeast of the depot. Limestone of the Luning formation also occurs southeast of the depot. Additionally, unaltered volcanic rocks are exposed near the depot (e.g., in the Garfield Hills) (DOE 2010).

5.3 SOILS

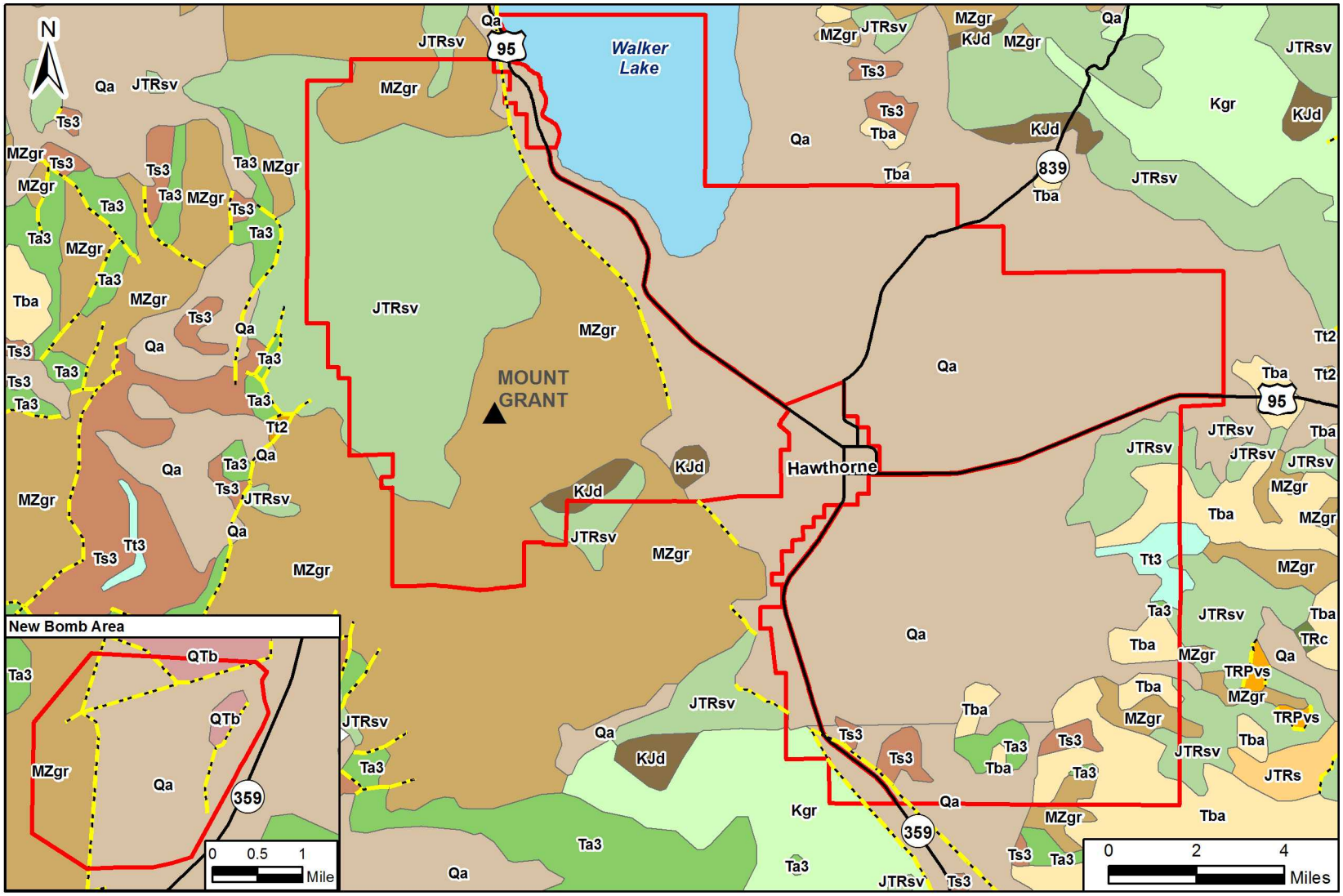
Soils at HWAD are composed of a variety of soil types associated with the depot's topography. In general, the lower elevations of the valley floor are dominated by finer grained soils mostly composed of silt and sand (loam) and small amounts of gravel. The alluvial apron between the valley floor and the surrounding mountain ranges is composed of coarser material, including loamy sand, gravelly sand, and gravelly and cobbly loamy sand. The mountains surrounding HWAD have the coarsest material, including coarse sand; gravelly, cobbly, and bouldery loamy sand; gravelly clay; and cobbly clay loam. Higher mountain soil is very shallow with frequent rock outcrops (Michael Baker 2009).

HWAD soils have been grouped based on their physical and geographic characteristics relative to topography and physical location. These physiographic groups were compiled from descriptions of 76 soil map units identified on HWAD by the Natural Resources Conservation Service (NRCS) (Michael Baker 2009). Table 2 lists the five physiographic soil groups and Figure 7 shows them.

Table 2.
HWAD Physiographic Soil Groups

Physiographic Group	Description	Locations Found
Bolsons, Lake Plains, and Beaches	Occurs on flat-to-very shallow 0-2% slopes; very deep, nearly level, well-drained, or somewhat excessively drained soils	Lake plains, barrier beaches, lagoons, and bolson floors
Bolsons, Pediments, and Alluvial Fans	Occurs on gentle-to-moderate 2-15% slopes; very deep, somewhat excessively drained soils	Bolsons, pediments, fan skirts, fan remnants, and insert fans
Hills, Mesas, and Plateaus	Occurs on moderate-to-steep 15-50% slopes; shallow, well-drained soils	Hills, mesas, and plateaus
Mountains and Mountain Slopes	Occurs on moderate-to-very steep 20-75% slopes; shallow, well-drained soils	Mountains and mountain slopes
Intermountain Basins and Floodplains	Occurs on gentle-to-moderate 4-15% slopes; very deep, well-drained soils	Intermountain basins, floodplains, and stream terraces

Source: Michael Baker 2009.



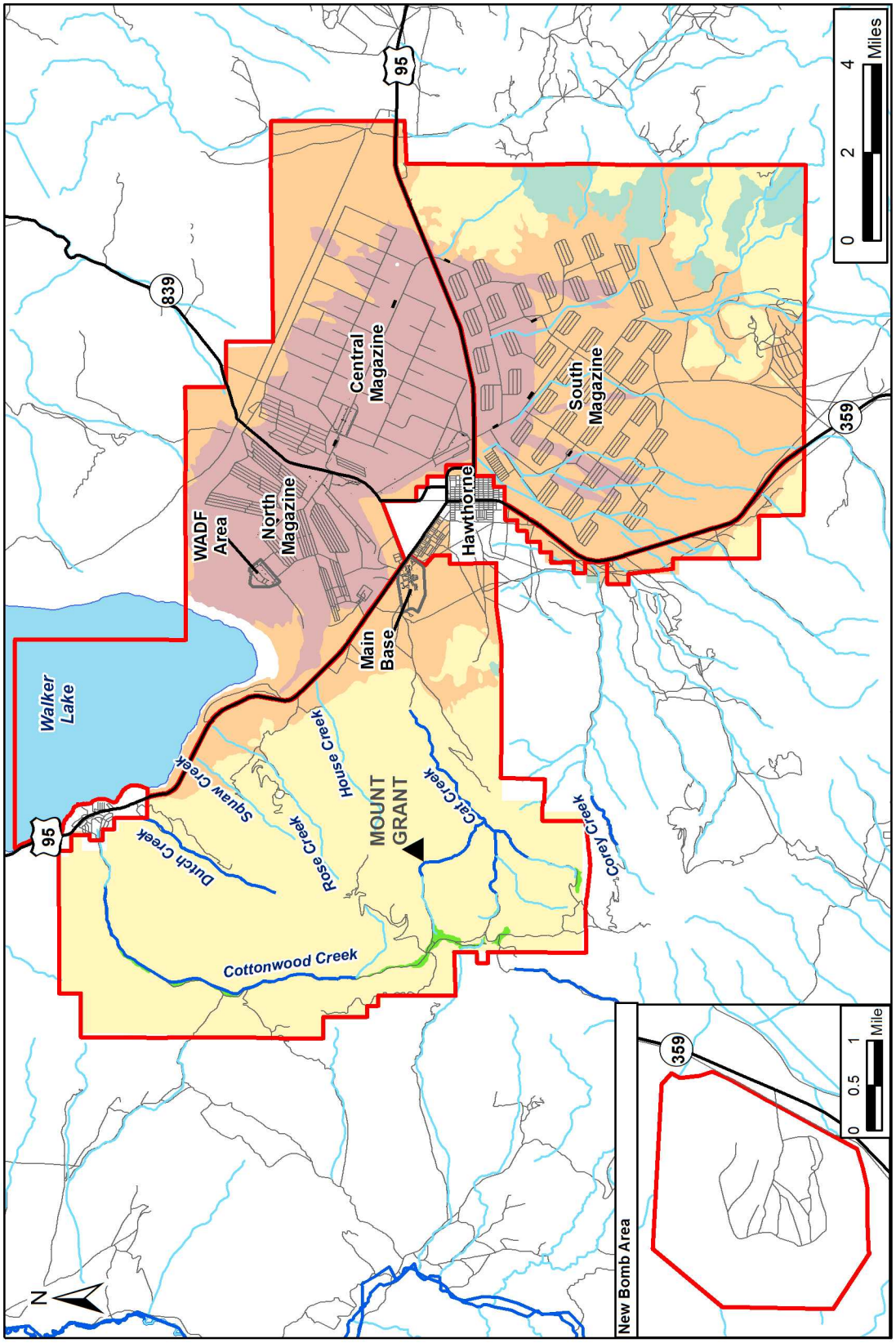
LEGEND

- Installation Boundary
- Highway
- Fault

HWAD Geology and Faults

Figure 6

Source: HWAD GIS 2012; USGS 2005.



Source: HWAD GIS 2012. Note: Soil data is not available for the New Bomb Area.

The Bolsons, Lake Plains, and Beaches physiographic soil group consists of soils on flat-to-very shallow slopes, which occur at the lowest elevations on HWAD in the valley floor and cover about 20 percent of the depot. The soils typically consist of fine sand, loamy sand, and lesser gravelly sand. These soils occur primarily in the North and Central Magazine areas, with some in the South Magazine Area (Michael Baker 2009).

The Bolsons, Pediments, and Alluvial Fans group consists of soils on gentle-to-moderately sloping terrain that cover approximately 32 percent of the depot. The soils typically consist of gravelly sand, stony and bouldery sand, and lesser loamy sand. These soils occur in all three magazine areas, on the Main Base, and on the alluvial fan slopes between the valley floor and the surrounding mountain ranges (Michael Baker 2009).

The Hills, Mesas, and Plateaus group consists of soils on moderate-to-steep sloping terrain that cover approximately 3 percent of the depot, on primarily undeveloped land. The soils occur in the southeast portion of the South Magazine Area and consist of gravelly and cobbly loamy sand, and gravelly coarse sand (Michael Baker 2009).

The Mountains and Mountain Slopes group consists of soils on moderate-to-very steep slopes on the surrounding mountains. This soil group covers approximately 37 percent of the depot, on primarily undeveloped land at Mount Grant and in mountainous portions of the South Magazine Area. The soils consist of coarse sand; gravelly, cobbly, and bouldery loamy sand; gravelly clay; and gravelly loam (Michael Baker 2009).

The Intermountain Basins and Floodplains group consists of soils on gentle-to-moderate sloping terrain that cover less than 1 percent of the depot. These soils occur in the higher elevations of Mount Grant along creeks. The soils consist of loam, sandy and silty clay loam, and gravelly loamy sand (Michael Baker 2009).

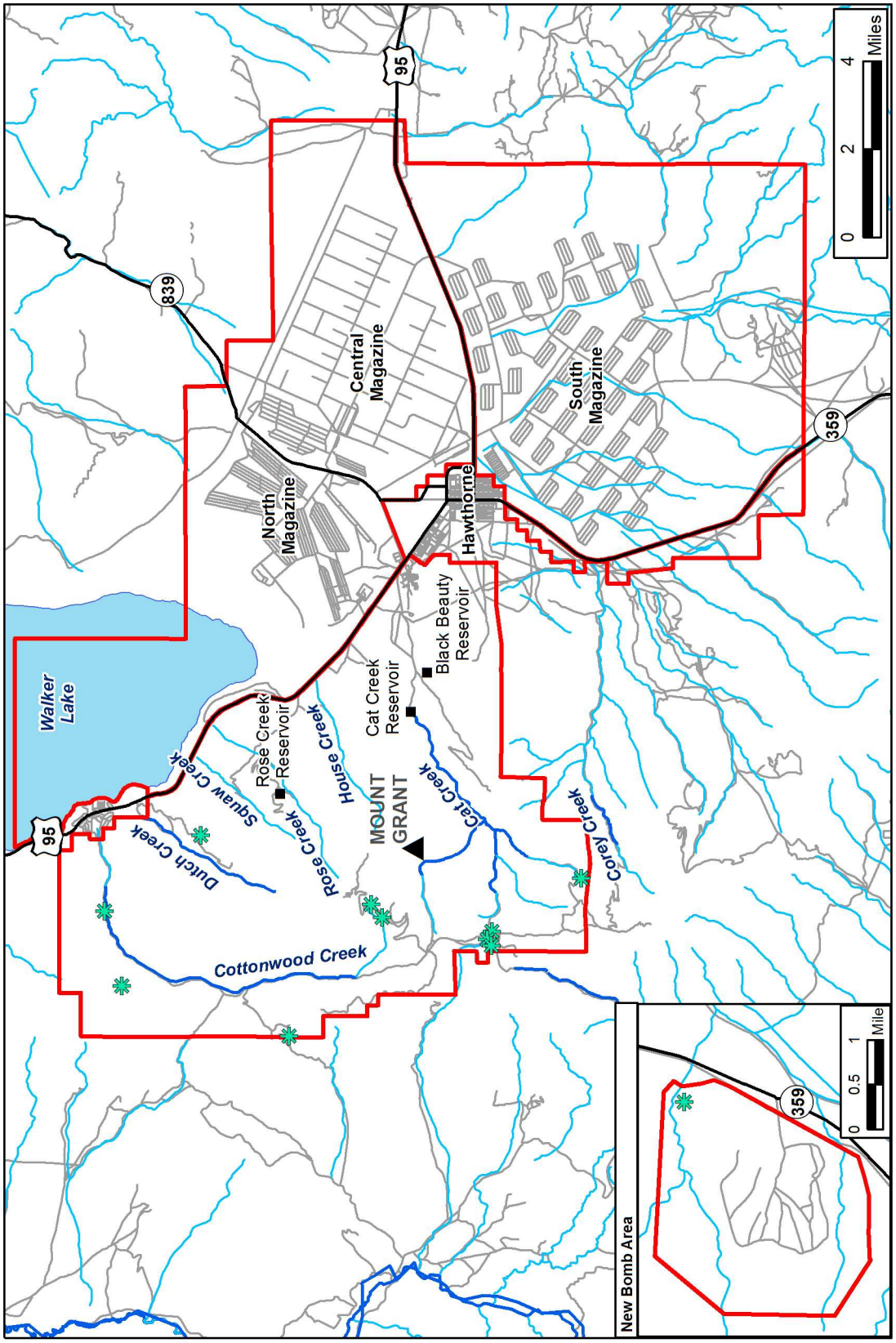
5.4 WATER RESOURCES

HWAD's water resources can be broadly divided into surface water and groundwater. HWAD's surface water resources are primarily Walker Lake and the creeks, springs, wetlands, and reservoirs in the Mount Grant area, although some ephemeral streams and wetlands are present in the magazine areas and the New Bomb Area.

5.4.1 Surface Water

Surface water bodies cover about 7 percent of HWAD (USGS 2018) and are shown in Figure 8. Three perennial streams (streams that have continuous flow) are found on Mount Grant: Cottonwood, Dutch, and Cat creeks. The remaining streams, which are found on Mount Grant, in the magazine areas, and in the New Bomb Area, are ephemeral or intermittent streams that carry water only temporarily after rain events. Multiple springs are located on Mount Grant and at least one known spring is located in the New Bomb Area.

On HWAD, surface water flows generally follow the topographic gradient. Surface water flows from west to east along the topographic gradient at Mount Grant and in the New Bomb Area. On the valley floor, surface water generally flows north toward Walker Lake. On the eastern portion of the depot, surface water follows the topographic gradient from the Gillis Mountain Range to the northeast and from the Garfield Hills to the east and southeast, generally flowing toward the valley floor and Walker Lake.


HWAD Surface Water Features
Figure 8
Walker Lake
Squaw Creek
Dutch Creek
Rose Creek
Rose Creek Reservoir
House Creek
MOUNT GRANT
Cat Creek Reservoir
Black Beauty Reservoir
Cat Creek
Corey Creek
Cottonwood Creek
North Magazine
Central Magazine
South Magazine
Hawthorne
95
839
359
0 2 4 Miles
New Bomb Area
0 0.5 1 Mile
LEGEND
Installation Boundary
Road
Permanent Stream
Intermittent Stream
Surface Water
Spring
Reservoir
Source: HWAD GIS 2012.

HWAD uses surface water from Mount Grant to supply much of its potable water. Water is captured in a series of basins and reservoirs on Mount Grant's major creeks, treated, and distributed via the depot's drinking water infrastructure. In the magazine areas, dikes and ditches control surface water flows during rain events (Michael Baker 2009).

This section discusses in more detail two features in HWAD's surface water system—the Mount Grant watershed and Walker Lake.

5.4.1.1 Mount Grant Watershed

The surface water resources in the Mount Grant area include seven creeks and numerous springs as shown in Figure 8. The seven creeks are Cat Creek (which has three tributaries—the North, Middle, and South forks), Cottonwood Creek, Dutch Creek, House Creek, Lapon Creek, Rose Creek, and Squaw Creek. Six of the creeks flow toward Walker Lake, while the remaining one, Lapon Creek, flows west away from HWAD.

Surface water in the Mount Grant watershed is a key natural resource for HWAD because it is the main water supply for the depot's military operations and readiness. In addition to providing HWAD with a high-quality potable water source, this area also provides surface water that supports diverse ecosystems and supplies some recharge to Walker Lake.

The process of capturing surface waters from Mount Grant for use at HWAD begins with waters from Cat, Cottonwood, Rose, and Squaw creeks being collected in a chain of catch basins, weirs, and diversion dams and conveyed by pipe to three storage reservoirs: Cat Creek, Rose Creek, and Black Beauty reservoirs. The waters first flow into Cat Creek and Rose Creek reservoirs, then into Black Beauty Reservoir. The system also includes Station Reservoir, an underground tank fed by Black Beauty Reservoir and groundwater supply wells (Michael Baker 2009).

Cat Creek Reservoir, a 50.3-million-gallon reservoir created by the Cat Creek Dam, was constructed in 1931. Black Beauty Reservoir, a 48.76-million-gallon earthen reservoir on the lower eastern slopes of Mount Grant that is fenced, was constructed in 1952 (Panamerican 2016).

Rose Creek Reservoir, a 39.43-million-gallon reservoir with an 11.5-acre surface area, was constructed in 1938 and is bounded by natural features and an earthen dam (Panamerican 2016). The reservoir is subject to draining and cleaning every 3 to 5 years, depending on the level of sedimentation. This process consumes time and funds and disrupts fisheries and aquatic biota. As funding becomes available, HWAD would like to conduct hydrologic and habitat (flora and fauna) assessments to determine the cause of the imbalance in the creek, reservoir, and wetland system and to develop corrective measures to avoid this impact to fisheries and aquatic biota.

Water moves from the reservoirs into HWAD's treatment facilities. HWAD completed a new potable water treatment plant around 2013. Both the new and old plants are located near Black Beauty Reservoir on the eastern slopes of Mount Grant. Other than filtration and chlorination, surface water from Mount Grant requires no additional treatment before being used by the depot. To maintain this high standard, the military has prohibited grazing and restricted public access to the area since the late 1920s. Consequently, Mount Grant maintains the healthy natural resources needed to protect surface water resources and is viewed as a baseline area

for comparison with similar terrestrial ecological systems that have been subject to grazing and increased human disturbance (Nachlinger 2003).

Once the water has been treated, it is distributed by belowground water lines to a system of water storage tanks. HWAD has seven elevated steel storage tanks (water towers) throughout the magazine areas, each with a capacity of 50,000 gallons. Two additional 500,000-gallon tanks that store treated water were recently installed near the new treatment plant and Black Beauty Reservoir. From there, water flows to end users on HWAD for fire protection, demilitarization, irrigation (primarily of the golf course), industrial uses, potable water supplies, and other uses.

The amount of potable water available from Mount Grant varies seasonally. From November to about May, approximately 99 percent of HWAD's water needs are met by Mount Grant surface water sources. In drier months, less water is available from Mount Grant and groundwater is used to meet demand. It is estimated that groundwater has provided no more than 40 percent of HWAD's total potable water during drier months.

The Mount Grant watershed is the only surface water source in the immediate area that is not contaminated with giardiasis (*Giardia lamblia*) and that generally has levels of total dissolved solids (TDS) low enough for it to be a potable water source. Groundwater in the area is a limited potable water source because of high mineral content and an underground geothermal source, and Walker Lake is not a feasible source of potable water because of water quality and quantity issues. Therefore, HWAD has taken steps to protect surface water resources at Mount Grant. HWAD limits access to the Mount Grant area so that the potential for surface water sources to be contaminated is minimized. Access to Cottonwood Creek Road and the Rose Creek and Cat Creek reservoirs is limited by locked gates on the roads leading to them. Black Beauty Reservoir is protected by a tall chain-link fence topped with barbed wire.

HWAD has an Operation and Maintenance Manual for Potable Water Systems that provides detailed instructions on water system maintenance in the Mount Grant watershed. Management of the water system includes frequent monitoring to ensure that water quality criteria are met, the system operates reliably and without failure, and maintenance and repairs are completed before the watershed and potable water supply are adversely affected. Table 3 lists the parameters that can affect water quality and the frequency with which they are monitored.

5.4.1.2 Walker Lake

The southern one-third of Walker Lake is located within HWAD boundaries. Walker Lake is one of three desert terminus lakes in the United States. A *terminal lake* is formed at the low point of an enclosed watershed basin, in this case, the Walker River Basin. A *desert terminal lake* has no outlet and thus is greatly affected by variations in water flows caused by upstream activities such as surface water diversion, groundwater pumping, and changes in the hydrologic cycle.

Walker Lake receives inflow from the Wassuk and Gillis Mountain ranges and is fed by the Walker River from the north and west. Over the past 100 years, Walker Lake levels have declined more than 160 feet and the volume of the lake has decreased from about 10 million acre-feet to less than 1 million acre-feet (Collopy and Thomas 2016). The water level of the lake is declining because of upstream water use, diversions of runoff for irrigation north of the lake, and surface runoff after a rainfall or snowmelt rarely reaching the lake because of the arid climate and diversions.

Table 3.
Watershed Monitoring Schedule

Parameter	Frequency
Turbidity throughout the watershed	Three times per week[a]
Inlet screens (for debris)	Three times per week[a]
Damage to piping or creek beds	Three times per week[a]
Dead animals	Three times per week[a]
Damage to fence line and encroachment by cattle	Three times per week[a]
Algae growth	Three times per week[a]
Unauthorized entrance	Three times per week[a]
Any change that threatens or potentially threatens the health of the watershed	Three times per week[a]
Weir	Three times per week[a]
Turbidity before chlorination	Continuous[b]
Disinfected water temperature	Continuous
Disinfected water pH	Continuous
Disinfectant contact time	Daily
Residual disinfectant concentration upon entering reservoir and exiting reservoir	Continuous

Source: CH2MHill 2007.
Notes:
[a] Increase frequency of monitoring with weather events that could increase turbidity such as wind and rainstorms.
[b] When turbidity levels are greater than 1 nephelometric turbidity unit, the reservoir is bypassed and the water is discharged to Walker Lake rather than distributed to the drinking water system.

As the lake's water level has declined, so has the quality of the lake's water. The lake's TDS, which primarily consist of minerals and salts, have increased from about 2,500 to 25,000 milligrams per liter (mg/L) over the past 100 years (Collopy and Thomas 2016). The lake's concentrations of several minerals, including arsenic, total phosphorus, and selenium, exceed federal and state aquatic life criteria for toxicity as well as the state TDS parameter to meet water quality standards for beneficial uses (chapter 445A of the Nevada Administrative Code (NAC–445A) (NAC 2018a; NDEP 2016).

Since 1994, HWAD has attempted to divert an annual average of 1 million gallons of water from the Mount Grant watershed to Walker Lake to help offset the loss of recharge sources. Although this helps to offset the recharge imbalance, discharging excess surface water from Mount Grant is only a partial remedy for the receding lake levels, and watershed-level solutions are needed.

The lake's declining water quality also is having adverse effects on aquatic life. Several species of fish, including the LCT and tui chub, and at least one species of zooplankton, have been eradicated as a result of the elevated TDS levels (NDEP 2014). The lake currently supports a very limited number of species because of its poor water quality. In addition, bird life around the lake has declined substantially (Jeffers 2018, personal communication).

There are currently no water rights for the lake. Congress enacted a law in 2005, however, that created a program to acquire water rights from willing sellers in the Walker Basin (H.R. 2419 Energy and Water Development Appropriations Act, 2006, section 208). Recently, the National Fish and Wildlife Foundation purchased water rights for the lake from willing sellers in the Walker River Basin so that more water will be allocated to Walker Lake. The Desert Research Institute and UNR are conducting the Walker Basin Research Project, which was developed under the authority of the federal legislation. The project is developing a method for optimizing the purchase of water in the Walker River Basin, evaluating alternative agricultural practices to reduce upstream water consumption, and evaluating the impacts of water removal from upstream crop-irrigated lands on the spread of invasive plants, aquatic and terrestrial ecosystems, and the local economy (Collopy and Thomas 2016).

The Walker Basin Restoration Program (WBRP) was established by Public Law 111-85 in 2009. The purpose of the WBRP is to restore and maintain Walker Lake and to protect agricultural, environmental, and habitat interests in the Walker Basin consistent with that purpose. WBRP's restoration goal is to increase natural flows in the Walker River through conveyance of water rights to restore and maintain Walker Lake to a long-term TDS average between 10,000 mg/L and 12,000 mg/L (WBC 2018). The Walker Basin Conservancy, a nonprofit organization established in 2014, is the lead for all WBRP activities. The conservancy is interested in collaborating with HWAD and other interested stakeholders on management actions that will restore Walker Lake such as riparian restoration (Hibbard 2018, personal communication).

HWAD does not currently use Walker Lake or the adjoining beachfront for mission activities such as training or testing. From the 1940s to the 1970s, however, the southern end of the lake was a backdrop for a munitions test range and UXO have been found in the area. As the lake's water level declines, additional shoreline is exposed at HWAD. The shoreline area is routinely surveyed, and identified UXO are either removed or detonated in place. According to a 1995 Army study of the lake, water, sediment, and fish tissue samples collected from the munitions test area and a control area in the lake showed no adverse environmental effects from the munitions testing (GAO 2000).

5.4.1.3 Water Quality Standards

In NAC–445A, the state designates beneficial uses and water quality standards for many surface water bodies (NAC 2018a).

The NAC contains two types of water quality standards: narrative and numeric. The narrative standards are applicable to all surface waters in Nevada and consist mostly of statements requiring waters to be free from various pollutants in sufficient levels so as not to be unsightly; interfere with any beneficial uses; create a public nuisance; be toxic to human, animal, plant, or aquatic life, or have any other adverse effects. The numeric standards are water body-specific and are meant to protect the beneficial uses of the water body. Numeric standards apply to four water bodies at HWAD: Cottonwood Creek, Rose Creek, Squaw Creek, Walker Lake (NDEP 2016).

Table 4 lists the water quality standards and beneficial uses for Walker Lake. Table 5 lists the water quality standards and beneficial uses for Cottonwood, Rose, and Squaw creeks.

Table 4.
Water Quality Standards for Walker Lake

Parameter	Requirements to Maintain Existing Higher Quality	Water Quality Standards for Beneficial Uses	Beneficial Uses
Temperature, single value	—	ΔT ≤ 2 °C[a]	Propagation of aquatic life.
pH, single value	—	Within range 6.5–9.7 standard units	Propagation of aquatic life, recreation involving contact with the water, and propagation of wildlife.
Dissolved oxygen, single value	—	≥ 5 mg/L[b]	Propagation of aquatic life, recreation involving contact with the water, recreation not involving contact with the water, and propagation of wildlife.
Suspended solids, single value	—	≤ 25 mg/L	Propagation of aquatic life.
Nitrogen species (as N), single value	Total inorganic nitrogen ≤ 0.3 mg/L	Nitrate ≤ 90 mg/L Nitrite ≤ 0.06 mg/L	Propagation of aquatic life, and propagation of wildlife.
Total ammonia (as N)	—	Varies[c]	Propagation of aquatic life.
Total phosphorus (as P), single value	—	≤ 0.82 mg/L	Propagation of aquatic life.
E. coli Annual geometric mean Single value	 — —	 ≤ 126/100 mL ≤ 235/100 mL	Recreation involving contact with the water, and recreation not involving contact with the water.

Source: NAC 2018a.
Notes:
— = value not established; °C = degrees Celsius; mL = milliliters.
[a] Maximum allowable increase in temperature above water temperature at the boundary of an approved mixing zone.
[b] When the lake is stratified, the dissolved oxygen applies only to the epilimnion.
[c] The ambient water quality criteria for ammonia varies, depending on pH level and whether it is a cold-water fishery or a warm-water fishery, and are specified in NAC 445A.118.

Table 5.
Water Quality Standards for Cottonwood, Rose, and Squaw Creeks

Parameter	Requirements to Maintain Existing Higher Quality	Water Quality Standards for Beneficial Uses	Beneficial Uses
Temperature, single value	—	≤ 20 °C, ΔT=0[a]	Propagation of aquatic life, and recreation involving contact with the water.
pH, single value	—	6.5–9.0	Watering livestock, irrigation, propagation of aquatic life, recreation involving contact with the water, municipal water supply, and propagation of wildlife.
Dissolved oxygen, single value	—	≥ 6 mg/L	Watering livestock, propagation of aquatic life, recreation involving contact with the water, recreation not involving contact with the water, municipal water supply, and propagation of wildlife.
Total phosphorus (as P), single value	—	≤ 0.10 mg/L	Propagation of aquatic life, recreation involving contact with the water, recreation not involving contact with the water, and municipal water supply.

Parameter	Requirements to Maintain Existing Higher Quality	Water Quality Standards for Beneficial Uses	Beneficial Uses
Total ammonia (as N)	—	Varies[b]	Propagation of aquatic life, and municipal water supply.
Total dissolved solids, single value	—	≤ 500 mg/L or the 95th percentile (whichever is less)	Watering livestock, irrigation, and municipal water supply.
E. coli Annual geometric mean Single value	—	 ≤ 126/100 mL ≤ 410/100 mL	Recreation involving contact with the water, and recreation not involving contact with the water.
Fecal coliform, single value	—	≤ 1,000/100 mL	Watering livestock, irrigation, recreation not involving contact with the water, municipal water supply, and propagation of wildlife.

Source: NAC 2018a.
Notes:
— = value not established; °C = degrees Celsius; mL = milliliters.
[a] Maximum allowable increase in temperature above water temperature at the boundary of an approved mixing zone, but the increase must not cause a violation of the single value standard.
[b] The ambient water quality criteria for ammonia varies, depending on pH level and whether it is a cold-water fishery or a warm-water fishery, and are specified in NAC 445A.118.

Walker Lake is on Nevada's 303(d) list of impaired waters because it exceeds the standards for arsenic, total phosphorus, and selenium and has impaired conditions for aquatic life. Section 303(d) of the Clean Water Act (CWA) requires each state to develop a list of water bodies needing work beyond existing controls to achieve or maintain water quality standards and support the water body's designated beneficial uses (NDEP 2016). Preventing further degradation of the lake's water quality will require watershed-level management actions.

Cottonwood, Rose, and Squaw creeks are designated as Class A waters, which means they are waters in areas of little human habitation, no industrial development or intensive agriculture, and where the watershed is relatively undisturbed by human activity. The beneficial uses of Class A waters are municipal supply, domestic supply, or both with treatment by disinfection only; propagation of aquatic life; propagation of wildlife; irrigation; watering of livestock; and contact and noncontact recreation (NAC 2018a).

5.4.2 Groundwater

HWAD is located almost entirely in the Walker Lake watershed. A small portion of HWAD high in the Wassuk Mountain Range at the western edge of its property on Mount Grant is located in the East Walker watershed (Michael Baker 2009).

The Walker Lake watershed is a closed hydrogeologic basin, and groundwater losses are generally the result of evaporation and groundwater pumping. Groundwater gradients are directed toward the valley axis and Walker Lake, but this gradient might differ locally. A small amount of groundwater is discharged to springs, and some could be lost through flow into the older consolidated rocks. Depth to groundwater at HWAD varies from about 5 feet below ground surface near the southern end of the Walker Lake watershed to about 200 feet in HWAD's Old Bomb Area (Plexus 2007).

Walker Lake Valley is underlain by an unknown thickness of alluvial fill. Water wells drilled to depths of more than 1,000 feet did not encounter bedrock. Groundwater occurs in the alluvium under both confined and unconfined conditions. The specific yield of the uppermost 100 feet of saturated material in Walker Lake Valley is reported to average 10 percent and could be as high as 15 percent. USGS has estimated the storage capacity of the aquifers in this area at approximately 900,000 acre-feet (Plexus 2007). Several wells near the town of Hawthorne and in the Whiskey Flats area have a saturated thickness exceeding 300 feet (Michael Baker 2009).

The quality of the groundwater at the edge of a closed basin such as the Walker Lake watershed is usually better than the groundwater in the central part of the basin. Water quality analyses of samples taken from potable water wells in Whiskey Flats and HWAD's Well No. 5 on the alluvial fan on the western part of the valley have TDS concentrations at or near EPA's secondary drinking water standard of 500 micrograms per liter. Wells closer to Walker Lake are reported to have even higher TDS concentrations (Michael Baker 2009; EPA 2017).

Groundwater in the basin is generally a poor source of potable water because of its relatively high levels of fluorides, metals, minerals, nitrates, sulfates, and TDS. Causes of the poor groundwater quality in the basin are unknown, but several natural sources are possible. The most significant of these sources is evaporite deposits in the valley fill material related to the retreat of Lake Lahontan. Mineralized geothermal water at depth in the basin could contribute to groundwater salinity. High TDS could be caused by recharge from mineralized zones in the mountain blocks (Michael Baker 2009). In addition, groundwater temperature is affected by an underground geothermal source, so it must be cooled before it can be used.

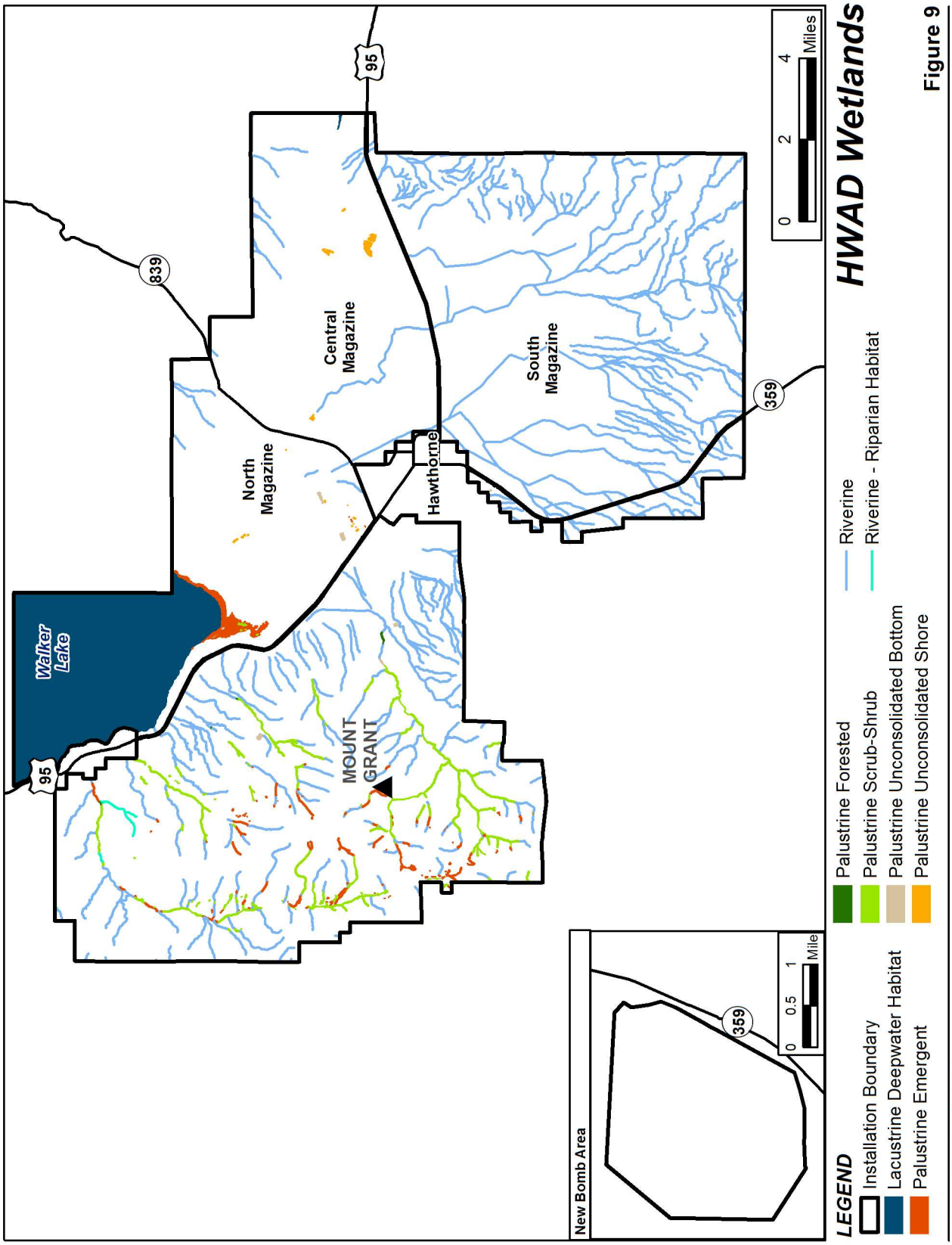
HWAD uses groundwater as a potable water source only as needed to augment surface water sources on Mount Grant (see section 5.4.1.1), typically primarily during HWAD's dry summers. Seven groundwater wells are located on HWAD. Well No. 11 is the only one currently used by HWAD to augment potable water supplies from surface water sources on Mount Grant (see section 5.4.1.1). As needed, water from the well is pumped to the Black Beauty Reservoir, cooled, treated, and then distributed to end users at HWAD. Groundwater is tested to ensure it meets drinking water standards and is either not used or is treated to comply with federal and state drinking water standards before it is distributed.

HWAD's water system is also connected to the town of Hawthorne, so HWAD can send water to Hawthorne or vice versa in emergencies. Hawthorne gets its potable water from groundwater wells primarily in the Whiskey Flats area (Michael Baker 2009).

5.5 WETLANDS AND RIPARIAN AREAS

Wetlands at HWAD are primarily located adjacent to streams and springs on Mount Grant, at the edge of Walker Lake, and in intermittent streambeds in the South Magazine Area, although some scattered wetlands are located in the North and Central Magazine areas. Figure 9 shows wetland areas on HWAD as delineated by USFWS in a 1999 report (USFWS 1999).

According to the 1999 USFWS report, HWAD has 710 acres of wetlands, 10,527 acres of deepwater habitat (i.e., Walker Lake), and 290 acres of riparian habitat (USFWS 1999). This equates to approximately 8 percent of HWAD's total acreage area. Table 6 identifies each type of wetland identified at HWAD and the associated acreage.


HWAD Wetlands
Figure 9
Walker Lake
MOUNT GRANT
North Magazine
Central Magazine
South Magazine
Hawthorne
95
839
359
0 2 4 Miles
New Bomb Area
0 0.5 1 Mile
LEGEND
Installation Boundary
Lacustrine Deepwater Habitat
Palustrine Emergent
Palustrine Forested
Palustrine Scrub-Shrub
Palustrine Unconsolidated Bottom
Palustrine Unconsolidated Shore
Riverine
Riverine - Riparian Habitat
Source: HWAD GIS 2012.

As shown in Table 6, palustrine emergent wetlands are the predominant type of wetland (61 percent), with scrub-shrub wetland being the next most common (about 23 percent). The predominant riparian habitat type is scrub-shrub mixed deciduous (about 35 percent), with forested mixed deciduous being the next most common (about 26 percent). Linear wetlands and riparian habitat totaled 366.2 miles: 42.5 miles of linear wetlands, 6.6 miles of linear riparian habitat, and 317.3 miles of rivers and streams. More than half of these linear features are intermittent streams (USFWS 1999).

Table 6.
Wetlands and Riparian Areas on HWAD

Wetland and Riparian Habitat Type	Acres	Percentage
Palustrine wetlands		
Emergent wetland	433.3	61.0%
Scrub-shrub wetland	161.2	22.7%
Unconsolidated shore	75.3	10.6%
Unconsolidated bottom	38.5	5.4%
Forested wetland	1.9	<1%
Total palustrine wetlands	**710.2**	**100.0%**
Deepwater habitats		
Lacustrine unconsolidated bottom	10,519.9	99.9%
Lacustrine unconsolidated shore	6.9	<1%
Total deepwater habitat	**10,526.8**	**100.0%**
Riparian habitats		
Scrub-shrub mixed deciduous	101.2	34.9%
Forested mixed deciduous	74.7	25.7%
Forested aspen	60.3	20.8%
Emergent	46.1	15.9%
Scrub-shrub willow	3.4	1.2%
Scrub-shrub Russian olive	2.7	<1%
Scrub-shrub tamarisk	1.8	<1%
Total riparian habitat	**290.2**	**100.0%**
Total wetland and riparian habitat	**11,527.2**	**100.0%**

Source: USFWS 1999.

Table 7 lists the wetland-associated plant species identified on HWAD during the 1999 USFWS survey. Table 8 lists examples of the dominant species in each wetland habitat type and common associates.

Table 7.
Wetland Plant Species Identified on HWAD

Plant Type	Common Name	Scientific Name
Trees		
	Fremont cottonwood	*Populus fremontii*
	Quaking aspen	*Populus tremuloides*
	Russian olive	*Elaeagnus angustifolia*
Shrubs		
	Big sagebrush	*Artemisia tridentata*
	Coyote willow	*Salix exigua*
	Rabbitbrush	*Ericameria nauseosa*
	Ragwort, groundsel	*Senecio* sp.
	Red osier dogwood	*Cornus sericea*
	Shadscale	*Atriplex confertifolia*
	Tamarisk, saltcedar	*Tamarix* sp.
	Willow	*Salix* sp.
	Wood's rose	*Rosa woodsii*
Herbs		
	Baltic rush	*Juncus balticus*
	Basin wild rye	*Leymus cinereus*
	Bluegrass	*Poa* sp.
	Cinquefoil	*Potentilla* sp.
	Foxtail	*Alopecurus* sp.
	Foxtail barley	*Hordeum jubatum*
	Hardstem bulrush	*Schoenoplectus acutus*
	Narrowleaf cattail	*Typha angustifolia*
	Northern green rush	*Juncus alpinoarticulatus*
	Nuttall's water starwort	*Callitriche pedunculosa*
	Rocky Mountain iris	*Iris missouriensis*
	Rush	*Juncus* sp.
	Saltgrass	*Distichlis spicata*
	Sedge	*Carex* sp.
	Southern bush monkeyflower	*Diplacus longiflorus*
	Water sedge	*Carex aquatilis*
	Woodrush	*Luzula* sp.
	Yarrow	*Achillea millefolium*

Source: USFWS 1999.

Table 8.
Wetland Habitats and Associated Species

Wetland Type (Map code)	Dominant Species	Common Associates
Palustrine forested, wetland, temporarily flooded (PFO1A)	Fremont cottonwood	Russian olive, willow, Wood's rose
Palustrine, scrub-shrub, wetland, seasonally flooded (PSS1C)	Willow	Bluegrass, rose
Palustrine scrub-shrub, wetland temporarily flooded (PSSS2A)	Tamarisk	Saltbush
Palustrine emergent, wetland, saturated (PEM1B)	Water sedge	Baltic rush, bluegrass, foxtail barley, Rocky Mountain iris
Palustrine emergent, wetland, seasonally flooded (PEM1C)	Saltgrass	Baltic rush, foxtail barley, Nuttall's water starwort
Riparian, lotic, forested, deciduous, aspen (Rp1FO6AS)	Russian olive	Fremont cottonwood, tamarisk, willow
Riparian lentic, scrub-shrub, deciduous tamarisk (Rp2SS6SC)	Tamarisk	Russian olive

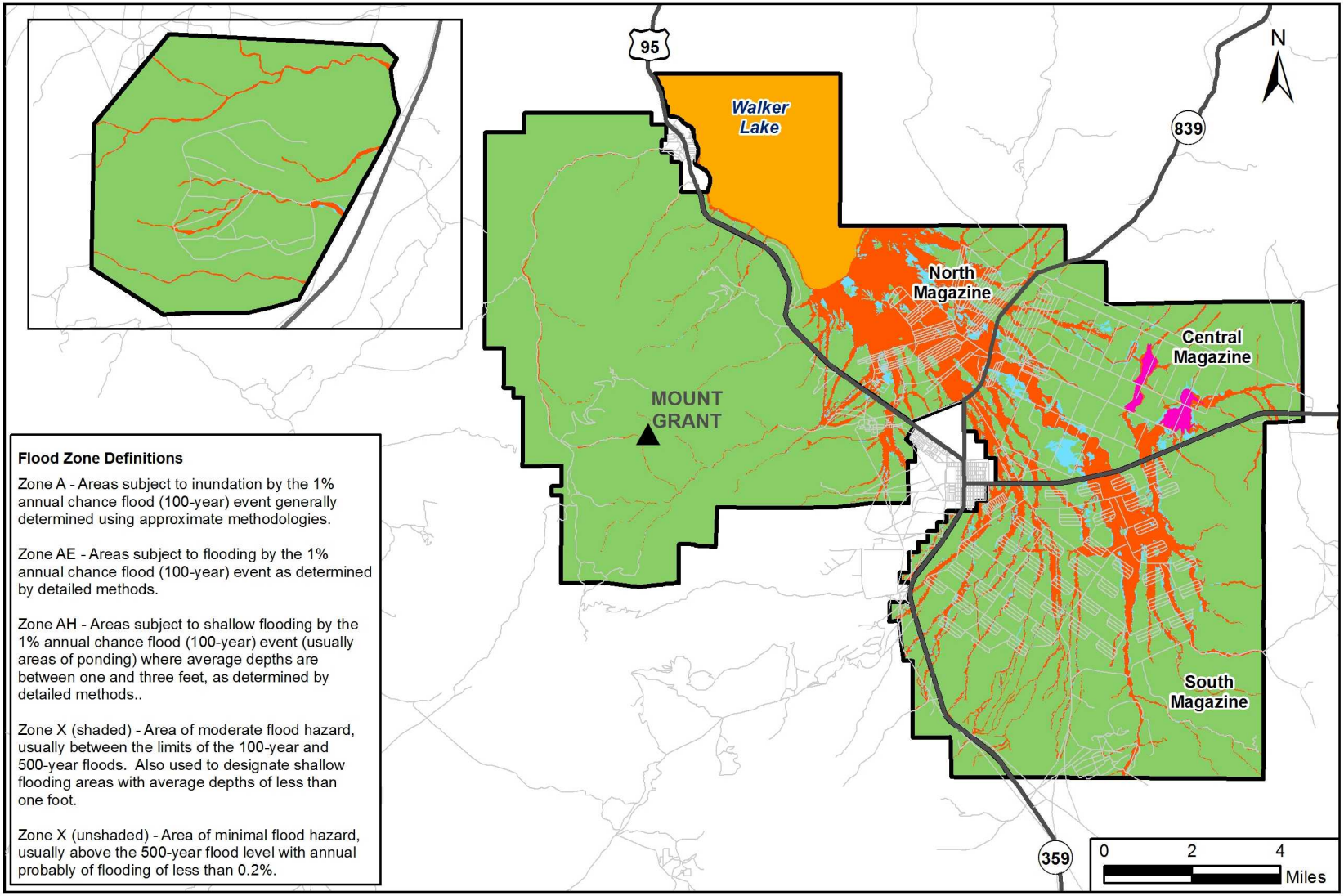
Source: USFWS 1999.

5.6 FLOODPLAINS

Table 9 describes and Figure 10 shows flood zones at HWAD, as determined by a recent floodplain delineation (see appendix E). Flood zones are described according to the nomenclature used by the Federal Emergency Management Agency (FEMA). As shown in Figure 10 and described in Table 9, 32,390 acres (Zones A, AE, and AH) are located in the 100-year flood zone, and 4,336 acres (Zone X [shaded]) are located in the 500-year flood zone. Most of HWAD (110,387 acres) is located outside the 500-year flood zone (Zone X [unshaded]).

Table 9.
Flood Zones

Zone	Description	Acreage on HWAD
A	Areas subject to inundation by the 1% annual chance flood (100-year) event generally determined using approximate methodologies.	10,816
AE	Areas subject to flooding by the 1% annual chance flood (100-year) event as determined by detailed methods.	20,909
AH	Areas subject to shallow flooding by the 1% annual chance flood (100-year) event (usually areas of ponding), where average depths are between 1 and 3 feet, as determined by detailed methods.	565
X (shaded)	Area of moderate flood hazard, usually between the limits of the 100-year and 500-year floods. Also used to designate shallow flooding areas with average depths of less than 1 foot.	4,336
X (unshaded)	Area of minimal flood hazard, usually above the 500-year flood level with annual probabilily of flooding less than 0.2%.	110,387



HWAD (Main Base)
Floodplain Mapping Flood Zones

Figure 10

Source: HWAD GIS 2012, USGS NED, ESRI

SECTION 6.0 ECOSYSTEM CONTEXT AND THE BIOTIC ENVIRONMENT

6.1 ECOSYSTEM CONTEXT

An ecoregion classification system has been developed to delineate general areas of ecosystem similarity in the United States. The classification system is the result of an interagency effort between USFS, the U.S. Environmental Protection Agency (EPA), and NRCS. The system is intended to provide a spatial framework of ecoregions to assist federal and state agencies and other interested parties in developing and implementing ecosystem-based management strategies. The system was developed by analyzing spatial patterns in biotic phenomena and other phenomena such as geology, physiography, climate, soils, land use, and hydrology (Panamerican 2016).

The classification system is composed of four levels of ecoregions: levels I, II, III, and IV, with level I being the most generalized and level IV being the most specific. This section describes level III and IV ecoregions at HWAD to provide an overview of the depot's ecosystems.

HWAD and most of the state of Nevada are located in the Central Basin and Range level III ecoregion (Bryce et al. 2003). The northern boundary of the state is located in the Northern Basin and Range ecoregion, and the southern tip of the state is located in the Mojave Basin and Range ecoregion. The Central Basin and Range ecoregion (13) is composed of north-trending, fault-block ranges and intervening, drier basins. In the high-elevation mountains, woodland, mountain brush, and scattered open forest are found. Low-elevation basins, slopes, and alluvial fans are either shrub- and grass-covered, shrub-covered, or barren. The potential natural vegetation is, in order of decreasing elevation and ruggedness, scattered western spruce-fir forest, juniper woodland, sagebrush, and saltbush-greasewood. The Central Basin and Range ecoregion is internally drained by ephemeral streams and once contained ancient Lake Lahontan. This ecoregion generally is warmer and drier than the Northern Basin and Range ecoregion to the north. Soils grade upslope from mesic Aridisols to frigid Mollisols. The land is primarily used for grazing. Additionally, some cropland is irrigated in valleys near mountain water sources.

The Central Basin and Range ecoregion is subdivided into 27 subregions, or level IV ecoregions, with HWAD occupying parts of five of these: the Lahontan Salt Shrub Basin, Tonopah Basin, Tonopah Sagebrush Foothills, Sierra Nevada-Influenced Ranges, and Sierra Nevada-Influenced High Elevation Mountains. Figure 11 shows level IV ecoregions and Table 10 lists their key characteristics.

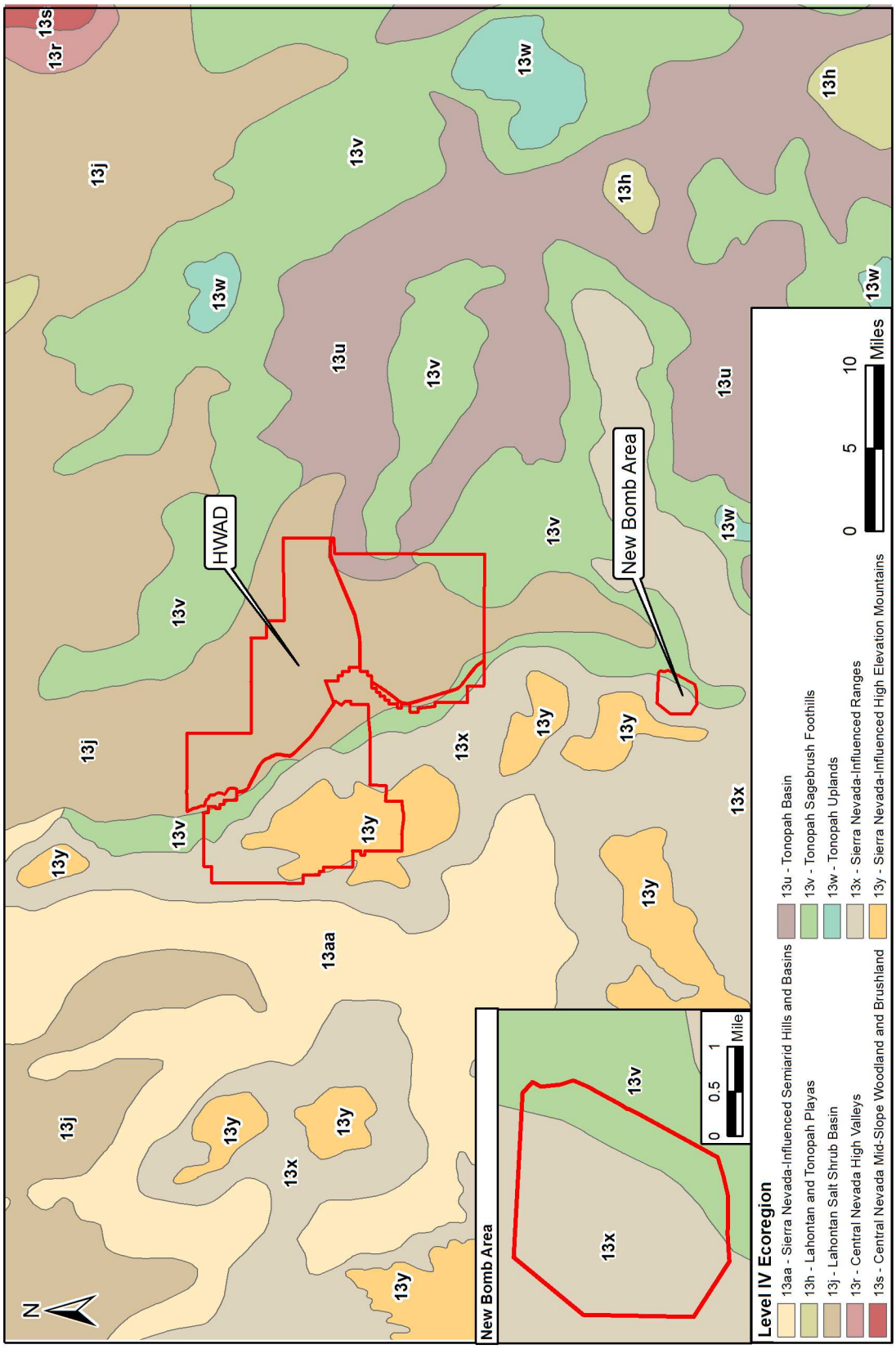


Figure 11

Source: HWAD GIS 2012; USEPA 2017.

Table 10.
Ecoregion Characteristics of HWAD

Ecoregion	Elevation (feet)	Local Relief (feet)	Physiography	Vegetation	Land Use
Lahontan Salt Shrub Basin (13j)	3,350–5,500	0–50; commonly nearly level	Broad, nearly level flats, playas, plains, terraces, and dunes	Mostly barren; saltbush–greasewood if vegetation is present	Wildlife habitat, recreation, and military reservation; limited grazing potential and unsuitable as cropland
Tonopah Basin (13u)	4,000–7,000	Less than 50–1,800	Broad, nearly flat to rolling valleys containing plains, hills, alluvial fans, dunes, and springs	Mostly saltbush–greasewood; some sagebrush; shrub understory has warm season grasses	Shrubland, rangeland, wildlife habitat, and some irrigated cropland
Tonopah Sagebrush Foothills (13v)	4,600–8,000	400–3,000	Foothills, hills, mesas, fans, and low mountains	Great Basin sagebrush community; mostly Wyoming big sagebrush and black sagebrush	Shrubland, rangeland, wildlife habitat, and military reservation
Sierra Nevada-Influenced Ranges (13x)	6,500–9,000	400–2,500	Mid-elevation mountain slopes, crests, ridges, and plateaus; scattered seasonal pools and small lakes	Mostly pinyon-juniper woodland	Woodland, brushland, rangeland, wildlife habitat, and recreation
Sierra Nevada-Influenced High Elevation Mountains (13y)	9,000–13,800	400–4,800	High elevation mountains, ridges, hills, and plateaus	Mountain-mahogany/subalpine-alpine forbs, mountain big sagebrush, low sagebrush, mountain-mahogany, and aspen groves	Brushland, shrubland, open evergreen forest, deciduous trees, rangeland, wildlife habitat, and recreation

Source: Bryce et al. 2003.

The level IV ecoregions are described as follows (Bryce et al. 2003):

The Lahontan Salt Shrub Basin (13j) is an expansive dry plain that was once beneath Pleistocene Lake Lahontan. The basin has a direct connection to the south through low-elevation valleys to the Mojave Basin and Range, but winters are cold enough to discourage the northward dispersal of many Mojavean species into the Lahontan Basin. Salt-tolerant shrubs cover the lower basin slopes and distinguish the Lahontan Salt Shrub Basin and Tonopah Basin from other Nevada salt shrub ecoregions. Sand dunes may occur where windblown sand accumulates against a barrier; dune complexes support a specialized plant community and diverse small mammal populations. The Carson and Truckee rivers, originating in the Sierra Nevada, provide water for irrigated farming. Riparian corridors along these rivers support the only trees found in the ecoregion.

The Tonopah Basin (13u) lies in the transition between the Great Basin and the more southerly Mojave Desert. The Tonopah Basin shows varying degrees of Great Basin and Mojave Desert characteristics. The west side of the Tonopah Basin is a continuation of the Lahontan Basin while the lower, hotter valley on the east side is more like the Mojave Desert. Arid-land shrubs cover broad rolling valleys, hills, and alluvial fans. The shrubs often codominate in highly diverse mosaics. The shrub understory includes warm season grasses. Valleys with perennial water contain endemic fish species.

The Tonopah Sagebrush Foothills ecoregion (13v) includes the low mountains and hills rising from the basin floor. The substrate is rocky and lacks the fine sediments found at lower elevations. Great Basin species are common in this ecoregion as they are further north. Because the ecoregion is in the rain shadow of the Sierra Nevada and is adjacent to the Mojave Desert, however, it is more arid. Understory species that are found farther north and east are largely absent. Mojave Desert species are more common in the east and south, where summer moisture is more prevalent. Streams are ephemeral and flow during and immediately after storms. Storm events can be of sufficient magnitude to move large quantities of sediment in streambeds. Because of the droughty conditions, the ecoregion has a low carrying capacity for cattle.

The Sierra Nevada-Influenced Ranges (13x) are those wooded Great Basin mountains that have climatic and biotic affinities to the Sierra Nevada. Overall, the ecoregion receives more precipitation than the mountain ranges of central Nevada. Precipitation amounts vary from range to range in relation to the local strength of the Sierra Nevada rain shadow. Because of minimal summer rainfall, the ecoregion contains pinyon-juniper woodland. The Pine Nut, Sweetwater, Virginia, Wassuk, and White ranges support varying amounts of Sierra Nevada flora, including small pine stands. Scattered ephemeral pools are perched over areas of flat, impermeable volcanic bedrock and support unique assemblages of flora and fauna. High ranges near the Sierra Nevada are more likely to have perennial streams.

The Sierra Nevada-Influenced High Elevation Mountains (13y) occupy the elevational zone above the woodland-covered Sierra Nevada-Influenced Ranges and are affected in varying degrees by Sierra Nevada climate. Elevations range from 9,000 to nearly 14,000 feet. The ecoregion is generally covered by shrubs, small groves of trees, scattered stands of high-elevation conifers, and Sierra Nevada subalpine and alpine forbs. Moisture captured by the highest ranges in the ecoregion result in substantial perennial stream flow in some areas.

6.2 VEGETATION COMMUNITIES AND FLORA

A PLS for vegetation communities was conducted in 2018. The PLS used the Southwest Regional Gap Analysis Project (SWReGAP) land cover dataset to assign vegetation communities. The PLS identified 22 vegetation communities and cover types at HWAD, including 15 native species-dominant SWReGAP communities, three nonnative species-dominant SWReGAP communities, one non-SWReGAP community, and three nonvegetated SWReGAP cover types. In addition, an overlay zone of nonnative tamarisk (*Tamarix* sp.) was identified. Figure 12 and Table 11 present information on vegetation communities on HWAD.

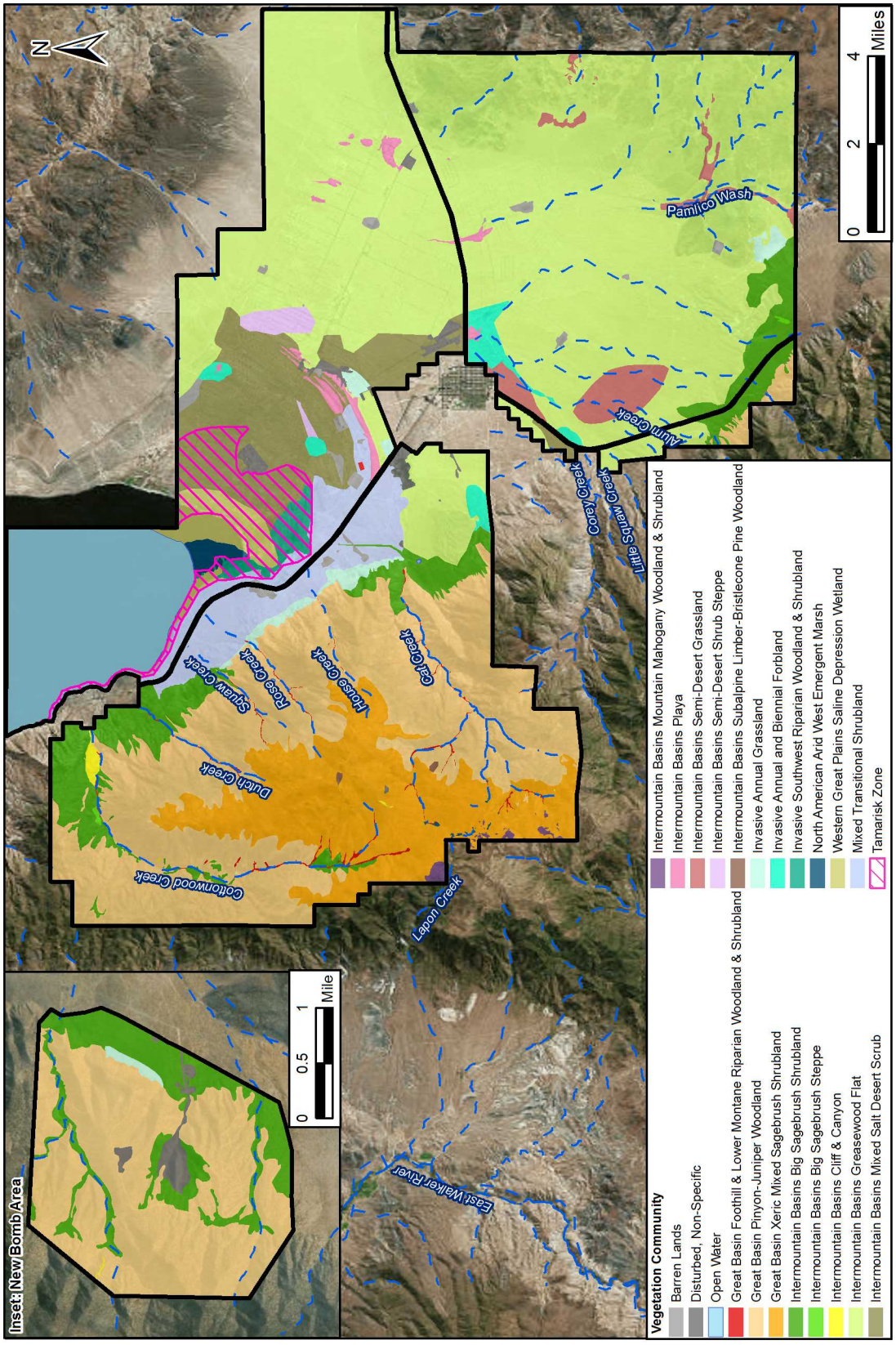

HWAD Vegetation
LEGEND
HWAD Boundary
Stream
Vegetation Community
Barren Lands
Disturbed, Non-Specific
Open Water
Great Basin Foothill & Lower Montane Riparian Woodland & Shrubland
Great Basin Pinyon-Juniper Woodland
Great Basin Xeric Mixed Sagebrush Shrubland
Intermountain Basins Big Sagebrush Shrubland
Intermountain Basins Big Sagebrush Steppe
Intermountain Basins Cliff & Canyon
Intermountain Basins Greasewood Flat
Intermountain Basins Mixed Salt Desert Scrub
Intermountain Basins Mountain Mahogany Woodland & Shrubland
Intermountain Basins Playa
Intermountain Basins Semi-Desert Grassland
Intermountain Basins Semi-Desert Shrub Steppe
Intermountain Basins Subalpine Limber-Bristlecone Pine Woodland
Invasive Annual Grassland
Invasive Annual and Biennial Forbland
Invasive Southwest Riparian Woodland & Shrubland
North American Arid West Emergent Marsh
Western Great Plains Saline Depression Wetland
Mixed Transitional Shrubland
Tamarisk Zone
Inset: New Bomb Area
0 0.5 1 Mile
0 2 4 Miles
N
Cottonwood Creek
Dutch Creek
Squaw Creek
Rose Creek
Horse Creek
Cal Creek
Lapon Creek
East Walker River
Coaldale Creek
Little Squaw Creek
Alum Creek
Pamlico Wash

Figure 12

Table 11.
HWAD Vegetation Communities by Acreage

Description	Acreage	Percent of HWAD Total Land Area
Intermountain Basins Greasewood Flat	60,467	41.4%
Great Basin Pinyon-Juniper Woodland	29,191	20.0%
Great Basin Xeric Mixed Sagebrush Shrubland	12,103	8.3%
Open Water	9,243	6.3%
Intermountain Basins Mixed Salt Desert Scrub	8,900	6.1%
Intermountain Basins Big Sagebrush Shrubland	8,026	5.5%
Mixed Transitional Shrubland	5,992	4.1%
Tamarisk Zone (overlay; acreage and percent cover not included in total)	4,760	3.3%
Intermountain Basins Semi-Desert Grassland	2,219	1.5%
Western Great Plains Saline Depression Wetland	1,914	1.3%
Invasive Annual and Biennial Forbland	1,323	0.9%
Invasive Annual Grassland	1,060	0.7%
Disturbed, Non-Specific	945	0.6%
Invasive Southwest Riparian Woodland and Shrubland	904	0.6%
Intermountain Basins Playa	857	0.6%
Barren Lands	795	0.5%
Intermountain Basins Semi-Desert Shrub Steppe	612	0.4%
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	460	0.3%
North American Arid West Emergent Marsh	452	0.3%
Intermountain Basins Mountain Mahogany Woodland and Shrubland	242	0.2%
Intermountain Basins Cliff and Canyon	171	0.1%
Intermountain Basins Subalpine Limber-Bristlecone Pine Woodland	46	< 0.1%
Intermountain Basins Big Sagebrush Steppe	45	< 0.1%
TOTAL[a]	**145,967**	**100%**

Note:
a Total does not match HWAD acreage because of minor variations between GIS acreage and real property records.

As shown in Table 11, the most prevalent communities by acreage are Intermountain Basins Greasewood Flat (60,467 acres, or 41.4 percent), Great Basin Pinyon-Juniper Woodland (29,191 acres, or 20 percent), and Great Basin Xeric Mixed Sagebrush Shrubland (12,103 acres, or 8.3 percent). These three communities cover approximately 70 percent of the depot. As shown in Figure 12, Intermountain Basins Greasewood Flat is primarily found in the flat, lower elevation magazine areas, covering much of the Central and South Magazine areas. Great Basin Pinyon-Juniper Woodland is found on the slopes of Mount Grant and throughout much of the New Bomb Area. Great Basin Xeric Mixed Sagebrush Shrubland is found at higher elevations on Mount Grant.

Other common communities included Intermountain Basins Mixed Salt Desert Scrub (8,990 acres, or 6.1 percent), Intermountain Basins Big Sagebrush Shrubland (8,026 acres, or 5.5 percent), and Mixed Transitional Shrubland (5,992 acres, or 4.1 percent). These three communities cover 15.7 percent of the depot. As shown on Figure 12, Intermountain Basins

Mixed Salt Desert Scrub covers much of the North Magazine and the western portion of the Central Magazine Area. Intermountain Basins Big Sagebrush Shrubland is found in the foothills of East Mount Grant, the foothills of off-depot mountains in the southwest portion of the South Magazine Area, and in the New Bomb Area. Mixed Transitional Shrubland is found east of Mount Grant on both sides of U.S. Route 95.

The remaining 16 communities and land covers compose 14.6 percent of the land area at HWAD and consist of shrublands, riparian areas, woodlands, shrub steppe, grassland, forbland, wetlands, and other communities and land cover types.

Three communities are dominated by nonnative species: Invasive Annual and Biennial Forbland (1,323 acres, or 0.9 percent), Invasive Annual Grassland (1,060 acres, or 0.7 percent), and Invasive Southwest Riparian Woodland and Shrubland (904 acres, or 0.6 percent). Collectively these communities represent 3,287 acres, or 2.2 percent of HWAD's land area. Section 6.3 addresses invasive plant species.

Lower elevations on HWAD vary in type of vegetation cover, from disturbed or sparsely vegetated to relatively high shrub cover. Vegetation in low-lying areas is dominated by shrublands, including Intermountain Basins Mixed Salt Desert Scrub, Intermountain Basins Greasewood Flat, and a non-SWReGAP community identified as Mixed Transitional Shrubland. Other lower elevation communities include Intermountain Basins Playa as a mosaic within shrubland communities; North American Arid West Emergent Marsh, Western Great Plains Saline Depression Wetland, and Invasive Southwest Riparian Woodland and Shrubland south of Walker Lake; Intermountain Basins Big Sagebrush Shrubland in the South Magazine Area; and Invasive Annual Grasslands or Invasive Annual and Biennial Forblands in relatively small patches in all three magazine areas.

Vegetation communities on Mount Grant vary in type with elevation. They generally transition from low-elevation Mixed Transitional Shrubland (on both sides of U.S. Route 95), Intermountain Basins Greasewood Flat (southeast of Cat Creek), and Intermountain Basins Mixed Salt Desert Scrub to the mid-elevation foothills dominated by Intermountain Basins Big Sagebrush Shrubland to the higher elevation Great Basin Pinyon-Juniper Woodlands, and, higher still, Xeric Mixed Sagebrush Shrubland. Other communities on Mount Grant include Intermountain Basins Montane Sagebrush Steppe, Intermountain Basins Subalpine Limber-Bristlecone Pine Woodland, Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland, North American Arid West Emergent Marsh, Intermountain Basins Mountain Mahogany Woodland and Shrubland, and Intermountain Basin Cliff and Canyon.

Vegetation in the New Bomb Area is composed of primarily Great Basin Pinyon-Juniper Woodland with lower elevation foothills dominated by Intermountain Basins Big Sagebrush Shrubland. A small section of Invasive Annual Grassland occurs on the east slopes of the area, and the areas used for demilitarization are classified as disturbed. Some evidence was observed in the area of bark beetle (*Ips* spp.) infestation in pinyon pine woodlands. The extent of infestation was not determined during the survey, and it is possible pinyon pine woodlands on Mount Grant could also be affected.

The survey team delineated a Tamarisk Zone south of Walker Lake (Figure 12) to indicate that several native vegetation communities have a component of invasive tamarisk shrubs. These areas are dominated by native species, considered to be representative of native vegetation

communities, and delineated as North American Arid West Emergent Marsh, Western Great Plains Saline Depression Wetland, and Intermountain Basins Mixed Salt Desert Scrub. An overlay of the Tamarisk Zone on the map of vegetation communities shows the current extent of this highly invasive shrub species and allows for future monitoring of the area. Invasive Southwest Riparian Woodland and Shrubland areas also were mapped in the Tamarisk Zone, where tamarisk and Russian olive (*Elaeagnus angustifolia*) are dominant and have invaded native riparian cottonwood habitat.

The acreage of disturbed and barren lands in Table 11 (Barren Lands, 745 acres, and Disturbed, Non-Specific, 945 acres) is likely underrepresented because disturbances with small footprints such as magazines were not always delineated on the vegetation map (Figure 12). Instead, the PLS focused on showing larger disturbances that have substantially changed the surrounding vegetation.

The team also documented the presence of several uncommon native vegetation communities with limited occurrence at HWAD. Examples of these communities are Western Great Plains Saline Depression Wetland (1,914 acres, or 1.3 percent), Intermountain Basins Playa (857 acres, or 0.6 percent), Intermountain Basins Semi-Desert Shrub Steppe (612 acres, or 0.4 percent), Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (460 acres, or 0.3 percent), North American Arid West Emergent Marsh (452 acres, or 0.3 percent), Intermountain Basins Mountain Mahogany Woodland and Shrubland (242 acres, or 0.2 percent), Intermountain Basins Subalpine Limber-Bristlecone Pine Woodland (46 acres, or less than 0.1 percent), and Intermountain Basins Big Sagebrush Steppe (45 acres, or less than 0.1 percent).

The two areas of Limber-Bristlecone Pine Woodlands in the West Mount Grant area were mapped based on information provided by the HWAD Natural Resources Manager. These rare, high-elevation areas could not be accessed during this survey to sample representative plots; however, a second community that falls into this classification was observed. That community included a single stand of whitebark pine (*Pinus albicaulis*) along the dry upland slopes of a drainage in the West Mount Grant area. Whitebark pine is a candidate for listing under the ESA. It is possible that additional areas of this vegetation community are present but were not observed during this survey.

During the PLS, the survey team found evergreen shrubs to be dead or highly stressed in many portions of the magazine areas, possibly the result of a regional drought that lasted from approximately 2011 to 2015 (NCICS 2018). This condition was particularly noticeable in three communities—Mixed Transitional Shrubland, Intermountain Basins Mixed Salt Desert Scrub, and Intermountain Basins Greasewood Flat—although not all areas of those communities exhibited high stress.

HWAD has no timber program. Cutting downed wood and deadwood for firewood is periodically allowed when they reach appropriate levels (Peterson 2017, personal communication).

Appendix A provides lists of plant species identified at HWAD, and appendix C provides a list of plant species identified in Mineral County. Section 6.5.1 discusses state-listed and other rare and sensitive plant species.

6.3 INVASIVE PLANT SPECIES

Surveys conducted in 2003 identified 19 invasive and/or nonnative plant species at HWAD, as shown in Table 12 and listed in appendix A (Tetra Tech 2004). The 2018 PLS for vegetation communities also documented several nonnative plant species, although they were documented opportunistically since they were not the focus of the survey. Nonnative species were most commonly found at the south end of Walker Lake (where tamarisk is prevalent), along road margins, and in other disturbed areas (Tetra Tech 2004, 2018).

Tamarisk, which commonly occurs as a midstory shrub or tree, poses the greatest threat to native plant communities at HWAD. It is prevalent near the south end of Walker Lake and is also found along roads on the Main Base and in riparian areas at Mount Grant. Tamarisk was initially planted southeast of Walker Lake in the early 1900s for erosion control, but it has since spread to other areas, including along the shoreline of Walker Lake. Because tamarisk is very aggressive and adaptable, it can outcompete most native species in several of the habitats found at HWAD, with potentially severe consequences for plant diversity, wildlife habitat quality, and groundwater levels (Tetra Tech 2004).

Of the nonnative species observed at HWAD, only tamarisk is listed as a Category C noxious weed in Nevada (NDA 2018). Category C weeds are generally established and widespread throughout Nevada, and the only statewide requirement is active eradication from the premises of a nursery stock dealer. In other words, these species have become widespread enough to preclude effective exclusion efforts. Instead, landowners can evaluate the potential and need for eradicating the species on a case-by-case basis. Successful tamarisk control requires cutting, digging, or burning the shrub in combination with chemical application. HWAD has used manual removal and introduction of the leaf beetle (*Diorhabda elongata deserticola*) to attempt to control tamarisk (Peterson 2017, personal communication).

Cheatgrass (*Bromus tectorum*), which is primarily found in the magazine areas and foothills and lower slopes of the East Mount Grant area, may also pose a significant threat to native ecosystems because it, too, is very competitive and can change the structure of soils as well as alter the natural regime. Like tamarisk, it can readily colonize previously undisturbed areas. The threat posed by this species at HWAD, however, is mitigated by the fact that it is unlikely to show up in soils with high salinity such as those found throughout much of the historic bed of Walker Lake (Tetra Tech 2004).

Although Russian thistle (*Salsola tragus*) and barbwire Russian thistle (*S. paulsenii*) were among the most widespread invasive species at HWAD, they pose less of a threat than tamarisk and cheatgrass. The two species show little inclination to spread beyond roadsides and disturbed areas at HWAD, and they are far less likely to colonize the greater ecosystem (Tetra Tech 2004).

None of the invasive and/or nonnative plant species known to occur at HWAD are on the federal list of noxious weed species; however, four species are on Nevada's list of noxious weeds as shown in Table 12 (USDA 2018a, 2018b).

Broadleaf weeds occur around HWAD warehouses, along railroads, and occasionally around office buildings.

Table 12.
Invasive and Nonnative Plant Species at HWAD

Common Name	Scientific Name	Occurrence	Nevada Noxious Weed
African rue	*Peganum harmala*	Terrestrial	Yes
Barbwire Russian thistle	*Salsola paulsenii*	Terrestrial	--
Bull thistle	*Cirsium vulgare*	Terrestrial	--
Cheatgrass	*Bromus tectorum*	Terrestrial	--
Common mullein	*Verbascum thapsus*	Terrestrial	--
Common St. Johnswort	*Hypericum perforatum*	Terrestrial	--
Common sunflower	*Helianthus annuus*	Terrestrial	--
Compact brome	*Bromus madritensis*	Terrestrial	--
Flixweed	*Descurainia sophia*	Terrestrial	--
Lesser burdock	*Arctium minus*	Terrestrial	--
Redstem filaree	*Erodium cicutarium*	Terrestrial	--
Rush skeletonweed	*Chondrilla juncea*	Terrestrial	Yes
Russian olive	*Elaeagnus angustifolia*	Wetland/terrestrial	--
Russian thistle	*Salsola tragus*	Terrestrial	--
Saltlover	*Halogeton glomeratus*	Terrestrial	--
Sweetclover	*Melilotus officinalis*	Terrestrial	--
Tamarisk, saltcedar	*Tamarisk* spp.	Terrestrial	Yes
Tansy ragwort	*Senecio jacobaea*	Terrestrial	--
Whitetop	*Cardaria draba*	Terrestrial	Yes
Yellow salsify	*Tragopogon dubius*	Terrestrial	--

Sources: Tetra Tech 2004, 2018; USDA 2018b.
Note: -- = not on Nevada noxious weed list.

6.4 FAUNA

The fauna discussed in this section represent common mammals, birds, reptiles, amphibians, fish, and benthic organisms observed at HWAD during surveys and assessments conducted on the installation. Appendix B provides a comprehensive list of fauna species observed at HWAD, and appendix C provides a list of fauna species with the potential to occur in Mineral County.

6.4.1 Mammals

Mammals inhabiting HWAD represent all trophic levels and contribute to the diverse ecosystem. No comprehensive inventory has been conducted for mammals inhabiting HWAD; however, miscellaneous surveys conducted at HWAD have identified more than 70 species. Appendix B lists mammals observed or with potential to occur at HWAD, and Table 13 lists select mammal species, their habitats, and diets.

Table 13.
Selected Mammal Species on HWAD

Species	Habitat	Diet	Comments
American black bear (*Ursus americanus*)	Mountainous terrain and dens below and in hollow trees, and beneath tree roots	Berries, nuts, tubers, small mammals, eggs, honey, garbage, and carrion.	Black bears were first observed on Mount Grant in 1993. HWAD has partnered with NDOW to avoid euthanizing black bears caught elsewhere by releasing them on Mount Grant. NDOW released six black bears on Mount Grant in 1996.
Black-tailed jackrabbit (*Lepus californicus*)	Lower desert scrub community along valley floor	Grasses and plants.	Whiskey Flats is a former Native American hunting ground for this species.
Bobcat (*Lynx rufus*)	Pinyon-juniper and foothills	Small mammals, rodents, and birds.	No data specific to HWAD have been collected.
Coyote (*Canis latrans*)	Pinyon-juniper and more open landscapes	Rodents and sometimes deer and sheep.	No data specific to HWAD have been collected.
Feral horses (*Equus caballus*)	The southern end of Walker Lake	Browse forbs and grasses.	Feral horses roam the Walker Lake area and are managed by BLM.
Mountain lion (*Puma concolor*)	Higher elevations of Mount Grant	Mule deer, Nelson desert bighorn sheep, feral horses are preferred prey, but will prey on most wildlife. A mature lion feeds on about one deer per week.	NDOW estimates that fewer than five lions are in the Mount Grant area (with ranges that include areas on and off HWAD). NDOW evaluates the benefits and drawbacks of controlling the population on HWAD in the context of the population that inhabits western Nevada and eastern California.
Mule deer (*Odocoileus hemionus*)	Pinyon-juniper in mountainous areas in spring/summer, lower elevations in winter	Twigs, shrubs, and herbs.	The resident mule deer population ranges from 20 to 100 annually. The number of migratory deer that overwinter at HWAD ranges from 200 to 300 animals. Population varies depending on weather severity, its direct effects on forage plant species and surface water availability, and indirect effects on birth rate and survival. The population has remained relatively stable over the years.
Nelson desert bighorn sheep (*Ovis canadensis nelsoni*)	Higher elevations, pinyon-juniper mountainous areas, and rocky canyons of Mount Grant	A variety of plants, including grasses, sedges, and woody plants.	Sheep were extirpated from the Wassuk Range prior to HWAD's establishment and were reintroduced by NDOW through a cooperative agreement in the late 1980s (HWAD, NDOW, and USFWS 1988). The estimated population of the sheep is 220 (Salsbury 2018, personal communication).
Ringtail (*Bassariscus astutus*)	Higher elevation pinyon-juniper habitat	Squirrels and rodents.	No data specific to HWAD have been collected.

Species	Habitat	Diet	Comments
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Common in open areas, inhabiting the lower desert scrub community along valley floor; especially around magazine storage areas	Seeds, insects, and meat.	No data specific to HWAD have been collected.
White-tailed jackrabbit (*Lepus townsendii*)	Open areas above 7,000 feet in the upper sagebrush communities and grassy plains	Grasses and other green vegetation during the summer, supplementing their diet with buds, bark, and small twigs during winter.	No data specific to HWAD have been collected; however, this species is generally very isolated and not often seen.
Yellow-bellied marmot (*Marmota flaviventris*)	Rocky terrain of valleys, slopes, and foothills	Grasses and forbs.	No data specific to HWAD have been collected.

Sources: Beever 2013, personal communication; Salsbury 2018, personal communication.

Nelson desert bighorn sheep (*Ovis canadensis nelsoni*) were extirpated from the Wassuk Range prior to HWAD being established and were reintroduced to Mount Grant in the late 1980s through HWAD's cooperative agreement with NDOW and USFWS (appendix D) (HWAD, NDOW, and USFWS 1988). NDOW conducts annual counts and estimates the current population at 220 sheep (Salsbury 2018, personal communication). HWAD allows access to Mount Grant to a limited number of bighorn sheep tag holders for hunting, as described in section 8.8. No other access for hunting and no access for trapping is allowed at this time.

Feral horses (*Equus caballus*) roam the area south of Walker Lake. BLM manages the horses when the need arises. A small population of burros (*Asinus* sp.) lives on Mount Grant below Cat Creek Reservoir. Since 2008, pronghorn antelope (*Antilocapra americana*) have become more common at HWAD, with antelope observed on Mount Grant, in the magazine areas, at the south end of Walker Lake, and in the Old Bomb Area (Salsbury 2018, personal communication).

Fifteen bat species are known to occur at HWAD, four of which Nevada lists as protected or threatened mammals under NAC 503 (NAC 2018b):

- Spotted bat (*Euderma maculatum*)—threatened mammal under NAC 503.030.2.
- Fringed myotis (*Myotis thysanodes*)—protected mammal under NAC 503.030.1.
- Brazilian free-tailed bat (*Tadarida brasiliensis*)—protected mammal under NAC 503.030.1.
- Pallid bat (*Antrozous pallidus)*—protected mammal under NAC 503.030.1.

The other 11 species identified at HWAD are the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), California myotis (*Myotis californicus*), western small-footed myotis (*M. ciliolabrum*), long-eared myotis (*M. evotis*), little brown myotis (*M. lucifugus*), long-legged myotis (*M. volans*), Yuma myotis (*M. yumanensis*), and western pipistrelle (*Parastrellus hesperus*).

HWAD is within the range of two additional bat species—Townsend's big-eared bat (*Corynorhinus townsendii*) and Western red bat (*Lasiurus blossevilii*)—both of which are listed as sensitive mammals under NAC 503.030.3 and are Nevada Species of Conservation Priority (NAC 2018b, NDOW 2013).

Bats have nested in storage warehouses at HWAD and their nests and droppings have interfered with mission activities. To address this issue, the Boy Scouts of America constructed bat boxes to serve as alternate nesting sites and HWAD sealed the warehouses to prevent bats from nesting in inappropriate places (Peterson 2018, personal communication).

6.4.2 Birds

Several bird surveys have been conducted at HWAD, some of which specify the location (either Mount Grant or Walker Lake), habitat (e.g., meadow, shoreline, and pinyon-juniper), relative abundance, and incidental observations. UC Davis conducted a bird survey in 2012 that included relative abundance in four canyons on Mount Grant in which 75 species were identified (UC Davis 2012).

Walker Lake used to provide habitat for multiple species of water birds and serve as a stopover for several migrating species, although these populations are greatly reduced because of the declining quality of the lake's water (Jeffers 2018, personal communication).

Overall, HWAD has documented 218 bird species on the depot. Birds of prey, game birds, birds that feed more on insects than seed, and neotropical migrants constitute most of the species documented at HWAD. Appendix B includes the compiled inventory of birds identified or with potential to occur at HWAD, and Table 14 includes additional information about select bird species at HWAD.

6.4.2.1 Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, was issued in 2001 and directs federal agencies that take actions that either directly or indirectly effect migratory birds to develop an MOU with USFWS and other federal agencies and to work with them to promote the conservation of migratory bird populations.

Pursuant to EO 13186, DoD signed an MOU with USFWS in 2014. The purpose of the MOU is to promote the conservation of migratory bird populations while sustaining the use of military lands and airspace for testing, training, and operations. The MOU notes that INRMPs, which are developed and updated in coordination with USFWS, will provide baseline data on the status of migratory bird species and populations at each installation. These data support the agencies' efforts to fulfill their responsibilities under the MOU (DoD and USFWS 2014).

Table 14.
Selected Bird Species on HWAD

Species	Habitat	Diet	Comments
American white pelican (*Pelecanus erythrorhynchos*)	Walker Lake as an annual stopover point en route to breeding grounds at Anaho Island in Pyramid Lake, Nevada, and in Canada	Fish	As many as 400 pelicans have been counted at Walker Lake during their migratory stopover.
California quail (*Callipepla californica*)	Open woodlands, brushy foothills, stream valleys, and often near permanent water sources	Legumes, weed seeds, fruit, insects, spiders, and snails	California quails were introduced to Mount Grant around 1986, but the population size is unknown.
Chukar partridge (*Alectoris chukar*)	Mountain range, lower sagebrush communities	Leaves and seeds of grasses and sagebrush	The chukar partridge is the most common game bird at HWAD. It is a nonnative species introduced to the Wassuk Range in 1945 that has become established throughout the range, including on Mount Grant.
Common loon (*Gavia immer*)	Walker Lake has been a stopover point for 1 to 2 months in spring and fall migration	Fish	Large populations of loons used to stopover at Walker Lake during the spring and fall migration; however, because of the lake's declining water quality, their use of the lake has declined substantially.
Dusky grouse (*Dendragapus obscurus*)	In and around evergreen trees; in spring, they migrate to lower elevations to breed, then return to higher elevations in the winter	Leaves (especially conifer needles), flowers, fruit, and insects (grasshoppers)	Small numbers inhabit Mount Grant. The species is native to northeastern Nevada and the central California mountains. The population on Mount Grant could represent the easternmost range of the California mountain population.
Mountain quail (*Oreortyx pictus*)	Chaparral and pinyon-juniper woodlands	Bulbs, green vegetation, insects, fruits, and berries	Mountain quail have been observed at HWAD, but the population size is unknown. In the winter, mountain quail migrate to lower elevations on foot.
Red-shouldered hawk (*Buteo lineatus*)	Eastern deciduous forested wetlands, but also attracted to Walker Lake	Reptiles and amphibians	It is assumed that a small nesting population exists on or near HWAD.
Snowy plover (*Charadrius nivosus*)	Walker Lake sand flats and sandy beaches of streams, lakes, and coasts	Insects, crustaceans, marine worms, and other aquatic biota	Snowy plovers have been identified on Walker Lake.

6.4.2.2 Birds of Conservation Concern

USFWS developed the Birds of Conservation Concern 2008 list to carry out the mandate from the 1988 amendment to the Fish and Wildlife Conservation Act (16 U.S.C. § 2901-2911) to identify populations of migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA. Inclusion on the Birds of Conservation Concern 2008 list does not afford the species legal protection; however, implementing proactive management and conservation actions could reduce the potential for these species to be afforded federal protections in the future (USFWS 2008). Appendix B identifies bird species on the Birds of Conservation Concern 2008 list for Bird Conservation Region 9 (Great Basin) observed at HWAD.

6.4.3 Fish

Fish are limited in Walker Lake because of the lake's high concentration of TDS. Fish have been introduced to several creeks and to Rose Creek Reservoir at Mount Grant. Appendix B lists the fish identified or with potential to occur at HWAD.

Historically, HWAD stocked Rose Creek Reservoir with rainbow trout (*Oncorhynchus mykiss*), until fishing was prohibited as a result of security restrictions implemented after September 11, 2001. In 2015, HWAD reopened Rose Creek Reservoir for fishing in cooperation with NDOW and its urban fisheries program. NDOW stocked the reservoir with tiger trout (*Salmo trutta* x *Salvelinus fontinalis*) and tui chub. NDOW initially stocked the reservoir with 565 tiger trout in 2015 and an additional 99 trout in 2016 (Engebresten 2015; NDOW 2016a). The agency initially stocked the reservoir with about 250 tui chub from Walker Lake in 2009 (NDOW 2016b). The transfer was successful, and recently, several hundred fish of three age classes have been observed in the reservoir (NDOW 2012, 2016a). NDOW is monitoring the tui chub population and installed six habitat structures in the reservoir to protect the species from piscivorous fish and avian predators (NDOW 2016a).

Rose Creek Reservoir must be drained and cleaned every 3 to 5 years, disrupting fish and consuming time and funding. HWAD intends to conduct a hydrologic and habitat assessment to determine the cause of the imbalance in the creek, reservoir, and wetland system and to develop and implement corrective measures to avoid the impact of this activity to fisheries.

NDOW reintroduced LCT to Cottonwood Creek in the fall of 2016 as part of a study of the species under the Nevada Statewide Fisheries Program. In coordination with HWAD and the California Department of Fish and Wildlife, NDOW stocked the creek with 343 fish transported from Slinkard and Wolf creeks in California. The fish were released at nine preselected locations along Cottonwood Creek and are currently the only naturally reproducing population of Walker Basin LCT in Nevada. As part of the project, NDOW will monitor their progress and might augment the original population with LCT from other suitable donor streams to improve the chances of successful establishment of a population and provide the benefit of enhancing its genetic variability (NDOW 2016c; Urquhart 2018, personal communication). During a monitoring event in June 2018, NDOW found that a mining-era rock check dam located approximately 1 mile downstream of a cabin might be a barrier to LCT during periods of low flow and has recommended that the dam be modified so that it would not block fish passage (NDOW 2018a). HWAD, NDOW, and USFWS have agreed under an MOU (appendix D) that NDOW will monitor and manage the LCT in Cottonwood Creek; therefore, HWAD is not required to prepare an Endangered Species Management Plan for LCT.

Walker Lake's poor water quality has impaired aquatic life (see section 5.4). NDOW found that hatchery LCT experienced high death rates when released into Walker Lake because of high levels of TDS. Increased TDS concentrations have caused significant biological changes in Walker Lake, including a reduction in biological diversity and the extinction of at least one zooplankton species. The declining water quality is also directly related to the loss of native fish species (e.g., LCT, tui chub, Tahoe sucker [*Catostomus tahoensis*], Lahontan redside shiner [*Richardsonius egregius*], and Lahontan speckled dace [*Rhinichthys osculus robustus*]) (NDEP 2009; NDOW 2016b).

NDOW has not stocked Walker Lake with fish since 2009 because of the poor water quality conditions and will not stock it until water quality improves. LCT no longer occur in Walker Lake because of the extremely high TDS and even tui chub, the primary forage of LCT in Walker Lake, are unable to survive (NDOW 2018b). Anglers caught about 87,000 LCT in Walker Lake in 2002; that number was down to zero in 2011. NDOW's Mail-In Angler Questionnaire Survey shows that no fish have been caught in Walker Lake since 2010. Tui chub, which was the last known native fish species to survive in Walker Lake, has not been observed in the lake since about 2012 (NDOW 2012, 2016b).

6.4.4 Benthic Organisms

While benthic organisms are limited in Walker Lake because of the lake's high concentration of TDS, a diverse benthic community exists on Mount Grant. Appendix B lists the benthic organisms identified or with potential to occur at HWAD.

A benthic invertebrate species survey was conducted on Mount Grant in 1979, which identified 82 aquatic macroinvertebrate species (USAEHA 1979). Mayfly (*Ironodes*) and caddisfly (*Wormaldia* sp.) genera were the most abundant macroinvertebrates. When the streambeds and wetlands dry out in the summer, the benthic community becomes dormant and survives in an egg or larval stage.

Benthic species recorded in Walker Lake are the alkali fly (*Ephydra hians*), aquatic oligochaetes, biting midge (*Culicoides* sp.), chironomid midges (*Cricotopus ornatus* and *Tanypus grodhausi*), damselfly (*Enallagma clausum*), diving beetle (*Hygrotus masculinus*), epiphytic filamentous algae (*Cladophora glomerata*), oligochaete worm (genus *Monopylephorus*), and widgeon grass (*Ruppia maritima*). Extensive beds of widgeon grass occur in the summer in the lake's littoral zone (about 6.5 feet to 23 feet depth). The most common benthics are the chironomid midges and damselfly, and the less abundant are the alkali fly, biting midge, diving beetle, and aquatic oligochaetes. Walker Lake's salinity, however, has increased to levels that are threatening to and changing the populations of benthic organisms in the lake. The midge and damselfly populations have been decreasing, and the more salt-tolerant alkali fly has been increasing (Herbst et al. 2013, 2014; TNC 2013).

6.4.5 Reptiles and Amphibians

UNR conducted a survey in 1999 to document the species diversity and population status of reptile and amphibian populations at HWAD (Espinoza and Tracy 1999). Two species of amphibians and 16 species of reptiles were identified in the survey. Among the reptiles, eight species were lizards and eight were snakes. Many of the species encountered during the

survey, especially the lizards, were found in densities that were high relative to populations outside of the depot (Espinoza and Tracy 1999).

Table 15 contains a list of species observed during the UNR survey and their relative abundance. Appendix B contains a list of reptile and amphibian species observed or with potential to occur at HWAD. An updated herpetofauna survey is underway. Once available, the survey report will be placed in appendix F.

Table 15.
Herpetofauna Species on HWAD

Common Name	Scientific Name	Relative Abundance
Frogs and Toads		
Great Basin spadefoot	*Spea intermontana*	Common
Western toad	*Anaxyrus boreas*	Common
Lizards		
Common side-blotched lizard	*Uta stansburiana*	Abundant
Desert horned lizard	*Phrynosoma platyrhinos*	Abundant
Desert spiny lizard	*Sceloporus magister*	Common
Great Basin collared lizard	*Crotaphytus bicinctores*	Common
Long-nosed leopard lizard	*Gambelia wislizenii*	Abundant
Western fence lizard	*Sceloporus occidentalis*	Abundant
Western whiptail	*Aspidoscelis tigris*	Abundant
Zebra-tailed lizard	*Callisaurus draconoides*	Abundant
Snakes		
Coachwhip	*Masticophis flagellum*	Common
Common kingsnake	*Lampropeltis getula*	Uncommon
Great Basin gopher snake	*Pituophis catenifer deserticola*	Abundant
Long-nosed snake	*Rhinocheilus lecontei*	Common
Night snake	*Hypsiglena torquata*	Uncommon
Speckled rattlesnake	*Crotalus mitchellii*	Common
Striped whipsnake	*Masticophis taeniatus*	Uncommon
Great Basin rattlesnake	*Crotalus viridis lutosus*	Abundant

Source: Espinoza and Tracy 1999.

6.5 SPECIAL STATUS SPECIES

6.5.1 Flora

No federally listed threatened or endangered plant species have been identified at HWAD, although one ESA candidate species, whitebark pine, occurs on Mount Grant (Tetra Tech 2018). The whitebark pine is found on steep slopes and windy exposures in subalpine and alpine habitats in western North America. Populations have been found in areas with a wide range of precipitation, from 20 to 100 inches annually. The trees are long-lived, with one documented specimen over 1,200 years old. Whitebark pine is a pioneer species that helps

stabilize loose soils after disturbance. Its seeds provide food for multiple species of birds and mammals and have been a food source for Native Americans. White pine blister rust (*Cronartium ribicola*), an introduced fungal pathogen, and mountain pine beetle (*Dendroctonus ponderosae*) are the greatest threats to this species. Climate change is also considered a threat (USDA 2018c).

Six rare plant species were identified at HWAD during a 2000 survey (Nachlinger 2001):

- Alexander buckwheat (*Eriogonum ochrocephalum* var. *alexanderae*)—two populations with a total of approximately 3,500 individuals.
- Beatley buckwheat (*Eriogonum beatleyae*)—four populations with a total of approximately 3,610 individuals.
- Bodie Hills rock cress (*Boechera bodiensis*)—four populations with a total of approximately 38 individuals.
- Gray wavewing (*Cymopterus cinerarius*)—one population of approximately 200 individuals.
- Sand cholla (*Grusonia pulchella*)—three widely scattered individuals in the magazine areas, one of which was dead. (A fourth individual was found in the North Magazine Area by HWAD personnel after the survey.)
- Wassuk beardtongue (*Penstemon rubicundus*)—10 populations with a total of approximately 600 individuals.

All six species are on Nevada's at-risk list (NNHP 2018b). The Nevada Native Plant Society status for Alexander buckwheat, Bodie Hills rock cress, and gray wavewing is "watch list species, potentially vulnerable to becoming threatened;" and the status for Beatley buckwheat, sand cholla, and Wassuk beardtongue is "delisted, dropped from consideration, no longer of concern" (NNHP 2018a). Three of the six species—Alexander buckwheat, Beatley buckwheat, and Wassuk beardtongue—are endemic to the western Great Basin (Nachlinger 2001).

The state-listed critically endangered Sodaville milkvetch (*Astragalus lentiginosus* var. *sesquimetralis*) was not observed at HWAD during the 2000 Rare Plant Survey, although eight other species of the genera Astragalus, including freckled milkvetch (*A. lentiginosus* var. *kennedyi*), were observed. Oryctes (*Oryctes nevadensis*), a rare plant that is not currently a state-listed species, was not observed during the 2000 survey; however, the 2000 field season was too dry for this annual to germinate and grow and it is highly likely that orcytes does occur at HWAD. Oryctes is also endemic to the western Great Basin (Nachlinger 2001).

6.5.2 Fauna

6.5.2.1 Federally Listed Species

Table 16 presents the ESA-listed species for Mineral County. The LCT, a threatened species, is the only ESA-listed species known to occur on HWAD. The yellow-billed cuckoo (*Coccyzus americanus*) and North American wolverine (*Gulo gulo luscus*) have not been identified on HWAD; their potential to occur at HWAD is assessed below. In addition to the species listed in Table 16, species that occur at HWAD and are protected by federal law include the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle (*Aquila chrysaetos*), which are protected under the BGEPA and MBTA, and many species of migratory birds that are protected under the MBTA.

Table 16.
Federally Listed Threatened and Endangered Species in Mineral County, Nevada

Common Name	Scientific Name	Group	Status
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Fishes	Threatened
North American wolverine	*Gulo gulo luscus*	Mammals	Proposed threatened
Yellow-billed cuckoo	*Coccyzus americanus*	Birds	Threatened

Source: USFWS 2018a.

Lahontan cutthroat trout. The LCT was one of the first fishes listed under the ESA. It was originally classified as endangered in 1970 and reclassified as threatened in 1975. Several factors that include fishing and adverse changes in the hydrology and water quality of the Walker River Basin led to the species' decline in the region (USFWS 1995). The primary documents that outline the species' biology and conservation needs are the *Recovery Plan for the Lahontan Cutthroat Trout* (USFWS 1995) and the *Short-Term Action Plan for Lahontan Cutthroat Trout in the Walker River Basin* (WRBRIT 2003). LCT used to occur in Walker Lake; however, the species was extirpated from the lake because of poor water quality. In coordination with HWAD, NDOW introduced 343 LCT to Cottonwood Creek in the fall of 2016 and is monitoring their status (Urquhart 2018, personal communication).

North American wolverine. The North American wolverine occupies remote high mountain environments where temperatures are cold year-round and snow cover persists for most of the year. This rarely encountered species typically lives in inhospitable areas away from human populations. The species' estimated population in the contiguous United States is 250 to 300 individuals. Nevada is thought to be within the historical range of the wolverine; however, the species is not currently known to occur there (USFWS 2013, 2018b, 2018c). Based on the species' habitat requirements, it is unlikely that a North American wolverine would occur at HWAD.

Yellow-billed cuckoo. Breeding yellow-billed cuckoos are riparian obligates and nest almost exclusively in low-to-moderate elevation riparian woodlands with native broadleaf trees and shrubs that are 20 hectares or more in extent within arid to semiarid landscapes. They are most commonly associated with cottonwood/willow-dominated vegetation cover, but the composition of dominant riparian vegetation can vary across its range. Habitat often consists of willows (*Salix* spp.) mixed with Fremont cottonwoods (*Populus fremontii*), and narrow-leaf cottonwood (*P. augustifolia*) and mesquite (*Prosopis* spp.). They have not been found nesting in isolated riparian patches or linear riparian habitats that are less than 10–20 meters wide, although single birds have been detected in such isolated patches or linear habitats during migration or the early breeding season (Halterman et al. 2016). Based on the species' habitat requirements, it is unlikely that a yellow-billed cuckoo would occur at HWAD.

6.5.2.2 State At-Risk Species

Table 17 lists the state at-risk species that have been observed on HWAD. Appendix C provides the state at-risk species list for Mineral County. In addition to being designated under the ESA as threatened (see section 6.5.1), LCT also is included on Nevada's at-risk species list. A summary of relevant information about the remaining species is presented below. The greater sage-grouse, although no longer an ESA candidate species and not a state at-risk species, is widely recognized as a vulnerable species and is also discussed below.

All of the bird species listed in Table 17 are protected under the MBTA. HWAD complies with the MBTA as well as with the MOU between DoD and USFWS to promote the conservation of migratory birds. HWAD has also conducted specific research and management efforts for several other species listed in Table 17. HWAD has worked with USFWS to monitor bald eagles, with USGS and NDOW to research and monitor the American pika, and with NDOW to identify and manage bats.

Table 17.
Nevada At-Risk Species Occurring at HWAD

Common Name	Scientific Name	NAC Designation	Nevada Species of Conservation Priority
American pika	*Ochotona princeps*	Protected Mammal	Yes
American water shrew	*Sorex palustris*	None	Yes
Bald eagle	*Haliaeetus leucocephalus*	Endangered Bird	Yes
Ferruginous hawk	*Buteo regalis*	None	No
Fringed myotis	*Myotis thysanodes*	Protected Mammal	Yes
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Game Fish	No
Little brown myotis	*Myotis lucifugus*	None	Yes
Pale kangaroo mouse	*Microdipodops pallidus*	Protected Mammal	Yes
Pallid bat	*Antrozous pallidus*	Protected Mammal	No
Spotted bat	*Euderma maculatum*	Threatened Mammal	Yes

Sources: NDOW 2013; NNHP 2018a, 2018b.

As shown in Table 17, most of the state at-risk species known to occur at HWAD are identified as species of conservation priority in the *Nevada Wildlife Action Plan* (WAP) (NDOW 2013). The WAP identifies species of conservation priority, the state's 22 key habitats that support those species, specific research needs and conservation challenges for each species, and conservation strategies for each habitat that will help conserve those species. HWAD will coordinate with NDOW as needed to assist in addressing research needs and conservation challenges identified in the WAP for species that occur at HWAD.

American pika. The American pika, a comparatively smaller relative of the lagomorph family of hares and rabbits, is designated on the Nevada state at-risk list as a protected mammal under NAC 503.030.1 (NAC 2018b; NNHP 2018a, 2018b). The species' habitat is restricted to high-elevation talus slopes of which only around 10,000 acres exist throughout the state of Nevada. The American pika is highly sensitive to temperature; death can occur at temperatures greater than 77.9 ºF (USFWS 2018d). At HWAD, American pika are present on Mount Grant only at higher elevations with suitable temperatures. The American pika population has declined across the southern Great Basin, and research continues to investigate this decline. Mount Grant is a valuable control site for this research because its ecology is relatively undisturbed compared to other sites (Beever 2013, personal communication). Dr. Erik Beever of USGS has researched American pikas on Mount Grant for many years, including studying their abundance, distribution, and climate sensitivity. He installed numerous sensors to record climate and may propose additional studies in the future. Survey by Dr. Beever from 1994-2013 documented American pikas as low as 8,290 feet in 2007, up to within 420 feet of the summit of Mount

Grant. Surveys detected 29 individuals in 1998 and 17 individuals in 2007—a decline consistent with pika range retractions, extirpations, and declines in abundance in the southern Great Basin (Beever 2013, personal communication). Activities such as construction, recreational use, and livestock grazing have negatively impacted suitable habitat (NDOW 2013).

American water shrew. The American water shrew is generally found near streams or other water bodies that provide both terrestrial and aquatic habitat for foraging and abundant cover for shelter (e.g., dense vegetation, rocks, logs, and crevices). It is a continuous consumer with little to no energy reserves and is most frequently observed active and foraging in the few hours around sunrise and sunset. The species requires high water quality and is particularly vulnerable to the destruction of aquatic habitat through pollution, water diversions, and habitat fragmentation. Although more research is needed, the population is declining (NDOW 2013).

Bald eagle. The bald eagle was delisted from the ESA in 2007 because its population has recovered; however, bald eagles are protected under the MBTA and the BGEPA, and the bald eagle is designated on the Nevada state at-risk list as an endangered bird under NAC 503.050.2 (NAC 2018b; NNHP 2018a, 2018b). Transient bald eagles have been observed overwintering on Walker Lake; however, the decline in the lake's water quality and fish populations make it less likely that the eagles will continue to overwinter there. Golden eagles have been observed nesting on Mount Grant. The *National Bald Eagle Management Guidelines* (USFWS 2007) provide landowners and land managers with information on human activities that have the potential to disturb eagles, as well as on implementation of the BGEPA and MBTA protections, with an overall goal of minimizing impacts on the species. Bald eagles are known to rely on established roost sites for wintering and foraging; therefore, any activities that might disturb, destroy, or obstruct roosting sites or foraging areas could impact eagles and constitute a violation of the BGEPA and/or MBTA (NDOW 2013). Before proceeding with any activity that might potentially disturb an eagle roosting site or foraging area, HWAD should contact USFWS for advice and recommendations on minimizing impacts to the maximum extent practicable.

Ferruginous hawk. Habitat for the ferruginous hawk includes open range, dry grassland, sagebrush, saltbrush, and greasewood flats, and the edge of pinyon-juniper or other woodland and desert communities. The population at HWAD is considered stable; however, the species is not observed as frequently as would be expected given the presence of suitable habitat in the Great Basin. In Nevada, ferruginous hawks are known to primarily nest in live juniper tees (lone or peripheral trees are preferred), tufa stacks, rock outcrops, and occasionally utility towers. The species avoids areas of intensive agriculture and human disturbance and is susceptible to habitat loss resulting from agricultural and other human development (NDOW 2013).

Fringed myotis. The fringed myotis is designated on the Nevada state at-risk list as a protected mammal under NAC 503.030.1 (NAC 2018b; NNHP 2018a, 2018b). This bat species is considered rare and is not commonly captured during survey efforts. The species' population size and trends are not well understood. Its range of suitable habitats extends from low desert scrub to high-elevation coniferous forests. Fringed myotis roosts in mines, caves, trees, and buildings both day and night. Like most bats, fringed myotis is vulnerable to disturbance during hibernation, and being disturbed too often can result in death. Activities that might disturb fringed myotis include sealing mines, timber harvesting, and building demolition. As with all bats, fringed myotis is likely susceptible to white-nose syndrome (NDOW 2013).

Greater sage-grouse. The greater sage-grouse is on the Nevada state watch list (NNHP 2018). It is one of only a few "sagebrush-obligate" bird species that are dependent on the sagebrush steppe and Great Basin sagebrush ecosystems (NDOW 2013), which makes them particularly susceptible to impacts related to loss, fragmentation, and/or degradation of sagebrush habitat.

The Bi-State population of greater sage-grouse that occurs along the border of Nevada and California is geographically isolated from the other populations of the species and classified as a distinct population segment (DPS) (USGS 2017). Significant efforts have been made by a collaboration of federal partners, state agencies, and universities in the bi-state area to conduct research and monitoring activities on the distribution, movement, habits, and requirements of the Bi-State DPS.

HWAD is located within the Mount Grant Population Management Unit (PMU) of the Bi-State DPS, according to the *2012 Bi-State Action Plan* (BSAP) (BTACNC 2012). This plan summarizes conservation efforts implemented in Nevada and eastern California since 2004 and provides a prioritized framework for effective long-term conservation of the Bi-State DPS. Short-term plan recommendations include protecting continuous blocks of unfragmented habitat; restoring habitat connectivity and historic habitat impacted by wildlife, invasive species, or pinyon-juniper encroachment; and acquiring or conserving easements on important private lands (BTACNC 2012). In the long-term, the BSAP recommends developing a Bi-State Science-Based Adaptive Management Plan and a Conservation Planning Tool that will help prioritize and direct future conservation efforts. These efforts will be informed by the findings and conclusions of current and ongoing research and monitoring efforts.

The Mount Grant PMU is approximately 699,079 acres and is located entirely within Lyon and Mineral counties, Nevada. The portion of HWAD within the Mount Grant PMU encompasses 48,936 acres, or 7 percent of the PMU. According to historical records, Mount Grant has never supported a large population of sage-grouse (NDOW 2004). HWAD, however, is considered to have prime sage-grouse habitat within the Mount Grant PMU, and its high-quality habitat has been maintained because of limited human disturbance and no livestock grazing. Maintaining current land management practices as well as implementing anticipated projects on Mount Grant are expected to support propagation of the species. Additionally, monitoring suggests that the Mount Grant PMU provides winter habitat for the greater sage-grouse (BTACNC 2012).

The Bi-State Local Working Group (LWG) published a sage-grouse progress report in 2015. The LWG conducted a lek survey from March 3 to April 5, 2015. A *lek* is an assembly of birds during mating season for breeding. The surveyors identified 15 known lek locations and eight active leks in the Mount Grant PMU, one of the largest number of known active leks in the surveyed area. The 2015 average number of males per active lek was 17.3, a significant drop from the 2014 average number of 34.0 (LWG 2015).

Threats to the Bi-State DPS include human activity; predators; habitat fragmentation; and destruction of habitat caused by wildlife, invasive species, and/or pinyon-juniper encroachment (USGS 2017). The LWG has completed multiple projects to improve sage-grouse habitat in the Mount Grant PMU—including pinyon-juniper removal, noxious weed control, and sagebrush and meadow restoration—and works with HWAD to maintain and improve brood habitat quality at Lapon Meadows (LWG 2015). HWAD personnel recently marked fenceposts in the Mount Grant area to reduce the risk of bird strikes (Peterson 2017, personal communication).

Additional management strategies have been identified in the *Mount Grant Initial Conservation Assessment and Strategies* report (Nachlinger 2003) and the *Sage Grouse Conservation Plan for Nevada and Eastern California* (NDOW 2004), which includes elements for sage-grouse conservation planning, risk assessment, strategies and actions to minimize risk factors, implementing conservation measures, and monitoring efforts (NDOW 2004). The NRCS launched the Sage Grouse Initiative in 2010, a program for conserving at-risk wildlife through voluntary cooperation, incentives, and community support, achieving wildlife conservation through sustainable ranching and habitat preservation (SGI 2013).

The greater sage-grouse population at Mount Grant has rebounded from near extirpation around 2000 to a current estimate of 500 birds (Peterson 2018, personal communication). HWAD participates in the bi-annual meetings of the LWG, which includes USFWS, NDOW, U.S. Department of Agriculture, BLM, and other agencies (Peterson 2017, personal communication). HWAD coordinates with federal and state agencies, universities, and others as applicable to assist in addressing research needs and conservation challenges identified in the BSAP and the WAP (BTACNC 2012; NDOW 2013).

Little brown myotis. The little brown myotis, or little brown bat, hibernates in caves and mines and forms very large maternity colonies. The species occurs in the northern part of the state and is usually found in coniferous forest near water at higher elevations and higher latitudes. Roost sites include hollow trees, buildings, rock outcrops, mine tunnels, and caves. Like most bats, the little brown myotis is vulnerable to disturbance during hibernation and, in some instances, being disturbed too often can result in death. Disturbance during maternity season can result in adults abandoning the site and/or their young. The species' diet is primarily aquatic insects, and foraging typically occurs along water margins. Activities that might disturb little brown myotis include loss of pinyon-juniper habitat, pesticide application, building demolition, and mine reclamation. The species has been significantly impacted by white-nose syndrome in the eastern United States, but not yet in the western part of the country. Additional research is needed to establish specific preferences of little brown myotis in Nevada (NDOW 2013).

Pale kangaroo mouse. The pale kangaroo mouse is designated on the Nevada state at-risk list as a protected mammal under NAC 503.030.1 (NAC 2018b; NNHP 2018a, 2018b). The population is in decline; however, additional research is needed to establish an accurate range and population size in Nevada. The pale kangaroo mouse is a highly specialized sand-obligate species; suitable habitat is limited to fine, loose sandy soils in valley bottoms of saltbush and greasewood flats or near sagebrush at elevations ranging between 3,900 and 6,000 feet. Activities that might disturb the pale kangaroo mouse include agriculture, fire, colonization of habitat by invasive species, urbanization, and livestock grazing (NDOW 2013).

Pallid bat. The pallid bat is idesignated on the Nevada state at-risk list as a protected mammal under NAC 503.030.1 (NAC 2018b; NNHP 2018a, 2018b). The population is in decline; however, additional research is needed to establish an accurate range and population size in Nevada. The pallid bat frequently feeds by scooping large prey from the ground. Pallid bats are common in arid habitats with rocky outcroppings and usually roosts in small colonies of around 20 bats rock crevices, buildings, and caves (NDOW 2018c).

Spotted bat. The spotted bat is designated on the Nevada state at-risk list as a threatened mammal under NAC 503.030.2 (NAC 2018b; NNHP 2018a, 2018b). The population trend is unknown, and this bat species is rarely captured during survey efforts. The range of suitable habitats extends from low-elevation desert scrub to high-elevation coniferous forests. The spotted bat primarily roosts in cracks, crevices, and caves associated with cliff faces, but there is some evidence that it might use mines during the winter. Very rarely, roosts have been observed on buildings. Spotted bats are known to roost singly or in small clusters and may move roost sites frequently as well as periodically wake from hibernation to forage and drink. Their diet is primarily moths, and foraging typically occurs in canyons; over open water, open meadows, and open coniferous woodland; and along forest edges. Activities that might disturb the spotted bat include construction that impacts cliff and canyon faces, mining and quarry operations, urbanization, pesticide application, loss of foraging habitat, and loss of access to open water. As with all bats, the spotted bat is likely susceptible to white-nose syndrome (NDOW 2013).

6.6 SENSITIVE AREAS

Per DoDM 4715.03, a *sensitive area* is any area that is restricted by federal regulation or installation requirements for reasons related to natural resources. Examples of sensitive areas are critical habitat for threatened and endangered (T&E) species, essential fish habitat, wildland fire areas, and special management areas.

Mount Grant is considered a sensitive area since its protection is important to ensuring HWAD's potable water supply and meeting HWAD's natural resources management goals. There are no sensitive areas as defined by DoDM 4715.03 at HWAD.

SECTION 7.0 NATURAL RESOURCES AND THE MILITARY MISSION

Mission activities and natural resources have ongoing effects on each other. The mission activities at HWAD, like any human activities, impact land, water, and air on the installation (section 7.1). Projected future mission activities are anticipated to be similar to current mission activities so impacts on natural resources are expected to remain similar to current conditions (section 7.2). Sustainable natural ecosystems are necessary to support continuance of HWAD's mission activities (section 7.3), but maintaining them can place certain constraints on those activities (section 7.4).

7.1 CURRENT MISSION IMPACTS ON NATURAL RESOURCES

Mission activities at HWAD can affect natural resources, including air, noise, water, and biological resources (i.e., flora and fauna). Additionally, the use of hazardous materials and the presence of contaminated sites also can affect natural resources.

7.1.1 Air Quality

Mineral County is located within the Nevada Intrastate Air Quality Control Region (40 CFR 81.276) and has been designated by EPA as being in full attainment for all criteria pollutants (EPA 2018a). Air pollutant emission sources at HWAD are industrial operations, hazardous waste storage areas, weapons firing, explosions, and vehicle use. All operations on HWAD from which regulated air pollutants are emitted are environmentally compliant and operate under appropriate state and federal permits (Michael Baker 2009).

7.1.2 Noise Environment

The New Bomb Area is a demilitarization area where munitions are regularly detonated, generating noise. Standard operating procedures (SOPs) are enforced to limit the impact of noise from detonations on area noise receptors. Detonations are not allowed on overcast days because cloud cover magnifies the noise they produce, or when wind speed exceeds 15 miles per hour because the noise carries further than under calm wind conditions. These SOPs minimize disturbance of people in the town or Hawthorne or at the HWAD Main Base. Detonations that could affect off-depot noise receptors are no longer conducted at the Old Bomb Area southeast of the Main Base (SOC 2017a).

HWAD does not have an airport or airstrip, so noise from aircraft operations is not a concern. The depot previously had an airstrip but ceded it to Mineral County.

7.1.3 Water Resources

Maintaining the Mount Grant area in an ecologically sound manner is an important priority for natural resources management at HWAD because streams on Mount Grant supply much of the depot's potable water. To preserve water quality, HWAD has prohibited grazing and restricted human activity in the Mount Grant area for many years. Maintaining the quality of that area's surface water sources is particularly important since groundwater quality data show consistently high concentrations of several regulated water quality parameters at various locations in HWAD's groundwater basin. These concentrations frequently exceed the EPA secondary standards for drinking water. Origins of the poor water quality in the basin are unknown, but several natural sources are possible (Michael Baker 2009).

7.1.4 Biological Resources

HWAD cooperates with or actively participates in regional conservation plans and strategies for biological resources to the maximum extent compatible with the military mission. These plans and strategies include the *Bi-State Action Plan for Greater Sage-Grouse* and NDOW's WAP (BTACNC 2012; NDOW 2013). As a federal entity, HWAD complies with federal wildlife conservation laws, including the BGEPA, ESA, and MBTA. HWAD maintains a natural resources management staff that implements the INRMP and cooperates with NDOW, USFWS, and other public agencies and interested parties to ensure that the depot's biological resources are protected and conserved while achieving no net loss to the military mission.

Access restrictions to the Mount Grant area, primarily to preserve potable water sources, support biological resources in that area. Research indicates that the Mount Grant area is relatively pristine ecologically, providing a rare baseline site where flora and fauna communities and biodiversity have been minimally influenced by human presence.

7.1.5 Hazardous Materials and Waste

HWAD stores a large amount of elemental mercury as part of its mission. The installation's mission operations also require the use and storage of hazardous materials such as compressed gases, fuels, lubricants, oils, pesticides, and solvents. HWAD also generates hazardous waste during renovation, recovery, and disposal of unserviceable ammunition and explosives and during general depot support activities. Hazardous explosive material at HWAD that cannot be recycled or reused is demilitarized at the New Bomb Area disposal facility. Hazardous waste generated at HWAD is transported off-site by licensed transporters and disposed of at permitted treatment, storage, and disposal facilities (Michael Baker 2009).

7.1.6 Contaminated Site Restoration

The Army Defense Environmental Restoration Program (DERP) at HWAD comprises the Installation Restoration Program (IRP), Military Munitions Response Program (MMRP), and Compliance Restoration. Those programs are documented in an IAP that addresses soil, surface water, and groundwater pollution remediation and monitoring. The IAP contains the cleanup history, site status, and future actions necessary to achieve remedial objectives.

Under the IRP, HWAD investigates and, if necessary, remediates former disposal and test areas (U.S. Army 2004). HWAD has 129 sites under the IRP, of which 123 have been classified as No Further Action (NFA) needed. The following six sites remain active (HWAD 2017):

- 101-44 Impoundment (HWAAD-B04)
- Building 336: Fuel Storage Area (HWAAD-B24A)
- 103-6 POL Pit (HWAAD-B26)
- 103-16 Catchment Pit (HWAAD-B27A)
- 49-10 Pit/Landfill #1 and #2 (HWAAD-I09)
- Burn Area (HWAAD-I02)

The MMRP addresses UXO, discarded military munitions, and munitions constituents at concentrations high enough to pose an explosive hazard and potential environmental contamination. HWAD has 21 sites under the MMRP, of which 14 have been classified as NFA. The following seven sites remain active (HWAD 2017):

- Walker Lake Land Test Range (HWAAP-008-R-01)
- ASROC Ranges (HWAAP-009-R-01)
- ASROC Ranges (HWAAP-010-R-01)
- Pre-1940 Detonating Pits (HWAAP-012-R-01)
- Pre-1940 Detonating Pits (HWAAP-013-R-01)
- Whiskey Flats (HWAAP-020-R-01)
- Old Bomb Rocket Firing Range-East (HWAAP-022-R-01)

The mission of the Compliance Restoration program is to perform appropriate, cost-effective cleanup to protect human health, safety, and the environment and to sustain operational readiness and training. HWAD has 18 sites under the Compliance Restoration program, 16 of which have been classified as NFA. The following two sites remain active (HWAD 2017):

- 103-41 Unlined Ponds (CCHWAAD-B29)
- 101-42 Catchment Pit (CCHWAAD-I15)

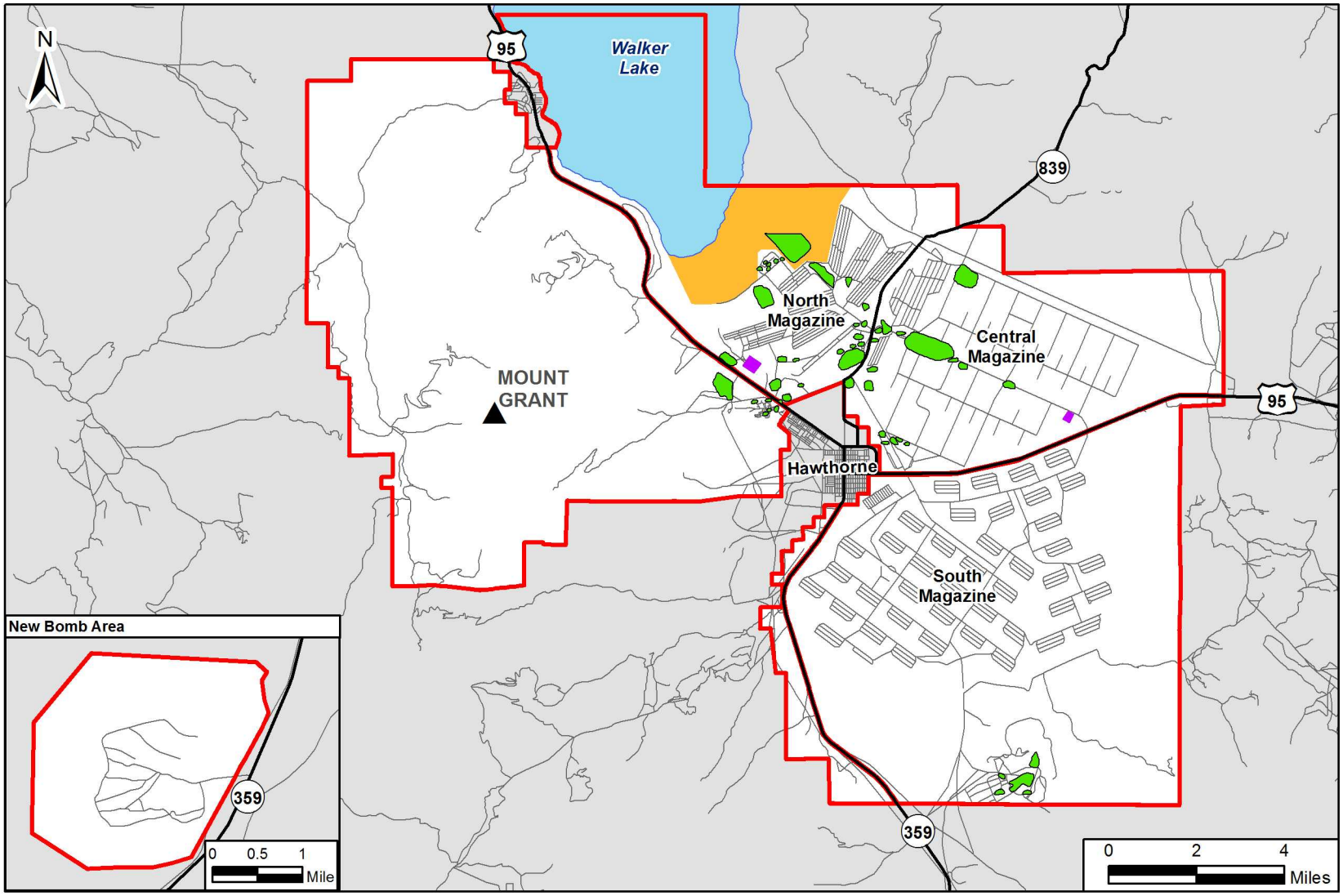
Contaminants of concern at DERP sites on HWAD include explosives; lubricants, petroleum, and oil; metals; and volatile organic compounds. Media of concern are groundwater and soil. Depending on site conditions, groundwater and soil sampling are conducted, contaminated soil is removed, and natural attenuation of the contaminants is monitored. Figure 13 shows HWAD's active IRP, MMRP, and Compliance Restoration sites.

7.2 Future Mission Impacts on Natural Resources

The HWAD 2009 RPMP describes the proposed short-range (5 to 7 years) and long-range (beyond 7 years) plans for future development of the depot. HWAD anticipates updating its RPMP soon to provide updated information about development plans. Anticipated changes include potential storage of railcars on HWAD's railroad tracks; additional tenant operations to more fully use existing space; and building construction, demolition, and renovation as needed to meet current mission requirements (Michael Baker 2009; Peterson 2017, personal communication).

The Army is considering developing a geothermal project at HWAD that might produce up to 30 megawatts of energy. As envisioned, the geothermal plant would provide all required electric power to HWAD with the Army receiving revenues from excess energy sold to the grid. The fuel source for the plant would be naturally occurring underground steam and hot water. The project is currently in the planning stages (King 2017, personal communication).

The military mission of HWAD is not anticipated to change in the near future and changes to facilities and operations are not anticipated to substantially alter natural resources or natural resources management needs. Mission impacts on natural resources, therefore, are expected to be substantially similar to those described in section 7.1.



HWAD Restoration Sites

Figure 13

Source: HWAD GIS 2012.

7.3 NATURAL RESOURCES NEEDED TO SUPPORT THE MILITARY MISSION

The Army recognizes that a healthy and viable natural resource base is required to support the military mission. This INRMP helps to ensure that environmental considerations are an integral part of planning activities at HWAD and that the depot's natural resources are protected in accordance with federal laws and Army regulations and policies. These natural resources support the mission at HWAD by providing the appropriate terrain for the military activities and adequate buffer zones around military activities such as ammunition storage.

7.3.1 Undeveloped Land

Undeveloped land at HWAD is necessary for buffering off-depot lands from mission activities such as demilitarization and ammunition storage. Demilitarization operations that involve exploding munitions require large buffer zones to minimize the effects of the noise and potential shrapnel on surrounding military and nonmilitary sites. Undeveloped land is also necessary as a buffer area around munition storage sites so that an accidental explosion would not adversely affect surrounding sites.

7.3.2 Surface Water

HWAD obtains its potable water from Mount Grant. To ensure a clean and sufficient supply of water for personnel and mission activities, HWAD protects surface water resources by limiting access to the Mount Grant area. Minimal human use and development protect surface water from erosion, pollution, and other activities that could degrade water quality and enable HWAD to prioritize resource conservation in the area.

7.4 NATURAL RESOURCES CONSTRAINTS ON MISSIONS AND MISSION PLANNING

Natural resources at HWAD impose very minor constraints on the military mission. Currently, only one federally listed T&E species, the LCT, and no critical habitats for protected species occur on the depot. The LCT, extirpated from Walker Lake by poor water quality, was introduced to Cottonwood Creek by NDOW in 2016 and is an experimental population. HWAD's agreement with NDOW is that HWAD does not have to actively manage for the fish; the agency will assume that responsibility (appendix D).

Because the Mount Grant watershed is the potable water supply source for HWAD and the water supply must be protected, a limited amount of logistical and tactical training is the only mission activity that occurs in the Mount Grant area. Groundwater in the HWAD area is a poor source of potable water because it is high in mineral content, so protection of surface water quality from the Mount Grant area is a high priority.

HWAD has 710 acres of wetlands, 10,527 acres of deepwater habitat (i.e., Walker Lake), and 290 acres of riparian habitat (USFWS 1999). Most of these wetland and riparian areas are located on Mount Grant or at the south end of Walker Lake, where mission activities are minimal; however, some wetlands are located in the magazine areas near everyday mission operations. Where applicable, wetlands are marked with signs that say "Do not enter wetland area; it is illegal to disturb wetland areas Sec. 401 & Sec. 404 C.W.A and 33 CFR 323.3(a) & 323.3(b)."

SECTION 8.0 NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the natural resources management program at HWAD. It describes how natural resources on the depot are currently managed and identifies management measures for new and continued management activities. Consistency and integration with other HWAD programs and plans are also addressed.

One key component of HWAD's natural resources management program is the depot's limitations on public access for hunting, fishing, trapping, grazing, and agriculture, combined with restrictions on off-road driving and the overall low level of human activity in buffer areas. These restrictions have generally supported natural resources effectively and continuing them is fundamental to the protection and conservation of HWAD's natural resources

Another key component of HWAD's natural resources management program is the depot's partnerships with public agencies and other interested parties. Allowing research and restoration projects to be conducted by and in cooperation with others has supplemented HWAD's staff resources and enhanced their knowledge of natural resources on the depot. HWAD will continue to facilitate research and volunteer requests from agencies and organizations wishing to contribute to the study, management, and restoration of natural resources at HWAD

8.1 FISH AND WILDLIFE MANAGEMENT

The goal of the fish and wildlife management program at HWAD is to protect and conserve fish and wildlife populations and their habitats consistent with accepted scientific principles, in compliance with applicable laws and regulations, and in consideration of the military mission. The objective of fish and wildlife management is to use an ecosystem approach in combination with specific management efforts to effectively achieve that goal.

8.1.1 Fisheries Management

The primary goal of fisheries management at HWAD is to protect and conserve its fishery resources. The management objectives of the program are to sustain and, where applicable, enhance fish populations and their habitats to maintain healthy fish populations and biodiversity. Appendix B provides a list of fish and benthic species known to occur at the depot.

As described in section 6.4.3, LCT are found in Cottonwood Creek after being introduced by NDOW in 2016 and are managed by NDOW in accordance with an MOU with HWAD and USFWS (see appendix D). Currently, this is the only naturally reproducing population of Walker Basin LCT in Nevada. NDOW intends to monitor the species' success and assess the need for additional management actions (Urquhart 2018, personal communication). HWAD plans to support and facilitate NDOW's efforts. NDOW has recommended modifying a mining-era rock check dam located approximately 1 mile downstream of a cabin that might be a barrier to LCT during periods of low flow (NDOW 2018a). In addition, USFWS supports considering and pursing the introduction of additional LCT populations to the Cat and Rose creek drainages.

Tui chub and tiger trout are found in Rose Creek Reservoir, and sport fishing is allowed there by permit. HWAD intends to continue stocking Rose Creek with sport fish and allowing fishing in accordance with NDOW fishing regulations as long as those activities are compatible with HWAD's natural resources management goals and the military mission.

Rose Creek Reservoir has to be drained and cleaned every 3 to 5 years, disrupting fish and consuming time and funding. HWAD intends to conduct a hydrologic and habitat assessment to determine the cause of the imbalance in the creek, reservoir, and wetland system and to develop and implement corrective measures to avoid the impact of this activity on fisheries.

Poor water quality in Walker Lake has dramatically reduced fish populations in the lake and extirpated some species, as described in section 6.4.3. Research is ongoing by UNR and others into Walker Lake fisheries and water quality and measures that could be taken to improve conditions in the lake.

Partnering with others is another important component of HWAD's fisheries management program. Partnering with NDOW to release LCT into Cottonwood Creek is a good example of a cooperative effort that supplemented funding and staff resources at HWAD while supporting efforts to restore a threatened species and enhancing fishery resources on the depot. HWAD will continue to facilitate cooperative efforts with universities, public agencies, nongovernmental organizations, and contractor partners to supplement its internal fisheries management efforts.

Under this INRMP, HWAD will implement the following management measures related to managing fisheries:

- Continue coordination with NDOW on LCT introduced to Cottonwood Creek. Consider NDOW's recommendation to modify the mining-era rock check dam that might block fish passage. In coordination with NDOW and USFWS, consider and purse introducing additional LCT populations to the Cat and Rose creek drainages.
- Monitor and maintain tui chub populations in Rose Creek Reservoir in collaboration with NDOW.
- Continue to facilitate NDOW stocking of Rose Creek Reservoir with sport fish, and continue to allow sport fishing, as appropriate.
- Investigate the need to periodically dewater Rose Creek Reservoir to determine if actions could be taken to make the reservoir self-sustaining. Implement corrective measures, as appropriate.
- Support and facilitate any proposed efforts to study and document the health of the fish and benthos communities in HWAD water bodies.
- Continue to stay abreast of research into Walker Lake fisheries and water quality and adjust management activities as needed in response.

8.1.2 Wildlife Management

The primary goal of wildlife management at HWAD is to protect and conserve its wildlife resources. The management objectives of the program are to sustain and, where applicable, enhance wildlife populations and their habitats to maintain healthy populations and biodiversity.

HWAD allows access to Mount Grant to a limited number of bighorn sheep tag holders for hunting and allows anglers access to Rose Creek Reservoir for fishing. No other hunting or fishing access is allowed on the depot at this time. Opportunities for hunting and fishing at HWAD are described in more detail in section 8.8. HWAD does not grant public access for trapping. When necessary, HWAD uses trapping to control predators or other nuisance

animals. HWAD does trapping in coordination with a government trapper when applicable. HWAD also does not allow grazing or agriculture on its lands.

In general, the limits on public access for hunting, fishing, trapping, grazing, and agriculture, combined with restrictions on off-road driving and the overall low level of human presence in portions of HWAD such as Mount Grant, have sustained and enhanced wildlife populations and habitats. By continuing these restrictions, HWAD will continue to successfully protect and conserve its wildlife resources and the habitats on which they depend.

As with fisheries, HWAD has enhanced its wildlife management efforts by partnering with others. HWAD will continue to facilitate cooperative efforts with universities, public agencies, nongovernmental organizations, and contractor partners to supplement funding and staff resources to meet its goal and objectives for wildlife management. Studies and restoration projects conducted by HWAD and cooperatively with others document baseline conditions and trends and provide information upon which to base further action to enhance the health and biodiversity of wildlife and their habitats. Information about wildlife and natural resources is incorporated into natural resources planning and decision-making.

Most wildlife species that are not afforded special legal protection are passively managed unless conditions indicate that more active management is needed. Conditions that could trigger active management efforts include overpopulation, unusual declines in population, nuisance behaviors, and disease. Projects that protect and restore wildlife habitats also support wildlife management efforts.

Table 18 presents information about certain wildlife species that are the subject of previous or ongoing research and/or management actions at HWAD. Special status wildlife species are addressed in section 8.3.

Table 18.
Management of Selected Wildlife Species at HWAD

Species	Management information
Mammals	
American pika	Research by USGS indicates that American pika populations at Mount Grant have experienced declines similar to those of other populations in the region. Currently, American pika are managed through the usage restrictions at Mount Grant. HWAD will continue to support requests by USGS and other parties to continue research and monitoring of the species at HWAD.
Antelope	Although no systematic studies have been done, sighting of antelope at HWAD has become increasingly common, indicating that populations on Mount Grant and elsewhere on HWAD are growing. Currently, antelope are managed through the depot's access limitations, which preclude access for antelope hunting on HWAD property.
Bats	As stated in section 6.4.1, 15 bat species, including four state-protected species, have been observed at HWAD. Bats have roosted in HWAD warehouses, interfering with mission operations. Bats are being managed by sealing buildings and placing noise-generating devices that deter bats in areas where they interfere with operations and building bat boxes to provide alternative roosting sites (Peterson 2017, personal communication). HWAD's Pest Controller responds to requests to inspect buildings for bats and facilities personnel make repairs needed to prevent bats from accessing buildings.

Species	Management information
Mammals	
Feral horses	The Gillis Mountain Range feral horse population extends onto the portion of Walker Lake managed by HWAD. The population is expected to increase to the point at which the herd will require culling to avoid damage to wetlands and water quality. BLM has primary responsibility for controlling the feral horse population. HWAD will notify BLM if the need for additional management actions is identified, and HWAD and BLM will coordinate those actions.
Mountain lions and other predators	Generally, mountain lions and other predators are passively managed. Access for hunting of mountain lions and other predators is not allowed on HWAD land. If predator populations exceed their carrying capacity and control becomes necessary, HWAD will coordinate with NDOW for predator removal. If predator populations fall to critical levels because of disease or other imbalances, HWAD will coordinate with NDOW to determine what measures can be taken to help the population recover to a sustainable level.
Mule deer	Although access to HWAD property for mule deer hunting is prohibited, it is allowed on other properties in the area in accordance with NDOW regulations. If overforaging is observed on depot land, HWAD will coordinate with NDOW on potential mule deer harvesting.
Nelson desert bighorn sheep	Nelson desert bighorn sheep will continue to be managed in collaboration with NDOW. HWAD will allow access to Mount Grant for hunting to a limited number of bighorn sheep tag holders in accordance with NDOW hunting regulations, as described in section 8.8. HWAD anticipates that NDOW will continue annual population counts to monitor herd size and composition. NDOW might augment the herd by introducing outside stock to improve genetic diversity. If so, HWAD will collaborate with NDOW to facilitate that effort. NDOW is evaluating constructing a fence along Highway 95 to reduce the number of bighorn fatalities and creating additional water sources on Mount Grant to discourage the sheep from looking for water elsewhere. HWAD will coordinate with NDOW to evaluate these actions. Domestic sheep (*Ovis aries*) carry and transmit a form of pneumonia to which Nelson desert bighorn sheep are susceptible. To prevent the bighorn sheep at HWAD from contracting this disease, the cooperative agreement between NDOW and HWAD for the reintroduction of Nelson desert bighorn sheep prohibits grazing domestic sheep within HWAD's boundaries (HWAD, NDOW, and USFWS 1988). HWAD does not allow grazing inside its boundary and seeks support from USFWS and NDOW to manage grazing in the buffer zone around the depot.
Birds	
Dusky grouse	Dusky grouse (formerly blue grouse) are present on Mount Grant. HWAD will continue to manage dusky grouse by prohibiting public access, which precludes hunting and limits other activities on Mount Grant.
Game birds	Game birds such as chukar partridge and California quail are present on Mount Grant. HWAD will continue to manage game birds by prohibiting public access, which precludes hunting and limits other activities on Mount Grant.
Nuisance birds	Birds that nest in HWAD buildings such as rock doves (pigeons) require control if they interfere with mission activities, deteriorate building conditions, or exhibit other nuisance behaviors. When necessary, birds are controlled by manually removing their nests. Nests are removed by HWAD's Pest Controller when no eggs or young are present in coordination with HWAD's Natural Resources Manager, as necessary.
Herpetofauna	
Herpetofauna	Information about reptile and amphibian communities at HWAD relies on a 1999 study conducted by UNR (Espinoza and Tracy 1999). In accordance with that survey's recommendations, HWAD personnel are educated about the importance of herpetofauna in an effort to decrease incidences of roadkill. Speed limits on the depot are generally low, which also helps to decrease roadkill of herpetofauna. HWAD is planning an additional survey in 2018–2019 to increase knowledge and understanding of the depot's herpetofauna. HWAD will also implement any management measures recommended in that survey.

Under this INRMP, HWAD will implement the following management measures related to managing wildlife:

- Continue to limit access to and activities in the Mount Grant watershed area to levels appropriate to protect wildlife, habitats, and water quality.
- Continue sealing structures where bats interfere with mission operations so that bats cannot enter.
- Evaluate the need for additional bat boxes to provide alternate roosting sites, and partner with another organization to construct additional bat boxes if needed. Monitor the use of bat boxes.
- Continue the MOA with NDOW for Nelson desert bighorn sheep.
- Continue facilitating monitoring and management efforts by NDOW for fish and wildlife species under their management purview, including Nelson desert bighorn sheep, bats, bears, and fish species.
- Continue facilitating feral horse monitoring and management efforts by BLM.
- Conduct an additional herpetofauna survey in 2018–2019 to increase knowledge and understanding of the depot's herpetofauna, and implement any additional management measures recommended in that survey.
- Update the depot's PLSs for fauna and migratory birds approximately every 10 years or as needed to support natural resources management.

8.2 VEGETATION MANAGEMENT

The goal of vegetation management at HWAD is to maintain native plant communities and minimize loss of vegetative cover through ecosystem management principles without compromising mission activities. The management objective of the program is to sustain native vegetation and terrestrial habitat by minimizing disturbance to the extent that doing so does not compromise mission activities.

Section 6.2 discusses vegetation communities, and appendix A provides a list of flora species known to occur on the depot. HWAD has sufficient information about vegetation communities present on the depot to support management efforts.

HWAD actively manages vegetation in the depot's developed areas to the extent necessary. Areas where vegetation is actively maintained include roads, railways, sidewalks, buildings, fire hydrants, the golf course, cantonment landscaped areas, and near other infrastructure. Vegetation in those areas is mowed, pruned, fertilized, and otherwise managed as needed to achieve a well-landscaped appearance. Although certain areas such as the golf course are irrigated, irrigation is kept to a minimum to conserve water. Native species of water-efficient plants are chosen for landscaped areas.

Vegetation in HWAD's minimally developed areas is mostly managed passively; however, vegetation is removed or cut back in certain areas to maintain visibility for security purposes and to prevent vegetation from interfering with mission operations. Generally, vegetation and terrestrial habitats in HWAD's minimally developed areas are in good condition compared to off-depot lands where grazing and greater human presence are common. HWAD's vegetation and terrestrial habitats are sometimes used as a baseline for habitats with minimal disturbance.

NDOW recommends removing or thinning trees in some areas on Mount Grant to increase the quality of the habitat for wildlife, particularly for greater sage-grouse and Nelson desert bighorn sheep (Urquhart 2018, personal communication). Thinning can benefit wildlife by opening up areas where grasses and forbs have been crowded out by an overmature tree canopy, allowing them to obtain enough sunlight and moisture to grow and provide additional forage for wildlife. For water quality, the roots of the grasses and forbs help stabilize the soil, reducing runoff and erosion that carries sediment and litter into waterways and adversely affects water quality. HWAD will evaluate the need for tree removal and thinning on Mount Grant to enhance wildlife habitat.

Under this INRMP, HWAD will implement the following management measures related to managing vegetation:

- Evaluate the need and seek necessary approvals for tree removal and thinning of pinyon-juniper stands in appropriate areas on Mount Grant to benefit wildlife and their habitat.
- Update the depot's PLSs for flora and vegetation communities approximately every 10 years (the next survey would be scheduled for 2028) or as needed to support natural resources management.
- Assess the impact of bark beetle on trees at HWAD, and consider removing infected trees.

8.3 SPECIAL STATUS SPECIES MANAGEMENT

The goal of special status species management at HWAD is to monitor and conserve listed species and their habitats in accordance with applicable laws and regulations and Army policy on responsible stewardship. The objective of the program is to take appropriate actions to increase the populations of listed species so they can be delisted and to prevent the populations of species with potential to become listed from declining to the point at which they require listing.

As required by AR 200-1, the Army ensures that it carries out mission requirements in harmony with the requirements of the ESA for the protection of listed species and critical habitat (HQDA 2007). Species that are candidates for ESA listing or are state-listed as threatened, endangered, or of special concern are not protected under the ESA. AR 200-1 does not require Army installations to make special provisions for the management of those species on federal lands; however, the regulation stipulates that installations are to include these species in their INRMPs (HQDA 2007). HWAD understands the importance of conserving species that are not federally listed, particularly since those species might become federally listed in the future, potentially affecting the military mission. Thus, even though it is more difficult to justify funding specifically for the management of these species, HWAD strives to conserve them as funding permits. HWAD also seeks to implement cooperative efforts with partners such as NDOW to monitor and conserve such species.

The LCT is the only ESA-listed species known or likely to occur at HWAD. It was extirpated from Walker Lake as a result of high salinity levels and was subsequently introduced to Cottonwood Creek by NDOW in 2016. HWAD and NDOW have agreed under an MOU (appendix D) that NDOW will monitor and manage the LCT in Cottonwood Creek; therefore, HWAD is not required to prepare an Endangered Species Management Plan for LCT (Peterson 2017, personal communication). HWAD's habitat protection measures for Mount Grant (e.g.,

limiting access, disturbance, and fishing, and preserving water quality) combined with monitoring efforts and research conducted by NDOW and USFWS are consistent with the federally designed recovery plan for the LCT and constitute the management measures being implemented at HWAD to support recovery of the species.

Many bird species protected under the MBTA and BGEPA are known to occur at HWAD. Appendix B provides a comprehensive list of bird species observed at HWAD, many of which are protected by the MBTA. The MBTA prohibits any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, unless that activity is otherwise permitted by the USFWS (50 CFR part 10.12; 16 U.S.C. § 668(a)). Federal permits are required to take, possess, transport, or dispose of migratory birds, bird parts, feathers, nests, or eggs. Annual reporting of takes is also required. Typically, HWAD's operations do not result in takes of migratory birds; however, if necessary, HWAD will prepare and send permit applications and annual reports to the USFWS Region 8 Migratory Bird Permit Office.

State-listed plant and animal species are known to occur at HWAD, as described in section 6.5. State-listed bird species are managed in compliance with the BGEPA, MBTA, EO 13186, and MOU between DoD and USFWS to promote the conservation of migratory bird populations. Management measures for bats are found in section 8.1.2 and include partnering with others to construct bat boxes as alternate roosting sites and sealing structures where bats interfere with mission operations so they cannot enter. State-listed and rare plant species, the American pika, and the pale kangaroo mouse are passively managed and are expected to benefit from HWAD's restrictions on access, trapping, grazing, and agriculture.

As described in section 6.5, USGS continues to monitor the greater sage-grouse on Mount Grant, where they are detected throughout the year (USGS 2017). The primary management measures for greater sage-grouse are restrictions on access for hunting, trapping, grazing, and agriculture on Mount Grant and continuing to facilitate tracking and research efforts. HWAD recently marked fenceposts in the Mount Grant area to reduce the strike risk to birds (Peterson 2017, personal communication). When resources allow, HWAD would also like to enhance habitat for greater sage-grouse by installing rock dikes or similar infrastructure to minimize snowmelt runoff and to create riparian habitat in a meadow area along the North Fork Cat Creek and in other likely sage-grouse use areas (Peterson 2017, personal communication). HWAD also plans to continue to participate in multiagency coordination efforts such as attending meetings of the LWG to support greater sage-grouse conservation efforts.

Under this INRMP, HWAD will implement the following management measures to conserve special status species:

- Continue cooperating with NDOW regarding maintenance and management of LCT in Cottonwood Creek.
- Coordinate with USFWS regarding steps to be taken to ensure the protection of any federally listed species should they be found on the depot.
- Prepare and send permit applications and annual reports to the USFWS Region 8 Migratory Bird Permit Office if takes of migratory birds are anticipated or occur accidentally.
- When resources allow, enhance habitat for greater sage-grouse in the Mount Grant area, including along the North Fork Cat Creek and other likely sage-grouse use areas.

- Continue to participate in multiagency coordination as part of the greater sage-grouse conservation initiative.
- Conserve the stand of whitebark pine, an ESA candidate species, on Mount Grant.
- Identify and conserve ESA candidate, state-listed, and other rare and sensitive species as funding permits without restricting mission operations. Facilitate cooperative efforts with partners to monitor and conserve those species.

8.4 WATER RESOURCES MANAGEMENT

The goal of water resources management at HWAD is to protect and conserve the depot's water resources. HWAD's objectives for water resources management are to preserve water quality by limiting activities near potable water sources, monitor water quality, and monitor and maintain water resource infrastructure such as catch basins and dams.

As described in section 5.4, HWAD relies heavily on surface water resources from Mount Grant and to a lesser extent on local groundwater resources for potable water to support mission operations. Therefore, it is critical that HWAD protect and conserve its water resources. HWAD does this in two ways. First, it restricts public access for hunting, fishing, trapping, grazing, agriculture, and other activities in the Mount Grant area to protect the depot's potable water supplies at their source. Second, HWAD implements a water quality assessment program that includes routine inspection of water system infrastructure and monitoring of potable water sources and groundwater across the installation. Data from these activities help to identify water quality concerns and inform natural resources management decisions.

SOC has the primary responsibility for potable water monitoring activities. SOC monitors water infrastructure and implements preventative maintenance and repairs as described in section 5.4. SOC regularly samples potable water to ensure that it meets drinking water standards and distributes a consumer confidence report of water quality as required by law. Potable water is treated via filtration, chlorination, or other means necessary before distribution to end users. Groundwater is also monitored in accordance with the installation's *Work Plan for Basewide Groundwater Monitoring Program* and/or other applicable regulations or guidance documents (Plexus 2007). Groundwater monitoring is done to check water quality and to support investigation and remediation activities under the IRP, MMRP, and Compliance Restoration programs.

Surface water is also a precious resource for the ecological integrity of this arid region. HWAD manages its water resources to ensure the availability of surface water to support the conservation of fish, aquatic biota, terrestrial wildlife, and vegetation on the installation. HWAD discharges excess water from Mount Grant to Walker Lake to support the hydrology of the Walker Lake watershed. HWAD also implements water conservation practices to moderate daily water consumption to the maximum extent possible.

Stormwater is both passively and actively managed. In undeveloped areas stormwater follows the natural topography and infiltrates into the ground naturally, recharging the area's aquifers. Stormwater is actively managed in developed areas, where drainage features such as ditches, culverts, and dikes are present that control stormwater movement and prevent flooding and erosion. Stormwater is managed in accordance with HWAD's SWPPP and applicable laws,

ordinances, and regulations. Stormwater quality testing is done in accordance with HWAD's National Pollutant Discharge Elimination System (NPDES) permits (SOC 2017c).

HWAD's Explosive Ordnance Disposal Department will continue to survey the south end of Walker Lake for UXO. Any UXO that is found will be disposed of in accordance with applicable DoD guidance. HWAD will continue to restrict access to this and other areas where UXO could be present.

Under this INRMP, HWAD will implement the following measures related to managing water resources:

- Continue to limit public access for hunting, fishing, trapping, grazing, agriculture, and other activities in the Mount Grant area to protect potable water sources. Monitor trespass cattle at Mount Grant and maintain exclusion fencing, as needed.
- Continue water infrastructure inspections and water quality monitoring to ensure the functionality of HWAD's potable water system and protect the quality of potable water supplies from Mount Grant. Conduct preventative maintenance and repairs as needed.
- Continue groundwater monitoring in accordance with the installation's *Work Plan for Basewide Groundwater Monitoring Program* and/or other applicable regulations or guidance documents (Plexus 2007).
- Continue to conserve water to the maximum extent possible.
- Evaluate water use and management of the reservoirs for the potential to affect fish habitat.
- Continue to release excess water (after HWAD requirements are met) from Mount Grant to Walker Lake to support recharge of the lake.
- Continue managing stormwater in accordance with HWAD's SWPPP and Water Resources Management Plan, NPDES permit requirements, and other applicable regulations.
- Continue to periodically survey the area south of Walker Lake for UXO and properly dispose of any UXO found.
- Conduct a survey to delineate floodplains in areas where flood hazards have not been determined.

8.5 WETLAND AND RIPARIAN AREA MANAGEMENT

The goal of wetland and riparian area management at HWAD is to protect and conserve these resources. The objective of wetland and riparian area management is to protect these areas from modification, loss, and degradation to the maximum extent possible in a manner consistent with DoD natural resources policy and applicable regulations.

DoD natural resources policy states that wetlands will be protected to the maximum extent possible. Activities affecting wetlands require environmental analysis in accordance with AR 200-1 and in compliance with applicable federal and state laws and regulations. USACE permits are required under section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403) before beginning any work or building any structures in a navigable water of the United States and under section 404 of the CWA (33 U.S.C. § 1251 *et seq.*) for the discharge of dredge or fill material into waters of the United States, including wetlands. Additionally, EO 11990 requires

federal agencies to minimize the impact of any significant action contributing to the loss or degradation of wetlands and to initiate action to enhance their natural value.

As described in section 5.5, HWAD has 11,527 acres of wetlands and riparian areas. While wetlands and riparian areas on Mount Grant, at the south edge of Walker Lake, and in the southern part of the South Magazine Area are located in low-use areas, wetlands in the North and Central Magazine areas and the northern part of the South Magazine are located closer to everyday mission-related activities. Where applicable, wetlands are marked with signs that say "Do not enter wetland area; it is illegal to disturb wetland areas Sec. 401 & Sec. 404 C.W.A and 33 CFR 323.3(a) & 323.3(b)."

HWAD's wetlands and riparian areas are a vital source of water and habitat for wildlife. These areas along streams on Mount Grant are important to protecting the depot's potable water supplies from sedimentation. HWAD will continue to maintain the riparian areas along these streams and elsewhere on the depot and to evaluate and implement restoration activities such as removal of invasive species when needs are identified.

Under this INRMP, HWAD will implement the following management measure to conserve wetlands:

- Maintain vegetated riparian areas along streams and lakes as applicable. Assess riparian areas periodically for removal of invasive species and other restoration needs, and implement management actions as needed.
- For wetlands and riparian areas located near everyday mission activities, conduct a jurisdictional wetland delineation consistent with current USACE protocols to update the boundaries of these areas. If needed following the delineation, adjust signage marking wetland areas to reflect any changes in boundaries.
- Avoid to the maximum extent possible activities that would impact wetlands. If impacts cannot be avoided, comply with section 404 of the CWA and other applicable regulations and conduct appropriate compensatory mitigation as needed for identified impacts.

8.6 SOIL MANAGEMENT

The goal of soil management at HWAD is to sustain soil resources and minimize erosion. The objectives of soil management are to avoid soil disturbance, maintain vegetative cover, and implement best management practices (BMPs) to minimize erosion resulting from mission activities.

Many of the soil series that occur at HWAD have a moderate-to-high potential for erosion. Wind erosion can affect exposed soils, resulting in dust that, in turn, affects air quality and visibility. Areas most susceptible to wind erosion at HWAD include the unpaved roadways, railroad beds, construction sites, road margins, and other areas with no vegetation. Water erosion occurs when rainfall events carry exposed soils in stormwater runoff. Areas susceptible to water erosion include streambeds, the earthen sides of igloos, and areas with no vegetation.

Erosion at HWAD is minimized by implementing the management measures below. Examples of soil conservation measures include maintaining soil surfacing such as vegetative cover, gravel, and other soil stabilizing agents; limiting off-road travel; and implementing erosion control BMPs at construction sites and other high-traffic areas.

Construction sites or other areas where soil is exposed or disturbed are particularly susceptible to erosion, generation of airborne dust, and soil and other pollutants entering stormwater runoff. Construction sites of 1 acre or more must comply with NPDES requirements and obtain a permit. These construction sites must install and maintain erosion and sediment controls that are sufficient to effectively control erosion and sediment discharge to stormwater for the duration of the project. HWAD's SWPPP includes erosion and sediment control guidelines.

Under this INRMP, HWAD will implement the following management measures related to managing soils:

- Continue to limit off-road traffic in vegetated areas.
- Minimize areas of exposed soils. When the exposure of soils is necessary to support mission objectives (e.g., construction projects), use BMPs to minimize erosion and fugitive dust. Examples of erosion BMPs include installing sediment fencing, hay bales, mulching, or geotextile matting around the site; minimizing off-road driving; applying soil stabilizing agents; and revegetating the area promptly when the project is complete.
- Maintain gravel or other surfacing materials along railroads, around buildings, in the magazine areas where loading and unloading activities occur, and in other areas of exposed soils.
- Use soil stabilizing agents that are free of oil, acid, alkali salt, and other substances that could harm plants and wildlife.
- Ensure that construction contracts contain BMPs to stabilize soils, minimize airborne dust, and manage stormwater runoff. Inspect construction sites to ensure that BMPs are implemented and are sufficient to effectively control erosion, airborne dust, and stormwater runoff.
- Revegetate disturbed areas promptly to minimize fugitive dust and erosion and to prevent encroachment of invasive species. Use fast-growing, climate-tolerant native species so that soil stabilization and revegetation occur in a timely manner.
- Maintain HWAD's stormwater infrastructure, including the system of ditches in the magazine areas, to control drainage and reduce soil erosion.

8.7 WILDLAND FIRE MANAGEMENT

A *wildland fire* is defined in AR 200-1 as "any nonstructural fire that occurs on unimproved grounds. This includes wildfires and prescribed fires" (HQDA 2007). The goal of HWAD's wildland fire management activities is to minimize wildfire loss. The management objective is to implement effective policies, planning, fire prevention, personnel training, infrastructure, communications, operational systems, safety, and coordination to minimize wildfire loss (SOC 2017a).

Fire is a natural process that can contribute to ecosystem sustainability. Wildland fire can be used to support natural resource goals and objectives such as habitat improvement and invasive weed management. Wildfires, however, also have the potential to negatively impact mission activities and natural resources. Wildfires can endanger personnel, damage or destroy property, and hinder mission operations or readiness. When fire regimes deviate from natural conditions such as fuel buildup to hazardous levels, wildfires can have negative rather than positive impacts on habitats, flora and fauna, and soil and water resources.

HWAD's desert climate, with high temperatures coupled with low precipitation, makes HWAD susceptible to wildfires. Although wildfires have occurred infrequently at HWAD, fires caused by natural weather events and human error are a threat. Wildfires at HWAD have the potential to be especially damaging because of the installation's ammunition activities and its use of potable water from Mount Grant.

Managing wildland fires at HWAD is the responsibility of HWAD's Fire Department. Currently the Fire Department has 24 staff members: Fire Chief, Chief Fire Inspector, Training Officer/Fire Inspector, three Assistant Fire Chiefs, three Fire Captains, and 18 Firefighters (McKinzie 2018, personal communication). The depot's EOP provides guidance for wildland fire preparedness and response at HWAD (SOC 2017a) and is available from HWAD's Fire Department. The plan provides guidance on roles and responsibilities, mutual aid agreements, public information, incident response procedures, post-incident debriefing, recovery and restoration, environmental considerations, and other topics (SOC 2017a).

The guidelines in the EOP are to be followed by all fire and emergency services personnel when responding to wildland fires. Annex C of the EOP describes emergency response actions in the event of a wildland fire, specifying management practices and policies necessary for a fire protection organization to develop an effective wildfire control program. HWAD has a Wildland Fire Team that is staffed, trained, and equipped to handle small wildfires (SOC 2017a). On average, HWAD has two to three wildland fires per year (McKinzie 2018, personal communication).

HWAD's Fire Department conducts prescribed burns on an as-needed basis along the railroad rights-of-way and flood control drainages and around explosive storage and parking areas (McKinzie 2018, personal communication).

HWAD manages fuel buildup on Mount Grant as needed by mechanically removing woody fuels (Nachlinger 2003). Several reports suggest that fuels reduction is needed on portions of Mount Grant to reduce wildfire risk: the 2003 *Mount Grant Initial Conservation Assessment and Strategies* (Nachlinger 2003), HWAD's EOP (SOC 2017a), and the 2005 *Fire Regime Condition Class (FRCC) Mapping at Mount Grant, Hawthorne Army Depot* (Campbell et al. 2005); however, HWAD personnel report that currently, fuel reduction is not needed in the Mount Grant area (McKinzie 2018, personal communication).

AR 200-1 and the *Army Wildland Fire Policy Guidance* require that "installations with unimproved grounds that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool" develop and implement an Integrated Wildland Fire Management Plan (IWFMP) that is compliant and integrated with the installation's existing fire and emergency services program, INRMP, and ICRMP (DA ACSIM 2002; HQDA 2007). Currently, HWAD does not have an IWFMP. The EOP provides the guidance for wildland fire preparedness and response followed at HWAD.

In the event of a substantial fire, natural resource rehabilitation efforts will be evaluated and implemented to the maximum extent to which they would be beneficial to the ecosystem and resources allow. Rehabilitation efforts could include seeding or planting trees to prevent erosion and minimize establishment of nonnative species. Fire is a natural part of the ecosystem and, where appropriate, the ecosystem will be allowed to recover naturally.

HWAD has mutual aid agreements related to fire and emergency services as outlined below. The agreements may be changed or expanded as required. Copies of these agreements are available from HWAD's Environmental Division or Fire Department. HWAD's Fire Department provides mutual aid two to three times a month, and the last time HWAD requested mutual aid was in 2012 (McKinzie 2018, personal communication).

- Mutual Aid Agreement with Mineral County Fire Department, which allows for mutual aid in responding to wildland fires, hazardous materials incidents, or other incidents; fighting fires; and providing emergency medical services. The agreement establishes response area boundaries, protection guidelines, safety limitations, and command structure (HWAD and MCFD 2017).
- MOA between HWAD and Mount Grant General Hospital, which allows for mutual aid in coordinating services to minimize risk to patient care and hospital operations in the event of a disaster (HWAD and MGGH 2017).
- Cooperative Fire Protection Agreement between HWAD; USFS, Humboldt-Toiyabe National Forest; and BLM, Carson City District, which specifies the command structure, annual operating plan, and payment between HWAD and the cooperating agencies to help prevent, detect, and suppress wildland fires occurring within the protection areas of the signatory agencies (HWAD, USFS, and BLM 2006). The 2006 agreement is expired and is in the process of being updated (McKinzie 2018, personal communication). When a wildland fire occurs, this agreement establishes which entity will be the first responder, the protocols for incident command, and required personal protective equipment (HWAD, USFS, and BLM 2006).
- MOA between HWAD and the WRPT, which safeguards the WRPT and their property from damage resulting from rail or highway accidents involving transportation of HWAD ammunition, explosives, hazardous materials, or other materials and equipment traveling through the tribe's reservation (HWAD and WRPT 2017).

Under this INRMP, HWAD will implement the following natural resources management measures consistent with HWAD's EOP related to effectively managing wildland fires while protecting the environment:

- In accordance with AR 200-1 and the *Army Wildland Fire Policy Guidance* (DA ACSIM 2002; HQDA 2007), prepare an IWFMP that is compliant and integrated with the installation's existing fire and emergency services program, INRMP, and ICRMP.
- Maintain mutual aid agreements for fire and emergency management support with state and federal agencies, Mineral County, WRPT, and other entities as applicable. Renew expired agreements and update agreements as needed.
- Maintain fuel loads at levels appropriate for the prevention of major wildfires. Periodically evaluate fuel buildup and, when necessary, reduce fuel loads by mechanical means (e.g., hand cutting, mowing, and grading).
- Continue the prescribed burn program to assist with fuel reduction and management.
- Revegetate fire-affected areas with native or other desirable plants when appropriate to prevent encroachment of invasive weeds.

8.8 PUBLIC ACCESS AND OUTDOOR RECREATION

The Sikes Act and DoDI 4715.03 require that the INRMP provide for public access to DoD lands and waters and for educational or recreational use of natural and cultural resources by the public when compatible with mission activities, safety, security, and ecosystem sustainability. DoD policy also requires that these opportunities be made available to people with disabilities to the maximum extent possible without substantial modification of the natural environment. In accordance with the American Indian Religious Freedom Act of 1978, DoD policy is to provide Native Americans reasonable access to DoD lands and resources of religious importance to them or important to the continuance of their cultures, consistent with the military mission and safety and security requirements.

The goal of public access and outdoor recreation management at HWAD is to provide reasonable public access to facilitate the sustainable educational and recreational use of HWAD's natural and cultural resources. The objectives of the program are to enhance public awareness of and appreciation of HWAD's natural resources and to encourage conservation research and restoration activities at HWAD.

All public access to HWAD is subject to mission, safety, and security restrictions. All people wishing to access HWAD property must meet the security requirements to gain entry to the installation and may be denied access by security personnel. All visitors must pass through the HWAD Main Base security gate, undergo a security screening, and register with and obtain a permit from the SOC Security Office. Access requirements and restrictions may change at any time. HWAD Security and Environmental Division personnel can advise the public on current requirements and restrictions. Subject to these restrictions, HWAD has multiple opportunities for public access and outdoor recreation, including the following:

- Walker Lake Golf Course
- Hunting Nelson desert bighorn sheep
- Fishing at Rose Creek Reservoir
- Camping at Rose Creek Cabin or Dixie Camp
- Naturalist sightseeing on Mount Grant
- Research and volunteer opportunities for universities and other organizations studying natural resources or conducting restoration projects
- Native American access for cultural and ceremonial purposes

Most of these opportunities are generally accessible to people with disabilities.

Off-road vehicle use is not permitted at HWAD and off-road foot travel is restricted.

8.8.1 Walker Lake Golf Course

The Walker Lake Golf Course is a nine-hole course covering about 51 acres on the Main Base area adjacent to the family housing. The course is open to the public as long as golfers meet the security requirements to enter HWAD's Main Base Security Gate. The fairways and tees consist of Kentucky bluegrass, and the greens consist of bent grass. SOC manages the golf course.

8.8.2 Hunting

NDOW implements Nevada's hunting program, which includes establishing hunting seasons and harvest quotas; issuing licenses, tags, and permits and collecting associated fees; and maintaining check stations and documenting takes. HWAD allows access to hunters with NDOW-issued tags for a limited amount of sport hunting for Nelson desert bighorn sheep on Mount Grant. Groups are limited to a maximum of 10 people and may require an escort. No other hunting is allowed at HWAD. HWAD does not allow trapping. Limitations on access for hunting at Mount Grant are necessary to preserve water quality and meet natural resource goals and objectives.

Hunting must be done in accordance with Nevada law (e.g., it must occur within season with an appropriate hunting tag and license). Access for hunting is also subject to restrictions associated with HWAD mission, safety, security, and natural resources management requirements. The HWAD Natural Resources Program Manager is responsible for overseeing hunting activities at HWAD and ensuring that these activities are conducted in compliance with applicable laws and regulations.

8.8.3 Fishing

NDOW implements Nevada's fishing program, which includes establishing fishing seasons and harvest quotas; issuing licenses, tags, and permits and collecting associated fees; and maintaining check stations and documenting takes.

At HWAD, fishing is allowed at Rose Creek Reservoir, in cooperation with the NDOW urban fisheries program. The reservoir is open for fishing during the day from May through September. The reservoir has been stocked with tiger trout and tui chub and is a popular fishing spot for area residents. NDOW estimated use by 34 anglers and 102 fish caught in 2015; in 2016 these numbers increased to 129 anglers and 104 fish caught (NDOW 2016a). Before going to the reservoir, anglers must check in with the SOC Security Office, pass a background screening, and obtain a fishing permit. Anglers must also notify the office upon their departure (Engebresten 2015; Justus 2018, personal communication).

Fishing must be done in accordance with Nevada law (e.g., it must occur within season with an appropriate fishing license and within allowable take limits). Fishing is also subject to restrictions associated with HWAD mission, safety, security, and natural resources management requirements. The HWAD Natural Resources Program Manager is responsible for overseeing fishing activities at HWAD and ensuring that these activities are conducted in compliance with applicable laws and regulations.

Fishing is not allowed at HWAD's portion of Walker Lake because of the potential presence of UXO. Access to HWAD property at the southern end of Walker Lake is gated, fenced, and posted with signs stating, "No Trespassing" or "Danger, Unexploded Munitions, Keep Out," and a line of safety buoys runs across the water of Walker Lake at the HWAD northern boundary line.

The township of Walker Lake (about 11 miles north of HWAD on the western shore of Walker Lake) and the adjacent Walker Lake State Recreation Area (operated by BLM) offer recreational activities such as camping and boating access to the central portion of Walker Lake. Fishing

and boating in the lake have been adversely affected by the lake's high salinity and low oxygen levels, which has extirpated many fish and is damaging to boats.

8.8.4 Camping and Sightseeing

HWAD has two camp sites on Mount Grant, Camp Dixie and Rose Creek Cabin. Camp Dixie is located in Cottonwood Canyon and is a rarely used rustic camp site equipped with a concrete shelter with a fireplace, a cleared area with stones for building campfires, and a restroom. Running water is not available.

Rose Creek Cabin is about 100 feet west of Rose Creek Reservoir on Mount Grant. Rose Creek Cabin is a wilderness cabin designed for a maximum of six campers with two rooms, a kitchen, a bathroom, a screened-in porch, and a fireplace. The water source for the cabin is surface flow from the watershed and is not potable. The cabin was restored by the local Boy Scouts in 2015, in cooperation with HWAD and SOC (Engebresten 2015). The cabin is not open to the public, but camping is permitted by the Depot Commander on a case-by-case basis. Requests to use the cabin are vetted by HWAD's SOC Security Office prior to submittal to the Depot Commander for approval (Isom 2018, personal communication).

Naturalist sightseeing such as birding, observing wildlife or wildflowers, picnicking, and hiking at Mount Grant is generally permitted subject to mission, safety, security, and environmental conservation restrictions and may require an escort. Visitors must obtain access from the HWAD SOC Security Office and notify the office upon departure.

A local nonprofit organization, the 911 Memorial Mt. Grant Committee, sponsors the Mount Grant Challenge in remembrance of those who lost their lives in the September 11, 2001, attack. The event is a day-hike from the mountain's base to its peak that has taken place each September since 2011 (9/11 Memorial 2018).

8.8.5 Research and Restoration Opportunities

HWAD has been very active in facilitating research and volunteer opportunities for natural resources agencies, universities, and other organizations wishing to contribute to the study, management, and restoration of natural resources at HWAD. As described in section 3.0, natural resource agencies that have conducted research or restoration projects at HWAD include USFWS, USGS, and NDOW. Universities that have conducted research or projects at HWAD include San Francisco State University, UC Berkeley, UC Davis, and UNR. Other organizations that have done work at HWAD include The Nature Conservancy, Great Basin Bird Observatory, and Boy Scouts of America.

HWAD's Natural Resources Program Manager manages requests by natural resources agencies, universities, and other organizations to conduct research and restoration projects on HWAD lands. Allowing research and restoration projects to be conducted by and in cooperation with others has supplemented HWAD's staff resources and enhanced HWAD's knowledge of natural resources on the depot.

8.8.6 Native American Access

Subject to mission, safety, security, and environmental conservation restrictions, HWAD grants members of the WRPT access for cultural and ceremonial activities such as gathering pine nuts for the tribe's annual festival.

8.8.7 Management Measures

HWAD will implement the following management measures related to public access and outdoor recreation:

- Continue to allow public access to HWAD lands for educational and recreational use of natural and cultural resources by the public when compatible with mission activities, safety, security, and ecosystem sustainability.
- Limit public access and outdoor recreation within the Mount Grant watershed area to levels appropriate to protecting water quality and other sensitive resources in the area.
- Continue to provide Native Americans reasonable access to DoD lands and resources of religious importance to them or important to the continuance of their cultures, consistent with the military mission and safety and security requirements.
- Continue to make outdoor recreational opportunities at HWAD available to people with disabilities to the maximum extent possible without substantial modification of the natural environment.
- Continue to facilitate research and restoration opportunities for educational institutions, public agencies, and nongovernmental organizations wishing to study natural resources or conduct restoration projects at HWAD.

8.9 CONSERVATION LAW ENFORCEMENT PROGRAM

The Sikes Act and DoDI 4715.03 require that the INRMP provide for the enforcement of applicable conservation laws and regulations on military lands by maintaining sufficient staffing levels of trained and capable natural resources law enforcement personnel. The goal of conservation law enforcement at HWAD is to enforce natural resources laws and regulations. The objectives of conservation law enforcement on HWAD are to protect natural resources from criminal destruction and to enhance public safety by enforcing conservation laws and access restrictions.

The HWAD SOC Security Office as well as HWAD Department of the Army Police are responsible for law enforcement at HWAD (Justus 2018, personal communication). Law enforcement personnel provide installation security, patrol the installation, and enforce all applicable regulations on the installation. If individuals are detained for trespassing or other infractions, they are handled in accordance with applicable law. The Security Office will coordinate with HWAD's environmental personnel regarding any person suspected of violating natural resources or cultural resources laws at HWAD.

Trespassing is generally not an issue on the Main Base and in the magazine areas, but signs of natural resources-related, recreational trespassers (e.g., unauthorized hunters and fishermen and off-road vehicle riders) and trespass range animals (e.g., cattle and sheep) have been found on Mount Grant. Trespassers may access HWAD via Wheeler Pass, and HWAD plans to evaluate additional measures to prohibit vehicle access to Wheeler Pass. Patrols look for signs

of trespassing such as cut fences, vehicle and animal tracks, and spent ammunition. Anyone found trespassing is turned over to the Department of the Army Police (Justus 2018, personal communication).

As described in section 8.8, NDOW implements Nevada's hunting and fishing programs and HWAD's Natural Resources Program Manager is responsible for overseeing access for hunting and fishing activities at HWAD and ensuring they are in compliance with applicable laws and regulations.

Under this INRMP, HWAD will implement the following management measures related to enforcing conservation laws:

- Maintain staffing of trained and capable natural resources law enforcement personnel at levels sufficient to effectively monitor and enforce all natural resources laws and regulations.
- Ensure that all natural resources law enforcement personnel meet the requirements for training and weapons qualification for their experience and rank, and receive appropriate continuing education to enhance understanding of natural resources and ecosystem management.
- Continue to manage access for hunting and fishing in compliance with Nevada law.
- Evaluate additional measures to prohibit vehicle access via Wheeler Pass.

8.10 INVASIVE SPECIES MANAGEMENT

The goal of invasive species management at HWAD is to implement cost-effective measures that will effectively prevent the spread of invasive species and noxious weeds and reduce their presence where practicable. The objectives of invasive species management are to control or eradicate existing invasive plants and to prevent further introduction or spread of invasive plants.

Regulations and policies relevant to invasive species and noxious weed management include the Plant Protection Act (7 U.S.C. § 7701 *et seq*.); Noxious Weed Control and Eradication Act of 2004 (7 U.S.C. § 7781 *et seq*.); AR 200-1 (HQDA 2007); DoDI 4715.03 (DoD 2011); DoDI 4150.07, *DoD Pest Management Program* (DoD 2008); and EO 13112, *Invasive Species* (64 FR 6183, February 8, 1999), as amended by EO 13751, *Safeguarding the Nation from the Impacts of Invasive Species* (81 FR 88609, December 8, 2016). These and other applicable regulations, policies, and guidance require HWAD, to the maximum extent practicable, to prevent the introduction of invasive species, monitor and control invasive species populations, conduct research on invasive species to more effectively control them, and restore native species in habitats that have been invaded by nonnative species.

Nineteen invasive and/or nonnative plant species, including four Nevada state-listed noxious weed species, are found at HWAD, as described in section 6.3. In HWAD's undeveloped areas, barbwire thistle, Russian thistle, and tamarisk are among the most widespread. Multiple species of invasives and broadleaf weeds occur in disturbed and developed areas such as around buildings and along roadsides and railroads (Tetra Tech 2004).

Invasive species and noxious weeds at HWAD are controlled in accordance with the principles of integrated pest management (IPM) and with the methods detailed in HWAD's PMP (HWAD 2012). SOC personnel use physical controls that include mowing and manual removal as well as chemical controls that include EPA-registered and Nevada state-approved herbicides, as appropriate. When evaluating and selecting appropriate control methods, SOC selects the least costly method that will provide effective control while minimizing potential disturbance to nontarget plants and animals, their habitats, and water resources. Occasionally, it might be necessary to use multiple control methods in combination to effectively control invasive species.

HWAD's cantonment area includes a vehicle wash station that was installed in 2010. Training vehicles are washed at the station before leaving the cantonment area so weeds will not be transferred to other areas. Vehicle undercarriages are also spot checked for cleanliness when arriving off-station.

Under this INRMP, HWAD will implement the following management measures in managing invasive plant species:

- Comply with all federal and state laws related to invasive species and noxious weeds.
- Update the depot's 2003 invasive species survey, and develop an Invasive Species Management Plan (ISMP) that identifies areas impacted by invasive species and noxious weeds and specifies methods to control or eradicate them, particularly tamarisk and invasives in riparian areas, but also other invasive species and noxious weeds observed at HWAD. Implement controls as outlined in the ISMP.
- Use physical controls (e.g., mowing and manual removal), pesticide application, and native plant restoration (e.g., replanting) methods alone or in combination to control or eradicate invasive species and noxious weeds. When conducting control activities, minimize adverse effects on nontarget plants, wildlife, and habitats, and water resources.
- Continue to wash all vehicles at the vehicle wash station to minimize transport and spread of invasive species.
- Promptly revegetate disturbed and fire-affected areas with native or other desirable plants when appropriate to prevent encroachment of invasive species.

8.11 PEST MANAGEMENT

The goal of HWAD's pest management program is to use IPM techniques to control or eliminate pest populations when warranted. The objectives of the pest management program are to protect human health from pests and prevent or minimize pest damage to real property and natural resources.

HWAD has a PMP as required by DoDI 4150.07 prepared in accordance with AR 200-1 (DoD 2008; HQDA 2007). The PMP is a framework through which pest management is defined and accomplished at HWAD. The elements of the PMP include pest identification, prioritization of pest management work, administrative information, health and safety data, environmental considerations, and pesticide management information (HWAD 2012). HWAD's adherence to the PMP ensures effective, economical, and environmentally acceptable pest management and will maintain compliance with pertinent laws and regulations. The PMP is consistent with this INRMP and is used as a tool to reduce reliance on pesticides and enhance environmental protection.

Pest management operations at HWAD are performed by HWAD's Pest Controller, an employee of SOC, HWAD's operating contractor. In accordance with the PMP, HWAD uses an IPM approach that consists of the judicious use of both chemical and nonchemical control techniques to achieve effective pest management with minimal pesticide use. The PMP contains worksheets that specify both chemical and nonchemical controls for each pest typically encountered at HWAD. Controls are typically implemented only when leaving pests uncontrolled would adversely affect mission operations or human health and safety or result in damage to structures or other property. The PMP is available from HWAD's Environmental Division and should be referred to for detailed information on any specific aspect of pest control operations or pest problems on HWAD.

Species identified as pests at HWAD include disease vectors and other health-related pests (the top priority of pest control at HWAD), general household pests, invasive or undesirable vegetation (see section 6.3), ornamental plant and turf pests, and other miscellaneous pests. Examples of pests and control activities at HWAD include the following:

- Rodents such as pocket gophers and mice can burrow into magazines and munition containers and damage munitions. They can also carry Hantavirus, which can be transmitted to humans. Surveys are conducted for evidence of rodent activity and, when necessary, rodents are controlled with traps or chemicals.
- Birds and bats can nest or roost in buildings, adversely affecting mission operations. Birds are controlled by placing screens to exclude them from nesting in undesirable areas. If necessary, nests may be removed in accordance with the MBTA and other applicable environmental regulations. Bats are controlled by constructing bat boxes to provide alternate roosting sites and sealing buildings so they cannot enter them.
- Species such as ants, beetles, aphids, midges, mosquitoes, gnats, earwigs, roaches, spiders, ticks, wasps, bees, scorpions, and hornets can affect human health, damage vegetation, and exhibit other nuisance behaviors and are controlled with IPM techniques, including pesticide application when needed.
- Species such as coyotes and feral animals can become a nuisance by their presence in controlled areas or by undesirable activity. When necessary, animals are controlled by IPM techniques, including relocation. Feral horses are managed by BLM, and feral cats and dogs are turned over to Mineral County Animal Control.

Under this INRMP, HWAD will implement the following natural resources management measures that are consistent with the depot's PMP to effectively manage pests while protecting the environment:

- Continue to implement the PMP and the principles of IPM to effectively manage pests while minimizing the use of chemical pesticides.
- Review and update the 2012 PMP. Continue to control pests in accordance with the updated PMP.
- Monitor for signs of pest infestations and, when necessary, implement controls promptly.
- Evaluate newly proposed pest control methods and periodically reevaluate ongoing pest control operations to ensure compliance with applicable natural resources regulations, including the BGEPA, CWA, ESA, and MBTA.

- Consider protection of the environment, water resources, wildlife, and habitats before conducting pest control operations, particularly before applying chemical pesticides. Do not apply pesticides directly to wetlands or water areas unless the product label states that such use is specifically approved and HWAD's Pest Controller approves the application.
- Perform pest management operations and pesticide applications in a manner that minimizes the risk of contamination of the environment or unnecessary exposure of nontarget natural resources, plants, and wildlife.

8.12 CULTURAL RESOURCES MANAGEMENT

HWAD's cultural resources are documented and managed in accordance with its ICRMP (Earth Tech 2002). The ICRMP was prepared in compliance with AR 200-1 and DoDI 4715.16, *Cultural Resources Management*, and outlines the Army's policies, procedures, and responsibilities for meeting cultural resources compliance and management requirements at HWAD. The ICRMP was being updated when this INRMP was written and is available from HWAD's Environmental Division. The ICRMP is designed to be integrated with and consistent with the INRMP and other HWAD plans.

The goal of cultural resources management is to preserve the depot's cultural resources. From a natural resources perspective, the objective of cultural resources management is to integrate cultural resources management into natural resources management on the depot.

This section provides a summary of HWAD archaeological, architectural, Native American, and paleontological resources. For detailed information regarding cultural resources on HWAD, see the installation's ICRMP.

8.12.1 Archaeological Resources

Several archaeological surveys have been conducted at HWAD, resulting in a total of 116 prehistoric sites being reported: 15 sites are eligible for listing in the National Register of Historic Places (NRHP), 91 sites are ineligible sites, and 10 sites of unknown eligibility. In addition, 13 historic sites have been reported, 3 of which are eligible and 10 of which are ineligible. None of these sites have been formally nominated for inclusion in the NRHP (Earth Tech 2002).

8.12.2 Architectural Resources

No buildings or other structures at HWAD are currently listed in the NRHP, although many are eligible for listing. HWAD as a whole has been recommended as eligible for inclusion in the NRHP as a historic district because of its importance to military and engineering history and its overall retained integrity. The proposed Hawthorne Naval Ammunition Depot Historic District includes 2,496 contributing resources (438 buildings and 2,058 other structures) and 57 noncontributing resources (30 buildings and 27 other structures). Contributing resources include HWAD's elevated tanks, dams, and reservoirs. Other water system resources such as pump houses and treatment buildings are noncontributing resources (Panamerican 2016).

8.12.3 Native American Resources

Two federally recognized Native American tribes are resident in the HWAD area: the WRPT and the Yerington Paiute Tribe. The tribes are self-governing and are associated with the Northern Paiute Tribe (DOE 2010). The WRPT Reservation is located north of HWAD in Mineral, Churchill, and Lyon counties. Yerington Paiute Tribe lands are northwest of HWAD in Lyon County (EPA 2018b).

No traditional cultural properties (TCPs) or sacred sites have been formally identified at HWAD, although no systematic inventories of these resources have been undertaken. Some of the prehistoric archaeological sites (see section 8.12.1), however, could be considered TCPs by local Native American groups. Known tribal resources include pine nuts gathered for traditional and ceremonial purposes and could include other plants, animals, locations, or landscape features (Michael Baker 2009; Peterson 2017, personal communication).

In the mid-2000s, human remains were exposed in the North Magazine Area near the southern end of Walker Lake. At the time of discovery, HWAD coordinated with the WRPT and left the remains undisturbed in accordance with the tribe's wishes, marking the location with a global positioning system to prevent future disturbance (Peterson 2017, personal communication).

8.12.4 Paleontological Resources

Paleontological resources are any fossilized remains, traces, or imprints of organisms, preserved in or on the Earth's crust that are of paleontological interest and that provide information about the history of life on Earth. To date, no paleontological resources have been found or reported on HWAD; however, no systematic investigations have been conducted (Earth Tech 2002; URS 2009).

8.12.5 Management Measures

Cultural resources at HWAD are managed by the Cultural Resources Manager, an officer designated by the depot Commander. The Cultural Resources Manager should be involved in the early stages of project planning any time a natural resource program activity or project is planned that might have the potential to impact historic or cultural resources. For example, if natural resources management activities such as vegetation management are to take place, the Cultural Resources Manager can determine whether potentially eligible resources might be affected. To comply with section 106 of the NHPA and with the Archeological Resources Protection Act, the Cultural Resources Manager would contact the Nevada SHPO when needed to determine whether further action is necessary.

Under this INRMP, HWAD will implement the following management measures that are consistent with the ICRMP:

- HWAD’s Cultural Resource Manager will coordinate internally during the planning stages of any project that might have the potential to impact historic or cultural resources. If cultural resources could be affected, the Cultural Resources Manager will determine if consultation with the Nevada SHPO is required, if a Phase I archaeological survey will be needed, and/or if avoidance or mitigation measures are necessary.

- Complete a phase I archaeological survey on portions of HWAD that have not been previously surveyed to complete the inventory per section 110 of the NHPA. As necessary, complete phase II testing to determine NRHP-eligibility of the areas. Seek Nevada SHPO approval for any areas proposed for exclusion from the survey due to prior disturbance.
- Document activities in accordance with the Native American Graves Protection and Repatriation Act (NAGPRA); specifically, document the circumstances surrounding the discovery of human remains at the North Magazine Area in the mid-2000s. At the time of discovery, HWAD coordinated with the WRPT and left the remains undisturbed in accordance with the tribe's wishes, but this discovery should be formally documented.
- Create a comprehensive Tribal Consultation Plan to formalize relationships with tribes. As part of the project, establish MOAs with tribes with identified TCPs.
- Request a formal letter from the Nevada SHPO concurring with NRHP-eligibility recommendations for the 2,496 historic resources found to be NRHP-eligible in the 2016 architectural survey. Develop an MOA or programmatic agreement with the Nevada SHPO that would cover and streamline review of recurring activities installationwide for both archaeological and architectural resources.

8.13 CLIMATE CHANGE PREPAREDNESS

DoD acknowledges that climate change will have serious implications on the department's ability to maintain military infrastructure and ensure military readiness (GAO 2017). A DoD survey found that 50 percent of DoD sites have already experienced negative effects from extreme weather, with the highest number of reported effects from drought, wind, and nonstorm surge-related flooding (DoD 2018).

At HWAD, the goal of climate change preparedness is to determine how climate change might affect natural resources and, by extension, the military mission. The objective is to prepare for and minimize the effects of climate change on natural resources at HWAD. To support this goal and objective, the INRMP includes a review of predicted climate trends, the potential impacts of these trends, and associated natural resources management measures.

8.13.1 Climate Change Overview

Temperatures, precipitation, and the composition of the atmosphere have already been and will continue to be affected by climate change. Average air temperatures have increased more than 2 °F in the United States over the last 50 years and are projected to increase further. Precipitation in the United States has increased on average approximately 5 percent in the last 50 years. Models suggest northern areas of the United States will become wetter, while southern (dry) areas of the country (e.g., where HWAD is located) will become drier. The current level of carbon dioxide in the atmosphere of approximately 390 parts per million is more than 30 percent above its highest level over at least the last 800,000 years. These climatic changes are expected to increase the instance and severity of drought, which can increase the frequency and intensity of wildfires (NFWPCAP 2012).

Climate change affects species' growth rates, alters patterns of food availability, and shifts rates and patterns of decomposition and nutrient cycling. One or more climate-related factors can alter the distribution, abundance, phenology, physiology, and behavior of species and the

diversity, structure, and function of ecosystems. The more rapidly the climate changes, the higher the probability is that natural systems will be disrupted and experience unexpected events (NFWPCAP 2012).

Species and populations with highly specialized habitat requirements or narrow environmental tolerances; small, isolated, rare, or declining populations; and groups especially sensitive to pathogens are especially sensitive to climate change. Species with low reproductive rates, long generation times, and low genetic diversity and that are threatened by other factors are particularly vulnerable (NFWPCAP 2012).

Many invasive species in the United States stand to benefit from climate change. The ranges of some invasive species have already expanded, and predicted changes in temperature and precipitation are expected to provide favorable conditions for the establishment of new invasive species. Climate change can shift the ranges of native and invasive species, create favorable conditions by which nonnative species become invasive, and introduce and spread invasive species through severe weather events (NFWPCAP 2012).

Similarly, many pathogens that effect terrestrial species are sensitive to changes in temperature, rainfall, and humidity, making them sensitive to climate change. Pathogen development and survival rates and host susceptibility could increase, along with incidents of disease transmission. Most host-parasite systems are predicted to experience more frequent or severe disease impacts under climate change (NFWPCAP 2012).

8.13.2 Climate Change in the HWAD Region

Climate change predictions for the HWAD region include the following:

- An increase in temperatures, heat waves, and droughts
- Reduced snowpack and earlier spring snowmelt
- Lower spring and summer streamflows
- Increased storm severity and warmer winter storms
- An increase in severity and frequency of wildfires
- An increase in the number and prevalence of invasive species
- Declining populations of native flora and fauna (EPA 2016; Melillo et al. 2014; NFWPCAP 2012; NNHP 2017)

The National Climate Assessment report places HWAD in the Southwest region of the United States (Melillo et al. 2014). This region is historically the hottest and driest region in the nation, and water availability has influenced human settlement and the economy throughout the region's history. The region is projected to experience increased heat, drought, insect outbreaks, and wildfires. Human-caused temperature increases and drought also have caused earlier spring snowmelt and shifted runoff to earlier in the year (Melillo et al. 2014).

Depending on the growth rate of global emissions, average annual temperatures in the Southwest are projected to rise by up to 2.5 °F to 5.5 °F by 2041 to 2070 and by up to 5.5 °F to 9.5 °F by 2070 to 2099, with the greatest increases in the summer and fall. Summertime heat waves are projected to become longer and hotter, while the trend of decreasing wintertime cold air outbreaks is projected to continue (Melillo et al. 2014).

The southwestern United States is prone to drought. Future droughts are projected to become more frequent, intense, and longer lasting. These conditions will increase the challenge of water resources management and increase natural hazards such as wildfire (Melillo et al. 2014).

The hydrology of the area is also projected to change. Historically, the snowpack in the region's mountains melts slowly, releasing water to regional streams in the spring and summer. Under future conditions, less snowpack is anticipated, and any snowpack there is will melt earlier in the year, causing winter flooding and reduced streamflows in spring and summer (Melillo et al. 2014). Streamflow totals in the Great Basin and other Southwestern watersheds were 5 to 37 percent lower between 2001 and 2010 than the average flows during the 20th century. Projections of further reduction of late-winter and spring snowpack and subsequent reductions in runoff and soil moisture pose increased risks to water supplies needed to maintain the Southwest's cities, agriculture, and ecosystems (Melillo et al. 2014).

In 2017, a historically wet winter and spring in western Nevada resulted in significantly more vegetation growth than in previous years. This period was followed by warmer than average summer temperatures that increased the rate of vegetation dry-out. The combination of more and drier vegetation resulted in increased wildfire risk (BLM 2017).

Changes in temperature and hydrology and an increase in the number of wildfires could be beneficial for invasive species, creating favorable conditions for them to spread. For example, an increase in temperature benefits cheatgrass, which thrives in hot, open, fire-prone environments, crowds out native shrubland species, and could alter fire regimes (NFWPCAP 2012).

Native species of flora and fauna might also be impacted by climate change. The Nevada Natural Heritage Program (NNHP) Climate Change Program is using the NatureServe Climate Change Vulnerability Index to assess the vulnerability of flora and fauna to climate change. NNHP has identified multiple species that occur at HWAD whose populations are likely to decline because of climate change (NNHP 2017). For example, the American pika is a highly temperature-sensitive species that is considered an indicator species of how wildlife at higher elevations might fare under climate change. It is estimated that local pika extinctions in the Great Basin have been five times as high in the last 10 years as they were in the previous century, and the low elevation boundary for this species is moving upslope by about 492 feet per decade (Melillo et al. 2014).

Climate change impacts such as rising temperatures, reduced streamflows, and more frequent wildfires could adversely impact HWAD's ability to accomplish its mission and affect military readiness. For example, less snowpack would result in reduced streamflows on Mount Grant, affecting HWAD's potable water supply. Another possibility is that more frequent and severe wildfires could adversely impact mission operations or the Mount Grant watershed.

The potential effects of these trends on natural resources management at HWAD could include the following:

- Decreased amounts of potable water from surface water sources in the summer months, leading to increased reliance on groundwater and an increased need for water conservation.
- Competition from invasive species could increase, leading to the need for additional actions to control the invasive species.

- Additional species of flora and fauna could become federally listed as T&E species, resulting in increased T&E species management requirements.
- Incidences of food and water shortages for plants and animals could increase and lead to increased incidences of plant and animal disease and death. Over time, this situation could lead to ecosystem-level shifts in flora and fauna patterns.
- Energy use to meet building cooling demand could increase. An increased need for energy security could necessitate land management actions such as dedicating additional land and/or natural resources to energy production.
- Severe weather events could cause flash floods and erosion. Additional land management actions could be needed to prepare for and minimize the effects of flooding and erosion and to restore natural resources if they are damaged by those events.
- Increases in the frequency and severity of wildfires are anticipated. Additional land management actions could be needed to prepare for increased frequency and severity of wildfires such as adding more firebreaks and conducting more prescribed burns to protect infrastructure and property. HWAD's firefighting resources are anticipated to be increasingly called upon to provide mutual aid.

DoD initiated a Screening Level Vulnerability Assessment Survey in 2014 to assess current installation-specific vulnerabilities to climate impacts, with the survey data to be used to identify areas and installations where more detailed vulnerability assessments might be needed (DoD 2018). The Army is also issuing a vulnerability assessment tool for installations to use in conjunction with planning guidance being developed by Headquarters, Department of the Army. The vulnerability assessment tool and DoD guidance will assist installations in the following:

- Consistently assessing their vulnerabilities for specific functional areas (e.g., natural resources, water supply)
- Integrating considerations related to those vulnerabilities into their installation-level plans (e.g., INRMP, RPMP, Water Resources Management Plan)

Consistent use of the vulnerability assessment tool will enable the Army to prioritize future installation-level actions to meet mission requirements and identify and address potential Armywide issues (DoD 2018).

8.13.3 Management Measures

HWAD's climate change management is guided by DoD Directive 4715.21, *Climate Change Adaptation and Resilience* (DoD 2016); DoDM 4715.03, Enclosure 8, *Planning for Climate Change Impacts to Natural Resources* (DoD 2013); EO 13653, *Preparing the United States for the Impacts of Climate Change* (78 FR 66819, November 1, 2013); *Department of Defense 2014 Climate Change Adaptation Roadmap* (DoD 2014); and other applicable policy and science.

The ecosystem effects of climate change will likely be incremental and challenging to distinguish and assess. HWAD will take a proactive approach to climate change assessment and analysis and use adaptive management to adjust actions and approaches to climate change preparedness.

Under this INRMP, HWAD will implement the following management measures to assess and respond to the impacts of climate change:

- Use the Army's vulnerability assessment tool and planning guidance to conduct a vulnerability assessment to address the impacts of climate change on natural resources of interest at HWAD. Determine how those vulnerabilities might impact the military mission. Identify adaptive management strategies to mitigate the risks and potential impacts of climate change. Review and update the vulnerability assessment as needed or approximately every 5 years.
- Collaborate with internal and external stakeholders on climate change challenges, including management agencies of the surrounding land (BLM and USFS) and the NNHP Climate Change Program on issues such as minimizing wildfire risk and climate change impacts on flora and fauna.

8.14 SUMMARY OF GOALS, OBJECTIVES, AND MANAGEMENT MEASURES

Table 19 presents a summary of the resource-specific goals, objectives, and management measures presented in the previous sections. Although some management measures may pertain to multiple resources, each management measure is listed only once under the resource with which it most closely aligns. These management measures, along with the overarching goals, objectives, and projects presented in section 9.0, represent the principal actions proposed as part of natural resources management over the next 5 years at HWAD.

Table 19.
Summary of Goals, Objectives, and Management Measures

Resource Area: Fisheries Management **Goal:** Protect and conserve HWAD's fishery resources. **Management Objectives:** Sustain and, where applicable, enhance fish populations and their habitats to maintain healthy fish populations and biodiversity.
Management Measures • Continue coordination with NDOW on LCT introduced to Cottonwood Creek. Consider NDOW's recommendation to modify the mining-era rock check dam that might block fish passage. In coordination with NDOW and USFWS, consider and purse introducing additional LCT populations to the Cat and Rose creek drainages. • Monitor and maintain tui chub populations in Rose Creek Reservoir in collaboration with NDOW. • Continue to facilitate NDOW stocking of Rose Creek Reservoir with sport fish, and continue to allow sport fishing, as appropriate. • Investigate the need to periodically dewater Rose Creek Reservoir to determine if actions could be taken to make the reservoir self-sustaining. Implement corrective measures, as appropriate. • Support and facilitate any proposed efforts to study and document the health of the fish and benthos communities in HWAD water bodies. • Continue to stay abreast of research into Walker Lake fisheries and water quality, and adjust management activities as needed in response.
Resource Area: Wildlife Management **Goal:** Protect and conserve HWAD's wildlife resources. **Management Objective:** Sustain and, where applicable, enhance wildlife populations and their habitats to maintain healthy populations and biodiversity.

Management Measures

- Continue to limit access to and activities in the Mount Grant watershed area to levels appropriate to protect wildlife, habitats, and water quality.
- Continue sealing structures where bats interfere with mission operations so that bats cannot enter.
- Evaluate the need for additional bat boxes to provide alternate roosting sites, and partner with another organization to construct additional bat boxes if needed. Monitor the use of bat boxes.
- Continue the MOA with NDOW for Nelson desert bighorn sheep.
- Continue facilitating monitoring and management efforts by NDOW for fish and wildlife species under their management purview, including Nelson desert bighorn sheep, bats, bears, and fish species.
- Continue facilitating feral horse monitoring and management efforts by BLM.
- Conduct an additional herpetofauna survey in 2018–2019 to increase knowledge and understanding of the depot's herpetofauna, and implement any additional management measures recommended by this survey.

Resource Area: Vegetation Management

Goal: Maintain native plant communities and minimize loss of vegetative cover through ecosystem management principles without compromising mission activities.

Management Objective: Sustain native vegetation and terrestrial habitat by minimizing disturbance to the extent that doing so does not compromise mission activities.

Management Measures

- Evaluate the need and seek necessary approvals for tree removal and thinning of pinyon-juniper stands in appropriate areas on Mount Grant to benefit wildlife and their habitat.
- Update the vegetation communities and flora PLS approximately every 10 years (the next survey would be scheduled for 2028) or as needed to support natural resources management.
- Assess the impact of bark beetle on trees at HWAD, and consider removing infected trees.

Resource Area: Special Status Species Management

Goal: Monitor and conserve listed species and their habitats in accordance with applicable laws and regulations and Army policy on responsible stewardship.

Management Objective: Take appropriate actions to increase the populations of listed species so they can be delisted and to prevent the populations of species with potential to become listed from declining to the point at which they require listing.

Management Measures

- Continue cooperating with NDOW regarding maintenance and management of LCT in Cottonwood Creek.
- Coordinate with USFWS regarding steps to be taken to ensure the protection of any federally listed species should they be found on the depot.
- Prepare and send permit applications and annual reports to the USFWS Region 8 Migratory Bird Permit Office if takes of migratory birds are anticipated or occur accidentally.
- When resources allow, enhance habitat for greater sage-grouse in the Mount Grant area, including the North Fork Cat Creek and other likely sage-grouse use areas.
- Identify and conserve ESA candidate, state-listed, and other rare and sensitive species as funding permits without restricting mission operations. Facilitate cooperative efforts with partners to monitor and conserve those species.

Resource Area: Water Resources Management

Goal: Protect and conserve HWAD's water resources.

Management Objectives: Preserve water quality by limiting activities near potable water sources, monitor water quality, and monitor and maintain water resource infrastructure such as catch basins and dams.

Management Measures

- Continue to limit public access for hunting, fishing, trapping, grazing, agriculture, and other activities in the Mount Grant area to protect potable water sources. Monitor trespass cattle at Mount Grant and maintain exclusion fencing, as needed.
- Continue water infrastructure inspections and water quality monitoring to ensure the functionality of HWAD's potable water system and protect the quality of potable water supplies from Mount Grant. Conduct preventative maintenance and repairs as needed.
- Continue groundwater monitoring in accordance with the depot's *Work Plan for Basewide Groundwater Monitoring Program* and/or other applicable regulations or guidance documents (Plexus 2007).
- Continue to conserve water to the maximum extent possible.
- Evaluate water use and management of the reservoirs for the potential to affect fish habitat.
- Continue to release excess water (after HWAD requirements are met) from Mount Grant to Walker Lake to support recharge of the lake.
- Continue managing stormwater in accordance with HWAD's SWPPP and Water Resources Management Plan, NPDES permit requirements, and other applicable regulations.
- Continue to periodically survey the area south of Walker Lake for UXO and properly dispose of any UXO found.
- Conduct a survey to delineate floodplains in areas where flood hazards have not been determined.

Resource Area: Wetland and Riparian Area Management

Goal: Protect and conserve wetlands and riparian areas.

Management Objective: Protect wetlands and riparian areas from modification, loss, or degradation to the maximum extent possible in a manner consistent with DoD natural resources policy and applicable regulations.

Management Measures

- Maintain vegetated riparian areas along streams and lakes as applicable. Assess riparian areas periodically for removal of invasive species and other restoration needs, and implement management actions as needed.
- For wetlands and riparian areas located near everyday mission activities, conduct a jurisdictional wetland delineation consistent with current USACE protocols to update the boundaries of these areas. If needed following the delineation, adjust signage marking wetland areas to reflect any changes in boundaries.
- Avoid to the maximum extent possible activities that would impact wetlands. If impacts cannot be avoided, comply with section 404 of the CWA and other applicable regulations and conduct appropriate compensatory mitigation as needed for identified impacts.

Resource Area: Soil Management

Goal: Sustain soil resources and minimize erosion.

Management Objectives: Avoid soil disturbance, maintain vegetative cover, and implement BMPs to minimize erosion resulting from mission activities.

Management Measures

- Continue to limit off-road traffic in vegetated areas.
- Minimize areas of exposed soils. When the exposure of soils is necessary to support mission objectives (e.g., construction projects), use BMPs to minimize erosion and fugitive dust. Examples of erosion BMPs include installing sediment fencing, hay bales, mulching, or geotextile matting around the site; minimizing off-road driving; applying soil stabilizing agents; and revegetating the area promptly when the project is complete.
- Maintain gravel or other surfacing materials along railroads, around buildings, in the magazine areas where loading and unloading activities occur, and in other areas of exposed soils.
- Use soil stabilizing agents that are free of oil, acid, alkali salt, and other substances that could harm plants and wildlife.
- Ensure that construction contracts contain BMPs to stabilize soils, minimize airborne dust, and manage stormwater runoff. Inspect construction sites to ensure that BMPs are implemented and are sufficient to effectively control erosion, airborne dust, and stormwater runoff.
- Revegetate disturbed areas promptly to minimize fugitive dust and erosion and to prevent encroachment of invasive species. Use fast-growing, climate-tolerant native species so that soil stabilization and revegetation occur in a timely manner.

- Maintain HWAD's stormwater infrastructure, including the system of ditches in the magazine areas, to control drainage and reduce soil erosion.

Resource Area: Wildland Fire Management

Goal: Minimize wildfire loss.

Management Objective: Minimize wildfire loss through the implementation of effective policies, planning, fire prevention, personnel training, infrastructure, communications, operational systems, safety, and coordination.

Management Measures

- In accordance with AR 200-1 and the *Army Wildland Fire Policy Guidance* (DA ACSIM 2002), prepare an IWFMP that is compliant and integrated with the installation's existing fire and emergency services program, INRMP, and ICRMP.
- Maintain mutual aid agreements for fire and emergency management support with state and federal agencies, Mineral County, WRPT, and other entities as applicable. Renew expired agreements and update agreements as needed.
- Maintain fuel loads at levels appropriate for the prevention of major wildfires. Periodically evaluate fuel buildup and, when necessary, reduce fuel loads by mechanical means (e.g., hand cutting, mowing, and grading).
- Continue the prescribed burn program to assist with fuel reduction and management.
- Revegetate fire-affected areas with native or other desirable plants when appropriate to prevent encroachment of invasive weeds.

Resource Area: Public Access and Outdoor Recreation

Goal: Provide reasonable public access to HWAD to facilitate the sustainable educational and recreational use of HWAD's natural and cultural resources.

Management Objectives: Enhance public awareness of and appreciation of HWAD's natural resources, and encourage conservation research and restoration activities at HWAD.

Management Measures

- Continue to allow public access to HWAD lands for educational and recreational use of natural and cultural resources by the public when compatible with mission activities, safety, security, and ecosystem sustainability.
- Limit public access and outdoor recreation within the Mount Grant watershed area to levels appropriate to protecting water quality and other sensitive resources in the area.
- Continue to provide Native Americans reasonable access to DoD lands and resources of religious importance to them or important to the continuance of their cultures, consistent with the military mission and safety and security requirements
- Continue to make outdoor recreational opportunities at HWAD available to people with disabilities to the maximum extent possible without substantial modification of the natural environment.
- Continue to facilitate research and restoration opportunities for educational institutions, public agencies, and nongovernmental organizations wishing to study natural resources or conduct restoration projects at HWAD.

Resource Area: Conservation Law Enforcement

Goal: Enforce natural resources laws and regulations.

Management Objectives: Protect natural resources from criminal destruction, and enhance public safety by enforcing conservation laws and access restrictions.

Management Measures

- Maintain staffing of trained and capable natural resources law enforcement personnel at levels sufficient to effectively monitor and enforce all natural resources laws and regulations.
- Ensure that all natural resources law enforcement personnel meet the requirements for training and weapons qualification for their experience and rank, and receive appropriate continuing education to enhance understanding of natural resources and ecosystem management.
- Continue to manage access for hunting and fishing at HWAD in compliance with Nevada law.
- Evaluate additional measures to prohibit vehicle access via Wheeler Pass.

Resource Area: Invasive Species Management

Goal: Implement cost-effective measures that will effectively prevent the spread of invasive plant species and noxious weeds and reduce their presence where practicable.

Management Objectives: Control or eradicate existing invasive plants, and prevent further introduction or spread of invasive plants.

Management Measures

- Comply with all federal and state laws related to invasive species and noxious weeds.
- Update the depot's 2003 invasive species survey, and develop an ISMP that identifies areas impacted by invasive species and noxious weeds and specifies methods to control or eradicate them, particularly tamarisk and invasives in riparian areas, but also other invasive species and noxious weeds observed at HWAD. Implement controls as outlined in the ISMP.
- Use physical controls (e.g., mowing and manual removal), pesticide application, and native plant restoration (e.g., replanting) methods alone or in combination to control or eradicate invasive species and noxious weeds. When conducting control activities, minimize adverse effects on nontarget plants, wildlife, and habitats, and water resources.
- Continue to wash all vehicles at the vehicle wash station to minimize transport and spread of invasive species.
- Promptly revegetate disturbed and fire-affected areas with native or other desirable plants when appropriate to prevent encroachment of invasive species.

Resource Area: Pest Management

Goal: Use IPM techniques to control or eliminate pest populations when warranted.

Management Objectives: Protect human health from pests, and prevent or minimize pest damage to real estate and natural resources caused by pests.

Management Measures

- Continue to implement the PMP and the principles of IPM to effectively manage pests while minimizing the use of chemical pesticides.
- Review and update the 2012 PMP. Continue to control pests in accordance with the updated PMP.
- Monitor for signs of pest infestations and, when necessary, implement controls promptly.
- Evaluate newly proposed pest control methods and periodically reevaluate ongoing pest control operations to ensure compliance with applicable natural resources regulations including the BGEPA, CWA, ESA, and MBTA.
- Consider protection of the environment, water resources, wildlife, and habitats before conducting pest control operations, particularly before applying chemical pesticides. Do not apply pesticides directly to wetlands or water areas unless the product label states that such use is specifically approved and HWAD's Pest Controller approves the application.
- Perform pest management operations and pesticide applications in a manner that minimizes the risk of contamination of the environment or unnecessary exposure of nontarget natural resources, plants, and wildlife.

Resource Area: Cultural Resources Management

Goal: Preserve HWAD's cultural resources.

Management Objective: Integrate cultural resources management into natural resources management on the depot.

Management Measures

- HWAD's Cultural Resource Manager will coordinate internally during the planning stages of any project that might have the potential to impact historic or cultural resources. If cultural resources could be affected, the Cultural Resources Manager will determine if consultation with the Nevada SHPO is required, if a phase I archaeological survey will be needed, and/or if avoidance or mitigation measures are needed.
- Complete a phase I archaeological survey on portions of HWAD that have not been previously surveyed to complete the inventory per section 110 of the NHPA. As necessary, complete phase II testing to determine NRHP-eligibility of the areas. Seek Nevada SHPO approval for any areas proposed for exclusion from the survey due to prior disturbance.

- Document activities in accordance with NAGPRA; specifically, document the circumstances surrounding the discovery of human remains at the North Magazine Area in the mid-2000s. At the time of discovery, HWAD coordinated with the WRPT and left the remains undisturbed in accordance with the tribe's wishes, but this discovery should be formally documented.
- Create a comprehensive Tribal Consultation Plan to formalize relationships with tribes. As part of the project, establish MOAs with tribes with identified TCPs.
- Request a formal letter from the Nevada SHPO concurring with NRHP-eligibility recommendations for the 2,496 historic resources found to be NRHP-eligible in the 2016 architectural survey. Develop an MOA or PA with the Nevada SHPO that would cover and streamline review of recurring activities installationwide for both archaeological and architectural resources.

Resource Area: Climate Change Management

Goal: Determine how climate change might affect natural resources and, by extension, the military mission.

Management Objective: Prepare for and minimize the effects of climate change on natural resources at HWAD.

Management Measures

- Use the Army's vulnerability assessment tool and planning guidance to conduct a vulnerability assessment to address the impacts of climate change on natural resources of interest at HWAD. Determine how those vulnerabilities might impact the military mission. Identify adaptive management strategies to mitigate the risks and potential impacts of climate change. Review and update the vulnerability assessment as needed or approximately every 5 years.
- Collaborate with internal and external stakeholders on climate change challenges, including management agencies of surrounding land (BLM and USFS) and the state of Nevada NNHP Climate Change Program on issues such as minimizing wildfire risk and climate change impacts on flora and fauna.

SECTION 9.0 MANAGEMENT GOALS, OBJECTIVES, AND PROJECTS

The emphasis of an INRMP is to achieve certain goals for maintaining and improving the natural environment at an installation. This section lists the goals, objectives, and projects for natural resources management at HWAD. Preparing these goals, objectives, and projects involved review and analysis of the current conditions of the existing resources as detailed in sections 4.0 through 6.0 and natural resources management practices as detailed in section 8.0. The review process included interviewing HWAD personnel; collecting and reviewing existing environmental documentation; and conducting field reconnaissance at HWAD.

The relationship between natural resources management goals, objectives, and projects is as follows:

Goals. Goals are the primary focal point for the implementation of the INRMP over the 5 years covered by the plan (2019–2023). A goal reflects the values of the installation by expressing a vision of a desired condition for the installation's natural resources in the foreseeable future. Each goal is supported by one or more objectives.

Objectives. Each goal is supported by objectives that indicate a management initiative or strategy that will be used to achieve the stated goal. An objective specifically states what will be done and how it will be done.

Projects. Projects are the individual actions required to achieve an objective. Project statements describe the specific methods that will be used to achieve the objective. Projects are actions that become line items in the proposed budgets for INRMP implementation. Projects are prioritized based on need, and need is based on the importance of a project in moving the natural resources management program toward successfully achieving its goals. Projects are not listed for all goals and objectives in the plan, but as circumstances or conditions that require natural resources protection arise on HWAD, supporting projects will be formulated to ensure that the goals and objectives are met.

Goals, objectives, and projects are not necessarily presented in order of importance. HWAD will initiate and complete the identified projects in accordance with current mission requirements and funding.

GOAL 1: IDENTIFY, PROTECT, AND CONSERVE WATER RESOURCES.

OBJECTIVE 1.1: Maintain the depot's potable water supply sources and water system infrastructure.

PROJECT 1.1.1: Continue to limit public access for hunting, fishing, trapping, grazing, agriculture, and other activities in the Mount Grant area to protect potable water sources. Monitor trespass cattle at Mount Grant and maintain exclusion fencing, as needed.

PROJECT 1.1.2: Continue water infrastructure inspections and water quality monitoring to ensure the functionality of HWAD's potable water system and protect the quality of potable water supplies from Mount Grant. Conduct preventative maintenance and repairs as needed.

PROJECT 1.1.3: Continue to release excess water (after HWAD requirements are met) from Mount Grant to Walker Lake to support recharge of the lake.

OBJECTIVE 1.2: Avoid disturbance or degradation of wetlands and riparian areas.

PROJECT 1.2.1: Maintain vegetated riparian areas along streams and lakes as applicable. Assess riparian areas periodically for removal of invasive species and other restoration needs, and implement management actions as needed.

PROJECT 1.2.2: For wetlands and riparian areas located near everyday mission activities, conduct a jurisdictional wetland delineation consistent with current USACE protocols to update the boundaries of these areas. If needed following the delineation, adjust signage marking wetland areas to reflect any changes in boundaries.

PROJECT 1.2.3: Avoid to the maximum extent possible activities that would impact wetlands. If impacts cannot be avoided, comply with section 404 of the CWA and other applicable regulations and conduct appropriate compensatory mitigation as needed for identified impacts.

OBJECTIVE 1.3: Identify flood hazard areas.

PROJECT 1.3.1: Conduct a survey to delineate floodplains in areas where flood hazards have not been determined.

GOAL 2: IDENTIFY, PRESERVE, AND RESTORE SPECIAL STATUS SPECIES.

OBJECTIVE 2.1: Preserve federally listed T&E species.

PROJECT 2.1.1: Continue coordination with NDOW on LCT introduced to Cottonwood Creek. Consider NDOW's recommendation to modify the mining-era rock check dam that might block fish passage. In coordination with NDOW and USFWS, consider and purse introducing additional LCT populations to the Cat and Rose creek drainages.

OBJECTIVE 2.2: Identify, preserve, and restore state-listed and other special status or sensitive species to the maximum extent possible and as funding permits.

PROJECT 2.2.1: When resources allow, enhance habitat for greater sage-grouse in the Mount Grant area, including the North Fork Cat Creek and other likely sage-grouse use areas.

PROJECT 2.2.2: Continue to participate in multiagency coordination as part of the bi-state greater sage-grouse conservation initiative.

PROJECT 2.2.3: Conserve the stand of whitebark pine, an ESA candidate species, on Mount Grant.

PROJECT 2.2.4: Continue to facilitate cooperative efforts with partners to monitor and conserve special status species as resources permit without restricting mission operations.

GOAL 3: IDENTIFY, PRESERVE, AND RESTORE WILDLIFE SPECIES AND THEIR HABITATS.

OBJECTIVE 3.1: Identify, preserve, and restore native wildlife species at HWAD.

PROJECT 3.1.1: Continue to limit access to and activities in the Mount Grant watershed area to levels appropriate to protect wildlife, habitats, and water quality.

PROJECT 3.1.2: Monitor and maintain tui chub populations in Rose Creek Reservoir in collaboration with NDOW.

PROJECT 3.1.3: Continue to facilitate NDOW stocking of Rose Creek Reservoir with sport fish, and continue to allow sport fishing, as appropriate.

PROJECT 3.1.4: Continue sealing structures where bats interfere with mission operations so that bats cannot enter.

PROJECT 3.1.5: Evaluate the need for additional bat boxes to provide alternate roosting sites, and partner with another organization to construct additional bat boxes if needed. Monitor the use of bat boxes.

PROJECT 3.1.6: Continue the MOA with NDOW for Nelson desert bighorn sheep.

PROJECT 3.1.7: Continue facilitating monitoring and management efforts by NDOW for fish and wildlife species under their management purview, including Nelson desert bighorn sheep, bats, bears, and fish species.

PROJECT 3.1.8: Continue facilitating feral horse monitoring and management efforts by BLM.

PROJECT 3.1.9: Conduct an additional herpetofauna survey in 2018–2019 to increase knowledge and understanding of the depot's herpetofauna, and implement any additional management measures recommended by this survey.

PROJECT 3.1.10: Update the depot's PLSs for fauna and migratory birds approximately every 10 years or as needed to support natural resources management.

OBJECTIVE 3.2: Preserve and restore habitat important to wildlife species.

PROJECT 3.2.1: Investigate the need to periodically dewater Rose Creek Reservoir to determine if actions could be taken to make the reservoir self-sustaining. Implement corrective measures, as appropriate.

PROJECT 3.2.2: Evaluate additional measures to prohibit vehicle access via Wheeler Pass.

OBJECTIVE 3.3: Cooperate and coordinate with appropriate interested parties on natural resources management.

PROJECT 3.3.1: Continue to facilitate research and restoration opportunities for educational institutions, public agencies, and nongovernmental organizations wishing to study natural resources or conduct restoration projects at HWAD.

OBJECTIVE 3.4: Control pests.

PROJECT 3.4.1: Review and update the 2012 PMP. Continue to control pests in accordance with the updated PMP.

GOAL 4: IDENTIFY, PRESERVE, AND RESTORE NATIVE PLANTS AND TERRESTRIAL HABITATS.

OBJECTIVE 4.1: Identify, preserve, and restore native plants and terrestrial habitats.

- PROJECT 4.1.1: Evaluate the need and seek necessary approvals for tree removal and thinning of pinyon-juniper stands in appropriate areas on Mount Grant to benefit wildlife and their habitat.

PROJECT 4.1.2: Update the vegetation communities and flora PLS approximately every 10 years (the next survey would be scheduled for 2028) or as needed to support natural resources management.

PROJECT 4.1.3: Assess the impact of bark beetle on trees at HWAD, and consider removing infected trees.

OBJECTIVE 4.2: Control invasive species.

PROJECT 4.2.1: Update the depot's 2003 invasive species survey, and develop an ISMP that identifies areas impacted by invasive species and noxious weeds and specifies methods to control or eradicate them, particularly tamarisk and invasives in riparian areas, but also other invasive species and noxious weeds observed at HWAD. Implement controls as outlined in the ISMP.

PROJECT 4.2.2: Promptly revegetate disturbed and fire-affected areas with native or other desirable plants when appropriate to prevent encroachment of invasive species.

GOAL 5: MANAGE NATURAL RESOURCES TO MINIMIZE THE POTENTIAL FOR WILDFIRE LOSS.

OBJECTIVE 5.1: Minimize wildfire loss through the implementation of effective policies and planning, and prevention measures.

PROJECT 5.1.1: In accordance with AR 200-1 and the *Army Wildland Fire Policy Guidance* (DA ACSIM 2002; HQDA 2007), prepare an IWFMP that is compliant and integrated with the installation's existing fire and emergency services program, INRMP, and ICRMP.

PROJECT 5.1.2: Maintain mutual aid agreements for fire and emergency management support with state and federal agencies, Mineral County, WRPT, and other entities as applicable. Renew expired agreements and update agreements as needed.

PROJECT 5.1.3: Evaluate the need to reduce fuel loads to levels appropriate for the prevention of major wildfires. Periodically evaluate fuel buildup and, when necessary, reduce fuel loads by mechanical means (e.g., hand cutting, mowing, and grading).

PROJECT 5.1.4: Continue the prescribed burn program along the railroad rights-of-way, explosive parking areas, and flood control drainages to assist with fuel reduction and management.

GOAL 6: ASSESS THE POTENTIAL IMPACTS OF CLIMATE CHANGE ON NATURAL RESOURCES AND THE MISSION.

OBJECTIVE 6.1: Assess climate change preparedness.

PROJECT 6.1.1: Use the Army's vulnerability assessment tool and planning guidance to conduct a vulnerability assessment addressing the potential impacts of climate change on natural resources of interest at HWAD. Determine how those vulnerabilities might impact the military mission. Identify adaptive management strategies to mitigate the risks and potential impacts of climate change. Review and update the vulnerability assessment as needed or approximately every 5 years.

GOAL 7: MAINTAIN NATURAL RESOURCES PROGRAM DATA.

OBJECTIVE 7.1: Maintain a complete record of natural resources data in an organized and readily accessible manner.

PROJECT 7.1.1: Develop a repository of natural resources and cultural resources data, including geospatial data, that includes all data collected by HWAD and its partners (e.g., agencies, universities, contractors). Ensure that the data are in a format readily usable by environmental personnel.

SECTION 10.0 IMPLEMENTATION

If implemented as written, this INRMP will fulfill the intent and requirements of the Sikes Act and other applicable federal and state regulations for managing natural resources on HWAD. Successful implementation of this INRMP requires an organizational structure that identifies funding, staffing, and data management procedures; prioritizes projects; and describes processes for reviewing and updating the INRMP. This section describes those elements of the program.

10.1 FUNDING

The Office of the Secretary of Defense considers funding for preparing and implementing this INRMP, as required by the Sikes Act, to be a high priority. The economic reality, however, is that not all the projects and programs identified in this INRMP will receive immediate funding. Table 20 (at the end of this section) lists the programs and projects identified in this INRMP, which are organized by the goals listed in section 1.2. The projects have been placed into three priority-based categories: high, medium, and low. They are prioritized based on need, and need is based on the importance of a project in moving the natural resources management program toward successfully achieving its goals.

HWAD, AMC, USFWS, and NDOW recognize that year-to-year congressional appropriations for implementing the Army's mission change and might require changes in priorities and project implementation schedules. If these changes require deferral, redirection, or cancellation of high-priority projects, HWAD, in consultation with AMC, will determine which projects or plans should be implemented first. Projects that require funding will proceed only after funding is obtained. Nothing in this plan can be interpreted to violate the Anti-Deficiency Act. In every case, HWAD and AMC will ensure that constraints on the military mission are avoided and minimized whenever possible.

In accordance with DoDI 4715.03, the projects identified in this INRMP are classified as either recurring requirements or nonrecurring requirements for funding evaluation. The following summarizes these funding categories:

- Recurring Natural Resources Conservation Management Requirements: Administrative, personnel, and other costs associated with managing the DoD Natural Resources Conservation Program that are necessary to meet applicable compliance requirements in federal and state laws, regulations, EOs, and DoD policies or are in direct support of the military mission, with priority given to recurring natural resources conservation management requirements associated with the operation of facilities, installations, and deployed weapons systems.
- Nonrecurring Natural Resources Conservation Management Requirements:
    - Current Compliance: Includes installation projects and activities to support (1) an installation out of compliance (e.g., that has received an enforcement action from an authorized federal or state agency or local authority); (2) a signed compliance agreement or consent order, (3) meeting requirements with applicable federal or state laws, regulations, standards, EOs, or DoD policies; (4) immediate and essential maintenance of operational integrity or military mission sustainment; and (5) projects or activities that will be out of compliance if not implemented in the program year.

- Maintenance Requirements: Includes projects and activities needed to meet an established deadline beyond the program year and to maintain compliance. Examples include (1) compliance with future deadlines; (2) conservation, geographic information system mapping, and data management to comply with federal, state, and local regulations, EOs, and DoD policy; (3) efforts undertaken in accordance with nondeadline-specific compliance requirements of leadership initiatives; (4) wetlands enhancement to minimize wetlands loss and enhance existing degraded wetlands; and (5) conservation recommendations in biological opinions issued pursuant to the ESA.
- Enhancement Actions beyond Compliance: Includes projects and activities that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives but are not specifically required by law, regulation, or EO, and are not of an immediate nature. Examples include (1) community outreach activities, (2) educational or public awareness projects, (3) restoration or enhancement of natural resources when no specific compliance requirement dictates a course or timing of action, and (4) management and execution of volunteer and partnership programs.

Must-fund requirements are those projects and activities in the recurring and current compliance categories. Must-fund projects and actions include those required to (1) meet the USFWS criteria for T&E species management, (2) provide for qualified natural resources personnel, and (3) prevent resource loss or degradation that could affect military readiness. Not all projects listed in the INRMP are must-funds.

10.2 NATURAL RESOURCES MANAGEMENT STAFFING

The Natural Resources Manager oversees the programs and projects identified in this INRMP and their implementation. Additional staff that support the natural resources management program by performing related tasks within their jurisdictions include HWAD's Environmental Division, operating contractor, Security, Police, Facilities Management, Real Property, Maintenance, and Contract Administration.

Implementing the projects discussed in this INRMP will require active outside assistance, which might come from state and federal agencies, universities, and contractors. The use of these resources is the most efficient and cost-effective method for temporarily acquiring expertise. Outside parties might or might not be reimbursed, depending on the terms of their agreements with HWAD.

10.3 DATA MANAGEMENT

Effective data collection, storage, management, and analysis are essential to HWAD's natural resources management program. Data about HWAD's natural resources include electronic and hard-copy maps, reports, and geospatial information. Electronic data are stored primarily on computer hard drives with hard copies kept in the Environmental Division office. Data analysis is consistent with currently accepted standards for the respective projects undertaken and data collected.

As described in section 9.0, HWAD has identified a need to develop a single repository of natural resources and cultural resources data, including geospatial data, that includes all data collected by HWAD and its partners (e.g., agencies, universities, contractors). All data in the repository should be in formats that are readily usable by environmental personnel.

10.4 ANNUAL REVIEW REQUIREMENTS

The Sikes Act requires each installation with significant natural resources to report annually on the status of its INRMP implementation. HWAD reports progress toward meeting natural resources conservation program measures of merit to the Deputy Undersecretary of Defense (Installations and Environment) at each environmental management review and to Congress in the Defense Environmental Programs Annual Report to Congress. HWAD reports the following:

- The installation name and location
- If the installation meets Sikes Act requirements
- If annual feedback has been received from USFWS and/or NDOW
- Funding requirements in reporting per fiscal year to implement the INRMP
- Amount required for recurring projects
- Amount required for nonrecurring projects

In accordance with DoDI 4715.03, HWAD conducts annual self-assessments using Natural Resources Conservation Metrics to assess INRMP implementation, measure conservation efforts, ensure no net loss of military testing or training lands, understand the conservation program's support of the military mission, and indicate the success of partnerships with USFWS and NDOW. HWAD will, at a minimum, assess requirements, goals, and objectives of the Sikes Act annually in the following seven focus areas:

- INRMP Project Implementation
  - Are INRMP projects, including follow-up inventorying and monitoring work, properly identified, developed, and submitted for funding?
  - Has project funding been received, obligated, and expended?
  - Have projects been completed, and do they meet expected objectives?
- Federally Listed Species and Designated Critical Habitat
  - Are conservation efforts effective?
  - Does the INRMP provide conservation benefits necessary to preclude critical habitat designation?
  - Are at-risk species identified, and are steps being undertaken to preclude listing?
- Partnerships and Effectiveness
  - Has the INRMP review team (i.e., DoD, USFWS, and NDOW) been effective in ensuring the INRMP's implementation?
  - Are other partnerships needed to meet INRMP goals?
  - Have other partnerships been effectively used to meet INRMP goals?

- Fish and Wildlife Management and Public Use
  - Are public recreational opportunities such as hunting, fishing, and wildlife viewing available to base residents and employees?
  - Are public recreational opportunities such as hunting, fishing, and wildlife viewing available to the public?
- Team Adequacy
  - Is the installation's natural resources team adequately resourced to fully implement the INRMP?
  - Is the installation's natural resources team adequately trained to fully implement the INRMP?
  - Does the installation encourage retaining existing natural resources personnel to maintain corporate knowledge and manage resources with the most qualified professionals to support the military mission?
- Ecosystem Integrity
  - To what extent are the installation's native ecological systems currently intact?
  - In what ways are the installation's various habitats susceptible to change or damage from different stressors?
  - What stressors affect each habitat type?
- INRMP Impact on the Installation Mission
  - To what degree (i.e., high, medium, or low) are the INRMP and its associated actions supporting the installation's ability to sustain the current and potential future military mission?

10.5 ANNUAL COORDINATION REQUIREMENTS

In accordance with DoDI 4715.03 and DoDM 4715.03, HWAD communicates annually with USFWS and NDOW regarding INRMP implementation progress, potential areas of improvement, and expected projects for the coming year. HWAD's Natural Resources Manager will place copies of any feedback received from annual coordination with USFWS and NDOW in appendix G.

10.6 UPDATING THE INRMP

According to DoDI 4715.03, reviews of the INRMP for operation and effect must be performed no less frequently than every 5 years. HWAD, USFWS, and NDOW review the INRMP every 5 years to determine whether it is implemented pursuant to the Sikes Act and contributes to the conservation and rehabilitation of natural resources on the installation. DoDM 4715.03 and the Sikes Act Tripartite MOU between the DoD, USFWS, and state fish and wildlife agencies provide additional detail on the process for engaging the agencies in 5-year updates.

HWAD's Natural Resources Manager will place copies of any relevant natural resources data collected from agencies, universities, or other partners from 2019 to 2023 in appendix H. These reports and others as relevant will be used to update the INRMP in 2023.

10.7 MONITORING INRMP IMPLEMENTATION

In accordance with DoDM 4715.03, HWAD will implement the INRMP by doing the following:

- Actively requesting funds to implement the projects, activities, and other requirements in support of the goals and objectives identified in the INRMP
- Ensuring sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP
- Inviting annual feedback from USFWS and NDOW on the effectiveness of the INRMP
- Documenting specific INRMP activities undertaken and accomplished each year
- Evaluating the effectiveness of past and current management activities, and adapting them as needed to future actions

Table 20 shows the programs and projects identified for implementation in this INRMP, along with prioritization, approximate cost and timeframe for implementation, and identification of responsible parties. Project prioritization is based on the importance of a project in moving the natural resources management program toward successfully achieving its goals.

Table 20.
Summary of INRMP Projects

GOALS, OBJECTIVES, AND PROJECT NAMES	PRIORITY	CLASS	PROJECTED COST[a]	IMPLEMENTATION TIMEFRAME	RESPONSIBLE PARTY AND PARTNERS
GOAL 1: IDENTIFY, PROTECT, AND CONSERVE WATER RESOURCES.					
OBJECTIVE 1.1: Maintain the depot's potable water supply sources and water system infrastructure.					
Continue to limit public access for hunting, fishing, trapping, grazing, agriculture, and other activities in the Mount Grant area to protect potable water sources. Monitor trespass cattle at Mount Grant and maintain exclusion fencing, as needed.	High	Recurring	None	Ongoing	HWAD Environmental Division + SOC
Continue water infrastructure inspections and water quality monitoring to ensure the functionality of HWAD's potable water system and protect the quality of potable water supplies from Mount Grant. Conduct preventative maintenance and repairs as needed.	High	Recurring	Variable	Ongoing	SOC
Continue to release excess water (after HWAD requirements are met) from Mount Grant to Walker Lake to support recharge of the lake.	Medium	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + SOC
OBJECTIVE 1.2: Avoid disturbance or degradation of wetlands and riparian areas.					
Maintain vegetated riparian areas along streams and lakes as applicable. Assess riparian areas periodically for removal of invasive species and other restoration needs, and implement management actions as needed.	Medium	Nonrecurring, Enhancement	Case-specific	Ongoing	HWAD Environmental Division + SOC
For wetlands and riparian areas located near everyday mission activities, conduct a jurisdictional wetland delineation consistent with current USACE protocols to update the boundaries of these areas. If needed following the delineation, adjust signage marking wetland areas to reflect any changes in boundaries.	High	Nonrecurring, Current Compliance	$150,000	2019–2020	HWAD Environmental Division + USACE + Contractor
Avoid to the maximum extent possible activities that would impact wetlands. If impacts cannot be avoided, comply with section 404 of the CWA and other applicable regulations and conduct appropriate compensatory mitigation as needed for identified impacts.	Medium	Nonrecurring, Maintenance	Case-specific	Ongoing	HWAD Environmental Division + SOC + Contractor
OBJECTIVE 1.3: Identify flood hazard areas.					
Conduct a survey to delineate floodplains in areas where flood hazards have not been determined.	High	Nonrecurring, Enhancement	$175,000	2018–2019	HWAD Environmental Division + Contractor

GOALS, OBJECTIVES, AND PROJECT NAMES	PRIORITY	CLASS	PROJECTED COST[a]	IMPLEMENTATION TIMEFRAME	RESPONSIBLE PARTY AND PARTNERS
GOAL 2: IDENTIFY, PRESERVE, AND RESTORE SPECIAL STATUS SPECIES.					
OBJECTIVE 2.1: Preserve federally listed T&E species.					
Continue coordination with NDOW on LCT introduced to Cottonwood Creek. Consider NDOW's recommendation to modify the mining-era rock check dam that might block fish passage. In coordination with NDOW and USFWS, consider and purse introducing additional LCT populations to the Cat and Rose creek drainages.	High	Recurring	$250,000	Ongoing	HWAD Environmental Division + NDOW
OBJECTIVE 2.2: Identify, preserve, and restore state-listed and other special status or sensitive species to the maximum extent possible and as funding permits.					
When resources allow, enhance habitat for greater sage-grouse in the Mount Grant area, including the North Fork Cat Creek and other likely sage-grouse use areas.	Medium	Nonrecurring, Enhancement	$250,000	2020–2022	HWAD Environmental Division + NDOW + USGS + Contractor
Continue to participate in multiagency coordination as part of the bi-state greater sage-grouse conservation initiative.	Medium	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + Agencies
Conserve the stand of whitebark pine, an ESA candidate species, on Mount Grant.	Medium	Nonrecurring, Maintenance	None	Ongoing	HWAD Environmental Division
Continue to facilitate cooperative efforts with partners to monitor and conserve special status species as resources permit without restricting mission operations.	Medium	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + Agencies and Organizations
GOAL 3: IDENTIFY, PRESERVE, AND RESTORE WILDLIFE SPECIES AND THEIR HABITATS.					
OBJECTIVE 3.1: Identify, preserve, and restore native wildlife species at HWAD.					
Continue to limit access to and activities in the Mount Grant watershed area to levels appropriate to protect wildlife, habitats, and water quality.	High	Recurring	None	Ongoing	HWAD Environmental Division
Monitor and maintain tui chub populations in Rose Creek Reservoir in collaboration with NDOW.	Medium	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + NDOW
Continue to facilitate NDOW stocking of Rose Creek Reservoir with sport fish, and continue to allow sport fishing, as appropriate.	Low	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + NDOW
Continue sealing structures where bats interfere with mission operations so that bats cannot enter.	Medium	Nonrecurring, Enhancement	Case-specific	Ongoing	SOC
Evaluate the need for additional bat boxes to provide alternate roosting sites, and partner with another organization to construct additional bat boxes if needed. Monitor the use of bat boxes.	Low	Nonrecurring, Enhancement	Case-specific	Ongoing	HWAD Environmental Division + NDOW + Volunteer Organization(s)

GOALS, OBJECTIVES, AND PROJECT NAMES	PRIORITY	CLASS	PROJECTED COST[a]	IMPLEMENTATION TIMEFRAME	RESPONSIBLE PARTY AND PARTNERS
Continue the MOA with NDOW for Nelson desert bighorn sheep.	Medium	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + NDOW
Continue facilitating monitoring and management efforts by NDOW for fish and wildlife species under their management purview, including Nelson desert bighorn sheep, bats, bears, and fish species.	Medium	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + NDOW
Continue facilitating feral horse monitoring and management efforts by BLM.	Low	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + BLM
Conduct an additional herpetofauna survey in 2018–2019 to increase knowledge and understanding of the depot's herpetofauna, and implement any additional management measures recommended by this survey.	High	Nonrecurring, Enhancement	$150,000	2018–2019	HWAD Environmental Division + Contractor
Update the depot's PLSs for fauna and migratory birds approximately every 10 years or as needed to support natural resources management.	Medium	Nonrecurring, Maintenance	$200,000	2020–2022	HWAD Environmental Division + Contractor
OBJECTIVE 3.2: Preserve and restore habitat important to wildlife species.					
Investigate the need to periodically dewater Rose Creek Reservoir to determine if actions could be taken to make the reservoir self-sustaining. Implement corrective measures, as appropriate.	Medium	Nonrecurring, Enhancement	$200,000	2020–2022	HWAD Environmental Division + Contractor + NDOW
Evaluate additional measures to prohibit vehicle access via Wheeler Pass.	Low	Nonrecurring, Maintenance	Case-specific	2020–2022	HWAD Environmental Division + SOC
OBJECTIVE 3.3: Cooperate and coordinate with appropriate interested parties on natural resources management.					
Continue to facilitate research and restoration opportunities for educational institutions, public agencies, and nongovernmental organizations wishing to study natural resources or conduct restoration projects at HWAD.	Low	Nonrecurring, Enhancement	None	Ongoing	HWAD Environmental Division + Agencies and Organizations
OBJECTIVE 3.4: Control pests.					
Review and update the 2012 PMP. Continue to control pests in accordance with the updated PMP.	High	Nonrecurring, Current Compliance	$100,000	2018–2019	HWAD Environmental Division + Contractor
GOAL 4: IDENTIFY, PRESERVE, AND RESTORE NATIVE PLANTS AND TERRESTRIAL HABITATS.					
OBJECTIVE 4.1: Identify, preserve, and restore native plants and terrestrial habitats.					
Evaluate the need and seek necessary approvals for tree removal and thinning of pinyon-juniper stands in appropriate areas on Mount Grant to benefit wildlife and their habitat.	Medium	Nonrecurring, Enhancement	$100,000	2020–2022	HWAD Environmental Division + SOC + Contractor

GOALS, OBJECTIVES, AND PROJECT NAMES	PRIORITY	CLASS	PROJECTED COST[a]	IMPLEMENTATION TIMEFRAME	RESPONSIBLE PARTY AND PARTNERS
Update the vegetation communities and flora PLS approximately every 10 years (the next survey would be scheduled for 2028) or as needed to support natural resources management.	Low	Nonrecurring, Maintenance	$150,000	2028	HWAD Environmental Division + Contractor
Assess the impact of bark beetle on trees at HWAD, and consider removing infected trees.	Medium	Nonrecurring, Maintenance	$85,000	2020–2022	HWAD Environmental Division + Contractor
OBJECTIVE 4.2: Control invasive species.					
Update the depot's 2003 invasive species survey, and develop an ISMP that identifies areas impacted by invasive species and noxious weeds and specifies methods to control or eradicate them, particularly tamarisk and invasives in riparian areas, but also other invasive species and noxious weeds observed at HWAD. Implement controls as outlined in the ISMP.	High	Nonrecurring, Maintenance	$100,000	2018–2019	HWAD Environmental Division + Contractor
Promptly revegetate disturbed and fire-affected areas with native or other desirable plants when appropriate to prevent encroachment of invasive species.	High	Nonrecurring, Maintenance	Case-specific	Ongoing	HWAD Environmental Division + SOC
GOAL 5: MANAGE NATURAL RESOURCES TO MINIMIZE THE POTENTIAL FOR WILDFIRE LOSS.					
OBJECTIVE 5.1: Minimize wildfire loss through the implementation of effective policies and planning, and prevention measures.					
In accordance with AR 200-1 and the *Army Wildland Fire Policy Guidance* (DA ACSIM 2002; HQDA 2007), prepare an IWFMP that is compliant and integrated with the installation's existing fire and emergency services program, INRMP, and ICRMP.	High	Nonrecurring, Current Compliance	$100,000	2018–2019	HWAD Environmental Division + Contractor
Maintain mutual aid agreements for fire and emergency management support with state and federal agencies, Mineral County, WRPT, and other entities as applicable. Renew expired agreements and update agreements as needed.	High	Recurring	None	Ongoing	HWAD Environmental Division + SOC
Evaluate the need to reduce fuel loads to levels appropriate for the prevention of major wildfires. Periodically evaluate fuel buildup and, when necessary, reduce fuel loads by mechanical means (e.g., hand cutting, mowing, and grading).	High	Nonrecurring, Enhancement	Case-specific	Ongoing	HWAD Environmental Division + SOC + Contractor
Continue the prescribed burn program to assist with fuel reduction and management.	High	Recurring	Case-specific	Ongoing	HWAD Environmental Division + SOC

GOALS, OBJECTIVES, AND PROJECT NAMES	PRIORITY	CLASS	PROJECTED COST[a]	IMPLEMENTATION TIMEFRAME	RESPONSIBLE PARTY AND PARTNERS
GOAL 6: ASSESS THE POTENTIAL IMPACTS OF CLIMATE CHANGE ON NATURAL RESOURCES AND THE MISSION.					
OBJECTIVE 6.1: Assess climate change preparedness.					
Use the Army's vulnerability assessment tool and planning guidance to conduct a vulnerability assessment addressing the potential impacts of climate change on natural resources of interest at HWAD. Determine how those vulnerabilities might impact the military mission. Identify adaptive management strategies to mitigate risks and potential impacts of climate change. Review and update the vulnerability assessment as needed or approximately every 5 years.	High	Nonrecurring, Current Compliance	$100,000	2018–2020	HWAD Environmental Division + Contractor
GOAL 7: MAINTAIN NATURAL RESOURCES PROGRAM DATA.					
OBJECTIVE 7.1: Maintain a complete record of natural resources data in an organized and readily accessible manner.					
Develop a repository of natural resources and cultural resources data, including geospatial data, that includes all data collected by HWAD and its partners (e.g., agencies, universities, contractors). Ensure that the data are in a format readily usable by Environmental Division personnel.	Medium	Nonrecurring, Maintenance	$100,000	2020–2022	HWAD Environmental Division + Contractor

Note:
a None = no additional cost is anticipated beyond the salaries of natural resources personnel.

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Appendix A
Hawthorne Army Depot Flora Species List

Flora Species List (Updated 2018)

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Appendix A
Hawthorne Army Depot Flora Species List

Common Name	Scientific Name	Notes	Source
Phytoplankton			
Green algae	*Chlorophyta*	(1) Seven genera identified (2) 17 genera identified	(1) UNR 1994; (2) USAEHA 1979
Yellow-green and gold-brown algae	*Chrysophyta*	Nine genera identified	USAEHA 1979
Blue-green algae	Cy*anophyta; Nodularia spumigena*	(1) 10 genera, but only one species identified; (2) 17 genera identified	(1) UNR 1994; (2) USAEHA 1979
Diatoms sp.		27 genera identified	UNR 1994
Diatom	*Achnanthes spp.*	--	USAEHA 1979
Diatom	*Amphora spp.*	--	USAEHA 1979
Diatom	*Anomoeoneis spp.*	--	USAEHA 1979
Diatom	*Caloneis spp.*	--	USAEHA 1979
Diatoms	*Chaeotceros elmorei*	--	USAEHA 1979
Diatom	*Cocconeis spp.*	--	USAEHA 1979
Diatom	*Cyclotella spp.*	--	USAEHA 1979
Diatom	*Cymbella spp.*	--	USAEHA 1979
Diatom	*Diatoma spp.*	--	USAEHA 1979
Diatom	*Epithemia spp.*	--	USAEHA 1979
Diatom	*Fragilaria spp.*	--	USAEHA 1979
Diatom	*Frustulia rhomboides var. saxonica*	--	USAEHA 1979
Diatom	*Gomphonema spp.*	--	USAEHA 1979
Diatom	*Hantzschia amphioxys*	--	USAEHA 1979
Diatom	*Navicula spp.*	--	USAEHA 1979
Diatom	*Nitzschia spp.*	--	USAEHA 1979
Diatom	*Opephora martyi*	--	USAEHA 1979
Diatom	*Pinnularia spp.*	--	USAEHA 1979
Diatom	*Rhoicosphenia curvata*	--	USAEHA 1979
Diatom	*Rhopalodia gibba var. ventricosa*	--	USAEHA 1979
Diatom	*Stauroneis phoenicentreron*	--	USAEHA 1979
Diatom	*Surirella spp.*	--	USAEHA 1979
Diatom	*Synedra rumpens*	--	USAEHA 1979

Common Name	Scientific Name	Notes	Source
Tree			
Tree of heaven	Ailanthus altissima	Invasive	Nachlinger 2003
Iodine bush	*Allenrolfea occidentalis*	--	DZHC 1997; USAEHA 1979
Alder	*Alnus* sp.	--	Fleishman 2017
Thinleaf alder	*Alnus incana* spp. *tenuifolia*	--	DZHC 1997; TNC 1990
Russian olive	*Elaeagnus angustifolia*	Invasive	USDA SCS 1991; USACE 1980; USFWS 1999; Tetra Tech 2004
Western juniper	*Juniperus occidentalis*	--	Fleishman 2017
Utah juniper	*Juniperus osteosperma*	--	DZHC 1997; UNLV 1992; USAEHA 1979; TNC 2001
Whitebark pine	*Pinus albicaulis*	ESA Candidate; NNHP at-risk list	DZHC 1997; TNC 1990
Limber pine	*Pinus flexilis*	--	DZHC 1997; TNC 1990
Jeffrey pine	*Pinus jeffreyi*	--	DZHC 1997; Fleishman 2017; TNC 1990
Singleleaf pinyon, Pinyon pine	*Pinus monophylla*	--	DZHC 1997; Fleishman 2017; TNC 1990, 2001; UNLV 1992; USAEHA 1979
Ponderosa pine, yellow pine	*Pinus ponderosa*	--	DZHC 1997; USAEHA 1979
Black cottonwood	*Populus balsamifera* spp. *trichocarpa*	--	DZHC 1997; USAEHA 1979; USACE 1980
Fremont cottonwood	*Populus fremontii*	--	DZHC 1997; Fleishman 2017; TNC 1990; USAEHA 1979; USFWS 1999; Tetra Tech 2004
Lombardy poplar	*Populus nigra*	--	DZHC 1997; Fleishman 2017; USAEHA 1979
Quaking aspen	*Populus tremuloides*	--	DZHC 1997; Fleishman 2017; TNC 1990; USFWS 1999
White x crack willow	*Salix alba x fragilis*	Invasive	TNC 2001
Geyer willow, silver willow	*Salix geyeriana*	--	TNC 2001
Arroyo willow	*Salix lasiolepis*	--	DZHC 1997; TNC 1990, 2001
Lemmon's willow	*Salix lemmonii*	--	TNC 2001
Greenleaf willow	*Salix lucida* var. *caudata*	--	DZHC 1997; TNC 1990
Yellow willow	*Salix lutea*	--	TNC 2001
Shrub or sub-shrub			
Serviceberry	*Amelanchier alnifolia*	--	DZHC 1997; Fleishman 2017; USAEHA 1979
Little sagebrush	*Artemisia arbuscula*	--	DZHC 1997; TNC 1990, 2001
Black sagebrush	*Artemisia nova*	--	USAEHA 1979
Budsage	*Artemisia spinescens*	--	DZHC 1997; TNC 1990; USAEHA 1979

Common Name	Scientific Name	Notes	Source
Shrub or sub-shrub (Continued)			
Basin big sagebrush	*Artemisia tridentata* ssp. *tridentata*	--	DZHC 1997; Fleishman 2017; TNC 1990; UNLV 1992; USAEHA 1979; USFWS 1999
Mountain big sagebrush	*Artemisia tridentata* ssp. *vaseyana*	--	DZHC 1997
Wyoming big sagebrush	*Artemisia tridentata* ssp. *wyomingensis*	--	DZHC 1997; UNLV 1992; USAEHA 1979; TNC 2001
Fourwing saltbush	*Atriplex canescens*	--	DZHC 1997; TNC 1990, 2001; USAEHA 1979; USACE 1980; Tetra Tech 2004
Shadscale saltbrush	*Atriplex confertifolia*	--	DZHC 1997; TNC 1990, 2001; UNLV 1992; USAEHA 1979; USACE 1980; USFWS 1999
Smotherweed	*Bassia* sp.	--	USDA SCS 1991
Green molly	*Bassia americana*	--	USDA SCS 1991; TNC 2001
Desert brickellbush	*Brickellia desertorum*	--	DZHC 1997; TNC 1990
Longleaf brickellbush	*Brickellia longifolia* var. *multiflora*	--	
Littleleaf brickellbush	*Brickellia microphylla*	--	DZHC 1997; TNC 1990
Buckbrush	*Ceanothus cuneatus*	--	Fleishman 2017
Curl-leaf mountain mahogany	*Cercocarpus ledifolius* var. *intercedens*	--	DZHC 1997; TNC 1990, 2001; UNLV 1992; USAEHA 1979
Desert sweet	*Chamaebatiaria millefolium*	--	DZHC 1997; TNC 1990; UNLV 1992; TNC 2001
Yellow rabbitbrush, green rabbitbrush	*Chrysothamnus viscidiflorus*	--	Fleishman 2017; TNC 2001
Yellow rabbitbrush	*Chrysothamnus viscidiflorus* ssp. *puberulus*	--	DZHC 1997; TNC 1990
Yellow rabbitbrush	*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*	--	DZHC 1997; TNC 1990
Yellow rabbitbrush	*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*	--	DZHC 1997; TNC 1990; USDA SCS 1991; UNLV 1992
Redosier dogwood	*Cornus sericea*	--	DZHC 1997; TNC 1990
Redosier dogwood	*Cornus sericea* spp. *sericea*	--	DZHC 1997; USAEHA 1979; USFWS 1999
Nevada jointfir	*Ephedra nevadensis*	--	DZHC 1997; TNC 1990, 2001; USAEHA 1979
Mormon tea	*Ephedra viridis*	--	DZHC 1997; TNC 1990, 2001; UNLV 1992; USAEHA 1979; Tetra Tech 2004
Whitestem goldenbush	*Ericameria discoidea* var. *discoidea*	--	DZHC 1997; TNC 1990

Common Name	Scientific Name	Notes	Source
Shrub or sub-shrub (Continued)			
Dwarf goldenbush	*Ericameria nana*	--	DZHC 1997; TNC 1990
Goldenbush	*Ericameria* sp.	--	DZHC 1997
Rubber rabbitbrush	*Ericameria nauseosa*	--	DZHC 1997; Fleishman 2017; TNC 1990; UNLV 1992; USAEHA 1979; USACE 1980
Singlehead goldenbush	*Ericameria suffruticosa*	--	DZHC 1997; TNC 1990
Beatley's buckwheat	*Eriogonum beatleyae*	NNHP at-risk list	TNC 2001
Heermann's buckwheat	*Eriogonum heermannii var. argense*	--	DZHC 1997; TNC 1990, 2001
Heermann's buckwheat	*Eriogonum heermannii* var. *humilius*	--	DZHC 1997; TNC 1990, 2001
Slender buckwheat	*Eriogonum microthecum* var. *laxiflorum*	--	DZHC 1997; TNC 1990, 2001
Alexander's buckwheat	*Eriognoum ochrocephalum* var. *alexanderae*	NNHP at-risk list	TNC 2001
Sulfur-flower buckwheat	*Eriogonum umbellatum*	--	DZHC 1997: USAEHA 1979; TNC 1990, 2001
Spiny greasebush	*Glossopetalon spinescens* var. *aridum*	--	DZHC 1997; TNC 1990; UNLV 1992
Spiny hopsage	*Grayia spinosa*	--	DZHC 1997; TNC 1990; USAEHA 1979
Sand cholla	*Grusonia pulchella*	NNHP at-risk list	TNC 2001
Broom snakeweed	*Gutierrezia sarothrae*	--	DZHC 1997; USAEHA 1979; Tetra Tech 2004
Prickleleaf	*Hecastocleis shockleyi*	--	DZHC 1997; TNC 1990
Rockspirea	*Holodiscus dumosus*	--	DZHC 1997; TNC 1990
Burrobush	*Hymenoclea salsola*	--	DZHC 1997; TNC 1990
Winterfat	*Krascheninnikovia lanata*	--	DZHC 1997; TNC 1990
Honeysuckle	*Lonicera* sp.	--	DZHC 1997; USAEHA 1979
Lupine	*Lupinus* sp.	--	USDA SCS 1991
Water jacket	*Lycium andersonii*	--	DZHC 1997; TNC 1990; USAEHA 1979
Peach thorn	*Lycium cooperi*	--	USDA SCS 1991; USAEHA 1979
Shockley's desert-thorn	*Lycium shockleyi*	--	TNC 2001
Spiny menodora	*Menodora spinescens*	--	DZHC 1997; TNC 1990, 2001
Pricklypear	*Opuntia* sp.	--	USDA SCS 1991
Mountain tail-leaf	*Pericome caudata*	--	DZHC 1997; TNC 1990
Nevada rockdaisy	*Perityle megalocephala* var. *megalocephala*	--	DZHC 1997' TNC 1990

Common Name	Scientific Name	Notes	Source
Shrub or sub-shrub (Continued)			
Alpine timothy	*Phleum alpinum*	--	USDA SCS 1991
Phlox	*Phlox* sp.	--	USDA SCS 1991
Desert peach	*Prunus andersonii*	--	DZHC 1997; Fleishman 2017; TNC 1990
Sierra plum	*Prunus subcordata*	--	DZHC 1997; USAEHA 1979
Chokecherry	*Prunus virginiana*	--	DZHC 1997; TNC 1990
Nevada dalea	*Psorothamnus polydenius* var. *polydenius*	--	DZHC 1997; USAEHA 1979; TNC 2001
Desert bitterbrush	*Purshia glandulosa*	--	DZHC 1997; TNC 1990; USAEHA 1979
Antelope bitterbrush	*Purshia tridentata*	--	DZHC 1997; TNC 1990, 2001
Golden currant	*Ribes aureum*	--	DZHC 1997; TNC 1990; USAEHA 1979
Wax currant	*Ribes cereum*	--	DZHC 1997; TNC 1990
Whisky currant	*Ribes cereum* var. *pedicellare*	--	DZHC 1997; USAEHA 1979
Whitestem gooseberry	*Ribes inerme*	--	DZHC 1997; USAEHA 1979
Alpine gooseberry	*Ribes lasianthum*	--	DZHC 1997; USAEHA 1979
Gooseberry currant	*Ribes montigenum*	--	DZHC 1997; USAEHA 1979
Currant, gooseberry	*Ribes* sp.	--	DZHC 1997; Fleishman 2017; TNC 1990; USAEHA 1979; Tetra Tech 2004
Desert gooseberry	*Ribes velutinum*	--	DZHC 1997; TNC 1990
Woods' rose	*Rosa woodsii*	--	DZHC 1997; Fleishman 2017; TNC 1990; UNLV 1992; USAEHA 1979; USFWS 1999
Booth's willow	*Salix boothii*	--	DZHC 1997; TNC 1990
Drummond's willow	*Salix drummondiana*	--	DZHC 1997; TNC 1990
Coyote willow	*Salix exigua*	--	DZHC 1997; TNC 1990, 2001; UNLV 1992; USAEHA 1979; USFWS 1999
Crack willow	*Salix fragilis*	--	TNC 2001
Red willow	*Salix laevigata*	--	USAEHA 1979
Arroyo willow	*Salix lasiolepis*	--	USAHEA 1979
Yellow willow	*Salix lutea*	--	DZHC 1997; TNC 1990
Scouler's willow	*Salix scouleriana*	--	USAEHA 1979
Willow	*Salix* sp.	--	DZHC 1997; Fleishman 2017; TNC 1990, 2001; Tetra Tech 2004
Purple sage	*Salvia dorrii* spp. *dorrii*	--	TNC 2001

Common Name	Scientific Name	Notes	Source
Shrub or sub-shrub (Continued)			
Blue elderberry	*Sambucus nigra* spp. *cerulean*	--	DZHC 1997; TNC 1990; USAE HA 1979
Bailey's greasewood	*Sarcobatus baileyi*	--	DZHC 1997; TNC 1990
Greasewood	*Sarcobatus vermiculatus*	--	DZHC 1997; TNC 1990; USAEHA 1979
Tansy ragwort, stinking willie	*Senecio jacobaea*	Invasive	Tetra Tech 2004
Ragwort, groundsel	*Senecio* sp.		USFWS 1999
Silver buffaloberry	S*hepherdia argentea*	--	DZHC 1997; TNC 1990
Gray chickensage	*Sphaeromeria cana*	--	DZHC 1997' TNC 1990
Alkali sacaton	*Sporobolus airoides*	--	USDA SCS 1991
Panamint princesplume	*Stanleya elata*	--	DZHC 1997; UNLV 1992
Desert princesplume	*Stanleya pinnata*	--	DZHC 1997; Rathbun 1997
Five-stamen tamarisk	*Tamarix chinensis*	--	DZHC 1997; TNC 1990
Smallflower tamarisk	*Tamarix parviflora*	--	DZHC 1997; TNC 1990; USACE 1980
Tamarisk, saltcedar	*Tamarix ramosissima*	Invasive, NNWL	DZHC 1997; USAEHA 1979; USFWS 1999; Tetra Tech 2004
Spineless horesbrush	*Tetradymia canescens*	--	DZHC 1997; TNC 1990
Littleleaf horsbrush	*Tetradymia glabrata*	--	DZHC 1997; TNC 1990, 2001; USAEHA 1979
Fourpart horsebrush	*Tetradymia tetrameres*	--	USAEHA 1979
Graminoid (grass or grass-like species)			
No common name found	*Achnatherum* x *bloomeri*	--	USDA SCS 1991
Indian ricegrass	*Achnatherum hymenoides*	--	DZHC 1997; TNC 1990, 2001; UNLV 1992; USAEHA 1979
Lemmon's needlegrass	*Achnatherum lemmonii* var. *lemmonii*	--	USDA SCS 1991
Letterman's needlegrass	*Achnatherum lettermanii*	--	DZHC 1997; TNC 1990
Columbia Dore's needlegrass	*Achnatherum nelsonii* spp. *dorei*	--	USDA SCS 1991
Nevada needlegrass	*Achnatherum nevadensis*	--	DZHC 1997; TNC 1990
Western needlegrass	*Achnatherum occidentale*	--	DZHC 1997; TNC 1990; UNLV 1992
Pine needlegrass	*Achnatherum pinetorum*	--	DZHC 1997; TNC 1990
Desert needlegrass	*Achnatherum speciosum*	--	DZHC 1997; TNC 1990, 2001; USAEHA 1979; Tetra Tech 2004
Thurber's needlegrass	*Achnatherum thurberianum*	--	DZHC 1997; TNC 1990
Needlegrass	*Achnatherum* spp.	--	DZHC 1997; TNC 1990; USAEHA 1979

Common Name	Scientific Name	Notes	Source
Graminoid (grass or grass-like species) (Continued)			
Spike bentgrass	*Agrostis exarata*	--	DZHC 1997; TNC 1990
Rough bentgrass	*Agrostis scabra*	--	DZHC 1997; TNC 1990
Creeping bentgrass	*Agrostis stolonifera*	--	DZHC 1997; TNC 1990
Foxtail	*Alopecurus* sp.	--	USFWS 1999
King's eyelashgrass	*Blepharidachne kingii*	--	DZHC 1997; TNC 1990
California brome	*Bromus carinatus*	--	DZHC 1997; TNC 1990
Rescuegrass	*Bromus catharticus*	--	DZHC 1997; TNC 1990
Red brome	*Bromus rubens*	--	DZHC 1997; TNC 1990
Cheatgrass	*Bromus tectorum*	Invasive	DZHC 1997; Fleishman 2017; UNLV 1992; USACE 1980; TNC 2001; Tetra Tech 2004
Purple reedgrass	*Calamagrostis purpurascens*	--	DZHC 1997; TNC 1990, 2001
Water sedge	*Carex aquatilis*		USFWS 1999
Slenderbeak sedge	*Carex athrostachya*	--	DZHC 1997; TNC 1990, 2001
Douglas' sedge	*Carex douglasii*	--	DZHC 1997; TNC 1990
Smallwing sedge	*Carex microptera*	--	DZHC 1997; TNC 1990
Nebraska sedge	*Carex nebrascensis*	--	DZHC 1997; TNC 1990
Woolly sedge	*Carex pellita*	--	DZHC 1997; TNC 1990
Dunhead sedge	*Carex phaeocephala*	--	DZHC 1997; TNC 1990
Ross' sedge	*Carex rossii*	--	DZHC 1997; TNC 1990
Sedge	*Carex* sp.	--	DZHC 1997; TNC 1990
Desert sweet	*Chamaebatiaria millefolium*	--	USDA SCS 1991
Saltgrass	*Distichlis spicata*	--	DZHC 1997; TNC 1990; USAEHA 1979; USACE 1980; USFWS 1999
Squirreltail	*Elymus elymoides*	--	DZHC 1997; TNC 1990, 2001; UNLV 1992; USACE 1980
Thickspike wheatgrass	*Elymus lanceolatus* spp. *lanceolatus*	--	USDA SCS 1991
Slender wheatgrass	*Elymus trachycaulus*	--	USDA SCS 1991
Slender wheatgrass	*Elymus trachycaulus* spp. *trachycaulus*	--	DZHC 1997; TNC 1990
Horsetail	*Equisetum* sp.	--	DZHC 1997; TNC 1990
Bailey's buckwheat	*Eriogonum baileyi*	--	USAEHA 1979
Desert trumpet	*Eriogonum inflatum*	--	USAEHA 1979; TNC 2001
Volcanic buckwheat	*Eriogonum lemmonii*	--	USAEHA 1979
Rosy buckwheat	*Eriogonum rosense*	--	TNC 2001
Buckwheat	*Eriogonum* sp.	--	Rathbun 1997; USAEHA 1979

Common Name	Scientific Name	Notes	Source
Graminoid (grass or grass-like species) (Continued)			
Alpine fescue	*Festuca brachyphylla*	-	DZHC 1997; TNC 1990
Idaho fescue	*Festuca idahoensis*	--	DZHC 1997; TNC 1990
Fowl mannagrass	*Glyceria striata*	--	TNC 2001
Salt heliotrope	*Heliotropium curassavicum*	--	USDA SCS 1991
Needle and thread	*Hesperostipa comata*	--	DZHC 1997; TNC 1990
Meadow burley	*Hordeum brachyantherum*	--	DZHC 1997; TNC 1990
Smooth barley	*Hordeum murinum* spp. *glaucum*	--	DZHC 1997; TNC 1990
Foxtail barley	*Hordeum jubatum*	--	USDA SCS 1991; USFWS 1999
Povertyweed	*Iva axillaris*	--	USDA SCS 1991
Northern green rush	*Juncus alpinoarticulatus*		USFWS 1999
Baltic rush	*Juncus balticus*	--	DZHC 1997; TNC 1990; USFWS 1999
Swordleaf rush	*Juncus ensifolius*	--	DZHC 1997; TNC 1990
Longstyle rush	*Juncus longistylis*		TNC 2001
Sierra rush	*Juncus nevadensis*	--	DZHC 1997; TNC 1990
Straightleaf rush	*Juncus orthophyilus*	--	DZHC 1997; TNC 1990
Rush	*Juncus* sp.	--	USFWS 1999
Prairie Junegrass	*Koeleria macrantha*	--	DZHC 1997; TNC 1990
Spike fescue	*Leucopoa kingii*	--	DZHC 1997; TNC 1990, 2001
Basin wildrye	*Leymus cinereus*	--	DZHC 1997; TNC 1990, 2001; USFWS 1999; Tetra Tech 2004
Beardless wildrye	*Leymus triticoides*	--	DZHC 1997; TNC 1990; USAEHA 1979
Woodrush	*Luzula* sp.	--	USFWS 1999
Rock melicgrass	*Melica stricta*	--	DZHC 1997; TNC 1990
Scratchgrass, alkali muhly	*Muhlenbergia asperifolia*		TNC 2001
Bush muhly	*Muhlenbergia porteri*	--	USACE 1980
Mat muhly	*Muhlenbergia richardsonis*	--	DZHC 1997; TNC 1990
Desert panicgrass	*Panicum urvilleanum*	--	USAEHA 1979
James' galleta	*Pleuraphis jamesii*	--	DZHC 1997; TNC 1990; UNLV 1992; USAEHA 1979
Cusick's bluegrass	*Poa cusickii*	--	DZHC 1997; TNC 1990; USDA SCS 1991
Cusick's bluegrass	*Poa cusickii* var. *epilis*	--	DZHC 1997; TNC 1990
Muttongrass	*Poa fendleriana*	--	DZHC 1997; TNC 1990
Timberline bluegrass	*Poa glauca* spp. *rupicola*	--	DZHC 1997; TNC 1990

Common Name	Scientific Name	Notes	Source
Graminoid (grass or grass-like species) (Continued)			
Fowl bluegrass	*Poa palustris*	--	DZHC 1997; TNC 1990
Kentucky bluegrass	*Poa pratensis*	--	DZHC 1997; TNC 1990
Sandberg bluegrass	*Poa secunda*	--	DZHC 1997; TNC 1990
Bluegrass	*Poa* spp.	--	DZHC 1997; TNC 1990; USFWS 1999
Annual rabbitsfoot grass	*Polypogon monspeliensis*	--	DZHC 1997; TNC 1990, 2001
Bluebunch wheatgrass	*Pseudoroegneria spicata* spp. *spicata*	--	USAEHA 1979
Saltmarsh alkaligrass	*Puccinellia fasciculata*	--	USAEHA 1979
Dock	*Rumex* spp.	--	USAEHA 1979
Hardstem bulrush	*Schoenoplectus acutus*	--	USFWS 1999
Common threesquare	*Schoenoplectus pungens*	--	TNC 2001
Panicled bulrush	*Scirpus microcarpus*	--	DZHC 1997; TNC 1990
Nevada bulrush	*Scirpus nevadensis*	--	TNC 2001
Bulrush	*Scirpus* sp.	--	DZHC 1997; TNC 1990
Tumblemustard	*Sisymbrium altissimum*	--	USDA SCS 1991
Sand dropseed	*Sporobolus cryptandrus*	--	DZHC 1997; TNC 1990; USACE 1980
Medusahead rye	*Taeniatherum caput-medusae*	Invasive, NNWL	USACE 1980
Spike spicatum	*Trisetum spicatum*	--	DZHC 1997; TNC 1990
Narrowleaf cattail	*Typha angustifolia*	--	USFWS 1999
Broadleaf cattail	*Typha latifolia*	--	DZHC 1997; TNC 1990; USACE 1980
Sixweeks fescue	*Vulpia octoflora* var. *hirtella*	--	DZHC 1997; TNC 1990
Sixweeks fescue	*Vulpia octoflora* var. *octoflora*	--	DZHC 1997; TNC 1990
Forb/herb			
Sand verbena	*Abronia* sp.	--	USDA SCS 1991
Yarrow	*Achillea millefolium*	--	DZHC 1997; TNC 1990; USAEHA 1979; USFWS 1999
Pale agoseris	*Agoseris glauca*	--	DZHC 1997; TNC 1990
Darkred onion	*Allium atrorubens*	--	DZHC 1997; TNC 1990
Twincrest onion	*Allium bisceptrun*	--	DZHC 1997; TNC 1990
Small onion	*Allium parvum*	--	DZHC 1997; TNC 1990
Onion	*Allium* sp.	--	DZHC 1997; TNC 1990
Pacific onion	*Allium validum*	--	DZHC 1997; TNC 1990
Bristly fiddleneck	*Amsinckia tessellata*	--	DZHC 1997; TNC 1990

Common Name	Scientific Name	Notes	Source
Forb/herb (Continued)			
Pigmyflower rockjasmine	*Androsace septentrionalis* ssp. *subumbellata*	--	DZHC 1997; TNC 1990
King's angelica	*Angelica kingii*	--	DZHC 1997; TNC 1990
Flat-top pussytoes	*Antennaria corymbosa*	--	DZHC 1997; TNC 1990
Rosy pussytoes	*Antennaria rosea*	--	DZHC 1997; TNC 1990
Pussytoes	*Antennaria* sp.	--	DZHC 1997; TNC 1990
Umber pussytoes	*Antennaria umbrinella*	--	DZHC 1997; TNC 1990
Spreading dogbane	*Apocynum androsaemifolium*	--	DZHC 1997; TNC 1990, 2001; USAEHA 1979
Western columbine	*Aquilegia formosa*	--	DZHC 1997; TNC 1990
Columbine	*Aquilegia* sp.	--	DZHC 1997; TNC 1990; USAEHA 1979
Bodie Hills rockcress	*Arabis bodiensis*	NNHP at-risk list	DZHC 1997; TNC 1990, 2001
Second rockcress	*Arabis holboellii* var. *retrofracta*	--	DZHC 1997; TNC 1990, 2001
Soldier rockcress	*Arabis lemmonii* var. *depauperata*	--	DZHC 1997; TNC 1990
Beautiful rockcress	*Arabis pulchra*	--	TNC 2001
Rockcress	*Arabis* sp.	--	DZHC 1997; TNC 1990; USACE 1980
Sicklepod rockcress	*Arabis sparsiflora* var. *sparsiflora*	--	TNC 2001
Spreadingpod rockcress	*Arabis* x *divaricarpa*	--	DZHC 1997; TNC 1990
Lesser burdock	*Arctium minus*	Invasive	Tetra Tech 2004
King's compact sandwort	*Arenaria kingii* var. *compacta*	--	DZHC 1997; TNC 1990, 2001
Flatbud pricklypoppy	*Argemone munita*	--	DZHC 1997; TNC 1990; USAEHA 1979; TNC 2001
Prickly poppy	*Argemone squarrosa*	--	Rathbun 1997
Arnica	*Arnica* sp.	--	DZHC 1997; TNC 1990
Tarragon	*Artemisia dracunculus*	--	DZHC 1997; TNC 1990, 2001
White sagebrush	*Artemisia ludoviciana* ssp. *incompta*	--	DZHC 1997; TNC 1990
Eaton's aster	*Aster bracteolatos*	--	DZHC 1997; TNC 1990
Aster	*Aster* sp.	--	DZHC 1997; TNC 1990
Milkvetch	*Astragalus* sp.	--	DZHC 1997; Rathbun 1997; TNC 1990; USAEHA 1979
Torrey's milkvetch	*Astragalus calycosus* var. *calycosus*	--	DZHC 1997; TNC 1990
Humboldt River milkvetch	*Astragalus iodanthus* var. *iodanthus*	--	DZHC 1997; TNC 1990

Common Name	Scientific Name	Notes	Source
Forb/herb (Continued)			
Long Valley milkvetch	*Astragalus johannis-howellii*	NNHP at-risk list	DZHC 1997; TNC 1990; USAEHA 1979
Kennedy's milkvetch	*Astragalus lentiginosus* var. *kennedyi*	--	DZHC 1997; TNC 1990
Woollypod milkvetch	*Astragalus purshii* var. *tinctus*	--	DZHC 1997; TNC 1990
Shockley's milkvetch	*Astragalus serenoi* var. *shockleyi*	--	DZHC 1997; TNC 1990
Balloonpod milkvetch	*Astragalus whitneyi* var. *whitneyi*	--	DZHC 1997; TNC 1990; USAEHA 1979
Arrowleaf balsamroot	*Balsamorhiza sagittata*	--	Rathbun 1997
American yellowrocket	*Barbarea orthoceras*	--	DZHC 1997; TNC 1990
Fivehorn smotherweed	*Bassia hyssopifolia*	--	DZHC 1997; TNC 1990; USAEHA 1979
Nuttall's water-starwort	*Callitriche pedunculosa*	--	USFWS 1999
Sego lilly	*Calochortus nuttalii*	--	DZHC 1997; TNC 1990
Browneyes	*Camissonia claviformis*	--	DZHC 1997; TNC 1990
Browneyes	*Camissonia claviformis* spp. *claviformis*	--	USAEHA 1979
Suncup	*Camissonia* sp.	--	DZHC 1997; TNC 1990
Sheperd's purse	*Capsella bursa-pastoris*	--	USACE 1980
Whitetop, hoary cress	*Cardaria draba*	Invasive, NNWL	DZHC 1997; TNC 1990; USAEHA 1979; Tetra Tech 2004
Desert paintbrush	*Castilleja chromosa*	--	DZHC 1997; TNC 1990; USAEHA 1979
Wyoming Indian paintbrush	*Castilleja linariifolia*	--	DZHC 1997; TNC 1990
Lesser Indian paintbrush	*Castilleja minor* spp. *minor*	--	TNC 2001
Dwarf alpine Indian paintbrush	*Castilleja nana*	--	DZHC 1997; TNC 1990
Indian paintbrush	*Castilleja* sp.	--	DZHC 1997; Rathbun 1997; TNC 1990
Desert centaury	*Centaurium exaltatum*	--	TNC 2001
Douglas' dustymaiden	*Chaenactis douglasii*	--	DZHC 1997; TNC 1990
Esteve's pincushion	*Chaenactis stevioides*	--	DZHC 1997; TNC 1990
Pincushion	*Chaenactis* sp.	--	DZHC 1997; TNC 1990
Lace lipfern	*Cheilanthes gracillima*	--	DZHC 1997; TNC 1990
Lambsquarters	*Chenopodium album*	--	USACE 1980
Goosefoot	*Chenopodium* sp.	--	DZHC 1997; TNC 1990; USAEHA 1979
Rush skeletonweed	*Chondrilla juncea*	Invasive, NNWL	Tetra Tech 2004

Common Name	Scientific Name	Notes	Source
Forb/herb (Continued)			
Bull thistle	*Cirsium vulgare*	Invasive	DZHC 1997; USAEHA 1979; Tetra Tech 2004
Rosy pussypaws	*Cistanthe rosea*	--	DZHC 1997; TNC 1990
Mount Hood pussypaws	*Cistanthe umbellata* var. *caudicifera*	--	DZHC 1997; TNC 1990
Maiden blue eyed Mary	*Collinsia parviflora*	--	DZHC 1997; TNC 1990
Tiny trumpet	*Collomia linearis*	--	DZHC 1997; TNC 1990
Field bindweed	*Convolvulus arvensis*	--	DZHC 1997; TNC 1990
Summer coralroot	*Corallorhiza maculata*	--	DZHC 1997; TNC 1990
Tapertip hawksbeard	*Crepis acuminata*	--	DZHC 1997; Rathbun 1997; TNC 1990
Dwarf alpine hawksbeard	*Crepis nana*	--	DZHC 1997; TNC 1990
Gray wavewing	*Cymopterus cinerarius*	NNHP at-risk list	TNC 2001
Cryptantha	*Cryptantha* sp.	--	USAEHA 1979
Anderson's larkspur	*Delphinium andersonii*	--	USAEHA 1979
Larkspur	*Delphinium* sp.	--	Rathbun 1997
Flixweed	*Descurainia sophia*	Invasive	Tetra Tech 2004
Southern monkeyflower	*Diplacus longiflorus*	--	USFWS 1999
Stream orchid	*Epipactis gigantea*	--	Provencher 2018
Rubber rabbitbrush	*Ericameria nauseosa*	--	USFWS 1999; TNC 2001; Tetra Tech 2004
Matted buckwheat	*Eriogonum caespitosum*	--	USDA SCS 1991
Clokey's fleabane	*Erigeron clokeyi*	--	TNC 2001
Fleabane	*Erigeron* sp.	--	USDA SCS 1991; USAEHA 1979
Redstem stork's bill	*Erodium cicutarium*	Invasive	USACE 1980; Tetra Tech 2004
Stork's bill	*Erodium* sp.	--	USDA SCS 1991
Spurge	*Euphorbia* sp.	--	USAEHA 1979
Cutleaf geranium	*Geranium dissectum*	--	USAEHA 1979
Carveseed	*Glyptopleura marginata*	--	USAEHA 1979
Curlycup gumweed	*Grindelia squarrosa*	--	USACE 1980
Saltlover	*Halogeton glomeratus*	Invasive	USDA SCS 1991; USACE 1980; Tetra Tech 2004
Common sunflower	*Helianthus annuus*	Invasive	Tetra Tech 2004
Common cowparsnip	*Heracleum maximum*	--	USAEHA 1979
Owl's-claws	*Hymenoxys hoopesii*	--	USAEHA 1979
Common St. Johnswort	*Hypericum perforatum*	Invasive, NNWL	Tetra Tech 2004

Common Name	Scientific Name	Notes	Source
Forb/herb (Continued)			
Rocky Mountain iris	*Iris missouriensis*	--	USDA SCS 1991; USFWS 1999
Iris	*Iris* sp.	--	USAEHA 1979
Prickly lettuce	*Lactuca serriola*	--	USACE 1980
Schott's calico	*Loeseliastrum schottii*	--	Rathbun 1997
Pepperweed	*Lepidium* sp.	--	Rathbun 1997; USDA SCS 1991
Bladderpod	*Lesquerella* sp.	--	USAEHA 1979
Granite prickly phlox	*Linanthus pungens*	--	TNC 2001
Watson's prickly phlox	*Linanthus watsonii*	--	TNC 2001
Nevada biscuitroot	*Lomatium nevadense*	--	USAEHA 1979
Lupine	*Lupinus* sp.	--	USAEHA 1979
Skeletonplant	*Lygodesmia* sp.	--	USDA SCS 1991
Starry false lily of the valley	*Maianthemum stellatum*	--	USAEHA 1979
Sweetclover	*Melilotus officinalis*	Invasive	Tetra Tech 2004
Smoothstem blazingstar	*Mentzelia laevicaulis*	--	USDA SCS 1991; TNC 2001
Seep monkeyflower	*Mimulus guttatus*	--	TNC 2001
Monkeyflower	*Mimulus* sp.	--	USAEHA 1979
Brittle sandwort	*Minuartia nuttallii* ssp. *fragilis*	--	TNC 2001
Brittle sandwort	*Minuartia nuttallii* ssp. *gracilis*	--	DZHC 1997; TNC 1990
Winged four o'clock	*Mirabilis alipes*	--	USAEHA 1979
Birdcage evening primrose	*Oenothera deltoides*	--	USDASCS 1991
Evening primrose	*Oenothera* sp.	--	USDA SCS 1991
Nevada oryctes	*Oryctes nevadensis*	NNHP at-risk list	TNC 2001
African rue	*Peganum harmala*	Invasive, NNWL	TNC 2001; Tetra Tech 2004
Palmer's penstemon	*Penstemon palmeri*	--	Rathbun 1997
Wassuk beardtongue	*Penstemon rubicundus*	NNHP at-risk list	TNC 2001
Phacelia	*Phacelia* sp.	--	Rathbun 1997
Knotweed	*Polygonum* sp.	--	USAEHA 1979
Cinquefoil	*Potentilla* sp.	--	USDA SCS 1991; USFWS 1999
Dock	*Rumex* sp.	--	USAEHA 1979
Red swampfire	*Salicornia rubra*	--	USAEHA 1979
Barbwire Russian thistle	*Salsola paulsenii*	Invasive	Tetra Tech 2004
Russian thistle	*Salsola tragus*	Invasive	Tetra Tech 2004
Bailey's greasewood	*Sarcobatus baileyi*	--	TNC 2001; Tetra Tech 2001
Desert globemallow	*Sphaeralcea ambigua*	--	TNC 2001

Common Name	Scientific Name	Notes	Source
Forb/herb (Continued)			
Globemallow	*Sphaeralcea* sp.	--	UNLV 1992; USDA SCS 1991; USAEHA 1979
Munro's globemallow	*Sphaeralcea munroana*	--	DZHC 1997; Rathbun 1997
Woollyhead parsnip	*Sphenosciadium capitellatum*	--	USAEHA 1979
Longstalk starwort	*Stellaria longipes*	--	DZHC 1997; TNC 1990
Brownplume wirelettuce	*Stephanomeria pauciflora*	--	DZHC 1997; TNC 1990
Masonic Mountain jewelflower	*Streptanthus oliganthus*	NNHP at-risk list	DZHC 1997; TNC 1990
Mojave seablite	*Suaeda moquinii*	--	DZHC 1997; TNC 1990
Desert snowberry	*Symphoricarpos longiflorus*	--	TNC 2001
Mountain snowberry	*Symphoricarpos oreophilus*	--	TNC 2001
Common dandelion	*Taraxacum officinale*	--	DZHC 1997; TNC 1990
Field pennycress	*Thlaspi arvense*	--	DZHC 1997; TNC 1990
Yellow salsify	*Tragopogon dubius*	--	Tetra Tech 2004
Desert horsepurslane	*Trianthema portulacastrum*	--	DZHC 1997; TNC 1990
Beatley's clover	*Trifolium andersonii* var. *beatleyae*		TNC 2001
Longstalk clover	*Trifolium longipes*	--	DZHC 1997; TNC 1990
Mountain carpet clover	*Trifolium monanthum*	--	DZHC 1997; TNC 1990
Cows clover	*Trifolium wormskioldii*	--	DZHC 1997; TNC 1990
Clover	*Trifolium* sp.	--	DZHC 1997; TNC 1990
Stinging nettle	*Urtica dioica* spp. *holosericea*	--	DZHC 1997; TNC 1990
Nettle	*Urtica* sp.	--	DZHC 1997; TNC 1990
Hairyfruit valerian	*Valeriana acutiloba* var. *pubicarpa*	--	DZHC 1997; TNC 1990
Common mullein	*Verbascum thapsus*	Invasive	Tetra Tech 2004
American speedwell	*Veronica americana*	--	DZHC 1997; TNC 1990
American vetch	*Vicia americana*	--	DZHC 1997; TNC 1990
Sixweeks fescue	*Vulpia octoflora* var. *octoflora*	--	USAEHA 1979
Woolly mule-ears	*Wyethia mollis*	--	DZHC 1997; TNC 1990

Notes

-- = No data or not applicable

ESA = Endangered Species Act

NNHP = Nevada Natural Heritage Program

NNWL = Nevada Noxious Weed List (NDA 2018)

References with the following citations are no longer available for review and species with those citations may refer to species identified at HWAD or species with the potential to occur at HWAD. The remaining citations refer to documented sightings at HWAD.

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- TNC 1990
- USACE 1980
- USAEHA 1979
- UNLV 1992
- UNR 1994, 1996

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Appendix B
Hawthorne Army Depot Fauna Species List

Fauna Species List (Updated 2018)

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Appendix B
Hawthorne Army Depot Fauna Species List

Common Name	Scientific Name	Notes	Source
Mammals			
White-tailed antelope squirrel	*Ammospermophilus leucurus*	--	USAEHA 1979; Blair and Kimball 1991
Pronghorn	*Antilocapra americana*	--	USAEHA 1979; Salsbury 2018, personal communication
Pallid bat	*Antrozous pallidus*	--	HAAP 1991
Burro	*Asinus* sp.	--	Salsbury 2018, personal communication
Ringtail	*Bassariscus astutus*	--	HAAP 1991
Pygmy rabbit	*Brachylagus idahoensis*	--	HAAP 1991
Coyote	*Canis latrans*	--	CECS 1991
Golden-mantled ground squirrel	*Callospermophilus lateralis*	--	USAEHA 1979
Long-tailed pocket mouse	*Chaetodipus formosus*	--	HAAP 1991
Western big-eared bat	*Corynorhinus rafinesquei*	--	HAAP 1991
Merriam's kangaroo rat	*Dipodomys merriami*	--	USAEHA 1979
Chisel-toothed kangaroo rat	*Dipodomys microps*	--	USAEHA 1979
Ord's kangaroo rat	*Dipodomys ordii*	--	HAAP 1991
Big brown bat	*Eptesicus fuscus*	--	HAAP 1991
Feral horse	*Equus caballus*	--	CECS 1991
North American porcupine	*Erethizon dorsatum*	--	HAAP 1991
Spotted bat	*Euderma maculatum*	--	HAAP 1991
Panamint chipmunk	*Eutamias paniminti*	--	HAAP 1991
Sagebrush vole	*Lemmiscus curtatus*	NNHP watch list	USAEHA 1979
Silver-haired bat	*Lasionycteris noctivagans*	--	USAEHA 1979
Eastern red bat, red bat	*Lasiurus borealis*	--	HAAP 1991
Hoary bat	*Lasiurus cinereus*	--	USAEHA 1979
Black-tailed jackrabbit	*Lepus californicus*	--	Blair and Kimball 1991
White-tailed jackrabbit	*Lepus townsendii*	--	USAEHA 1979
Bobcat	*Lynx rufus*	--	Blair and Kimball 1991
Yellow-bellied marmot	*Marmota flaviventris*	--	Blair and Kimball 1991
Striped skunk	*Mephitis mephitis*	--	HAAP 1991
Dark kangaroo mouse	*Microdipodops megacephalus*	--	HAAP 1991

Common Name	Scientific Name	Notes	Source
Mammals (Continued)			
Pale kangaroo mouse	*Microdipodops pallidus*	NNHP at-risk list	HAAP 1991
Long-tailed vole	*Microtus longicaudus*	--	HAAP 1991
Mountane vole	*Microtus montanus*	--	USAEHA 1979
Short-tailed weasel, stoat	*Mustela erminea*	--	HAAP 1991
Long-tailed weasel	*Mustela frenata*	--	HAAP 1991
California myotis	*Myotis californicus*	NNHP watch list	HAAP 1991
Western small-footed myotis	*Myotis ciliolabrum*	NNHP watch list	USAEHA 1979
Long-eared myotis	*Myotis evotis*	NNHP watch list	USAEHA 1979
Little brown myotis	*Myotis lucifugus*	NNHP at-risk list	USAEHA 1979
Fringed myotis	*Myotis thysanodes*	NNHP at-risk list	HAAP 1991
Long-legged myotis	*Myotis volans*	NNHP watch list	HAAP 1991
Yuma myotis	*Myotis yumanensis*	NNHP watch list	HAAP 1991
Bushy-tailed woodrat	*Neotoma cinereal*	--	CECS 1991
Desert woodrat	*Neotoma lepida*	--	HAAP 1991
American Mink	*Neovison vison*	--	HAAP 1991
American pika	*Ochotona princeps*	NNHP at-risk list	Beever 2013, personal communication
Mule deer	*Odocoileus hemionus*	--	USAEHA 1979
Northern grasshopper mouse	*Onychomys leucogaster*	--	HAAP 1991
Southern grasshopper mouse	*Onychomys torridus*	--	HAAP 1991
Nelson desert bighorn sheep	*Ovis canadensis nelsoni*	Reintroduced 1968	USAEHA 1979
Little pocket mouse	*Perognathus longimembris*	Valley floor	USAEHA 1979
Great Basin pocket mouse	*Perognathus parvus*	Sage brush and pinyon pine habits in valley and watershed	USAEHA 1979
Canyon mouse	*Peromyscus crinitus*	--	HAAP 1991
Deer mouse	*Peromyscus maniculatus*	Walker valley and watershed areas	USAEHA 1979
Pinyon mouse	*Peromyscus truei*	Mount Grant	USAEHA 1979
Western pipistrelle	*Pipistrellus hesperus*	--	HAAP 1991
Raccoon	*Procyon lotor*	--	HAAP 1991
Mountain lion	*Puma concolor*	--	Blair and Heindl 1992
Western harvest mouse	*Reithrodontomys*	--	HAAP 1991
Broad-footed mole	*Scapanus latimanus*	--	HAAP 1991
Merriam's shrew	*Sorex merriami*	--	HAAP 1991
American water shrew	*Sorex palustris*	NNHP at-risk list	HAAP 1991

Common Name	Scientific Name	Notes	Source
Mammals (Continued)			
Spotted skunk	*Spilogale putorius*	--	HAAP 1991
Mountain cottontail	*Sylvilagus nuttallii*	--	HAAP 1991
Brazilian free-tailed bat, Mexican free-tailed bat	*Tadarida brasiliensis*	--	HAAP 1991
Least chipmunk	*Tamias minimus*	--	USAEHA 1979
American badger	*Taxidea taxus*	--	HAAP 1991
Botta's pocket gopher	*Thomomys bottae*	--	HAAP 1991
Northern pocket gopher	*Thomomys talpoides*	--	HAAP 1991
Townsend's ground squirrel	*Urocitellus townsendii*	--	HAAP 1991
Gray fox	*Urocyon cinereoargenteus*	--	UHAAP 1991
American black bear	*Ursus americanus*	--	NDOW and HWAD 1997
Swift fox	*Vulpes velox*	--	CECS 1991
Birds			
Cooper's hawk	*Accipiter cooperii*	Walker Lake area, canyons	GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Sharp-shinned hawk	*Accipiter striatus*	Terrestrial	NWGPF 1997, GBBO 1998, 2003; Fleishman 2017
Spotted sandpiper	*Actitis macularius*	Walker Lake	Brussard et al. 1996
Clark's grebe	*Aechmophorus clarkii*	BCC, Shoreline	Stockwell 1994; Brussard et al. 1996, NWGPF 1997, GBBO 1998, 2003
Western grebe	*Aechmophorus occidentalis*	Shoreline	USAEHA 1979; HAAP 1991; Brussard et al. 1996; Stockwell 1994; NWGPF 1997; GBBO 1998, 2003
Northern saw-whet owl	*Aegolius acadicus*	Canyons	UC Davis 2012
White-throated swift	*Aeronautes saxatalis*	Canyons	UC Davis 2012
Red-wing blackbird	*Agelaius phoeniceus*	Terrestrial	NWGPF 1997, GBBO 2003
Wood duck	*Aix sponsa*		GBBO 2003
Chukar, Chukar partridge	*Alectoris chukar*	Terrestrial, foothills, canyons	USAEHA 1979; USFWS & NDOW 1991; GBBO 2003, UC Davis 2012; Fleishman 2017
Black-throated sparrow	*Amphispiza bilineata*	Canyons	UC Davis 2012; ERRG 2017; Fleishman 2017
Pintail, Northern pintail	*Anas acuta*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Green-winged teal	*Anas crecca*	Shoreline	HAAP 1991; Brussard et al. 1996; GBBO 1998, 2003

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Mallard	*Anas platyrhynchos*	Shoreline	USAEHA 1979; HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Great white-fronted goose	*Anser albifrons*	Shoreline	HAAP 1991; Brussard et al. 1996
Snow goose	*Anser caerulescens*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Ross's goose	*Anser rossii*	Walker Lake	Brussard et al. 1996
American pipit	*Anthus rubescens*	--	GBBO 2003
Western scrub-jay	*Aphelocoma californica*	Cottonwood Canyon	Fleishman 2017
Woodhouse's Scrub-jay	*Aphelocoma woodhouseii*	Terrestrial, canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Golden eagle	*Aquila chrysaetos*	Terrestrial, Walker Lake, BCC	USAEHA 1979; NWGPF 1997; GBBO 2003; USGS 2017; Fleishman 2017
Black-chinned hummingbird	*Archilochus alexandri*	Cottonwood Canyon	Fleishman 2017
Great egret	*Ardea alba*	--	Brussard et al. 1996
Great blue heron	*Ardea herodias*	Shoreline	HAAP 1991; Stockwell 1994; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Sagebrush sparrow	*Artemisiospiza nevadensis*	Terrestrial, shrubs in foothills, canyons, BCC	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; ERRG 2017; Fleishman 2017
Long-eared owl	*Asio otus*	Terrestrial, Mount Grant	HAAP 1987; NWGPF 1997; GBBO 1998, 2003
Lesser scaup	*Aythya affinis*	Shoreline	HAAP 1991; Brussard et al. 1996; GBBO 1998, 2003
Redhead	*Aythya americana*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Ring-necked duck	*Aythya collaris*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997, GBBO 2003
Greater scaup	*Aythya marila*	Shoreline	Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Canvasback	*Aythya valisineria*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997, GBBO 2003
Juniper titmouse	*Baeolophus ridgwayi*	--	GBBO 2003
Juniper titmouse	*Baeolophus ridgwayi*	Terrestrial	NWGPF 1997; GBBO 1998

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Cedar waxwing	*Bombycilla cedrorum*	Canyons	GBBO 2003, UC Davis 2012
American bittern	*Botaurus lentiginosus*	--	GBBO 2003
Brant	*Branta berincla*	Shoreline	HAAP 1991; Brussard et al. 1996
Canada goose	*Branta canadensis*	Shoreline	USAEHA 1979, HAAP 1991; Brussard et al. 1996; NWGPF 1997, GBBO 2003
Great horned owl	*Bubo virginianus*	Walker Lake	NWGPF 1997; GBBO 1998, 2003
Cattle egret	*Bubulcus ibis*	Shoreline	Brussard et al. 1996
Bufflehead	*Bucephala albeola*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Common goldeneye	*Bucephala clangula*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Barrow's goldeneye	*Bucephala islandica*	Shoreline	Brussard et al. 1996; NWGPF 1997, GBBO 2003
Red-tailed hawk	*Buteo jamaicensis*	Terrestrial, canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; ERRG 2017, USGS 2017; Fleishman 2017
Rough-legged hawk	*Buteo lagopus*	Walker Lake area	GBBO 1998, 2003
Red-shouldered hawk	*Buteo lineatus*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Ferruginous hawk	*Buteo regalis*	Terrestrial, NNHP at-risk list, BCC	NWGPF 1997, GBBO 2003
Swainson's hawk	*Buteo swainsoni*	Terrestrial, higher elevations, NNHP watch list	USAEHA 1979
Sanderling	*Calidris alba*	Shoreline	USAEHA 1979
Dunlin	*Calidris alpina*	Walker Lake	Brussard et al. 1996
Western sandpiper	*Calidris mauri*	Walker Lake	Brussard et al. 1996, GBBO 2003
Least sandpiper	*Calidris minutilla*	Walker Lake	Brussard et al. 1996, GBBO 2003
California quail	*Callipepla californica*	Walker Lake	NWGPF 1997; GBBO 1998; GBBO 2003; Fleishman 2017
Costa's hummingbird	*Calypte costae*	Cottonwood Creek	Fleishman 2017
Wilson's warbler	*Cardellina pusilla*	Terrestrial, willow thickets	USAEHA 1979; Fleishman 2017
Turkey vulture	*Cathartes aura*	Canyons	USGS 2017

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Hermit thrush	*Catharus guttatus*	Walker Lake area, canyons	GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Canyon wren	*Catherpes mexicanus*	Canyons	GBBO 2003; UC Davis 2012; Fleishman 2017
Greater sage-grouse	*Centrocercus urophasianus*	Terrestrial, foothills, canyons, NNHP watch list, BCC	USAEHA 1979; HAAP 1991; UC Davis 2012
Brown creeper	*Certhia Americana*	Canyons	GBBO 2003; UC Davis 2012; Fleishman 2017
Snowy plover	*Charadrius nivosus*	NNHP watch list, BCC, breeds on dry lake bed on east side; Shoreline	HAAP 1991; Stockwell 1994; Brussard et al. 1996
Semipalmated plover	*Charadrius semipalmatus*	Walker Lake	Brussard et al. 1996
Killdeer	*Charadrius vociferus*	Terrestrial, canyons	Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012
Black tern	*Chlidonias niger*	Walker Lake	Brussard et al. 1996
Lark sparrow	*Chondestes grammacus*	Semi-open sage brush grassy areas	USAEHA 1979; Fleishman 2017
Common nighthawk	*Chordeiles minor*	Terrestrial, canyons	USAEHA 1979; UC Davis 2012; Fleishman 2017
Bonaparte's gull	*Chroicocephalus philadelphia*	Shoreline	HAAP 1991; Brussard et al. 1996
Northern harrier	*Circus hudsonius*	Shoreline	NWGPF 1997; GBBO 1998, 2003; USGS 2017
Marsh wren	*Cistothorus palustris*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Long-tailed duck, oldsquaw	*Clangula hyemalis*	Shoreline	HAAP 1991; Brussard et al. 1996; GBBO 1998, 2003
Evening grosbeak	*Coccothraustes vespertinus*	Terrestrial	NWGPF 1997; GBBO 2003
Northern flicker	*Colaptes auratus*	Terrestrial, Rose canyon, Walker Lake, canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Rock pigeon	*Columba livia*	Terrestrial, urban areas, Walker Lake	USAEHA 1979; NWGPF 1997; GBBO 1998
Olive-sided flycatcher	*Contopus cooperi*	NNHP watch list, BCC, Canyons	UC Davis 2012
Western wood-pewee	*Contopus sordidulus*	Canyons	UC Davis 2012; Fleishman 2017
American crow, common crow	*Corvus brachyrhynchos*	Terrestrial, canyons	NWGPF 1997; USAEHA 1979; GBBO 2003; UC Davis 2012

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Common raven	*Corvus corax*	Terrestrial, throughout depot, canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; ERRG 2017; Fleishman 2017
Steller's jay	*Cyanocitta stelleri*	Terrestrial, canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Tundra Swan	*Cygnus columbianus*	Shoreline	HAAP 1991; GBBO 2003
Sooty grouse	*Dendragapus fuliginosus*	Cottonwood Canyon	Fleishman 2017
Dusky grouse	*Dendragapus obscurus*	Meadow	HAAP 1991
Black-throated gray warbler	*Dendroica nigrescens, Setophaga nigrescens*	Terrestrial	USAEHA 1979; Fleishman 2017
Yellow warbler	*Dendroica petechia, Setophaga petechia*	Terrestrial, Cottonwood and Rose Creek, willow canyons	USAEHA 1979; Fleishman 2017
Snowy egret	*Egretta thula*	Walker Lake	Brussard et al. 1996
Dusky flycatcher	*Empidonax oberholseri*	Canyons	UC Davis 2012; Fleishman 2017
Flycatcher	*Empidonax sp.*	Cottonwood Canyon	Fleishman 2017
Willow flycatcher	*Empidonax traillii*	Terrestrial, Cottonwood canyon, BCC	USAEHA 1979
Gray flycatcher	*Empidonax wrightii*	Canyons	UC Davis 2012; Fleishman 2017
Horned lark	*Eremophila alpestris*	Terrestrial, valley floor	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003, ERRG 2017; Fleishman 2017
Brewer's blackbird	*Euphagus cyanocephalus*	Terrestrial, canyons	HAAP 1991; GBBO 2003; UC Davis 2012; Fleishman 2017
Merlin	*Falco columbarius*	--	GBBO 2003
Prairie falcon	*Falco mexicanus*	Walker Lake, canyons, NNHP watch list	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; USGS 2017
American kestrel	*Falco sparverius*	Shoreline, Terrestrial, open country, canyons	NWGPF 1997; USAEHA 1979; GBBO 1998, 2003; UC Davis 2012; USGS 2017; Fleishman 2017
American coot	*Fulica americana*	Walker Lake	USAEHA 1979; HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998
Wilson's snipe	*Gallinago delicate*	Terrestrial	GBBO 2003
Common loon	*Gavia immer*	NNHP watch list; Shoreline	USAEHA 1979; HAAP 1991; Stockwell 1994; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Pacific loon	*Gavia pacifica*	Shoreline	HAAP 1989; Stockwell 1994; Brussard et al. 1996, GBBO 2003
Red-throated loon	*Gavia stellate*	Shoreline	Stockwell 1994; Brussard et al. 1996
MacGillivray's warbler	*Geothlypis tolmiei*	Terrestrial, willows, canyons	UC Davis 2012; Fleishman 2017
Northern pygmy-owl	*Glaucidium gnoma*	Walker Lake	NWGPF 1997; GBBO 2003
Pinyon jay	*Gymnorhinus cyanocephalus*	Terrestrial, canyons, BCC, NNHP watch list	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003, UC Davis 2012; Fleishman 2017
Cassin's finch	*Haemorhous cassinii, Carpodacus cassinii*	Terrestrial, canyons	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
House finch	*Haemorhous mexicanus*	Terrestrial, canyons	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Purple finch	*Haemorphous purpureus*	Canyons	UC Davis 2012; Fleishman 2017
Bald eagle	*Haliaeetus leucocephalus*	NNHP at-risk list, BCC	Brussard et al. 1996; NWGPF 1997; GBBO 1998
Black-necked stilt	*Himantopus mexicanus*	Shoreline	HAAP 1991; Stockwell 1994; Brussard et al. 1996
Barn swallow	*Hirundo rustica*	Terrestrial	NWGPF 1997, GBBO 2003
Harlequin duck	*Histrionicus histrionicus*	Shoreline	HAAP 1990
Caspian tern	*Hydroprogne caspia*	Shoreline	HAAP 1991; Stockwell 1994; Brussard et al. 1996
Varied thrush	*Ixoreus naevius*	Terrestrial	NWGPF 1997; GBBO 2003
Dark-eyed junco	*Junco hyemalis*	Terrestrial, canyon thickets	USAEHA 1979; GBBO 2003; UC Davis 2012; Fleishman 2017
Dark-eyed junco, gray-headed form	*Junco hyemalis caniceps*	Walker Lake area	GBBO 1998, 2003
Dark-eyed junco, red-backed form	*Junco hyemalis dorsalis*	Walker Lake area	GBBO 1998, 2003
Dark-eyed junco, slate-colored form	*Junco hyemalis hyemalis*	Walker Lake area	NWGPF 1997; GBBO 2003
Dark-eyed junco, Oregon form	*Junco hyemalis oreganus*	Walker Lake area	NWGPF 1997; GBBO 1998, 2003
Northern shrike	*Lanius borealis*	--	GBBO 2003
Loggerhead shrike	*Lanius ludovicianus*	Terrestrial, desert floor, and lower foothills; NNHP watch list, BCC	USAEHA 1979; NWGPF 1997; GBBO 1998

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Herring gull	*Larus argentatus*	Shoreline	USAEHA 1979; HAAP 1991; Stockwell 1994; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
California gull	*Larus californicus*	Shoreline, canyons	HAAP 1991; Stockwell 1994; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003; UC Davis 2012
Ring-billed gull	*Larus delawarensis*	Shoreline	USAEHA 1979; HAAP 1991; Stockwell 1994; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Glaucous gull	*Larus hyperboreus*	Shoreline	GBBO 2003
Western gull	*Larus occidentalis*	Shoreline	GBBO 2003
Franklin's gull	*Leucophaeus pipixcan*	Shoreline	HAAP 1991; Brussard et al. 1996
Gray-crowned rosy-finch	*Leucosticte tephrocotis*	Walker Lake area, NNHP watch list	GBBO 1998, 2003
Long-billed dowitcher	*Limnodromus scolopaceus*	Walker Lake	Brussard et al. 1996
Marbled godwit	*Limosa fedoa*	Shoreline, BCC	USAEHA 1979; Stockwell 1994; Brussard et al. 1996
Hooded merganser	*Lophodytes cucullatus*	Shoreline	Brussard et al. 1996
Red crossbill	*Loxia curvirostra*	Terrestrial, canyons	NWGPF 1997; GBBO 2003, UC Davis 2012
American wigeon	*Mareca americana*	Shoreline	Brussard et al. 1996; GBBO 2003
Gadwall	*Mareca strepera*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Belted kingfisher	*Megaceryle alcyon*	Shoreline	HAAP 1991; Brussard et al. 1996
Western screech owl	*Megascops kennicottii*		Fleishman 2017
Lewis's woodpecker	*Melanerpes lewis*	Walker Lake area, NNHP watch list, BCC	GBBO 1998, 2003
Swamp sparrow	*Melospiza georgiana*	Walker Lake area	GBBO 1998, 2003
Lincoln's sparrow	*Melospiza lincolnii*	Terrestrial, willows, Cottonwood Creek	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003
Song sparrow	*Melospiza melodia*	Terrestrial, margins of willows, Cottonwood Creek, canyons	USAEHA 1979; NWGPF, 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Common merganser	*Mergus merganser*	Shoreline	HAAP 1991; Stockwell 1994; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Red-breasted merganser	*Mergus serrator*	Shoreline	HAAP 1991; Brussard et al. 1996; GBBO 1998, 2003
Northern mockingbird	*Mimus polyglottos*	Walker Lake	GBBO 1998, 2003
Brown-headed cowbird	*Molothrus ater*	Canyons	UC Davis 2012; Fleishman 2017
Townsend's solitaire	*Myadestes townsendi*	Terrestrial, canyons	NWGPF 1997; GBBO 2003; UC Davis 2012; Fleishman 2017
Ash-throated flycatcher	*Myiarchus cinerascens*	Terrestrial, desert shrub areas, canyons	USAEHA 1979; UC Davis 2012
Clark's nutcracker	*Nucifraga columbiana*	Terrestrial, higher, canyons	USAEHA 1979; Brussard et al. 1996; UC Davis 2012; Fleishman 2017
Long-billed curlew	*Numenius americanus*	NNHP watch list, BCC, Walker Lake	Stockwell 1994; Brussard et al. 1996; GBBO 1998, 2003 USAEHA 1979
Black-crowned night-heron	*Nycticorax nycticorax*	Shoreline	HAAP 1991; Brussard et al. 1996
Mountain quail	*Oreortyx pictus*	Terrestrial, canyons	HAAP 1991; UC Davis 2012; Fleishman 2017
Sage thrasher	*Oreoscoptes montanus*	NNHP watch list, BCC, Terrestrial, canyons	NWGPF 1997; GBBO 2003, UC Davis 2012; Fleishman 2017
Orange-crowned warbler	*Oreothlypis celata*	Terrestrial, canyons	USAEHA 1979; UC Davis 2012; Fleishman 2017
Virginia's warbler	*Oreothlypis virginiae*	Canyons, BCC	UC Davis 2012; Fleishman 2017
Ruddy duck	*Oxyura jamaicensis*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Osprey	*Pandion haliaetus*	Shoreline	HAAP 1991; Brussard et al. 1996; GBBO 2003
House sparrow	*Passer domesticus*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Savannah sparrow	*Passerculus sandwichensis*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Fox sparrow	*Passerella iliaca*	Terrestrial, denser thickets, canyons	USAEHA 1979; UC Davis 2012; Fleishman 2017
Lazuli bunting	*Passerina amoena*	Canyons	UC Davis 2012; Fleishman 2017
American white pelican	*Pelecanus erythrorhynchos*	NNHP watch list, shoreline	USAEHA 1979; HAAP 1991; Stockwell 1994; Brussard et al. 1996
Cliff swallow	*Petrochelidon pyrrhonota*	Canyons	UC Davis 2012

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Double-crested cormorant	*Phalacrocorox auritus*	Shoreline	USAEHA 1979; HAAP 1991; Stockwell 1994; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Common poorwill	*Phalaenoptilus nuttallii*	Terrestrial, desert floor, canyons	USAEHA 1979; UC Davis 2012
Red-necked phalarope	*Phalaropus lobatus*	Shoreline	HAAP 1991; Brussard et al. 1996
Wilson's phalarope	*Phalaropus tricolor*	Shoreline	HAAP 1991; Brussard et al. 1996
Black-headed grosbeak	*Pheucticus melanocephalus*	Canyons	UC Davis 2012; Fleishman 2017
Black-billed magpie	*Pica hudsonia*	Terrestrial	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003
Downy woodpecker	*Picoides pubescens*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Hairy woodpecker	*Picoides villosus*	Terrestrial,cottonwoods, lower canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003, UC Davis 2012; Fleishman 2017
Green-tailed towhee	*Pipilo chlorurus*	Terrestrial, canyons, BCC	USAEHA 1979; UC Davis 2012; Fleishman 2017
Spotted towhee	*Pipilo maculatus*	Terrestrial, canyons	USAEHA 1979; NWGPF 1997; UC Davis 2012; Fleishman 2017
Western tanager	*Piranga ludoviciana*	Canyons	UC Davis 2012; Fleishman 2017
White-faced ibis	*Plegadis chihi*	NNHP watch list, shoreline	HAAP 1991; Stockwell 1994; Brussard et al. 1996
Black-bellied plover	*Pluvialis squatarola*	Terrestrial	Brussard et al. 1996
Horned grebe	*Podiceps auritus*	Shoreline	Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Red-necked grebe	*Podiceps grisegena*	Shoreline	HAAP 1987
Eared grebe	*Podiceps nigricollis*	Shoreline, BCC	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998
Pied-billed grebe	*Podilymbus podiceps*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Mountain chickadee	*Poecile gambeli*	Terrestrial, pines, canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003, UC Davis 2012; Fleishman 2017
Blue-gray gnatcatcher	*Polioptila caerulea*	Canyons	UC Davis 2012; Fleishman 2017

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Vesper sparrow	*Pooecetes gramineus*	Canyons	UC Davis 2012; Fleishman 2017
Sora	*Porzana carolina*	Walker Lake area	GBBO 1998, 2003
Bushtit	*Psaltriparus minimus*	Terrestrial, valley floor, canyons	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003, UC Davis 2012; Fleishman 2017
Great-tailed grackle	*Quiscalus mexicanus*	Walker Lake area	GBBO 1998, 2003
Virginia rail	*Rallus limicola*	Walker Lake area	GBBO 1998, 2003
American avocet	*Recurvirostra americana*	Shoreline	HAAP 1991; Stockwell 1994; Brussard et al. 1996
Ruby-crowned kinglet	*Regulus calendula*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Rock wren	*Salpinctes obsoletus*	Terrestrial, canyons	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; ERRG 2017; Fleishman 2017
Black phoebe	*Sayornis nigricans*	Cottonwood Creek	Fleishman 2017
Say's phoebe	*Sayornis saya*	Terrestrial, edges of valley floor	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003, Fleishman 2017
Broad-tailed hummingbird	*Selasphorus platycercus*	Terrestrial, foothills, canyons	USAEHA 1979; UC Davis 2012; Fleishman 2017
Yellow-rumped warbler	*Setophaga coronata*	Terrestrial	NWGPF 1997; GBBO 1998, 2003; Fleishman 2017
Yellow-rumped warbler, Audubon's warbler	*Setophaga coronate*	Canyons	UC Davis 2012
Blackburnian warbler	*Setophaga fusca*	Cottonwood Canyon	Fleishman 2017
Black-throated gray warbler	*Setophaga nigrescens*	Canyons	UC Davis 2012
Mountain bluebird	*Sialia currucoides*	Terrestrial, pines, canyons	USAEHA 1979; HAAP 1991; CECS 1991; GBBO 2003; UC Davis 2012; Fleishman 2017
Red-breasted nuthatch	*Sitta canadensis*	Terrestrial, pines	USAEHA 1979; NWGPF 1997; GBBO 2003, Fleishman 2017
White-breasted nuthatch	*Sitta carolinensis*	Terrestrial, canyons	NWGPF 1997; GBBO 2003; UC Davis 2012; Fleishman 2017
Northern shoveler	*Spatula clypeata*	Shoreline	HAAP 1991; Brussard et al. 1996; NWGPF 1997; GBBO 1998, 2003
Cinnamon teal	*Spatula cyanoptera*	Shoreline	Brussard et al. 1996
Blue-winged teal	*Spatula discors*	Shoreline	Brussard et al. 1996

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Red-naped sapsucker	*Sphyrapicus nuchalis*	Terrestrial, canyons	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Red-naped x red-breasted sapsucker hybrid	*Sphyrapicus nuchalis x ruber*	Cottonwood Canyon	Fleishman 2017
Red-breasted sapsucker	*Sphyrapicus ruber*	Walker Lake area, canyons	GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Pine siskin	*Spinus pinus*	Terrestrial, canyons	NWGPF 1997; GBBO 2003, UC Davis 2012; Fleishman 2017
Lesser goldfinch	*Spinus psaltria*	Terrestrial, canyons	NWGPF 1997; GBBO 2003, UC Davis 2012; Fleishman 2017
American goldfinch	*Spinus tristis*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Brewer's sparrow	*Spizella breweri*	NNHP watch list, BCC, Terrestrial, desert shrubs and lower foothills, canyons	USAEHA 1979; UC Davis 2012; Fleishman 2017
Chipping sparrow	*Spizella passerine*	Canyons	UC Davis 2012; Fleishman 2017
Calliope hummingbird	*Stellula calliope*	Cottonwood Creek, BCC	Fleishman 2017
Forster's tern	*Sterna forsteri*	Shoreline	HAAP 1991; Brussard et al. 1996
Common tern	*Sterna hirundo*	Walker Lake area	Stockwell 1994
Eurasian collared-dove	*Streptopelia decaocto*	Cottonwood Creek	Fleishman 2017
Western meadowlark	*Sturnella neglecta*	Terrestrial, desert and lower foothills	USAEHA 1979; NWGPF 1997; GBBO 1998, 2003
European starling	*Sturnus vulgaris*	Terrestrial	NWGPF 1997; GBBO 1998, 2003
Violet-green swallow	*Tachycineta thalassina*	Terrestrial, around reservoirs, canyons	USAEHA 1979; UC Davis 2012; Fleishman 2017
Bewick's wren	*Thryomanes bewickii*	Terrestrial, canyons	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Brown thrasher	*Toxostoma rufum*	--	GBBO 2003
Lesser yellowlegs	*Tringa flavipes*	BCC, Walker Lake	Stockwell 1994; Brussard et al. 1996
Greater yellowlegs	*Tringa melanoleuca*	Walker Lake	Stockwell 1994; Brussard et al. 1996; GBBO 2003
Willet	*Tringa semipalmata*	BCC, Walker Lake	Brussard et al. 1996
House wren	*Troglodytes aedon*	Canyons	UC Davis 2012; Fleishman 2017
Winter wren	*Troglodytes hiemalis*	--	GBBO 2003

Common Name	Scientific Name	Notes	Source
Birds (Continued)			
Pacific wren	*Troglodytes pacificus*	Cottonwood Creek	Fleishman 2017
American robin	*Turdus migratorius*	Terrestrial, canyons	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Barn owl	*Tyto alba*	Walker Lake area	GBBO 1998, 2003
Warbling vireo	*Vireo gilvus*	Canyons	UC Davis 2012, Fleishman 2017;
Plumbeous vireo	*Vireo plumbeus*	Canyons	UC Davis 2012; Fleishman 2017
Sabine's Gull	*Xema sabini*	Shoreline	HAAP 1990
Mourning dove	*Zenaida macroura*	Terrestrial, foothills, canyons	USAEHA 1979; GBBO 2003; UC Davis 2012; Fleishman 2017
White-throated sparrow	*Zonotrichia albicollis*	Terrestrial	GBBO 2003
Golden-crowned sparrow	*Zonotrichia atricapilla*	Terrestrial	GBBO 2003
White-crowned sparrow	*Zonotrichia leucophrys*	Terrestrial, canyons	NWGPF 1997; GBBO 1998, 2003; UC Davis 2012; Fleishman 2017
Reptiles and Amphibians			
Southern long-toed salamander	*Ambystoma macrodactylum sigillatum*	--	USAEHA 1979
Western toad	*Anaxyrus boreas*	--	Brussard et al. 1996; Stockwell 1994; Espinoza and Tracy 1999
California toad	*Anaxyrus boreas halophilus*	--	Brussard et al. 1996; Stockwell 1994
Red spotted toad	*Anaxyrus punctatus*	--	Brussard et al. 1996; Stockwell 1994
Western whiptail, tiger whiptail	*Aspidoscelis tigris*	--	USAEHA 1979; Espinoza and Tracy 1999
Great Basin whiptail	*Aspidoscelis tigris tigris*	--	HAAP 1991
Zebra-tailed lizard	*Callisaurus draconoides*	--	Espinoza and Tracy 1999
Rocky Mountain rubber boa	*Charina bottae utahensis*	--	Brussard et al. 1996; Stockwell 1994
Nevada shovel-nosed snake, western shovel-nosed snake	*Chionactis occipitalis talpina*	--	HAAP 1991
Western yellow-bellied racer	*Coluber constrictor mormon*	--	HAAP 1991
Mojave desert sindwinder, horned rattlesnake	*Crotalus cerastes*	--	HAAP 1991
Speckled rattlesnake	*Crotalus mitchellii*	--	Espinoza and Tracy 1999

Common Name	Scientific Name	Notes	Source
Reptiles and Amphibians (Continued)			
Panamint rattlesnake	*Crotalus mitchellii stephensi*	--	HAAP 1991
Western rattlesnake	*Crotalus viridis*	--	Blair and Heindl 1992; Espinoza and Tracy 1999
Great Basin rattlesnake	*Crotalus viridis lutosus*	--	HAAP 1991
Great Basin collared lizard	*Crotaphytus bicinctores*	--	Espinoza and Tracy 1999
Collared lizard, Oklahoma collared lizard	*Crotaphytus collaris*	--	USAEHA 1979; Blair and Heindl 1992
Regal ringneck snake	*Diadophus punctatus rigalus*	--	HAAP 1991
Sierra alligator lizard	*Elgaria coeruleus palmeri*	--	HAAP 1991
Sierra Nevada salamander	*Ensatina eschscholtzii platensis*	--	Brussard et al. 1996; Stockwell 1994
Western skink	*Eumeces skiltonianus*	--	HAAP 1991
Long-nosed leopard lizard	*Gambelia wislizenii*	--	USAEHA 1979; HAAP 1991; Blair and Heindl 1992; Espinoza and Tracy 1999
Night snake	*Hypsiglena torquata*	--	HAAP 1991; Espinoza and Tracy 1999
California kingsnake	*Lampropeltis californiae*	--	HAAP 1991
Common kingsnake	*Lampropelitis getula*	--	Espinoza and Tracy 1999
Sonoran mountain kingsnake	*Lampropelitis pyromelana*	--	HAAP 1991
California mountain kingsnake	*Lampropeltis zonata*	--	HAAP 1991
American bullfrog	*Lithobates catesbeianus*	--	HAAP 1991
Leopard frog	*Lithobates pipiens*	--	USAEHA 1979
Coachwhip	*Masticophis flagellum*	--	Blair and Heindl 1992
Red racer, red coachwhip	*Masticophis flagellum piceus*	--	HAAP 1991
Striped whipsnake	*Masticophis taeniatus*	--	HAAP 1991; Espinoza and Tracy 1999
Desert horned lizard	*Phrynosoma platyrhinos*	--	HAAP 1991; Espinoza and Tracy 1999
Western leaf-nosed snake, spotted leaf-nosed snake	*Phyllorhynchus decurtatus perkinsi*	--	HAAP 1991
Great Basin gopher snake, bull snake	*Pituophis catenifer deserticola*	--	HAAP 1991; Espinoza and Tracy 1999
Pacific chorus frog, Pacific tree frog	*Pseudacris regilla*	--	HAAP 1991
Northern red-legged frog	*Rana aurora*	--	HAAP 1991

Common Name	Scientific Name	Notes	Source
Reptiles and Amphibians (Continued)			
Long-nosed snake	*Rhinocheilus lecontei*	--	HAAP 1991; Espinoza and Tracy 1999
Western (Mojave) patch-nosed snake	*Salvadora hexalepis mojavensis*	--	HAAP 1991
Sage brush lizard	*Sceloporus graciosus*	--	HAAP 1991
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	--	HAAP 1991
Desert spiny lizard	*Sceloporus magister*	--	HAAP 1991; Espinoza and Tracy 1999
Western fence lizard	*Sceloporus occidentalis*	--	HAAP 1991; Espinoza and Tracy 1999
San Joaquin fence lizard	*Sceloporus occidentalis biseriatus*	--	HAAP 1991
Western ground snake	*Sonora semiannulata*	--	HAAP 1991
Great Basin spadefoot	*Spea intermontana*	--	USAEHA 1979; Espinoza and Tracy 1999
Utah black-headed snake	*Tantilla planiceps utahensis*	--	HAAP 1991
Sierra gartersnake	*Thamnophis couchii*	--	HAAP 1991
Western terrestrial gartersnake	*Thamnophis elegans*	--	HAAP 1991
Mountain gartersnake	*Thamnophis elegans elegans*	--	HAAP 1991
Wandering gartersnake	*Thamnophis elegans vagrans*	--	HAAP 1991
Valley garter snake	*Thamnophis sirtalis*	--	HAAP 1991
California lyre snake	*Trimorphodon lyrophanes*	--	HAAP 1991
Common side-blotched lizard	*Uta stansburiana*	--	USAEHA 1979; Blair and Heindl 1992; Espinoza and Tracy 1999
Fish			
Tui chub	*Gila bicolor*	Cat and Rose Creeks, Rose Creek Reservoir	NDOW 2016a
Lahontan cutthroat trout	*Onchorhynchus clarki henshawi*	ESA Threatened. NNHP At-Risk List. NDOW reintroduced LCT to Cottonwood Creek in 2016.	NDOW 2016b; Urquhart 2018, personal communication
Tiger trout	*Salmo trutta* x *Salvelinus fontinalis*	Rose Creek Reservoir	Salsbury 2018, personal communication
Insects (butterflies)			
Pacific orangetip	*Anthocharis sara*	Cottonwood Canyon	Fleishman 2017
Mormon metalmark	*Apodemia mormo*	Cottonwood Canyon	Fleishman 2017

Common Name	Scientific Name	Notes	Source
Insects (butterflies) (Continued)			
Western pygmy-blue	*Brephidium exile*	Cottonwood Canyon	Fleishman 2017
Alpine Sheridan's hairstreak	*Callophrys lemberti*	Cottonwood Canyon	Fleishman 2017
Spring azure	*Celastrina ladon*	Cottonwood Canyon	Fleishman 2017
Small wood-nymph	*Cercyonis oetus*	Cottonwood Canyon	Fleishman 2017
Great Basin wood-nymph	*Cercyonis sthenele*	Cottonwood Canyon	Fleishman 2017
Sagebrush checkerspot	*Chlosyne acastus*	Cottonwood Canyon	Fleishman 2017
Common ringlet	*Coenonympha tullia*	Cottonwood Canyon	Fleishman 2017
Queen Alexandra's sulphur	*Colias alexandra*	Cottonwood Canyon	Fleishman 2017
Orange sulphur	*Colias eurytheme*	Cottonwood Canyon	Fleishman 2017
Clouded sulphur	*Colias philodice*	Cottonwood Canyon	Fleishman 2017
Monarch	*Danaus plexippus*	Cottonwood Canyon	Fleishman 2017
Persius dustywing	*Erynnis persius*	Cottonwood Canyon	Fleishman 2017
California marble	*Euchloe hyantis*	Cottonwood Canyon	Fleishman 2017
Dotted-blue	*Euphilotes sp.*	Cottonwood Canyon	Fleishman 2017
Anicia checkerspot	*Euphydryas anicia*	Cottonwood Canyon	Fleishman 2017
Edith's checkerspot	*Euphydryas editha*	Cottonwood Canyon	Fleishman 2017
Western tailed-blue	*Everes amyntula*	Cottonwood Canyon	Fleishman 2017
Silvery blue	*Glaucopsyche lygdamus*	Cottonwood Canyon	Fleishman 2017
Arrowhead blue	*Glaucopsyche piasus*	Cottonwood Canyon	Fleishman 2017
Northern white-skipper	*Heliopetes ericetorum*	Cottonwood Canyon	Fleishman 2017
Reakirt's blue echinargus	*Hemiargus isola*	Cottonwood Canyon	Fleishman 2017
Common branded skipper	*Hesperia comma*	Cottonwood Canyon	Fleishman 2017
Juba skipper	*Hesperia juba*	Cottonwood Canyon	Fleishman 2017
Nevada skipper	*Hesperia nevada*	Cottonwood Canyon	Fleishman 2017
Uncas skipper	*Hesperia uncas*	Cottonwood Canyon	Fleishman 2017
Mohave sootywing	*Hesperopsis libya*	Cottonwood Canyon	Fleishman 2017
Acmon blue	*Icaricia acmon*	Cottonwood Canyon	Fleishman 2017
Boisduval's blue	*Icaricia icarioides*	Cottonwood Canyon	Fleishman 2017
Lupine blue	*Icaricia lupini*	Cottonwood Canyon	Fleishman 2017
Shasta blue	*Icaricia shasta*	Cottonwood Canyon	Fleishman 2017
Brown elfin	*Incisalia augustinus*	Cottonwood Canyon	Fleishman 2017
Western pine elfin	*Incisalia eryphon*	Cottonwood Canyon	Fleishman 2017
Marine blue	*Leptotes marina*	Cottonwood Canyon	Fleishman 2017
Friday's blue	*Limenitis fridayi*	Cottonwood Canyon	Fleishman 2017

Common Name	Scientific Name	Notes	Source
Insects (butterflies) (Continued)			
Lorquin's admiral	*Limenitis lorquini*	Cottonwood Canyon	Fleishman 2017
Weidemeyer's admiral	*Limenitis weidemeyerii*	Cottonwood Canyon	Fleishman 2017
Thicket hairstreak	*Loranthomitoura spinetorum*	Cottonwood Canyon	Fleishman 2017
Melissa blue	*Lycaeides melissa*	Cottonwood Canyon	Fleishman 2017
Tailed copper	*Lycaena arota*	Cottonwood Canyon	Fleishman 2017
Lustrous copper	*Lycaena cuprea*	Cottonwood Canyon	Fleishman 2017
Edith's copper	*Lycaena editha*	Cottonwood Canyon	Fleishman 2017
Blue copper	*Lycaena heteronea*	Cottonwood Canyon	Fleishman 2017
Lilac-Bordered copper	*Lycaena nivalis*	Cottonwood Canyon	Fleishman 2017
Ruddy copper	*Lycaena rubida*	Cottonwood Canyon	Fleishman 2017
Juniper hairstreak	*Mitoura siva*	Cottonwood Canyon	Fleishman 2017
Dainty sulphur	*Nathalis iole*	Cottonwood Canyon	Fleishman 2017
Ridings' satyr	*Neominois ridingsii*	Cottonwood Canyon	Fleishman 2017
Mourning cloak	*Nymphalis antiopa*	Cottonwood Canyon	Fleishman 2017
Milbert's tortoiseshell	*Nymphalis milberti*	Cottonwood Canyon	Fleishman 2017
Woodland skipper	*Ochlodes sylvanoides*	Cottonwood Canyon	Fleishman 2017
Two-tailed swallowtail	*Papilio multicaudatus*	Cottonwood Canyon	Fleishman 2017
Western tiger swallowtail	*Papilio rutulus*	Cottonwood Canyon	Fleishman 2017
Mylitta crescent	*Phyciodes mylitta*	Cottonwood Canyon	Fleishman 2017
Field crescent	*Phyciodes pulchellus*	Cottonwood Canyon	Fleishman 2017
Cabbage white	*Pieris rapae*	Cottonwood Canyon	Fleishman 2017
Greenish blue	*Plebejus saepiolus*	Cottonwood Canyon	Fleishman 2017
Sandhill skipper	*Polites sabuleti*	Cottonwood Canyon	Fleishman 2017
Sonora skipper	*Polites sonora*	Cottonwood Canyon	Fleishman 2017
Zephyr comma	*Polygonia zephyrus*	Cottonwood Canyon	Fleishman 2017
Becker's white	*Pontia beckerii*	Cottonwood Canyon	Fleishman 2017
Checkered white	*Pontia protodice*	Cottonwood Canyon	Fleishman 2017
Spring white	*Pontia sisymbrii*	Cottonwood Canyon	Fleishman 2017
Common checkered-skipper	*Pyrgus communis*	Cottonwood Canyon	Fleishman 2017
Small checkered-skipper	*Pyrgus scriptura*	Cottonwood Canyon	Fleishman 2017
Behr's hairstreak	*Satyrium behrii*	Cottonwood Canyon	Fleishman 2017
California hairstreak	*Satyrium californicum*	Cottonwood Canyon	Fleishman 2017
Sooty hairstreak	*Satyrium fuliginosum*	Cottonwood Canyon	Fleishman 2017
Great spangled fritillary	*Speyeria cybele*	Cottonwood Canyon	Fleishman 2017

Common Name	Scientific Name	Notes	Source
Insects (butterflies) (Continued)			
Nokomis fritillary	*Speyeria nokomis*	Cottonwood Canyon	Fleishman 2017
Zerene fritillary	*Speyeria zerene*	Cottonwood Canyon	Fleishman 2017
Gray hairstreak	*Strymon melinus*	Cottonwood Canyon	Fleishman 2017
West coast lady	*Vanessa annabella*	Cottonwood Canyon	Fleishman 2017
Red admiral	*Vanessa atalanta*	Cottonwood Canyon	Fleishman 2017
Painted lady	*Vanessa cardui*	Cottonwood Canyon	Fleishman 2017
Benthic species			
Epiphytic filamentous algae	*Cladophora glomerata*	--	TNC 2013
Chironomid midges	*Cricotopus ornatus and Tanypus grodhausi*	--	Herbst et al. 2013; Herbst et al. 2014
Biting midge	*Culicoides*	--	Herbst et al. 2014
Damselfly	*Enallagma clausum*	--	Herbst et al. 2013; Herbst et al. 2014
Alkali fly	*Ephydra hians*	--	Herbst et al. 2014
Diving beetle	*Hygrotus masculinus*	--	Herbst et al. 2014
Mayfly	*Ironodes sp.*	--	USAEHA 1979
Oligochaete worm	*Monopylephorus sp.*	--	Herbst et al. 2013
Widgeon grass	*Ruppia maritima*	--	TNC 2013; Herbst et al. 2013 Herbst et al. 2014
Caddisfly	*Wormaldia sp.*	--	USAEHA 1979
Aquatic oligochaetes	--	--	Herbst et al. 2014

Notes

-- = No data or not applicable

BCC = Bird Conservation Region 9 (Great Basin) U.S. Fish and Wildlife *Birds of Conservation Concern* 2008 list

References with the following citations are no longer available for review and species with those citations may refer to species identified at HWAD or species with the potential to occur at HWAD. The remaining citations refer to documented sightings at HWAD.

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- GBBO 1998

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Appendix C
Mineral County Species Lists

NNHP Mineral County At-Risk Species List (2018)

NNHP Mineral County Species List (2018)

USFWS Rare, Threatened, and Endangered Species for Mineral County, NV (2018)

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Mineral County

Displaying 1 - 50 out of 98 records

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Minor Group ID	Common Name	Species	G Rank	S Rank	Status
AB	Tricolored Blackbird	Agelaius tricolor	G1G2	S1B	At-Risk List
PD	Cima milkvetch	Astragalus cimae var. cimae	G3T2	S2	At-Risk List
PD	Long Valley milkvetch	Astragalus johannis-howellii	G2	S2	At-Risk List
PD	Sodaville milkvetch	Astragalus lentiginosus var. sesquimetralis	G5T1	S1	At-Risk List
PD	Lavin eggvetch	Astragalus oophorus var. lavinii	G4T2	S2	At-Risk List
PD	Tonopah milkvetch	Astragalus pseudiodanthus	G3Q	S2	At-Risk List
PD	Bodie Hills rockcress	Boechera bodiensis	G2	S2	At-Risk List
PP	dainty moonwort	Botrychium crenulatum	G3	S1?	At-Risk List
AB	Ferruginous Hawk	Buteo regalis	G4	S2	At-Risk List
AB	Yellow-billed Cuckoo	Coccyzus americanus	G5	S1B	At-Risk List
AM	Townsend's big-eared bat	Corynorhinus townsendii	G4	S2	At-Risk List
AF	Hiko White River springfish	Crenichthys baileyi grandis	G2T1	S1	At-Risk List
AF	Railroad Valley Springfish	Crenichthys nevadae	G2	S2	At-Risk List
PD	Bodie Hills draba	Cusickiella quadricostata	G2	S2	At-Risk List
PD	gray wavewing	Cymopterus cinerarius	G3	S1	At-Risk List
PD	Alexander buckwheat	Eriogonum alexanderae	G5T2T3	S2S3	At-Risk List
PD	Mono buckwheat	Eriogonum ampullaceum	G3	S1	At-Risk List
PD	Beatley buckwheat	Eriogonum beatleyae	G2Q	S3	At-Risk List
AM	spotted bat	Euderma maculatum	G4	S2	At-Risk List
II	early blue	Euphilotes enoptes primavera	G5T1	S1	At-Risk List
AB	Peregrine Falcon	Falco peregrinus	G4	S2	At-Risk List
PD	yellow spinecape	Goodmania luteola	G3	S1	At-Risk List
PD	sand cholla	Grusonia pulchella	G4	S2S3	At-Risk List
AB	Bald Eagle (Contiguous US Pop)	Haliaeetus leucocephalus	G5	S1B,S3N	At-Risk List
PD	dune sunflower	Helianthus deserticola	G2G3Q	S3	At-Risk List
AM	silver-haired bat	Lasionycteris noctivagans	G3G4	S3	At-Risk List
AM	hoary bat	Lasiurus cinereus	G3G4	S2S3	At-Risk List
AM	Fletcher dark kangaroo mouse	Microdipodops megacephalus nasutus	G4T2	S2	At-Risk List
AM	pale kangaroo mouse	Microdipodops pallidus	G3	S2	At-Risk List
AM	little brown myotis	Myotis lucifugus	G3	S2S3	At-Risk List
AM	fringed myotis	Myotis thysanodes	G4	S2	At-Risk List
AM	American pika	Ochotona princeps	G5	S2	At-Risk List

AF	Lahontan cutthroat trout	Oncorhynchus clarkii henshawi	G4T3	S3	At-Risk List
PD	oryctes	Oryctes nevadensis	G3	S3	At-Risk List
PD	Nevada dune beardtongue	Penstemon arenarius	G2G3	S2	At-Risk List
PD	Wassuk beardtongue	Penstemon rubicundus	G2G3	S3	At-Risk List
PD	Mono County phacelia	Phacelia monoensis	G3	S3	At-Risk List
PG	whitebark pine	Pinus albicaulis	G3G4	S3	At-Risk List
II	White Mountains icarioides blue	Plebejus icarioides albihalos	G5T2T3	S1	At-Risk List
PD	Williams combleaf	Polyctenium williamsiae	G2Q	S2	At-Risk List
II	Nevada alkali skipperling	Pseudocopaeodes eunus flavus	G3G4T3	S1	At-Risk List
IM	Wong's springsnail	Pyrgulopsis wongi	G2	S1	At-Risk List
PD	hermit cactus	Sclerocactus polyancistrus	G3	S2S3	At-Risk List
PD	Mono ragwort	Senecio pattersonensis	G2	S1	At-Risk List
AM	American water shrew	Sorex palustris	G5	S2	At-Risk List
AM	Inyo shrew	Sorex tenellus	G4	S2	At-Risk List
PD	Masonic Mountain jewelflower	Streptanthus oliganthus	G2G3	S2	At-Risk List
II	White Mountains cloudy wing	Thorybes mexicana blanca	G5T2	S1	At-Risk List
AM	pallid bat	Antrozous pallidus	G4	S3	Watch List
AB	Golden Eagle	Aquila chrysaetos	G5	S4	Watch List

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Mineral County Species List from Nevada Natural Heritage Program Website (2018)

Common Name	Scientific Name	Family Name	Minor Group	Major Group	NNHP Status	USESA Status	State Rank	Endemic	BLM Status	USFS Status	Nevada Status	WAP 2012	NNPS Status	CCVI
Tricolored Blackbird	Agelaius tricolor	Icteridae	Bird	Vertebrate Animal	Track all extant and selected historical EOs		S1B					SCP12		PS
pallid bat	Antrozous pallidus	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3		S	R5S	PM			
Golden Eagle	Aquila chrysaetos	Accipitridae	Bird	Vertebrate Animal	Track on a watch list only		S4		S			SCP12		PS
Callaway milkvetch	Astragalus callithrix	Fabaceae	Dicot	Vascular Plant	Track on a watch list only		S3		S				D	
Cima milkvetch	Astragalus cimae var. cimae	Fabaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S				W	
Long Valley milkvetch	Astragalus johannis-howellii	Fabaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S	R4S, R5S			M	PS
scorpion milkvetch	Astragalus lentiginosus var. scorpi	Fabaceae	Dicot	Vascular Plant	Track on a watch list only		S3?						D	
Sodaville milkvetch	Astragalus lentiginosus var. sesqu	Fabaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S1		S		CE		T	
Lavin eggvetch	Astragalus oophorus var. lavinii	Fabaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S	R4S			W	
Tonopah milkvetch	Astragalus pseudiodanthus	Fabaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S				D	PS
Western Burrowing Owl	Athene cunicularia hypugaea	Strigidae	Bird	Vertebrate Animal	Track on a watch list only		S3B		S			SCP12		PS
Bodie Hills rockcress	Boechera bodiensis	Brassicaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S	R4S, R5S			W	MV
pinyon rockcress	Boechera dispar	Brassicaceae	Dicot	Vascular Plant	Track on a watch list only		S1S2						M	
Shockley rockcress	Boechera shockleyi	Brassicaceae	Dicot	Vascular Plant	Track on a watch list only		S3			R5S			D	
dainty moonwort	Botrychium crenulatum	Ophioglossaceae	Fern	Vascular Plant	Track all extant and selected historical EOs		S1?		S	R4S, R5S			W	
Ferruginous Hawk	Buteo regalis	Accipitridae	Bird	Vertebrate Animal	Track all extant and selected historical EOs		S2		S			SCP12		PS
Swainson's Hawk	Buteo swainsoni	Accipitridae	Bird	Vertebrate Animal	Track on a watch list only		S2B		S					PS
Leichtlin mariposa lily	Calochortus leichtlinii	Liliaceae	Monocot	Vascular Plant	Track on a watch list only		S3							
Nevada suncup	Camissonia nevadensis	Onagraceae	Dicot	Vascular Plant	Track on a watch list only		S3	Y	S				D	
Greater Sage-Grouse	Centrocercus urophasianus	Phasianidae	Bird	Vertebrate Animal	Track on a watch list only		S3		S	R4S, R5S	GB	SCP12		HV
Western Snowy Plover	Charadrius nivosus nivosus	Charadriidae	Bird	Vertebrate Animal	Track on a watch list only		S3B		S			SCP12		MV
northern rubber boa	Charina bottae	Boidae	Reptile	Vertebrate Animal	Track on a watch list only		S3S4		S			SCP12		PS
Black Tern	Chlidonias niger	Laridae	Bird	Vertebrate Animal	Track on a watch list only		S2S3B					SCP12		PS
Yellow-billed Cuckoo	Coccyzus americanus	Cuculidae	Bird	Vertebrate Animal	Track all extant and selected historical EOs		S1B		S	T	SB	SCP12		MV
Olive-sided Flycatcher	Contopus cooperi	Tyrannidae	Bird	Vertebrate Animal	Track on a watch list only		S2B					SCP12		IL
Townsend's big-eared bat	Corynorhinus townsendii	Vespertilionidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2		S	R4S, R5S	SM	SCP12		PS
Hiko White River springfish	Crenichthys baileyi grandis	Goodeidae	Fish	Vertebrate Animal	Track all extant and selected historical EOs	Listed endangered	S1	Y	S		EF	SCP12		PS
Railroad Valley Springfish	Crenichthys nevadae	Goodeidae	Fish	Vertebrate Animal	Track all extant and selected historical EOs	Listed threatened	S2	Y	S	T	TF	SCP12		PS
Great Basin collared lizard	Crotaphytus bicinctores	Crotaphytidae	Reptile	Vertebrate Animal	Track on a watch list only		S4		S			SCP12		PS
Bodie Hills draba	Cusickiella quadricostata	Brassicaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S	R4S			W	PS
gray wavewing	Cymopterus cinerarius	Apiaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S1						W	EV
desert kangaroo rat	Dipodomys deserti	Heteromyidae	Mammal	Vertebrate Animal	Track on a watch list only		S2S3					SCP12		PS
big brown bat	Eptesicus fuscus	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3S4		S					
Watson goldenbush	Ericameria watsonii	Asteraceae	Dicot	Vascular Plant	Track on a watch list only		S3						D	
Alexander buckwheat	Eriogonum alexanderae	Polygonaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2S3	N	S				W	
Mono buckwheat	Eriogonum ampullaceum	Polygonaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S1						W	
Beatley buckwheat	Eriogonum beatleyae	Polygonaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S3		S				D	PS
Lahontan Basin buckwheat	Eriogonum rubricaule	Polygonaceae	Dicot	Vascular Plant	Track on a watch list only		S3	Y	S				D	
spotted bat	Euderma maculatum	Vespertilionidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2		S	R4S	TM	SCP12		PS
early blue	Euphilotes enoptes primavera	Lycaenidae	Insect	Invertebrate	Track all extant and selected historical EOs		S1	P	S					
Prairie Falcon	Falco mexicanus	Falconidae	Bird	Vertebrate Animal	Track on a watch list only		S4					SCP12		PS
Peregrine Falcon	Falco peregrinus	Falconidae	Bird	Vertebrate Animal	Track all extant and selected historical EOs		S2		S	R4S	EB	SCP12		PS
long-nosed leopard lizard	Gambelia wislizenii	Crotaphytidae	Reptile	Vertebrate Animal	Track on a watch list only		S4		S			SCP12		PS
Common Loon	Gavia immer	Gaviidae	Bird	Vertebrate Animal	Track on a watch list only		S2N					SCP12		PS
yellow spinecape	Goodmania luteola	Polygonaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S1	N					W	
sand cholla	Grusonia pulchella	Cactaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2S3		S		CY		D	
Pinyon Jay	Gymnorhinus cyanocephalus	Corvidae	Bird	Vertebrate Animal	Track on a watch list only		S3S4		S			SCP12		PS
Bald Eagle (Contiguous US Pop)	Haliaeetus leucocephalus	Accipitridae	Bird	Vertebrate Animal	Track all extant and selected historical EOs		S1B,S3N		S	R4S, R5S	EB	SCP12		PS
dune sunflower	Helianthus deserticola	Asteraceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S3						D	
Loggerhead Shrike	Lanius ludovicianus	Laniidae	Bird	Vertebrate Animal	Track on a watch list only		S4		S		SB	SCP12		PS
silver-haired bat	Lasionycteris noctivagans	Vespertilionidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S3		S			SCP12		PS
hoary bat	Lasiurus cinereus	Vespertilionidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2S3		S			SCP12		IL
sagebrush vole	Lemmiscus curtatus	Cricetidae	Mammal	Vertebrate Animal	Track on a watch list only		S3					SCP12		HV
Gray-crowned Rosy-Finch	Leucosticte tephrocotis	Fringillidae	Bird	Vertebrate Animal	Track on a watch list only		S3N		S			SCP12		HV
northern leopard frog	Lithobates pipiens	Ranidae	Amphibian	Vertebrate Animal	Track on a watch list only		S2S3		S		PA	SCP12		PS
Lewis's Woodpecker	Melanerpes lewis	Picidae	Bird	Vertebrate Animal	Track on a watch list only		S3		S			SCP12		PS
Candelaria blazing star	Mentzelia candelariae	Loasaceae	Dicot	Vascular Plant	Track on a watch list only		S3?	Y	S				D	
Fletcher dark kangaroo mouse	Microdipodops megacephalus nas	Heteromyidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2	Y	S		PM	SCP12		
pale kangaroo mouse	Microdipodops pallidus	Heteromyidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2		S		PM	SCP12		MV
California myotis	Myotis californicus	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3S4		S					

Mineral County Species List from Nevada Natural Heritage Program Website (2018)

Common Name	Scientific Name	Family Name	Minor Group	Major Group	NNHP Status	USESA Status	State Rank	Endemic	BLM Status	USFS Status	Nevada Status	WAP 2012	NNPS Status	CCVI
western small-footed myotis	Myotis ciliolabrum	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3S4		S			SCP12		PS
long-eared myotis	Myotis evotis	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3		S			SCP12		IL
little brown myotis	Myotis lucifugus	Vespertilionidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2S3		S			SCP12		IL
fringed myotis	Myotis thysanodes	Vespertilionidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2		S	R5S	PM	SCP12		IL
long-legged myotis	Myotis volans	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3S4		S					
Yuma myotis	Myotis yumanensis	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3		S					
Long-billed Curlew	Numenius americanus	Scolopacidae	Bird	Vertebrate Animal	Track on a watch list only		S2S3B		S			SCP12		PS
American pika	Ochotona princeps	Ochotonidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2		S		PM	SCP12		HV
Lahontan cutthroat trout	Oncorhynchus clarkii henshawi	Salmonidae	Fish	Vertebrate Animal	Track all extant and selected historical EOs	Listed threatened	S3	N	S	T	GF	SCP12		MV
Sage Thrasher	Oreoscoptes montanus	Mimidae	Bird	Vertebrate Animal	Track on a watch list only		S5B		S		SB	SCP12		MV
oryctes	Oryctes nevadensis	Solanaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S3		S				W	MV
Watson spinecup	Oxytheca watsonii	Polygonaceae	Dicot	Vascular Plant	Track on a watch list only		S3?		S				D	
canyon bat	Parastrellus hesperus	Vespertilionidae	Mammal	Vertebrate Animal	Track on a watch list only		S3S4		S					
American White Pelican	Pelecanus erythrorhynchos	Pelecanidae	Bird	Vertebrate Animal	Track on a watch list only		S2B					SCP12		MV
Nevada dune beardtongue	Penstemon arenarius	Scrophulariaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2	Y	S	R4S			W	MV
Wassuk beardtongue	Penstemon rubicundus	Scrophulariaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S3	Y	S	R4S			D	PS
tuni	Perideridia lemmonii	Apiaceae	Dicot	Vascular Plant	Track on a watch list only		S3?							
Reese River phacelia	Phacelia glaberrima	Hydrophyllaceae	Dicot	Vascular Plant	Track on a watch list only		S3?	Y	S				D	
Mono County phacelia	Phacelia monoensis	Hydrophyllaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S3		S	R4S, R5S			T	
desert horned lizard	Phrynosoma platyrhinos	Phrynosomatidae	Reptile	Vertebrate Animal	Track on a watch list only		S4		S			SCP12		PS
whitebark pine	Pinus albicaulis	Pinaceae	Gymnosperm	Vascular Plant	Track all extant and selected historical EOs	Candidate	S3		S	R4S, R5S				
saltmarsh allocarya	Plagiobothrys salsus	Boraginaceae	Dicot	Vascular Plant	Track on a watch list only		S2S3						W	
White Mountains icarioides blue	Plebejus icarioides albihalos	Lycaenidae	Insect	Invertebrate	Track all extant and selected historical EOs		S1							
White-faced Ibis	Plegadis chihi	Threskiornithidae	Bird	Vertebrate Animal	Track on a watch list only		S3B					SCP12		PS
Williams combleaf	Polyctenium williamsiae	Brassicaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S	R4S, R5S	CE		T	
Nevada alkali skipperling	Pseudocopaeodes eunus flavus	Hesperiidae	Insect	Invertebrate	Track all extant and selected historical EOs		S1		S					
Flammulated Owl	Psiloscops flammeolus	Strigidae	Bird	Vertebrate Animal	Track on a watch list only		S4B		S	R4S		SCP12		PS
Wong's springsnail	Pyrgulopsis wongi	Hydrobiidae	Mollusc	Invertebrate	Track all extant and selected historical EOs		S1	N	S	R5S		SCP12		MV
hermit cactus	Sclerocactus polyancistrus	Cactaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2S3				CY		D	
Mono ragwort	Senecio pattersonensis	Asteraceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S1			R4S, R5S			W	
American water shrew	Sorex palustris	Soricidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2		S			SCP12		MV
Inyo shrew	Sorex tenellus	Soricidae	Mammal	Vertebrate Animal	Track all extant and selected historical EOs		S2		S			SCP12		PS
Brewer's Sparrow	Spizella breweri		Bird	Vertebrate Animal	Track on a watch list only		S4B		S		SB	SCP12		MV
Masonic Mountain jewelflower	Streptanthus oliganthus	Brassicaceae	Dicot	Vascular Plant	Track all extant and selected historical EOs		S2		S	R4S, R5S			W	
Mexican free-tailed bat	Tadarida brasiliensis	Molossidae	Mammal	Vertebrate Animal	Track on a watch list only		S4		S		PM	SCP12		PS
Sierra gartersnake	Thamnophis couchii	Colubridae	Reptile	Vertebrate Animal	Track on a watch list only		S3							PS
White Mountains cloudy wing	Thorybes mexicana blanca	Hesperiidae	Insect	Invertebrate	Track all extant and selected historical EOs		S1							
kit fox	Vulpes macrotis	Canidae	Mammal	Vertebrate Animal	Track on a watch list only		S3				FM			PS

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

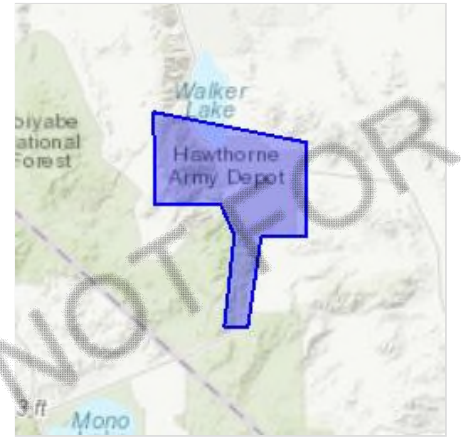
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Mineral County, Nevada



Local office

Reno Fish And Wildlife Office

(775) 861-6300
(775) 861-6301

1340 Financial Boulevard, Suite 234
Reno, NV 89502-7147

http://www.fws.gov/nevada/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
North American Wolverine Gulo gulo luscus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Birds

NAME	STATUS
Yellow-billed Cuckoo Coccyzus americanus There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Lahontan Cutthroat Trout Oncorhynchus clarkii henshawi No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3964	Threatened

Conifers and Cycads

NAME	STATUS
Whitebark Pine Pinus albicaulis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1748	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act [1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php

- Measures for avoiding and minimizing impacts to birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds
  http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see maps of where birders and the general public have sighted birds in and around your project area, visit E-bird tools such as the E-bird data mapping tool (search for the name of a bird on your list to see specific locations where that bird has been reported to occur within your project area over a certain timeframe) and the E-bird Explore Data Tool (perform a query to see a list of all birds sighted in your county or region and within a certain timeframe). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Brewer's Sparrow *Spizella breweri* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9291	Breeds May 15 to Aug 10

Clark's Grebe Aechmophorus clarkii — Breeds Jan 1 to Dec 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos — Breeds Dec 1 to Aug 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/1680

Green-tailed Towhee Pipilo chlorurus — Breeds May 1 to Aug 10
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9444

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Long-billed Curlew Numenius americanus — Breeds Apr 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5511

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Pinyon Jay Gymnorhinus cyanocephalus — Breeds Feb 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9420

Sage Thrasher Oreoscoptes montanus — Breeds Apr 15 to Aug 10
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9433

Virginia's Warbler Vermivora virginiae — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9441

Willet Tringa semipalmata — Breeds Apr 20 to Aug 5

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in your project's counties during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the counties of your project area. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

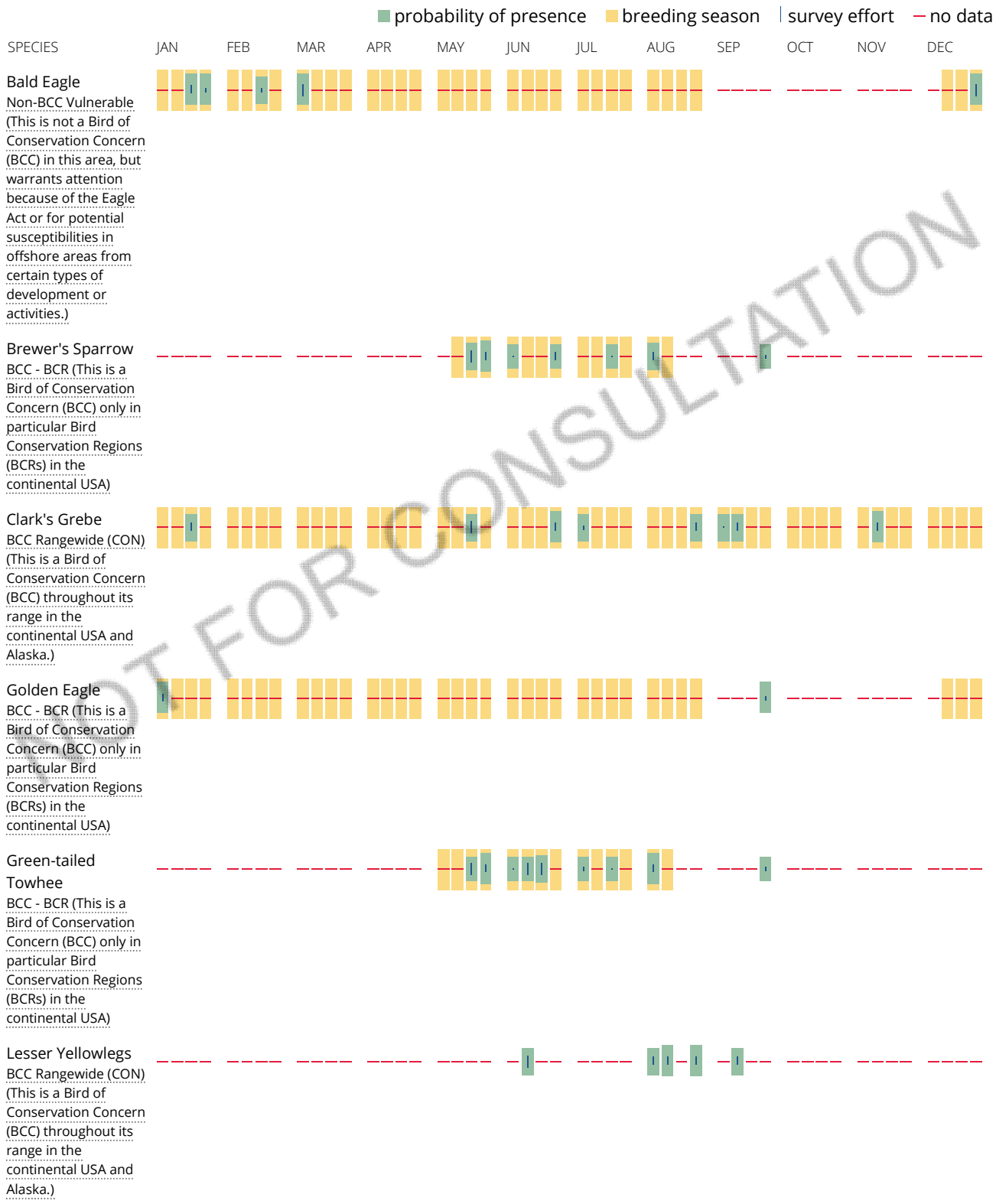
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

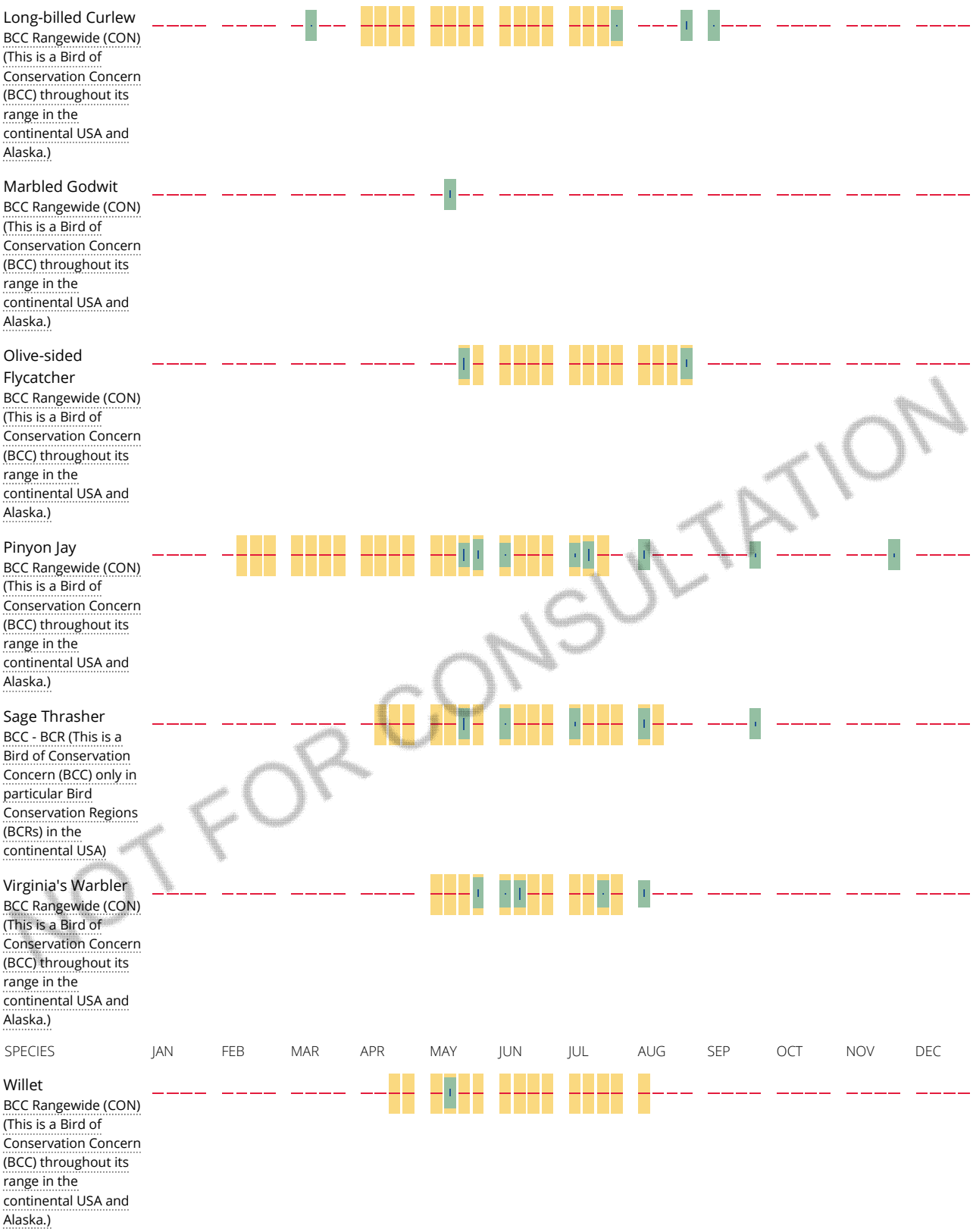
No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information.





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding

their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the counties which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird entry on your migratory bird species list indicates a breeding season, it is probable that the bird breeds in your project's counties at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the BGEPA should such impacts occur.

Facilities

Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Appendix D
Cooperative Agreements

Cooperative Agreement for the Reestablishment of Desert Bighorn Sheep on Lands Administered by the U.S. Army Ammunition Plant Hawthorne, Nevada (1988)

Memorandum of Understanding among Hawthorne Army Depot, Nevada Department of Wildlife, and U.S. Fish and Wildlife Service (undated)

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COOPERATIVE AGREEMENT FOR THE
REESTABLISHMENT OF DESERT BIGHORN SHEEP
ON LANDS ADMINISTERED BY THE U.S. ARMY AMMUNITION PLA T
HAWTHORNE, NEVADA

The Nevada Department of Wildlife proposes to transplant 20-25 desert bighorn sheep onto lands in the Mount Grant area which are administered by the U.S. Army Ammunition Plant, Hawthorne, Nevada. Transplant stock would be obtained from Lone Mountain in Esmeralda County and transported to the site and released by Department personnel. Approximately three of the animals would be equipped with radio telemetry transmitters to facilitate follow-up efforts.

The following conditions would apply to this cooperative effort to reestablish sheep on the Mount Grant area:

1. The Nevada Department of Wildlife will provide all manpower and funding necessary for the initial release and augmentory releases of sheep on Mount Grant within the boundaries of the military reservation.
2. The U.S. Army will allow the Nevada Department of Wildlife access to this area as needed to monitor the bighorn sheep population.
3. The U.S. Army will control public access to this area to the extent necessary to provide protection to the bighorn sheep resource.
4. The U.S. Army will consult the Nevada Department of Wildlife prior to initiating any activities, military or otherwise, on the Mount Grant area which may adversely impact the bighorn sheep resource.
5. The U.S. Army will not permit domestic sheep grazing with the confines of the military reservation on the Mount Grant area.
6. The Nevada Department of Wildlife will regularly provide the Army with information regarding the status and trends of bighorns on the Mount Grant area.

7. At such time that the Department of Wildlife determines there is a harvestable surplus of bighorn sheep on the Mount Grant area, they will consult and coordinate with the U.S. Army regarding a hunting season. The U.S. Army would allow limited public access to those people successful in obtaining bighorn sheep tags for the Mount Grant area. The Department of Wildlife and the U.S. Army would jointly administer a hunt of this type.

8. Upon approval this agreement becomes an addendum to the COOPERATIVE PLAN FOR CONSERVATION AND DEVELOPMENT OF FISH AND WILDLIFE ON THE U.S. ARMY AMMUNITION PLANT, HAWTHORNE, NEVADA, which was agreed to by both agencies in June of 1984.

10-26-88
Date

Commanding Officer
Army Ammunition Plant
Hawthorne, Nevada

10-31-88
Date

Plant Manager
D Z.B. Corporation
Operating Contractors of Hawthorne
Army Ammunition Plant

11-3-88
Date

Region I Manager
Nevada Department of Wildlife

*
Date

Regional Director
U.S. Fish and Wildlife Service

* Signature not required. See attached Cooperative Plan.

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Memorandum of Understanding
Among
Hawthorne Army Depot,
Nevada Department of Wildlife, and the
U.S. Fish and Wildlife Service

I Authority

This Memorandum of Understanding (MOU) among the Hawthorne Army Depot (HWAD), Nevada Department of Wildlife (NDOW), and the U.S. Fish and Wildlife Service (FWS), is hereby entered into under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661), the Fish and Wildlife Act of 1956 (16 U.S.C. 742 f(a)(4)), the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et. seq.) and the Nevada Revised Statutes Sections 503.351 and 503.584. Together, the HWAD, NDOW, and FWS are referred to in this MOU as the Cooperators.

II Purpose and Background

The purpose of this MOU is to facilitate a partnership among the Cooperators in development and maintenance of a population of Lahontan cutthroat trout (LCT) on lands managed by the HWAD. Lahontan cutthroat trout is a species of fish that occurs within the Great Basin and is listed as threatened under the Endangered Species Act of 1973, (ESA) as amended.

The Lahontan cutthroat trout are currently found in California, Nevada, and Oregon. LCT within the Walker River watershed are currently only known to occur as head water resident populations in California. The current population is substantially reduced from historic abundance and historic distribution, with current stream populations within Nevada suffering recent declines due to extreme drought from 2011-2014. Populations of LCT on lands managed by HWAD may decline despite good faith effort by the cooperators in population management with USFWS and NDOW.

III Statement of Mutual Interest and Mutual Benefits

The Hawthorne Army Depot is an installation operated by the Department of Defense (DOD) whose mission is to provide storage for ammunition and provide high altitude ground and air training for DOD personnel. Mt Grant is currently used for ground and air training activities and as such is closed to public access. Cottonwood Creek, Cat Creek, and portions of Corey Creek lie within the restricted area and have been identified as potential LCT habitat.

NDOW is a Department within the State of Nevada whose mission is to protect, preserve, manage and restore wildlife and its habitat for their aesthetic, scientific, educational, recreational, and economic benefits to citizens of Nevada and the United States, and to promote the safety of persons using vessels on the waters of Nevada. NDOW has specific responsibilities for the management and conservation of all resident species of wildlife in the State of Nevada.

FWS is a Federal agency whose mission, working with others, is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. FWS has specific responsibilities for the recovery of species listed under the ESA.

The Cooperators have identified common areas of interest in the conservation of the Walker River LCT populations and desire to assist one another in conducting actions to support conservation of the species. The Cooperators recognize the impacts to LCT due to physical habitat alterations as well as introduced non-native species and believe the Walker River population can be restored within Nevada through focused project efforts. The baseline stream and habitat data are sufficient to sustain LCT within the HWAD. Activities including elimination of non-native species, streambed restoration, vegetation enhancement, and stream quality improvements are desired to implement and sustain the conservation efforts.

The Cooperators recognize the importance and necessity of working together and agree to support and to coordinate, as appropriate, activities intended to benefit LCT. The Cooperators understand that participation in the conservation and recovery process for LCT under this MOU is voluntary.

The Cooperators mutually recognize the scientific expertise of one another in contributing to the conservation of the LCT. FWS and NDOW recognize the special capabilities and facilities of HWAD in contributing to this conservation effort. HWAD recognizes the regulatory and statutory responsibilities of the FWS and NDOW for the conservation and recovery of listed species under the ESA. This responsibility includes assisting, coordinating, and forming partnerships with Federal, State, and private entities in the national effort to prevent extinction of native species. FWS and NDOW mutually recognize that HWAD must operate and maintain the Mt Grant property to meet the consumptive and training use of DOD lands and thus needs to retain the ability to respond to emergency situations on the Mt Grant property promptly. In extreme situations, the status of the recovery waters may become secondary to the operation of the DOD lands. If such an emergency should arise, HWAD would notify FWS and NDOW as soon as possible.

In consideration of the above premises, the Cooperators agree as follows:

IV Responsibilities of the Cooperators

The Cooperators shall:

1. Work together in accomplishing mutually agreed objectives for Establishment and Maintenance of LCT populations at HWAD, including development of a Scope of Work outlining those objectives;
2. Modify the Scope of Work as necessary to accomplish the objectives of the MOU with the mutual agreement of the Cooperators;
3. Assist each other in managing streams to eradicate and exclude nonnative fish;
4. Work together to develop and present a program to educate HWAD employees and notice the public on the scientific facts and responsibilities involved with area endangered species.

V Responsibilities of HWAD:

HWAD shall:

1. Provide access to and use of the streams identified as potential LCT habitat by NDOW and FWS for the purpose of accomplishing the objectives of a Scope of Work for Establishment and Maintenance of LCT at HWAD;
2. Notify NDOW and FWS in advance of any major or non-routine operations/maintenance activities that may require salvage or transfer of fish;
3. Notify NDOW and FWS, as soon as reasonably possible, of any emergency procedures/operations that, in the judgment of HWAD, might have an effect on the fish, or immediately if fish are observed dead or dying for any or unknown reasons.
4. Provide reasonable access to NDOW and FWS for monitoring, salvage or transfer of fish consistent with safety and security requirements of HWAD.

VI Responsibilities of NDOW:

NDOW shall:

1. Ascertain the population of the species and periodically monitor the conditions present in the streams; and
2. Notify and coordinate with HWAD and FWS of needs for access or plans to eradicate, harvest the fish or other similar actions.

VII Responsibilities of FWS:

FWS shall:

1. Notify HWAD and NDOW immediately upon publication of any Rule, Regulation, or Notice in the Federal Register that clarifies or changes the regulatory status of LCT; and
2. Collaborate with HWAD and NDOW to participate in the development of any FWS recovery/habitat restoration plans for LCT and other fish species within the Mt Grant property.

VIII General Provisions:

1. **Property**. As such term is used herein, "Property" shall mean the DOD withdrawn lands inside the fenced area of the Mt Grant Training Area.
2. **Appropriations**. Nothing in this MOU shall be construed as obligating the Cooperators to expend funding or other resources, or as involving the United States or State of Nevada in any obligation for the present or future payment of funds in excess of appropriations authorized by law and administratively allocated for work undertaken pursuant to this MOU and/or supplemental to this MOU.
3. **Access to Property/Coordination**. The Cooperators each acknowledge and agree that permission is granted only to FWS and NDOW personnel responsible for the execution and conduct of the activities contemplated by this MOU to enter onto the Property solely for the purpose of engaging in activities in furtherance of each party's obligations hereunder. FWS and NDOW shall, if possible, give HWAD three days (72 hours) advance notice of their decision to enter upon the Property and obtain permission. FWS and NDOW shall identify who will be on the Property, during what period, what equipment they will bring and what activities they will be conducting in furtherance of their responsibilities under this MOU. FWS and NDOW recognize that access may be restricted at any time consistent with HWAD's operational and training needs on DOD lands.
4. **Amendments**. This MOU may be revised, as necessary, by the issuance of a written amendment, consented to, signed, and dated by all of the Cooperators.
5. **Publicity**. The Cooperators agree to submit to each other for prior review, materials proposed for release to the public media that reference activities being carried out under this MOU, by any employee of the HWAD, NDOW, or FWS.
6. **Indemnification**
    a. To the fullest extent of NRS Chapter 41 liability limitations, each party shall indemnify, hold harmless and defend, not excluding the other's right to participate, the other from and against all liability, claims, actions, damages, losses and expenses, including but not limited to reasonable

attorneys' fees and costs, arising out of any alleged negligent or willful acts or omissions of the party, its officers, employees and agents. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this paragraph.

b. The indemnification obligation under this paragraph is conditioned upon receipt of written notice by the indemnifying party within 30 days of the indemnified party's actual notice of any actual or pending claim or cause of action. The indemnifying party shall not be liable to hold harmless any attorneys' fees and costs for the indemnified party's chosen right to participate with legal counsel.

7. **Termination**. Any Cooperator may terminate their participation in this MOU by providing 30 days written notice to all other Cooperators. This MOU may be terminated in its entirety or it may be modified to include or exclude a Cooperator by mutual agreement of the Cooperators.

8. **Primary Contacts:**

Hawthorne Army Depot
Commander Hawthorne Army Depot
LTC. Scott M. Bishop
1 South Maine Avenue
Hawthorne Army Depot 89415-9404
Phone: (775) 945-7002
FAX (775) 945-7779

U.S. Fish & Wildlife Service, Reno Field Office
Field Supervisor
1340 Financial Blvd Suite 234
Reno, Nevada 89502
Phone: (775) 861-6300
Fax: (775)861-6301

Nevada Department of Wildlife
Kim Tisdale, Supervising Biologist - Fisheries
Western Region
1100 Valley Road
Reno, Nevada 89512
Phone: (775) 688-1882
After Hours Emergency: (775) 688-1331 (dispatch)
Fax: (775) 688-1595

IN WITNESS WHEREOF, the parties hereto have executed this MOU as of the last written date below.

U.S. FISH AND WILDLIFE SERVICE

_____
Ted Koch, Field Supervisor
Nevada Fish and Wildlife Office

_____
Date

NEVADA DEPARTMENT OF WILDLIFE

_____
Tony Wasley, Director

_____
Date

HAWTHORNE ARMY DEPOT

_____
LTC. Scott M. Bishop
Commander, Hawthorne Army Depot

_____
Date

OFFICE OF THE ATTORNEY GENERAL OF NEVADA

Approved as to form by:

_____
Deputy Attorney General for Attorney General

_____
Date

Appendix E
Herpetofauna Survey

To be completed by HWAD's Natural Resources Manager. Insert the herpetofauna survey report once it is complete.

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Appendix F
Review Documentation

To be added to by HWAD's Natural Resources Manager in coordination with USFWS and NDOW.

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Comment Matrix Draft Final Integrated Natural Resources Management Plan 2019-2023 Hawthorne Army Depot, Nevada						
Comment Number	**Page Number**	**Section/ Figure/Table/ Appendix**	**Line Number**	**Commentor**	**Comment**	**Response**
1	29	Section 5.4.1.2	20	Mark Freese, Nevada Dept of Wildlife	Add Tui chub (Gila bicolor) as species of fish extirpated from Walker Lake.	Added to section 5.4.1.2.
2	50	Section 6.4.1	11-21	Mark Freese, Nevada Dept of Wildlife	Other bat species known to occur at HWAD include the Pallid bat (Antrozous pallidus), which is a state protected species. Jenni Jeffers, NDOW Diversity Biologist observed a maternity roost in one of the loading docks.	Added to section 6.4.1, Table 17, and section 6.5.2.2.
3	50	Section 6.4.1	11-21	Mark Freese, Nevada Dept of Wildlife	We recommend also including the Townsend's big-eared bat (Corynorhinus townsendii) which is a state "sensitive" species. HWAD is within their range and they roost in rock features or pinyon juniper. Lastly, we recommend including the Western pipistrelle (Parastrellus Hesperus) as the HWAD is within its range and NDOW has document data points for that species in Mineral County and within the HWAD boundary.	Added to section 6.4.1.
4	50	Section 6.4.1, Table 13	NA	Mark Freese, Nevada Dept of Wildlife	NDOW has records of a black bear sighting in 1993 by Gregg Tanner. This was prior to the six bears being relocated there in 1996.	Revised wording in Table 13.
5	54	Section 6.4.3	13	Mark Freese, Nevada Dept of Wildlife	Remove Tiger trout from fish found in Rose Creek and Cat Creek reservoir as Tiger Trout only exist in Rose Creek Reservoir.	Text removed as requested.
6	56	Section 6.4.5, Table 15	NA	Mark Freese, Nevada Dept of Wildlife	We recommend replacing the "Western Rattlesnake" with the "Great Basin rattlesnake (Crotalus viridis lutosus)"	Revised as requested.
7	59	Section 6.5.2.2, Table 17	NA	Mark Freese, Nevada Dept of Wildlife	We recommend adding Brazilian Free-tailed Bat and Western Red Bat to this table, which are also a Nevada Species of Conservation Priority.	Text regarding these species was added to section 6.4.1 instead of Table 17 since Table 17 lists species known to occur at HWAD.
8	NA	Section 6.5.2.2	NA	Andy Starostka, Nevada FWS	Steve Able reviewed the INRMP and had no comments related to sage grouse.	Thank you for your review.
9	60	Section 6.5.2.2	23	Mark Freese, Nevada Dept of Wildlife	Consider rewording as recreational shooting is not a contributing factor to Pika habitat loss (i.e. recreation shooting would be a direct impact, not an indirect habitat issue).	Changed to "recreational use."
10	62	Section 6.5.2.2	17-18	Mark Freese, Nevada Dept of Wildlife	We recommend revising the following sentence as we are unsure what is being stated, "The species' population size and trends are unknown efforts".	Changed to "…are not well understood."
11	62	Section 6.5.2.2	26	Mark Freese, Nevada Dept of Wildlife	NDOW does have habitat and roost preferences for little brown bat and can provide that information upon request.	Text added to describe habitat and roost preferences.
12	Multiple	Section 8-10, Section 9, Table 19	Multiple	Mark Freese, Nevada Dept of Wildlife	Many of these items in sections 8-10 appear redundant and as such, a little confusing. To avoid such confusion we recommend eliminating the redundancy and simplifying these sections. For example, can the information in Section 9 be organized and merged with Table 19?	Army Materiel Command (AMC) directs that this standard format be used for all AMC INRMPs.
13	68	Section 8.1.1	35	Andy Starostka, Nevada FWS	The Fish and Wildlife Service acknowledges and appreciates the willingness of the HWAD to allow the introduction of LCT in Cottonwood Creek. Currently this the only naturally reproducing Walker Basin LCT in Nevada. We hope and encourage that the potential for additional populations in Cat and Rose Creek drainages be considered and pursued in the future. With a collaborative approach between the HWAD, NDOW and FWS, additional LCT recovery populations can be established with no or minimal impacts to Depot mission activities.	Language added to section 8.1.1 regarding potential introduction of LCT to Cat and Rose creek drainages. HWAD will continue to collaborate with NDOW and USFWS on LCT restoration efforts in accordance with the Memorandum of Understanding between these parties.

Comment Matrix Draft Final Integrated Natural Resources Management Plan 2019-2023 Hawthorne Army Depot, Nevada						
Comment Number	**Page Number**	**Section/ Figure/Table/ Appendix**	**Line Number**	**Commentor**	**Comment**	**Response**
14	70	Section 8.1.2	29	Mark Freese, Nevada Dept of Wildlife	We recommend adding a paragraph under section 8.1.2 describing the issues with Nelson desert bighorn sheep getting hit by cars on Highway 95. Additionally, we recommend adding management actions and projects that will help eliminate this issue. For example, we are currently evaluating a fence running along highway 95 to preclude BHS access onto the highway and adding additional water developments on HWAD and BLM property to keep BHS up on the Mountain and away from Walker Lake and the town of Walker Lake. We are happy to discuss in more detail. This recommendation should be carried from Section 8 through 10.	Language added to Table 18: Management of Selected Wildlife Species at HWAD that NDOW is evaluating constructing a fence along Highway 95 to minimize bighorn fatalities or providing additional water sources on Mount Grant to discourage them from crossing the highway. HWAD will coordinate with NDOW to further evaluate these efforts.
15	70	Section 8.1.2	33	Mark Freese, Nevada Dept of Wildlife	Reword to state, "HWAD allows access to a limited amount of bighorn sheep tag holders on Mount Grant and anglers fishing Rose Creek Reservoir. No other hunting or fishing access is allowed at this time."	Revised as requested.
16	71-72	Table 18	NA	Mark Freese, Nevada Dept of Wildlife	For antelope, mule deer, Nelson desert bighorn sheep, Dusky grouse, and Game Birds. We recommend rewording that HWAD allows or prohibits "access" as opposed to limiting or regulating "hunting", which is the responsibility of the Nevada Board of Wildlife Commissioners.	Revised as needed throughout document.
17	73	Section 8 and 10	1	Mark Freese, Nevada Dept of Wildlife	We recommend rewording, "Continue facilitating monitoring and management efforts by NDOW for fish and wildlife species under their management purview, including but not limited to Nelson desert bighorn sheep, bats, bears, fish species, etc. This recommendation should be carried from Section 8 through 10.	Revised as requested.
18	74	Section 8 and 10	3	Mark Freese, Nevada Dept of Wildlife	In addition to evaluating the need for tree removal, we recommend adding two bullets stating something similar to, "seek the necessary approvals, clearances, NEPA, etc. for Pinon Juniper removal projects to benefit wildlife and their habitat" and "apply for funding for projects that benefit wildlife and habitat". For the bi-state sage-grouse, encroached sagebrush habitats by Pinion Juniper trees is one of the greatest threats. With better sage-grouse spatial data (i.e. USGS sage-grouse collaring project) we will be able to identify areas for PJ removal (e.g. movement corridors, near leks, nesting, and brood rearing areas etc. in cooperation with USGS). This recommendation should be carried from Section 8 through 10.	Revised in sections 8 through 10.
19	75	Section 8 and 10	32	Mark Freese, Nevada Dept of Wildlife	We recommend rewording to allow for more habitat enhancements in addition to that area identified North of Cat Creek. This recommendation should be carried from Section 8 through 10.	Revised in sections 8 through 10.
20	77	Section 8.4	16	Mark Freese, Nevada Dept of Wildlife	Add a new bullet stating, "Evaluate water use and management of the reservoirs for the potential to effect fish habitat". We encourage HWAD to evaluate their water management strategies of the reservoirs so that potential negative impacts to fishery and aquatic resources is avoided and minimized.	Added to section 8.4 and Table 20.

Comment Matrix Draft Final Integrated Natural Resources Management Plan 2019-2023 Hawthorne Army Depot, Nevada						
Comment Number	**Page Number**	**Section/ Figure/Table/ Appendix**	**Line Number**	**Commentor**	**Comment**	**Response**
21	79	Section 8.7	15	Mark Freese, Nevada Dept of Wildlife	We support your efforts to improve fuels conditions and wildland fire suppression and rehabilitation efforts on Mount Grant. Mount Grant is an important wildlife resource and managing the fuels, wildfire suppression and rehabilitation are essential to ensuring its wildlife habitat values are maintained. We support your efforts to update agreements with other agency and partners and prepare an Integrated Wildland Fire Management Plan. In the event that a wildfire does occur on Mount Grant, does the HWAD have money to cover all rehabilitation activities? If not, what can be done to ensure that if a fire does occur, appropriate rehabilitation activities will be implemented?	Language added: In the event of a substantial fire, natural resource rehabilitation efforts would be evaluated and implemented to the extent they would be beneficial to the ecosystem and to the extent resources allow. Rehabilitation efforts could include seeding or tree planting to prevent erosion and minimize establishment of non-native species. Fire is a natural part of the ecosystem and, where appropriate, the ecosystem would be allowed to recover naturally.
22	81, 87	Sections 8.7, 8.10	20, 3	Mark Freese, Nevada Dept of Wildlife	We recommend rewording to the following “Revegetate fire-affected areas with native or desirable plants when appropriate to prevent encroachment of invasive weeds”, as some non-native, desirable species may be better utilized to suppress invasive non-desirable species while providing for better wildlife habitat.	Revised in sections 8 through 10.
23	82	Section 8.8.2	23	Mark Freese, Nevada Dept of Wildlife	Reword to state, “HWAD allows access to a limited….”	Revised as requested.
24	110	Objective 2.1	17	Mark Freese, Nevada Dept of Wildlife	Page 110, Objective 2.1. Consider adding a budget (e.g. $20,000) for modification of fish migration barriers (historic rock dams and road crossing culverts, i.e. Dixie camp road).	Due to the potential historic nature of the rock dams, a budget of $250,000 was added. Given the projected project cost and other priorities, it is unlikely this would be funded in the short term. However, HWAD will continue coordination with NDOW on this and other projects that could benefit fish species.
25	100	Section 9	34	Andy Starostka, Nevada FWS	Signs of recent cattle use (tracks and fresh manure patties in the road) in the upper Cottonwood Creek, near a location known as "Turkey Track." The INRMP states that grazing is not allowed, so it is assumed that these are trespass livestock.	Added reference to trepass cattle trespass in section 9 and Table 20, in addition to the existing reference to trepass cattle in section 8.9.
26	B-18	Appendix B	NA	Mark Freese, Nevada Dept of Wildlife	Page B-18. Rainbow trout, extirpated from HAWD. Remove tiger trout from Cat creek and Rose creek proper.	Revised as requested.
27	NA	Appendix D	NA	Mark Freese, Nevada Dept of Wildlife	Please include attached LCT management MOA to the Appendix.	LCT MOU added to Appendix D. Text edited to reference the MOU where appropriate.

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Appendix G
New Data and Reports

To be completed by HWAD's Natural Resources Manager. Insert any natural resources data collected from agencies, universities, or other partners.

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