U.S. ARMY
DUGWAY PROVING GROUND

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

5-year Update

2016-2020

Dugway Natural Resources Program Office
Dugway Utah

Program Manager
Robbie Knight

FINAL

Directorate of Environmental Programs

2016 INRMP UPDATE AND REVIEW
COORDINATION PAGE

This page is used to certify the INRMP update and annual review for operation and effect are appropriately coordinated for the Integrated Natural Resources Management Plan (INRMP) for Dugway Proving Ground (DPG).

By their signatures below, the certifying official acknowledges that the annual review and coordination of the INRMP has occurred for the specific year.

Robert N. Kay — 5-12-16

DPG Natural Resource Office — **Date**

5-18-16

U.S. Army — **Date**

5/17/2016

U.S. Fish and Wildlife Service — **Date**

ACTING DIRECTOR

5/17/16

Utah Division of Wildlife Resources — **Date**

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. Army Dugway Proving Ground

2016 5-Year Update Completed May 9, 2016

PREPARED BY

Dugway Proving Ground Natural Resource Office
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INRMP ANNUAL REVIEW AND 5-YEAR UPDATE COORDINATION

The DPG INRMP has been reviewed annually with external stakeholders and through Operation and Effect interviews with internal stakeholders. This update document fulfills the authority in DODI 4715.03, 18MAR2011, *INRMP Implementation Manual* and furthermore in the July 2013 MOU between the DoD, the U. S. Fish and Wildlife Service (FWS) and the Association of Fish and Wildlife Agencies (AFWA) *Streamlined INRMP Review Procedures* and the June 2015 USFWS *Guidelines for Streamlined INRMP Review*. DPG concluded that preparing a new INRMP at this time was not applicable because No significant changes to the direction of the current program were anticipated for the 5-year duration of the plan. Annual Operation and Effect assessments of the current program's implementation indicated that DPG was effectively fulfilling the criteria in the Office of the Secretary of Defense instruction and MOUs referenced above.

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PREFACE

Integrated management plans for natural and cultural resources provide resource managers with the "how to" and the justification to carry out Department of Defense's conservation goals. Integrated Natural Resource Management Plans support the military mission by providing for sustained use of its land, sea, and air space; protecting valuable natural and cultural resources for future generations; meeting all legal requirements; and promoting compatible multiple uses of those resources.

Ms. Sherri Goodman
Former Deputy Under Secretary of Defense (Environmental Security)

Dugway Proving Ground, Dugway, Utah… TEAM DUGWAY – Empowering the Nation's Defenders!

Dugway Proving Ground, Dugway, Utah… the only U.S. Army installation large and remote enough to permit comprehensive and realistic testing of biological and chemical defense systems, munitions, and smokes, obscurants, and illuminants with a commitment to environmental protection and personal and public safety.

Dugway Proving Ground provides quality testing, data, and information to serve America's soldiers, citizens, and allies by operating our nation's premier defense proving ground while conserving natural resources. Dugway Proving Ground is demonstrating that the two missions are compatible.

The land and its natural resources are vital to the well being of Dugway Proving Ground. The installation was established on public lands, and it is well understood that an important legal and stewardship responsibility came with these lands. Dugway Proving Ground is committed to that legal and stewardship role.

This Integrated Natural Resources Management Plan is Dugway Proving Ground's plan of action for the care and wise use of lands entrusted to us. The plan is for a five-year period, but the philosophy behind this plan is for a much longer period of time. Dugway Proving Ground is committed to using an ecosystem management approach to its natural resources program. Ecosystem management will help us protect biological diversity and make smart decisions regarding our use of renewable natural resources to support our military mission and the needs of our region and nation.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. ARMY DUGWAY PROVING GROUND DUGWAY, UTAH

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EXECUTIVE REPORT

It is our obligation to ensure that our Soldiers today – and the Soldiers of the future – have the land, water, and air resources they need to train; a healthy environment in which to live; and the support of local communities and the American people.[1]

Purpose

This 5-year updated Integrated Natural Resources Management Plan (INRMP) guides implementation of the natural resources program on Dugway Proving Ground (DPG) from 2016 through 2020. The program conserves DPG land and natural resources and helps ensure compliance with environmental laws and regulations. The INRMP outlines measures to ensure the maintenance of quality testing and training lands to accomplish DPG's critical military mission on a sustained basis and to ensure that natural resources conservation measures and Army military mission activities are integrated and consistent with federal stewardship requirements.

Environmental Compliance

General

Preparation and implementation of this INRMP are required by the Sikes Act (16 USC 670 *et seq.*), Army Regulation (AR) 200-3 (*Natural Resources – Land, Forest, and Wildlife Management*, Department of the Army 1995a), DoD instructionInstruction 4715.3 (*Environmental Conservation Program,* 3 May 1996) and Army Memorandum (21 March 1997), *Army Goals and -Implementing Guidance for Natural Resources Planning Level Survey (PLS) and Integrated Natural Resources Management Plans (INRMP)* (Department of the Army 1997a).

This INRMP facilitates DPG compliance with other federal and state laws, most notably laws associated with environmental documentation, wetlands, endangered species, and wildlife management. Compliance requirements at least partially affecting implementation of the INRMP are listed in Section 1.4.4. This plan describes how DPG will implement provisions of AR 200-1 (*Environmental Protection and Enhancement*, Department of the Army 2007) and local regulations, principally DPG Regulation 200-11 (*Recreational Hunting and Trapping at Dugway Proving Ground*) and DPG Regulation 350-2 (*Ranges and Training Areas*).

National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires disclosure of environmental impacts created by proposed major federal actions. 32 CFR Part 651 (*Environmental Analysis of Army Actions, Federal Register Vol. 67, No. 61, March 29, 2002*) and the Council on Environmental Quality (Implementing Guidelines for NEPA, 40 CFR Parts 1500-1508) recommend an Environmental Assessment (EA) be completed for natural resources management plans. 32 CFR Part 651 outlines NEPA compliance requirements of proposed Army actions. Recognizing the efficiencies and benefits associated by combining the INRMP and its associated EA into one document, the 2006-2010 plan was developed to satisfy both requirements, diverting from Army Guidelines to accommodate NEPA documentation within the plan.

[1] Robert J. Schoomaker, U.S. Army Chief of Staff, and R.L. Brownlee, Acting Secretary of the Army. Excerpt from *The Army Strategy for the Environment, "Sustain the Mission – Secure the Future"*

Sikes Act
The Sikes Act[2] states, *The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation...*

The Sikes Act (16 USC 670 *et seq*.) requires that, consistent with the use of military installations to ensure the preparedness of the Armed Forces, each INRMP shall, where appropriate and applicable, provide for:

- 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 for support of fish or wildlife;
- integration of, and consistency among, the various activities conducted under the INRMP;
- establishment of specific natural resources management objectives and time frames for proposed action;
- sustained use by the public of natural resources to the extent such use is not inconsistent with the needs of fish and wildlife resources management;
- public access to the military installation that is necessary or appropriate for sustained use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security;
- enforcement of natural resource laws and regulations;
- no net loss in the capability of military installation lands to support the military mission of the installation; and
- such other activities as the Secretary of the military department considers appropriate.

The Sikes Act also requires or provides for:

- regular review of this INRMP and its effects, not less often than every five years;
- provisions for spending hunting and fishing permit fees exclusively for the protection, conservation, and management of fish and wildlife, including habitat improvement and related activities in accordance with the INRMP;
- exemption from procurement of services under Office of Management and Budget Circular A-76 and any of its successor circulars; and
- priority for contracts involving implementation of this INRMP to state and federal agencies having responsibility for conservation of fish or wildlife.

This INRMP includes these items if they are applicable to natural resources management and land use at DPG.

Endangered Species Act
This INRMP has the signatory approval of the U.S. Fish and Wildlife Service (USFWS). This signature approval includes agreement that the INRMP complies with the Endangered Species Act (ESA). Review of the INRMP is informal consultation with regard to the ESA.

[2] The Sikes Act referenced in this INRMP is as amended, including Public Law 105-85, the Sikes Act Improvement Act of 1997 and as amended by Public Law 108-136, the National Defense Authorization Act of 2004.

Per provisions of the 2004 National Defense Authorization Act[3], this INRMP "*provides a benefit to the species for which critical habitat is proposed for designation*." The USFWS policy states that, where applicable, federal critical habitat designation is not warranted if the INRMP includes certain criteria, which are summarized in Section 4.8.1.1, *Critical Habitat*.

Scope

The INRMP will provide the basis and criteria for protecting and enhancing natural resources using landscape and ecosystem perspectives, consistent with the military mission. The INRMP applies to organizations internal and external to DPG that are involved with or interested in the management or use of DPG natural resources and lands. This application includes active duty units, reserve components, directorates, private groups, and individuals. This INRMP is an integral part of the DPG Master Plan and DPG Fire Management Plan.

Relationship to the Military Mission

DPG is a Department of Defense Major Range and Test Facility Base (MRTFB). DPG is one of the few U.S. Army installations large and remote enough to permit comprehensive and realistic testing of biological and chemical defense systems, munitions, and smokes, obscurants, and illuminants with a commitment to environmental protection and personal and public safety (Dugway Proving Ground 2003a). To accomplish this mission, realistic and quality testing and training opportunities are necessary. The natural environment found at DPG provides a wide variety of realistic testing and training opportunities.

This INRMP supports the military mission by protecting and enhancing lands upon which the mission is critically dependent. The Natural Resources Office (NRO) supports quality habitat initiatives which, over time will conserve species and preserve ecological processes. As a result, the persistence of landscape features on DPG provide realistic testing and training parameters for DoD operational units. Sound conservation practices ensure natural processes and landscape features are functional. Realistic testing and training elements result and mission objectives are supported. The INRMP also describes recreational opportunities associated with natural resources that are available to the DPG, local, and regional communities, when escorted by DPG personnel.

The INRMP describes impacts of the military mission upon natural resources and means to mitigate these impacts. However, this INRMP does not evaluate DPG's military mission, nor does it replace any requirement for environmental documentation of the military mission at DPG. This document shall be used in DPG planning processes and as a guide to continue program implemention objectives.

Partnerships

This document was prepared in partnership and cooperation with the U.S. Fish and Wildlife Service and the Utah Department of Natural Resources, representing the federal and state Sikes Act cooperating agencies, respectively. Other partners in this effort include universities, other federal and state agencies, and other nongovernmental organizations. This INRMP was developed and will be implemented according to principles within the Memorandum of Understanding developed by the DoD, USFWS, and International Association of Fish and Wildlife Agencies[4].

[3] Section 318, Military Readiness and Conservation of Protected Species, National Defense Authorization Act of 2004.

[4] *Memorandum of Understanding among the Department of Defense and the U.S. Fish and Wildlife Service and the International Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations*. January 2006.

INRMP Implementation Summary

This INRMP is designed to provide direct input into the budget process. The INRMP (chapters 4, 5, and 7) describes specific projects with timelines and budgets. Each project with its goals, objectives and timelines are listed in Appendix 7.4. Section 7.5, *Implementation Funding Options* lists each project by funding source and provides estimated implementation costs during fiscal years 2016-2020.

Costs and Benefits

- **Costs:** Funding will be primarily from environmental funds; revenues generated from the sale of hunting permits; and Army G3 appropriated training funds designated for implementation of the ITAM program.
- **Military Mission Benefits:** Implementation of this INRMP will improve the quality of the testing and training landscape. It will enhance the testing environment and mission realism through the perpetuation of more natural conditions and realistic training lands. It will improve health and safety and enhance the capability for long range planning at DPG.
- **Environmental Benefits:** The INRMP provides the basis for the conservation and protection of natural resources. It will help manage vegetation loss and soil erosion due to military activities, reduce the potential for environmental pollution, and promote biodiversity. Plan implementation will increase overall knowledge of the operation of DPG ecosystems through surveys and research. INRMP implementation will decrease long-term environmental costs and reduce personal and installation liabilities from environmental noncompliance.
- **Other Benefits:** Environmental awareness will be enhanced while testing and training at DPG. Community relations and DPG's environmental image, internal and external to Defense, will be enhanced. Quality of life for the DPG community and its neighbors will be improved.

INRMP Organization

This INRMP is organized into these distinct categories:

- Chapter 1 describes general relationships between natural resources management and the overall DPG mission. It lists compliance requirements, describes the natural resources management philosophy as a whole, describes regional programs, and updates management objectives as required by the Sikes Act.
- Chapter 2 identifies responsible parties and their roles in implementation of this INRMP.
- Chapter 3 describes the affected environment (physical, biological, and human) at DPG, including a description of the military mission and land management units.
- Chapter 4 describes natural resources programs as part of the standard garrison organization within the responsibility of Public Works, Environmental Programs (IMDU-PWEP) at DPG, using specific project descriptions.
- Chapter 5 describes programs directly related to natural resources, using specific project descriptions, but under the responsibility of other DPG organizations.
- Chapter 6 identifies unresolved issues.
- Chapter 7 provides means used for implementing this INRMP, including organization, personnel, external assistance, data analysis, project summary, funding, and command support.
- Chapter 8 describes the overall environmental consequences of implementing this INRMP and provides a final conclusion.
- **References** documents all sources referenced in this INRMP.
- **Agencies and Persons Consulted** identifies local, state, and federal agencies and individuals consulted by the preparers of this INRMP for their expertise.
- **Plan Preparers** identifies individuals, with their qualifications, who prepared this document.
- The **Distribution List** identifies all agencies, organizations, and individuals to whom copies of this INRMP were sent.

- The **Acronyms** section lists all acronyms used and their meaning.
- **Appendices** contain information or data relevant to natural resources management on DPG.

For those who are primarily interested in natural resources projects planned for 2016-2020, they are described in chapters 4, 5, and 7; summarized for budget purposes in sections 7.5, *Implementation Funding Options* and 7.6, *INRMP Implementation Costs*; and summarized by project with abbreviated goals and objectives in Appendix 7.4.

Monitoring INRMP Implementation

The INRMP will be evaluated through monitoring programs, including the Environmental Compliance Assessment System (every five years). The DPG NRO received an ECAS audit in 2011 without significant findings, the Environmental Quality Report, and reviews by the IMCOM West Region and other interested parties. The list of INRMP goals and objectives in Appendix 7.4 can provide a basis for evaluating plan implementation.

Annual reviews will be conducted, for operation and effect, with internal and external stakeholders, to determine whether the installation is implementing the INRMP to meet Sikes Act requirements and is contributing to the conservation and rehabilitation of natural resources on DPG.

NEPA Findings and Conclusions

2006 findings based on the incorporated EA indicated that, under the Preferred Alternative (implementation of the 2006-2010 INRMP), potential consequences would have either no significant adverse effects or beneficial effects on each resource area. The affected environment would not be significantly impacted by proceeding with the Preferred Alternative. No significant cumulative effects would be expected. Therefore, it was found in 2006 that the preparation of an Environmental Impact Statement (EIS) was not required, and that the preparation and publication of a Finding of No Significant Impact was appropriate. Over the course of implementation of the 2006-2010 INRMP and in the intervening period of time, no significant impacts or changes to the NRO program occurred, and as a result, preparation of an entirely new INRMP is not necessary. According to AR 200-1 guidance (Department of the Army 2007), this INRMP has been reviewed for operational effect and updated where necessary. No significant cumulative impacts are expected for the 2016-2020 INRMP operational period.

Summary

The INRMP outlines steps required to meet Department of Defense, U.S. Army, and Dugway Proving Ground legal and stewardship obligations for the natural resources on Dugway Proving Ground, while enabling the accomplishment of the military mission. The INRMP has been developed through cooperation with appropriate regulatory agencies. As a public document, it will support and perpetuate the military mission while fostering stewardship and goodwill for DPG, the U.S. Army, and the Department of Defense. This INRMP will not resolve all existing and/or future environmental issues. It does, however, provide the guiding strategy, personnel, and means to minimize and work toward resolution of such issues.

1.0 POLICY, COMPLIANCE, AND NEPA INTEGRATION

The Army Strategy for the Environmental Vision[5]

Sustain the Mission – Although much is changing, certain things remain constant. The Army's primary mission is to defend the United States – its people, its land, and its heritage. Our core values endure.

Secure the Future - … a sustainable Army simultaneously meets current as well as future mission requirements worldwide, safeguards human health, improves quality of life, and enhances the natural environment.

Meet the Challenges - … we are transforming how we fight, how we train, how we do business, and how we interact with others in order to continually improve and provide for the Nation's security.

The Army Strategy for the Environmental Goals[6]

- Foster a Sustainability Ethic – Foster an ethic within the Army that takes us beyond environmental compliance to sustainability.
- Strengthen Army Operations – Strengthen Army operational capability by reducing our environmental footprint through more sustainable practices.
- Meet Test, Training and Mission Requirements – Meet current and future training, testing, and other mission requirements by sustaining land, air, and water resources.
- Minimize Impacts and Total Ownership Costs – Minimize impacts and total ownership costs of Army systems, materiel, facilities, and operations by integrating the principles and practices of sustainability.
- Enhance Well–being – Enhance the well-being of our soldiers, civilians, families, neighbors and communities through leadership in sustainability.
- Drive Innovation – Use innovative technology and the principles of sustainability to meet user needs and anticipate future Army challenges.

Installation Command and staff are committed to environmental stewardship as an integral part of the mission at DPG. This commitment is evidenced by support of past environmental programs and their full support of this INRMP.

It is important to understand the relationship between the natural resources program and DPG as a whole. A comparison of the DPG mission with the mission, goals, and objectives of the natural resources program helps delineate this relationship.

1.1 Dugway Proving Ground Mission

[5] *Sustain the Mission, Secure the Future – The Army Strategy for the Environment.*
[6] *Sustain the Mission, Secure the Future – The Army Strategy for the Environment.*

Mission Statement

Protecting the national interests through operating the Nation's premier chemical/biological proving ground by:

- ***Adherence to Army Values***
- ***Conducting testing, training and operation assessments to the highest scientific and technical standards***
- ***Fostering environmental stewardship***
- ***Providing Garrison support to the mission***
- ***Exceeding customer expectations***

1.2 Natural Resources Mission, Goals, and Objectives

Natural Resources Mission

Provide professional management and stewardship of natural resources at Dugway Proving Ground to achieve optimum, sustainable use of testing and training lands, promote biodiversity and ecosystem functionality, provide opportunities for multiple compatible uses of natural resources, and comply with environmental laws.

DPG has developed the below natural resources goals and objectives to directly support goals within the Army Strategy for the Environment. These objectives, and those more specific in chapters 4, 5, and 7 (as summarized in Appendix 7.4) serve as a checklist to monitor the success of the INRMP. Some objectives fit more than one category. When this occurs, the most-fitting category was chosen.

Goal 1. Provide quality natural resources as a critical testing and training asset upon which to accomplish the military mission of DPG.

Objective 1. Ensure no net loss in the capability of installation lands to support existing and projected military testing and training operations on DPG.

Objective 2. Maintain quality testing and training lands through range monitoring, damage minimization, mitigation, and rehabilitation (*i.e.*, execution of the Integrated Training Area Management program).

Goal 2. Comply with laws and regulations that pertain to management of DPG natural resources.

Objective 1. Manage natural resources within the spirit and letter of environmental laws, particularly the Sikes Act upon which this INRMP is predicated.

Objective 2. Protect, restore, and manage sensitive species (*i.e.*, species listed as a species of concern by various governmental agencies) and wetlands.

Objective 3. Use procedures within NEPA to make informed decisions that include natural resources considerations and mitigation.

Objective 4. Ensure DPG's natural resources program is consistent with the protection of cultural and historic resources.

Objective 5. Implement this INRMP within the framework of Army policies and regulations.

Objective 6. Protect and manage threatened and endangered species and critical habitat in accordance with the Endangered Species Act, NEPA, AR 200-1, USFWS regulations and agreements, and other applicable laws or guidance from higher headquarters, if such species or habitats are identified on DPG.

Goal 3. Manage natural resources on DPG to assure good stewardship of public lands entrusted to the care of the Army.

Objective 1. Use adaptive ecosystem management strategies to protect, conserve, and enhance native fauna and flora.

Objective 2. Monitor and manage soils, water, vegetation, and wildlife on DPG with a consideration for wildlife, pristine plant communities, and human values associated with these resources.

Objective 3. Give special management consideration to species listed by the State of Utah in the natural resources management program.

Objective 4. Provide human-valued products of renewable natural resources when such products can be produced in a sustainable fashion without significant negative impacts on the military mission or other natural resources.

Objective 5. Ensure the DPG natural resources program is coordinated with installation organizations, other agencies, and conservation organizations with similar interests.

Objective 6. Provide professional enforcement of natural resources-related laws.

Goal 4. Improve the quality of life of the DPG and surrounding communities through natural resources-based recreation opportunities.

Objective 1. Provide high quality opportunities for hunting within biological and recreational carrying capacities of the resources.

Objective 2. Provide opportunities for outdoor activities, such as nature study, hiking, wildlife observation, etc.

Objective 3. Provide conservation education opportunities.

The ability to achieve these goals, including direct support of the military mission, depends directly on the health and condition of natural resources at DPG. Properly functioning ecological conditions at the installation provide the vegetation, soil, and water resources needed for military testing and training. These same conditions provide opportunities for outdoor recreation that are important assets to both military and civilian communities associated with DPG.

1.3 Support of Installation Goals

Implementation of this INRMP will support the mission of DPG. The Environmental Programs staff at DPG is committed to supporting the military mission, providing stewardship of resources entrusted to the Army, enhancing the quality of life of the DPG and surrounding communities, and being a valued member of the overall DPG team. Implementation of this INRMP will demonstrate those qualities.

1.4 Compliance Requirements

The INRMP is the primary mechanism for compliance with natural resources laws and regulations. Federal, state, and local laws and regulations may apply to proposed management actions in this plan.

1.4.1 Sikes Act

The Sikes Act[7], states, "*The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation ...*"

The Sikes Act (16 USC 670 *et seq*.) requires that, consistent with the use of military installations to ensure the preparedness of the Armed Forces, each INRMP shall, where appropriate and applicable, provide for:

- 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 for support of 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 action;
- sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources;
- public access to the military installation that is necessary or appropriate for use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security;
- enforcement of applicable natural resource laws and regulations;
- no net loss in the capability of installation lands to support the military mission of the installation; and
- such other activities as the Secretary of the military department determines appropriate.

The Sikes Act also requires or provides for:

- regular review of this INRMP for operation and effect, not less often than every five years;
- provisions for spending hunting and fishing permit fees exclusively for the protection, conservation, and management of fish and wildlife, including habitat improvement and related activities in accordance with the INRMP;
- exemption from procurement of services under Office of Management and Budget Circular A-76 and any of its successor circulars; and
- priority for contracts involving implementation of this INRMP to state and federal agencies having responsibility for conservation of fish or wildlife.

1.4.2 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires disclosure of environmental impacts created by proposed major federal actions. The intent of NEPA is to better inform decision-makers of potential impacts from proposed projects and to utilize this information early in the project planning process. 32 CFR Part

7 The Sikes Act referenced in this INRMP is as amended, including Public Law 108-136, the National Defense Authorization Act of 2004.

651, *Environmental Analysis of Army Actions* and the Council on Environmental Quality Implementing Guidelines for NEPA (40 CFR Parts 1500-1508) recommend an Environmental Assessment be completed for natural resources management plans.

1.4.3 Migratory Bird Legal Instrumentalities

Migratory Bird Treaty Act
The Migratory Bird Treaty Act is an international agreement among the United States, Canada, and Mexico that protects designated species of birds. Many birds are protected under the Migratory Bird Treaty Act. Birds classified as migratory include species that occupy DPG throughout the year. A complete list of all species of migratory birds protected by the Migratory Bird Treaty Act is in 50 CFR 10.13.

The Migratory Bird Treaty Act controls the taking of these birds, their nests, eggs, parts, or products. The Act states that it is unlawful "at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, attempt to capture, or attempt to kill, purchase, offer to purchase, deliver for shipment, ship, export, import, cause to be shipped, deliver for transport, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, possess, offer for sale, sell, offer to sell, barter, offer to barter, any migratory bird, any part, nest, or egg of any such bird, or any part, nest, or egg thereof;" unless and except as permitted by regulations in the Migratory Bird Treaty Act.

All persons, organizations, and agencies, are liable for prosecution for violations and must follow permitting requirements for taking migratory birds. Special purpose permits may be requested and issued that allow for the relocation or transport of migratory birds for management purposes.

Executive Order 13186
Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* requires the DoD and the USFWS to establish a memorandum of understanding (MOU) that will promote the conservation of migratory bird populations (Federal Resister, Volume 71, Number 168, 51580-51585, August 30, 2006). The Order directs federal agencies to identify where unintentional take is likely to have a measurable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the USFWS. EO 13186 states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that particular focus should be given to addressing population-level impacts.

On July 31, 2006, the Department of Defense (DOD) and the USFWS entered into a *Memorandum of Understanding to Promote the Conservation of Migratory Birds*, in accordance with Executive Order 13186. This MOU describes specific actions that should be taken by DOD to advance migratory bird conservation; avoid or minimize the take of migratory birds; and ensure DOD operations-other than military readiness activities-are consistent with the Migratory Bird Treaty Act. This MOU does not waive legal requirements under the MBTA, Bald and Golden Eagle Protection Act, ESA, or any other statutes and does not authorize the take of migratory birds.

To review to the categories of DoD activities this MOU specifically pertains to and summarized responsibilities of both the DoD and the USFWS outlined in the MOU, refer to section 1.4.3 *Migratory Bird Legal Instrumentalities* in the 2006-2010 INRMP.

Final Rule – Migratory Bird Permits; Take of Migratory Birds by Department of Defense

Section 315 of the 2003 National Defense Authorization Act provides that, not later than one year after its enactment, the Secretary of the Interior (Secretary) shall exercise authority under Section 704(a) of the Migratory Bird Treaty Act to prescribe regulations to exempt the Armed Forces for the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense or the Secretary of the military department concerned. The Authorization Act further requires the Secretary to promulgate such regulations with the concurrence of the Secretary of Defense.

The USFWS published a final rule (50 CFR Part 21, Federal Register Volume 72, Number 39, February 28, 2007, pp 8931-8950) thatexempts the Armed Forces for the incidental taking of migratory birds during military readiness activities. This rule "… *authorizes such take, with limitations, that result from military readiness activities of the Armed Forces. If any of the Armed Forces determine that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, then they must confer and cooperate with the Service (USFWS) to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects.*"

This rule only includes military readiness activities. It specifically does not include routine operation of installation operating support functions (*e.g.*, administrative offices, military exchanges or commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, laundries, recreation activities, shops, mess halls), operation of industrial activities, or construction or demolition of facilities relating to these routine operations.

"*The rule does not authorize take under the ESA* (Endangered Species Act). *If a military readiness activity may affect a listed species, the Armed Forces retains responsibility for consulting with the Service under section 7(a)(2) of the ESA. Similarly, if a military readiness activity is likely to jeopardize the continued existence of a species proposed for listing, the Armed Forces retain responsibility for conferring with the Service in accordance with section 7(a)(4) of the ESA.*"

"*Withdrawal of authorization may be proposed if the Secretary determines that failure to do so is likely to result in a significant adverse effect on a population of a migratory bird species and one or more of the following circumstances apply: (A) The Armed Forces have not implemented conservation measures that (i) are directly related to protecting the migratory bird species affected by the proposed military readiness activity; (ii) would significantly reduce take of migratory birds species affected by the military readiness activity, (iii) are economically feasible, and (iv) do not limit the effectiveness of military readiness activities. (B) The Armed Forces fail to conduct mutually agreed upon monitoring to determine the effects of a military readiness activity on migratory bird species and/or the efficacy of the conservation measures implemented by the Armed Forces. (C) The Armed Forces have not provided reasonably available information that the Secretary has determined is necessary to evaluate whether withdrawal of take authorization for the specific military readiness activity is appropriate.*"

The rule assumes that installations will use the NEPA process to determine whether an ongoing or proposed military readiness activity is "*likely to result in a significant adverse effect on the population of a migratory bird species of concern.*" If such significant adverse effects are likely, an installation would be required to confer with the USFWS to develop appropriate conservations measures to minimize or mitigate such significant adverse effects.

1.4.4 Army Regulations

AR 200-1 (*Environmental Protection and Enhancement*) (Department of the Army 2007) provides policy, procedures, and responsibilities for the conservation, management, and restoration of land and its natural

resources consistent with the military mission and national policies. It requires the preparation, implementation, and monitoring of an Integrated Natural Resources Management Plan for each installation. This regulation also requires an annual internal review of INRMPs by the Army.

AR 200-1, Chapter 6 (*Cultural Resources Management*) (Department of the Army 2007) provides guidelines for integrating cultural resources issues into an INRMP. Guidelines focus on cultural resources compliance requirements that are generated as a result of ecosystem management activities, contributions that cultural resources studies can make to ecosystem management decisions, and human activities, including those practiced by Native Americans, that should be supported and sustained in development and implementation of an ecosystem management plan.

AR 200-1, Chapter 5 (*Pest Management*) (Department of the Army 2007) establishes policy and procedures for installation pest management programs, emphasizing integrated pest management techniques. Installation pest management plans and installation INRMPs must be consistent with each other.

AR 350-19 (*The Army Sustainable Range Program*) (Department of the Army 2005) assigns responsibilities and provides policy and guidance for the Army ITAM program. It replaces AR 350-4, which was specific to ITAM. The regulation includes support for sustainable ranges, assessment of range sustainability, and management of automated and manual systems that support sustainable ranges.

1.4.5 List of Laws and Regulatory Instruments

Appendix 1.4.5 lists the most significant, but not complete, federal and state laws and regulations and other regulatory instruments that govern implementation of this INRMP.

1.5 Biodiversity Conservation and Ecosystem Management

Biological diversity (biodiversity) refers to the variety and variability among living organisms and the environment in which they occur. Biodiversity has meaning at various levels including ecosystem diversity, species diversity, and genetic diversity. The Department of Defense has developed *A Department of Defense (DoD) Biodiversity Management Strategy* (The Keystone Center 1996). This Strategy identifies five reasons to conserve biodiversity on military lands:

(1) ***sustain natural landscapes*** required for the training and testing necessary to maintain military readiness;
(2) ***provide the greatest return on the Defense investment*** to preserve and protect the environment;
(3) ***expedite the compliance process*** and help avoid conflicts;
(4) ***engender public support*** for the military mission; and
(5) ***improve the quality of life*** for military personnel.

The Keystone Center report (1996) notes that the challenge is *to manage for biodiversity in a way that supports the military mission*. This strategy identifies the INRMP as the primary vehicle to implement biodiversity protection on military installations. The model process developed within the strategy includes the following principles:

- support the military mission;
- use joint planning between natural resources managers and military operations personnel;
- integrate biodiversity conservation into INRMP and other planning protocols;
- involve internal and external stakeholders up front;
- emphasize the regional (ecosystem) context;
- use adaptive management;

- involve scientists and use the best science available; and
- concentrate on results.

The Department of Defense goal with regard to ecosystem management is, "*To ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, that approach shall maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations*."

DPG will use ecosystem management to guide its program. This management strategy enables the installation to conduct military testing and training while conserving natural resources upon which the quality of the military mission ultimately depends. Adaptive management is an important component of ecosystem management. Adaptive management involves implementing the best option, testing that option's results, and modifying implementation accordingly.

1.6 INRMP and NEPA Integration

This INRMP is an action-forcing document that triggers NEPA compliance requirements. 32 CFR Part 651 and AR 200-1 (Department of the Army 2007) state that INRMPs will normally use environmental assessment procedures.

32 CFR Part 651, *Environmental Analysis of Army Actions* requires the integration of the NEPA process early in project planning to ensure that planning and decision-making reflect environmental values, prevent delays, and minimize potential conflicts. The Council on Environmental Quality Implementing Guidelines for NEPA (40 CFR Parts 1500-1508) require environmental analyses and documentation under NEPA be integrated as much as practicable with other environmental reviews, laws, and executive orders. 32 CFR Part 651 specifically identifies the integration or concurrent development of natural resource management plans with appropriate NEPA analysis and documentation. Recognizing efficiencies and benefits associated by combining the INRMP and its associated environmental assessment (EA) into one document, the 2006-2010 INRMP was developed to satisfy both requirements. This INRMP, 2016-2020, does not require the development of a new EA, as conditions at DPG have not drastically changed since 2006 and this document is merely an update to the previous document.

For reference and to assist in identifying elements of the NEPA analysis, the following are specific locations within the 2006-2010 INRMP where required environmental assessment sections (40 CFR Part 1508.9(b)) are embedded:

- Purpose of and Need for Action - Section 1.6.1, *Purpose, Need, and Rationale*; (reference 2006-2010 INRMP)
- Description of Alternatives including the Proposed Action - Section 1.6.4, *Alternatives* (reference 2006-2010 INRMP); chapters 4, 5, and 7;
- Description of Affected Environment - Chapter 3;
- Analysis of Environmental Consequences - Chapter 8;
- Analysis of Cumulative Impacts - Section 8.3, *Cumulative Effects*;
- Agencies and Persons Consulted;
- Distribution List; and
- Appendices.

1.6.1 Interagency Coordination and Public Review

Interagency coordination is encouraged through the INRMP development process using personal communications, an annual meeting, and reviews of drafts. Native American groups are notified of the development of this INRMP and are invited to participate, per the *American Indian and Alaska Native Policy* (Department of Defense 1998).

The 2006-2010 INRMP was initially coordinated as an EA. Comments received during meetings and discussions as well as responses to requests for reviews with agency representatives, Native American tribes, or members of the general public were used for development of the final INRMP/EA. Appendix 1.6.6 includes comments received from agencies that reviewed the INRMP/EA. The public, Native American tribes, and agencies were notified of the findings and conclusions of the EA by announcement of the Finding of No Significant Impact in local newspapers and the availability of the INRMP/EA for public review for 45 days prior to implementation of the Preferred Action, this INRMP, by DPG. The Finding of No Significant Impact was published in the *Salt Lake Tribune*, *Deseret News*, and the *Tooele Transcript*, and the INRMP was made available from DPG.

Since 2010, the INRMP has been reviewed annually for Operation and Effect through interviews and Annual Summary meetings. Following the interviews comments are collected for the purpose of making adjustments to our approach. Projects that support the Mission are done year by year and are incorporated into our implementation of this document. Our Project Definition Worksheet (PDW) List implements the 2016-2020 INRMP.

2.0 RESPONSIBLE AND INTERESTED PARTIES

*We must strive to become systems thinkers if we are to benefit from the interrelationships of the **triple bottom line** of sustainability: mission, environment, and community*.[8]

2.1 Dugway Proving Ground

Office of the Commander

Garrison, DPG	Special Staff	West Desert Test Center
Chaplain Activities Office	Compliance Office	Commander
Command Judge Advocate	Command Judge Advocate	Chemical Test Division
Community Activities Division	Counterintelligence Office	COR Office
Division of Installation Support	Plans and Operations Office	Environmental Technology
Environmental Programs	Public Affairs Office	Life Sciences Division
Fire and Emergency Office	Resource Management Office	MET Division
Information Technology Office	Surety Office	Munitions and Obscurants Division
Internal Review and Audit Compliance Office		Program Analysis Office
Law Enforcement and Security Division		Joint Operational Testing and Training Division
Office of Equal Employment Opportunity		Test Operations Division
Resource Management Division		Test Technology Division

2.1.1 Commander

The DPG Commander implements policies and directives of the Department of the Army and the U.S. Army Test and Evaluation Command. The Commander bears ultimate responsibility for management of natural resources on DPG, including its land and wildlife. The Commander's support infers support by all other commands on the installation. Acting through the Command Group, personal and special staff, directors, and separate commanders, the Commander is responsible for (Department of the Army 1995a):

- providing for funding and staffing of natural resources management professionals and other resources required to effectively manage natural resources on the installation;
- planning land utilization to avoid or minimize adverse effects on environmental quality and provide for sustained accomplishment of the mission;
- entering into appropriate cooperative plans (16 USC 670a) with state and federal conservation agencies for the conservation and development of fish and wildlife, soil, outdoor recreation, and other resources;
- ensuring ongoing and timely coordination of current and planned land uses between mission, natural resources, environmental, legal, and master planning;
- inspecting and reviewing mitigation measures that have been implemented or recommended for the protection of natural resources as prescribed in environmental documentation in accordance with 32 CFR Part 651;

[8] Robert J. Schoomaker, U.S. Army Chief of Staff, and R.L. Brownlee, Acting Secretary of the Army. Excerpt from *The Army Strategy for the Environment, "Sustain the Mission – Secure the Future"*

- ensuring all installation land users are aware of and comply with procedures and requirements necessary to accomplish objectives of this INRMP together with laws, regulations, and other measures designed to comply with environmental quality objectives; and
- appointing a natural resources management professional as the Installation Natural Resources Coordinator.

2.1.2 Environmental Programs Division, IMDU-PWEP (IMCOM, Dugway, Public Works, Environmental Programs)

The Division of Environmental Programs chief will maintain an organization with the resources available to accomplish the INRMP and, acting through the Conservation/Preservation Division, is responsible for (Department of the Army 2007):

- developing and implementing programs to ensure the inventory, delineation, classification, and management of all applicable natural resources to include: wetlands, scenic areas, threatened and endangered species, sensitive and critical habitats, and other natural resource areas of special interest;
- providing for the training of natural resources personnel;
- preparing and implementing this INRMP;
- reviewing all environmental documents (*e.g.* environmental impact assessments and statements and remedial action plans) and construction designs and proposals to ensure adequate protection of natural resources, ensuring that technical guidance as presented in this INRMP is adequately considered;
- coordinating with local, state, and federal governmental and civilian conservation organizations relative to natural resources management for DPG; and
- managing all phases of the natural resources program for DPG with appropriate natural resources management personnel.

2.1.3 Other Installation Organizations

Implementation of this INRMP will require assistance from other installation organizations. Such organizations include various offices within Garrison, Special Staff, RIAC (Rapid Integration and Acceptance Center), West Desert Test Center; subordinate organizations; and tenant units and activities.

Garrison

Garrison provides planning and operation support; information and resource management; and basic services that support installation operations, such as housing, facility engineering, and security. The Division of Public Works maintains paved and unpaved roads and public grounds and maintains and repairs buildings. The Law Enforcement and Security Division implements and administers installation security and law enforcement, physical security, crime prevention, and chemical security terrorism counteraction. The Law Enforcement and Security Division is particularly important to the hunting program, and the Fire and Emergency Office is important to wildfire control on DPG.

Special Staff

The Command Judge Advocate provides legal advice, counsel, and services to Command, Staff, and subordinate elements of DPG. Specific Judge Advocate responsibilities with regard to integrated natural resources management include:

- conducting legal research and preparing legal opinions pertaining to interpretation and application of laws, regulations, statutes, and other directives;

- coordinating with the Department of Justice, Litigation Division of the Office of the Judge Advocate General, and other governmental agencies on matters pertaining to litigation for the federal government;
- advising DPG on compliance with NEPA; and
- advising DPG on laws and regulations that affect training land use, management, and compliance.

The Public Affairs Office is responsible for promoting an understanding of DPG operations among its various publics and providing professional public affairs advice and support to installation leaders and activities. The Public Affairs Office is an important component of the natural resources program for DPG, especially in disseminating information critical to implementation of the program.

West Desert Test Center
The West Desert Test Center carries out DPG's test mission and provides management control of mission-specific testing efforts. Range Control administers, schedules, assigns, and controls range use; monitors air traffic in and over DPG; coordinates airspace and ground activities; controls entry to, travel in, and exit from ranges; and provides routine and emergency communications base station for testing and training at DPG.

The West Desert Test Center, Environmental Technology Office (a tenant of DPG), particularly its Integrated Training Area Management program, is the interface between PWEP and testing and training activities in the field. Various divisions of the West Desert Test Center provide training area and range access to accomplish provisions of this INRMP, assist in enforcing considerations within range regulations, and are directly responsible for implementation and/or support of portions of this INRMP that directly affect or interact with testing and training responsibilities, which include:

- operating, scheduling, and maintaining DPG training and testing facilities, training areas, ranges, field training sites, and range equipment;
- preparing, maintaining, and enforcing DPG regulations involving the ITAM program and range operations;
- implementing the ITAM program (*i.e.*, training sustainment awareness, geographic information system, land condition monitoring, land rehabilitation);
- coordinating with PWEP on testing or training activities that may affect fish and wildlife, wetlands, vegetation, water, soils, and/or cultural resources; and
- coordinating with PWEP in the development of the ITAM annual workplan.

2.2 Other Defense Organizations

2.2.1 Northwest Installation Management Command
Installation Management Command Central Region is responsible for providing technical guidance to the DPG natural resources program by:

- assisting with program implementation and conducting staff visits to DPG,
- reviewing outdoor recreation plans for compatibility with the installation Master Plan and natural resources management plans and programs,
- ensuring that effective natural resources stewardship is an identifiable and accountable function of management, and
- providing technical review of the INRMP.

2.2.2 U.S. Army Test and Evaluation Command (ATEC)

The U.S. Army Test and Evaluation Command plans, integrates, and conducts experiments, developmental testing, independent operational testing, and independent evaluations and assessments to provide essential information to acquisition decision makers and commanders. ATEC's Vision is to determine the true capability provided to our Soldiers through resource informed developmental, integrated and operational test and evaluation in an independent and objective manner.

2.2.3 U.S. Army IMCOM

U.S. Army Materiel Command's mission is to provide superior technology, acquisition support, materiel development, logistics, and power projection and sustainment to the total force, across the spectrum of joint military operations. The U.S. Army Materiel Command overhauls and upgrades equipment; produces and provides bombs and ammunition; provides on-the-ground logistics assistance; maintains Army prepositioned stocks; researches, develops, and acquires conventional ammunition, food, clothing, battledress, etc.; manages foreign military sales in security assistance; and supports acquisition of end items and parts for weapons systems.

2.2.4 U.S. Army Environmental Command

U.S. Army Environmental Command leads and executes Army clean up and environmental quality programs, and provides technical expertise to enable soldier readiness and sustatinable military communities. It has support capabilities in the areas of NEPA, endangered species, cultural resources, environmental compliance, and related areas.

2.2.5 U.S. Army Corps of Engineers

U.S. Army Corps of Engineers, Engineer Research and Development Center laboratories and districts can provide research, technical, administrative, and logistical support to DPG. The U.S. Army Corps of Engineers has the primary responsibility for administering stormwater discharge permitting processes. The U.S. Army Corps of Engineers is a tenant on DPG. It executes the Installation Restoration Program and provides construction and design services for installation public works projects.

2.3 Other Federal Agencies

2.3.1 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS), Region 6, has a regional headquarters in Lakewood, Colorado that provides technical advice for management of fish and wildlife resources on DPG, particularly involving federally-listed species. Department of Army Regulation 200-1, Chapter 4, provides guidance to be followed by DPG when dealing with the USFWS for federal-listed species management. The USFWS Utah Field Office in Salt Lake City is the primary source of advice and assistance for the DPG natural resources program. The Fish Springs National Wildlife Refuge borders a portion of DPG's southern boundary. DPG and Refuge personnel work cooperatively on a regular basis but specific actions or projects often depend on funding.

The USFWS is a signatory cooperator in implementation of this INRMP in accordance with the Sikes Act. Appendix 2.3.1 contains specific items of agreement among the USFWS, Utah Department of Natural Resources, and DPG, as required by the Sikes Act.

2.3.2 Bureau of Land Management

The Bureau of Land Management (BLM) mission is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations. The BLM manages 22,900,000 acres of public land in Utah. Much of the land surrounding DPG is BLM property. DPG works cooperatively with the BLM on such issues as feral horse management, Dugway Fire Plan implementation, invasive species control, and wildland fire coordination on the Utah West Desert.

2.3.3 U.S. Department of Agriculture Animal and Plant Health Inspection Service

The Animal and Plant Health Inspection Service (APHIS) is responsible for protecting and promoting U.S. agricultural health, regulating genetically engineered organisms, administering the Animal Welfare Act and carrying out wildlife damage management activities.. The Animal and Plant Health Inspection Service strives to prevent the introduction of parasitic-plant pests and noxious weeds into the United States and works to exclude, detect, and eradicate newly introduced non-natives that pose the highest risk to U.S. agriculture or the environment. The Animal and Plant Health Inspection Service cooperates with other agencies to achieve environmentally sound and desirable forms of integrated management against introduced invasive species.

2.4 State Agencies

2.4.1 Utah Department of Natural Resources

The Utah Department of Natural Resources, through its Division of Wildlife Resources (UDWR) is responsible for management of most fish and wildlife within the state. The UDWR provides oversight for hunting on the installation and assists in managing nongame wildlife. The Utah Department of Natural Resources is a signatory cooperator in implementation of this INRMP. Appendix 2.3.1 contains specific items of agreement among the USFWS, Utah Department of Natural Resources, and DPG, as required by the Sikes Act.

2.4.2 Utah State Historic Preservation Office

The Utah State Historic Preservation Office (SHPO) works with individuals and groups throughout the state to identify, evaluate, and protect Utah's diverse range of historic, architectural, and archaeological resources. The SHPO undertakes and promotes the responsible collecting, preservation, and presentation of documentary materials and artifacts. The SHPO nominates significant properties to the National Register of Historic Places, and maintains the state's cultural resources inventory. The SHPO is responsible for Section 106 review of federally funded or assisted projects to ensure compliance with federal preservation legislation. The SHPO assesses the significance of properties within project areas, reviews the impact of projects on significant resources, and consults with agencies to develop ways to avoid or mitigate damage to the resources.

2.5 Native American Tribes

The United States has a unique legal relationship with Native American tribal governments as set forth in the Constitution of the United States, treaties, statutes, executive orders, and court decisions. Since the formation of the Union, the United States has recognized Native American tribes as domestic dependent nations under its protection. Executive Order 13175 and the *American Indian and Alaska Native Policy* (Department of Defense 1998) established regular and meaningful consultation and collaboration with Native American tribal governments. DPG provides a process that permits elected officials and other representatives of Indian tribal governments to provide meaningful and timely input on actions or policies that might be of tribal interest, such as those that affect sacred or Native American cultural sites.

Federally-recognized Indian tribes that have ancestral ties to land encompassed by DPG (Callister *et. al*. 2001) that may be consulted with regard to these issues include:

Confederated Tribes of the Goshute Reservations
Crow Tribe of Montana
Duckwater Shoshone Tribe
Eastern Shoshone Tribe
Ely Shoshone Tribe
Hopi Tribe
Navajo Nation
Northwestern Band of Shoshone Nation
Paiute Indian Tribe of Utah
Pueblo of Zuni
Shoshone-Bannock Tribes of the Fort Hall Reservation
Skull Valley Band of Goshute Indians
Te-Moak Tribe of Western Shoshone
Ute Indian Tribe

2.6 Local Governmental Agencies

Tooele and Juab counties have an interest in activities occurring at DPG particularly related to weed management. Both counties have a county weed supervisor, and Tooele County has a county weed board.

2.7 Universities

Universities that have been involved with implementation of the natural resources program at DPG include Brigham Young University, Colorado State University, Texas Regional Institute for Environmental Studies, Utah State University, the University of Utah, Boise State University Raptor Reseach Center, and the University of Idaho.

2.8 Other Interested Parties

Organizations interested in the implementation of this INRMP include, but are not limited to, The Nature Conservancy, Sierra Club, Partners in Flight, Hawk Watch International (HWI) and Raptor Inventory Nest Survey (RINS).

DPG employs contractors for many programs associated with natural resources. Subject matter experts are contracted to support INRMP preparation, collection of biological data, NEPA documentation, and other specific projects as needed.

3.0 AFFECTED ENVIRONMENT

We do not own this land; we are caretakers of the land and the plant and animal species that inhabit it. The American people entrust the land to our care, and we shall fulfill their trust. We shall conserve and protect these resources for the future.[9]

3.1 General Background

3.1.1 Location

DPG is located in Tooele County in west central Utah (Figure 3.1.1) about 80 miles southwest of Salt Lake City, the capital city of Utah. The closest town to the installation is Terra, which is nine miles east of the main gate. Tooele is the closest major town to DPG, about 38 miles to the northeast.

3.1.2 Neighbors

Lands neighboring DPG are owned or administered by BLM, USFWS (Fish Springs National Wildlife Refuge), State of Utah School and Institutional Trust Lands, U.S. Air Force, and private citizens. The DoD uses the airspace over Army and Air Force lands as well as adjacent public lands as a Maneuver Overflight Area. This area, including Army- and Air Force-administered lands, is known as the Utah Test and Training Range and encompasses over 15,000 square miles. Also in the vicinity of DPG are the Skull Valley Band of Goshute Indians of Utah Reservation and the Confederated Tribes of the Goshute Reservation. Nearby towns include Terra and Iosepa in Skull Valley and Callao along DPG's West Boundary.

3.1.3 Satellite Installations

DPG has no satellite installations.

3.1.4 Acreage and Acquisition

The initial land transfer for DPG occurred in 1942. Additional transfers and purchases brought the acreage to 798,855 acres. Present acreage of DPG is 798,214 acres (Public Affairs Office 2005). Section 3.1.5, *Installation History* includes additional information regarding acreage and acquisition.

3.1.5 Installation History

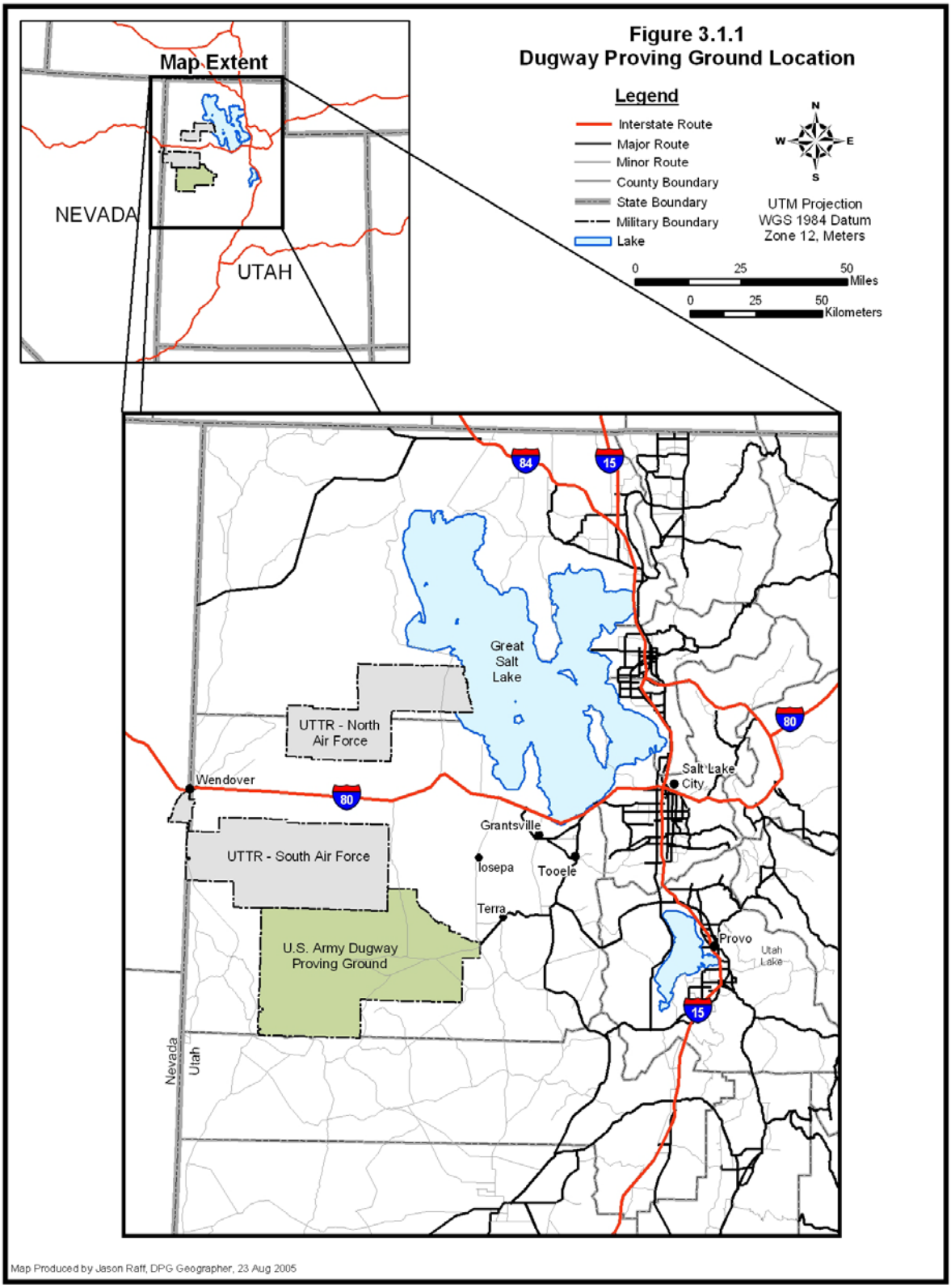
The following discussion of installation history is taken from the *FinalEnvironmental Impact Statement for Activities Associated with Future Programs at U.S. Army Dugway Proving Ground* (2003a). Three eras define the history at DPG: the World War II Era, the Korean War to the Late 1960s Era, and the Modern Era.

World War II Era

The Chemical Warfare Service had determined that its testing facilities at Aberdeen Proving Ground, Maryland were inadequate with little expansion potential. On February 6, 1942 President Franklin D. Roosevelt ordered the transfer of an initial 126,720 acres of public domain land to the Chemical Warfare Service. Six days later, DPG was officially established. An additional 141,680 acres of the public domain was withdrawn and transferred to the Chemical Warfare Service in April 1942. Subsequent land withdrawals and transfers, and purchases of land from the Hatch Brothers and the State of Utah contributed to the installation area of approximately 798,855 acres (Arrington and Alexander 1964).

[9] Robert M. Walker, former Assistant Secretary of the Army, Testimony before Congress, July 11, 1995.

Figure 3.1.1 Dugway Proving Ground Location



Construction of roads and facilities at the area known today as the Ditto Technical Center commenced immediately after DPG was established. By mid-May 1942 barracks were nearly completed at DPG. By summer 1942 laboratories, magazines, and machine shops were operating. Construction of an airstrip began in 1943 with an original 6,875 foot runway. A 54-foot control tower was added in 1944. Today, the airstrip is 13,125 feet and is known as Michael Army Airfield. Initial water, electrical, and sewage systems were completed in 1943 and 1944 but were all upgraded by 1945 to support increasing military testing activity. A 75-bed infirmary and an operations headquarters were completed in early 1943 and July 1944, respectively.

Testing of military weapons commenced in summer 1942 and rapidly expanded in scope and intensity. Originally tasked as a testing ground for weapons, DPG was expanded to include laboratory facilities, housing, and administration buildings (Baum 1947). Chemical weapons testing began in 1942; however, fullscale testing using biological agents did not commence until 1945 (Parsons Engineering Science 1996). Several important military developments in modern warfare were tested at DPG during World War II, including incendiary bombs, flame throwers, chemical weapons, chemical agent spraying, and biological weapons.

The end of World War II brought major changes to the installation. On January 16, 1947 the Secretary of War established the Western Chemical Center consolidating the operations of the Deseret Chemical Center in Rush Valley south of Tooele, Utah with DPG. Shortly thereafter, DPG was placed on inactive status.

Korean War to the Late 1960s Era

During summer 1950 DPG was reactivated in response to the Korean War. Work began on many activities originally established during World War II, with DPG now under the command of the Army Chemical Corps' Research and Development Command. New conventional weapon systems were tested. An intense period during the 1950s and 1960s ensued to conduct the following defensive testing.

Chemical testing - Extensive testing involving chemical warfare materials was conducted over many DPG ranges and grids in the 1950s and 1960s. Generally, tests used artillery, mortars, cluster bombs, massive bombs, drone rockets, land mines, and aerial sprays to release chemical agents or chemical simulants, and sampling arrays arranged in grids to measure the dissemination and behavior of chemicals at various horizontal and vertical locations in relation to the point of release. Dissemination of chemical warfare materials within cave, tunnel, and hilltop fortifications also occurred at several locations at DPG.

A well-publicized event in DPG's history occurred in 1968. Some 3,000 to 5,000 sheep in six separate flocks in nearby Skull Valley became ill and died over a 3- to 4-day period beginning on March 14, 1968. Three open-air tests involving persistent and nonpersistent chemical nerve agents had been conducted on March 13, 1968, at DPG from 15 to 35 miles upwind of the nearest affected flock. Commercial spraying using the pesticide heptachlor also occurred off-post in Skull Valley on March 15, 1968. The U.S. Congress Committee on Government Operations conducted hearings on the incident and issued a report in November 1969 that concluded that open-air testing of nerve gas caused death and injury to the sheep.

Biological testing - Testing of a wide spectrum of biological warfare materials also occurred at DPG. Pathogens were open-air tested from 1951 through 1967. The first closed laboratory tests were conducted at Granite Peak Installations 2 and 3; upon closing of these laboratories, subsequent tests occurred at Baker Area. Objectives of the biological warfare tests were to determine the military value of biological warfare munitions and the amount and effectiveness of biological agent producible in the atmosphere by various delivery systems. Generally, biological simulants were used for initial tests, followed by use of actual pathogens.

Radiological testing - A series of radiological tests involving atmospheric release of radioactive materials from munitions, sponsored by the Atomic Energy Commission, was conducted adjacent to Granite Peak from 1949 to 1953. In addition, a nuclear engine meltdown using several long-lived radioisotopes was simulated on the salt flats west of Granite Peak in the summer/fall of 1959. No nuclear detonations occurred on any DPG ranges. In 1952 English Village was constructed. English Village is the DPG administrative headquarters, residential area, and community center.

Modern Era

Open-air testing of chemical and biological agents never again occurred at DPG. On April 10, 1972 the U.S. signed the International Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological and Toxic Weapons and Their Destruction, known as the Biological Weapons Convention treaty. The Biological Weapons Convention treaty required signatories to execute "confidence building measures" aimed at increasing the confidence of signatories that the cosignatories were keeping control of their biological weapons systems in a way that avoided adverse human health effects and international security threats. Similarly, the Chemical Weapons Convention, which became enforceable under international law on April 29, 1997, prohibits the development, production, stockpiling, and use of chemical weapons and provides oversight for their destruction.

Between 1972 and 1983, the intensity of testing of chemical and biological defenses decreased due to these treaties. However, at various times in DPG's recent history, such as the 1991 Persian Gulf War, military testing of chemical and biological defenses has increased as a result of perceived chemical and biological threats.

Chemical and biological defense testing since 1969 has been conducted by the following two primary methods:

- in laboratory and large-scale chamber settings, using small amounts of chemical and biological agents, to test the effectiveness of protection, detection, and decontamination equipment and to test the effect of contamination and decontamination on the equipment under test; and
- in open-air situations, using chemical and biological simulants, to test the performance of protection, detection, and decontamination equipment.

DPG's indoor test capabilities were significantly upgraded in 1992 with the opening of the Reginald Kendall Combined Chemical Test Facility at Ditto Technical Center and in early 1998 with the opening of the Bushnell Materiel Test Facility at Carr Facility and Lothar Salomon Life Sciences Test Facility at Baker Area.

Chemical and biological agents are not and have not been tested outdoors since September 1969. Open-air testing of decontamination methods, contamination avoidance, and evaluation of threat dissemination methods, including the use of biological and chemical simulants in place of biological and chemical agents, has been done at DPG since September 1969.

The modern era is also noted by programs for testing battlefield smokes and obscurants in which open-air release of these materials is conducted under varying atmospheric and battlefield test conditions. Within the past 15 years, the breadth and diversity of DPG's modern mission have expanded through addition of mission/tenant activities. Some notable additions have been: the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS); Increased Unmanned Aerial Systems (UAS) testing, training and personnel, and the Rapid Integration Acceptance Center (RIAC); Toxic Industrial Chemical and Toxic Industrial Material (TIC/TIM); the Extended Range Multi-Purpose Unmanned Aerial System Test; the Passive Thunder II Test; Jack Rabbit I and II; and the Vulcan Tests in support of Naval Special Warfare Development Group (NSWDG). As with any new test or training event NEPA documents are prepared as

the proposed federal action is proposed and related INRMP content and agreements are incorporated within the prepared NEPA documentation.

3.1.6 Military Mission

Sound environmental stewardship enables the Army to train as we fight and fight as we train. Conservation of natural resources on installations ensures we protect the privilege to use our training and testing lands.[10]

3.1.6.1 Mission of Dugway Proving Ground

Section 1.1, *Dugway Proving Ground Mission* contains the DPG mission statement. The *Environmental Impact Statement for Activities Associated with Future Programs at U.S. Army Dugway Proving Ground* (2003a) and (2003b) and the *Environmental Assessment for Range Capabilities Improvements in Support of Training at U.S. Army Dugway Proving Ground 2012* provide detailed information regarding mission activities occurring at DPG. DPG is a DoD Major Range and Test Facility Base and serves as a primary chemical and biological defense testing center. DPG does not conduct any nuclear testing, and there are no plans to do so in the future. DPG manages the installation's facilities and administrative, technical, and logistic services to support DPG's mission as well as its tenants' training, testing, and research activities.

Testing

Testing has traditionally been and continues to be the major component of DPG's mission and programs. Testing is conducted at DPG for the following purposes.

- Developmental and operational testing is conducted to collect data on whether military materiel meets required design specifications and operational requirements to support acquisition decisions throughout a product's entire life-cycle.
- Testing is conducted to determine whether military equipment can survive contamination and subsequent decontamination of chemical and biological agents without adversely impacting its performance.
- Quality testing on military equipment and systems that have passed the design stage is conducted to ensure product quality, functionality, and operational characteristics.

These tests strengthen the readiness of U.S. and allied forces and deter enemy aggression.

In addition to its chemical and biological defense testing, DPG conducts and supports testing and technology development of:

- conventional munitions;
- equipment reliability, durability, and performance in weather extremes;
- characterization of air emissions from open burn/open detonation of obsolete or unsafe munitions;
- methods to demilitarize weapons;
- smoke, obscurant, and illuminant systems;
- chemical and biological modeling and simulation; and
- meteorological model development and validation.

Ground Training

[10] General Eric K. Shinseki, U.S. Army Chief of Staff, 2002 Army Earth Day Message.

DPG was first opened to Army Reserve Component training in 1969. Ground training on DPG includes a wide variety of activities at DPG, ranging from small group weekend training activities to 3,000- to 4,000-soldier tactical exercises lasting up to several weeks. Table 3.1.6.1 lists ground training activities and levels prior to 2003 (DPG EIS 2003b).

Table 3.1.6.1 Ground Training Activities and Levels*

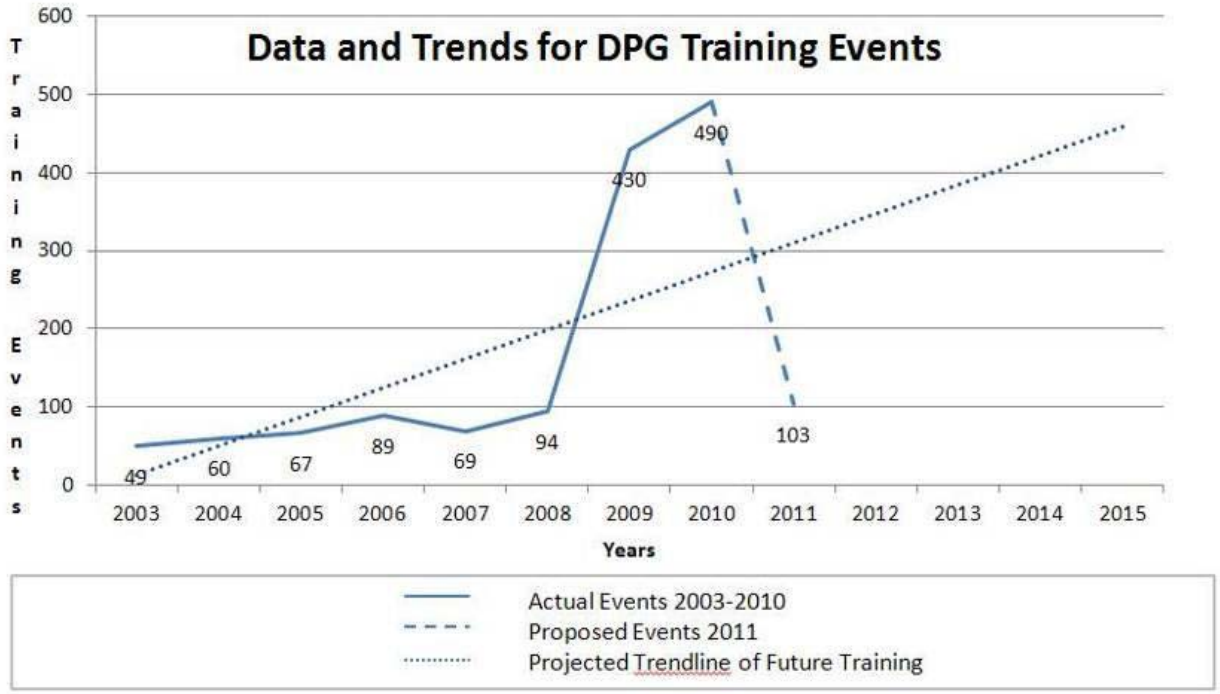
Training Type	Events	Days/Events	Troops	Vehicles
Field Artillery/Mortar	6-10 (a)	14	400-600	370 (b)
Aviation (Rotary and Fixed-wing)	6-10	14	25-250	70 (b, d)
Infantry, Small Unit, Special Operations (c)	10-15	30	12-400	84 (b, d)
Engineering	5-10	7-14	50-200	420 (b)
Counterterrorism	100-150	200-250	450-600	225-300 (b)
Chemical Units	3-6	30	500-2,000	225-300 (b)
Support to Fort Leonard Wood/U.S. Army Chemical School	24	5-7	20-50	18 (b)
Joint Exercises	1	45	500-3,000	430 (b, d)

* Annual averages.
(a) Includes Paladin activities.
(b) Estimated.
(c) Includes military intelligence units, law enforcement, and infantry units.
(d) Does not include rotary wing aircraft.

DPG Training Intensity Since 2003 ***(****Environmental Assessment for Range Capabilities Improvements in Support of Training at U.S. Army Dugway Proving Ground 2012)*

Using a baseline period of 2003 – 2010, the number of training events at DPG grew by 37% (see Table 3.1.6.2), and by February 2011 the requests for upcoming training were indicative of maintaining that trend (Merritt 2011). Such increase in training use was previously evaluated in the DPG EIS (2003) and Training EA (2003) in which the predicted growth of personnel and tactical vehicle use over this baseline period was estimated at 106% and 53% respectively. Much of the steady increase in training operational tempo can be attributed to DPG's unique CBRNE capability, its extensive land ranges and airspace, and to military policy changes which have encouraged greater use of test ranges for training and other compatible uses. The *Environmental Assessment for Range Capabilities Improvements in Support of Training at U.S. Army Dugway Proving Ground 2012* was not intended to reassess training intensity already analyzed in the prior NEPA analyses referenced above. It instead assesses the changes and enhancements DPG will consider in order to sustainably accommodate such increases.

Table 3.1.6.2: Training Intensity Trends (adapted from Merritt, 2011)



Field Artillery/Mortar

Field artillery/mortar activities includelive fire activities; route reconnaissance and convoy with both day and night movement; conducting tactical assembly area operations; perimeter defense operations; re-supply operations; crew drills, lanes training, and multi-echelon training in conjunction with artillery live fire exercises; participating in combined arms exercises with other services; and other activities as approved by the installation. These exercises may include supporting activities by infantry, small unit, special operations, engineering, chemical unit counterterrorism teams, and units conducting Improvised Explosive Device (IED) detection, avoidance, and countermeasure training.

Aviation (Rotary and Fixed-wing)

Aviation training consists of conducting aerial live fire activities, re-fueling and re-arming .activities, close air support in conjunction with ground forces, search and rescue training, airborne operations, re-supply operations, forward observer operations, insertion and extraction missions, and participation in joint exercise with other elements. Aviation training also includes unmanned aerial systems (UAS) testing, training, and capability assessments. With the addition of the Rapid Integration and Acceptance Center (RIAC) at DPG, the level of UAS operations has increased several fold.

Infantry, Small Unit, Special Operations

Infantry, small unit, and special operations consist of conducting live fire exercises (both mounted and dismounted), direct action against objectives, escape and evasion exercises, airborne operations, search and rescue exercises, special reconnaissance missions, Military Operations in Urban Terrain (MOUT) exercises, sniper training, advanced medical training, and day/night mounted/dismounted patrol activities.

Engineering (including Combat Engineer Units/Transportation/Firefighter)

Engineers conduct demolitions operations using various demolitions charges, quarry and haul gravel road aggregate to build new gravel roads and upgrade existing roads, upgrade buildings, and conduct engineer activities in coordination with other training units. Firefighters typically work with the DPG fire department in conducting training.

Counterterrorism

Counterterrorism training scenarios constantly change as the world terrorist situation evolves. The use of various types of equipment and at which facility the training takes place are decided as training requirements emerge. Facilities include opportunities for three types of training modes: classroom, laboratory, and simulated operational situations. All training situations use simulant materials, and none involve direct exposure of personnel to live agent materials.

Chemical Units

Chemical units ranging in size from companies to brigades conduct training at DPG. Chemical units typically train at DPG in conjunction with other unit training. These units typically perform smoke generation, reconnaissance, and decontamination activities.

Support to West Desert Test Center (WDTC), Special Programs Division

The WDTC Special Programs Division offers training courses specifically oriented to the needs of military forces, other federal personnel, and state and local first responders. Courses consist of lectures, hands-on training, and practical exercises in chemical/biological/radiological/nuclear/explosives (CBRNE) agent characteristics, sampling, protection, detection, decontamination, and in chemical/biological production signatures recognition. Realistic munitions and tactics training relating to potential Weapons of Mass Destruction scenarios likely to be encountered are also provided.

Joint Exercises

Joint exercises are large combined ground and air training exercises involving primarily Army and Air Force units operating in synchronized fashion. Other branches of military services, DoD contractors, and other DoD entities may participate as well. These exercises include the deployment and training of military units and two-way data transfers among joint service intelligence gathering systems, target acquisition systems, and weapons delivery systems. Joint exercises generally conform to typical field artillery training exercises but also include extensive interaction between various military services to include aerial support, special operations forces, and infantry type forces. Joint exercises typically involve the following activities:

- deploying wheeled and tracked vehicles and combat support units to areas in and around the training areas;
- live firing into impact areas;
- acquiring target and surveillance from Special Operations and infantry units;
- obtaining strategic and tactical operations by military intelligence units;
- combined arms live fire exercises using fixed and rotary wing aircraft, field artillery, target acquisition forces, and air traffic control personnel;
- B-28 Aerial Port operations to include loading and unloading aircraft, air traffic control, rearming and refueling aircraft, and combat communications operations;
- conducting search and rescue operations both from the air and ground;
- conducting airborne operations; and
- conducting battlefield operations using chemical units to include using fog oil and graphite oil to produce obscurant smoke and reconnaissance and decontamination operations.

Tenants and Customers

DPG tenants and customers are sponsors of activities conducted at DPG. A DPG tenant is an organization that uses DPG on a regular basis to conduct testing or training activities or to provide installation support activities. A DPG customer is a governmental or private entity that requires use of DPG's workforce, facilities, or vast land to conduct testing, technology development, or training activities. The scope of DPG customers ranges from an entity conducting a one-time activity to an entity conducting regular activities as part of an ongoing mission program at DPG. Unlike some tenants, DPG customers are not stationed at DPG.

Dugway Proving Ground Ancillary Activities

DPG tenants can be classified as groups that use DPG's infrastructure and support services to conduct testing, training, or research at the installation, or groups that provide support services for DPG's mission and the installation. DPG tenants include the public and private entities listed below.

- U.S. Air Force - 388th Range Squadron
- Army Health Clinic - Health Services
- Cosmic Ray Research Consortium
- Tooele County Public Schools
- U.S. Army Corps of Engineers
- U.S. Army Robert Morris Acquisition Center
- U.S. Postal Service
- Retail Sales - Defense Commissary Agency (DECA) and the Army and Air Force's Exchange System
- Technical Escort Unit - C Company
- Test Measurement and Diagnostic Center
- Utah National Guard
- JLENS
- PMUAS and RIAC

DPG tenants typically have administrative operations at DPG. Additionally, tenants normally use their own equipment to carry out their testing, training, scientific activity, or other activity at DPG. Tenants have an assigned DPG point of contact to assist the tenant with scheduling and administrative matters.

Dugway Proving Ground Customers

DPG conducts tests for a variety of DoD, other federal agency, and private customers. Customer testing at DPG is coordinated through U.S. Army Test and Evaluation Command (ATEC). ATEC test centers are authorized by ATEC headquarters to conduct testing operations.

Some customer tests are classified. In most cases, a test customer requests the use of a specific ATEC test facility such as DPG, based on the capabilities of the test center, prior relationships, customer convenience, test center marketing efforts, or because the requested test center will be the site for future mandated tests. In rare instances when a request for a test or services arrives at ATEC headquarters without a test center specified, ATEC coordinates with the customer to assign a test center. The assignment is made based on required capabilities, test center mission, or workload balance.

In addition to customer use of DPG for testing activities through the West Desert Test Center, other customers may use DPG for other activities, such as radar tracking by NASA, Reserve component training for units other than the Utah National Guard, Active component training, training classes (*i.e.*, counterterrorism), and fire-fighting training. DPG is funded by direct appropriated funds and Major Range and Test Facility Base customers. All customer tests or services require financing by the requester.

3.1.6.2 Installation Population

During 2014 DPG's total work force consisted of 1725 persons. This included 99 military (including tenants); 673 Department of Army civilians (and civilian tenants); 297 temporary tenants; 561 contractors; and 95 nonappropriated fund, U.S. Postal Service, Tooele County Schools, Credit Union, etc. personnel (Public Affairs Office February 2014 Population Report).

3.1.6.3 Natural Resources Needed to Support the Military Mission

Quality testing and training opportunities necessitate quality natural resources. Military training requires varying terrain to ensure the most realistic training experience. Training areas at DPG include vast areas of valley floor, foothills, salt and alkali desert, and rugged mountain ranges. These conditions and the four-season climate of west central Utah provide ideal conditions for training light, airborne, artillery, special operations, and joint command forces. Testing missions, particularly those requiring clear atmospheric conditions, necessitate quality vegetative conditions to hinder generation of airborne particulates.

DPG's remote location and large size enhance its value as a training range. This is important to training missions that include multiple units from different military organizations, such as combined training of Army and Air Force active and reserve units. Access to space is also important as types of training missions evolve to keep pace with more sophisticated weapons systems and aircraft that become available. DPG provides support to air training and training of ground-based personnel and equipment.

3.1.6.4 Effects of the Military Mission on Natural Resources

Compared to some of the surrounding area, DPG has retained much of the natural character of the landscape, acting as a refuge for some plants, animals, and natural communities. Much of the land at DPG is undeveloped and unoccupied. Nonetheless, threats to these resources arise from military activities.

Past Military Mission Impacts on Natural Resources

Initial development of DPG with its buildings, roads, facilities, and associated infrastructure was a significant impact associated with the military mission on DPG natural resources. Development of these facilities drastically altered the natural landscape and changed the character of the area.

Based on the best reconstruction of historic events, exotic annuals were competitively excluded from native plant communities, or at least competitively equal, from 1940-1969 (possibly through 1976), when land use was limited to winter sheep grazing and/or open-air testing of chemical and biological weapons. Beginning in 1969, increased soil disturbance occurred due to military training with tracked and wheeled vehicles. These activities created conditions that removed or killed native vegetation and created favorable seedbeds for annual exotics, which create abundant fine fuels during the fire season. Furthermore, annual exotics are more likely to carry a fire, once one has started, due to increased fuel continuity, than the widely-spaced native grasses and shrubs (Horman *et al*. 2000).

Military training activities have become the single most observable and chronic environmental impact at DPG. The area has experienced an increased frequency and intensity of rangeland fires (regardless of cause) which has been directly linked to a dramatic increase in exotic annual weeds. The association between weeds and fire is exacerbated by training traffic, which disturbs soil, thereby creating favorable seedbeds for new weeds. What has emerged is a self-perpetuating cycle between fires and exotic weeds; converting native shrubsteppe and desert scrub vegetation to exotic-dominated annual grasslands (Horman *et al*. 2000).

The conversion of native shrublands to annual exotic weeds not only means of loss of realistic training land, but also the loss of valuable wildlife habitat. Lower plant and animal diversity have been reported in sites dominated by cheatgrass and other annual exotics compared to adjacent unburned areas. The area covered by cheatgrass has increased due to disturbance and frequency of wildland fires. Conversely, the amount of

native habitat, primarily sagebrush communities, has decreased due to the increased fire frequency and replacement by invasive species (Horman *et al*. 2000).

Future Military Mission Impacts on Natural Resources
It is difficult to quantify effects of future military missions on natural resources at DPG. The intensity of use of DPG lands has increased significantly over the years and this trend will likely continue given the reality of Base Realignment and Closure actions occurring elsewhere. The potential impacts associated with new proposed actions are addressed through project specific environmental review.

Unit Changes
The Department of Defense is always evolving and becoming more efficient in meeting our stewardship responsibilities and has been challenged to make do with less in terms of both quantity and quality of training lands. Effective training resources must be managed so as to not exceed the optimum training carrying capacity of sites to ensure the long-term use of the resource can be guaranteed. Base Realignment and Closure is a reality, and other military missions may look toward DPG to fulfill their future training needs. Numerous training regimes could likely be accommodated by DPG, but impacts to natural resources, such as the loss of native vegetation, dispersion or loss of sensitive wildlife, erosion, etc. are likely. New missions and/or increased intensity of missions are closely scrutinized to determine their compatibility with the current mission and resources of DPG.

Environmental Stewardship
There are positive effects of the military mission on natural resources. The most significant effect of the military on DPG is its commitment to natural resource management, including minimization and mitigation of military mission damage. This natural resources commitment is beneficial to the military mission and the environment.

The presence of DPG continues to preserve native ecosystems by preventing other potentially harmful uses (*i.e.*, development) and by ensuring that land uses are conducted in a manner that protects the environment. Natural resource considerations and military testing and training demands limit the extent of other potentially damaging land uses.

3.1.6.5 Effects of Natural Resources or Their Management on the Military Mission
DPG command and staff are committed to successful completion of the military testing and training mission, and an integral part of that mission is good environmental stewardship. There are some aspects of natural resources or their management that may impact military testing and training activities.

At DPG some restrictions are imposed on the military mission due to natural resources needs. Restrictions are generally those that are associated with compliance with laws, such as the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. However, overall, management of natural resources has enhanced the capability of DPG to perform its mission. By virtue of being a military installation, many resources at DPG have retained value often lost in less protected areas. Natural systems are advantageous to and often enhance the military mission.

Other examples of restrictions that may be imposed on the military mission include restrictions on bivouac and ground training near springs, restrictions associated with buffer zones established for nesting raptors, and time delays for testing due to issues such as birds nesting in structures. There have been no mission conflicts with wetlands or threatened or endangered species on DPG. Wetlands and surface water resources are few and generally occur in areas that can be easily avoided.

DPG has adapted to impacts that management of its natural resources has imposed on the military mission and is proving that they are not mutually exclusive. Overall the effect of natural resources management on the military mission of DPG is beneficial to the mission.

3.2 Physical Environment and Climate

3.2.1 Physiography and Topography

The following discussion of physiography and topography is taken from Dugway Proving Ground (2003a). DPG is within the Great Basin subdivision of the Basin and Range Physiographic Province. The Basin and Range Physiographic Province includes parts of Idaho, Oregon, Nevada, Utah, California, Arizona, New Mexico, and northern Mexico. This province is characterized by a series of mostly isolated north-south trending mountain ranges that are separated by wide desert plains (Press and Siever 1982).

Most of DPG lies within the Great Salt Lake Desert, with mountains and low-lying basin areas covering remaining portions of DPG. DPG is bordered to the northeast by the Cedar Mountains and to the south by a series of ranges and valleys, the closest of which is the Dugway Range. The Onaqui Mountains and Davis Mountain lie to the east of DPG. The Deep Creek Range lies to the west and marks the boundary of the Great Salt Lake Desert. The Stansbury Mountains lie to the northeast of the Cedar Mountains. Topographic elevations at DPG range from 4,225 feet above mean sea level on the lowest point of the desert floor to 7,068 feet above mean sea level at the summit of Granite Peak.

Relatively extensive basin areas are broken by the topographic relief of the Cedar Mountains, Little Davis Mountain, Simpson Buttes, Camels Back Ridge, Wig Mountain, Granite Peak, and Sapphire Mountain. There are no large perennial surface water bodies that lie within or border DPG. However, two large playas are located in the western and southern portions of DPG, the DPG Playa and the Downwind Grid Playa. Vegetated and nonvegetated sand dunes are also located in the eastern and central portions of DPG and along DPG's northern and western boundaries.

3.2.2 Geology

The following discussion of geology is taken from Dugway Proving Ground (2003a). Mountain ranges within or adjacent to DPG are composed primarily of Paleozoic sedimentary rocks of marine origin and small exposures of volcanic and intrusive Tertiary igneous rocks. With exception of Granite Peak and the Simpson Mountains, which are composed mainly of Precambrian metamorphic and igneous rocks, low-lying basin areas are filled with thick accumulations of sediment derived from erosion of uplifted mountain ranges. Sediments consist of Tertiary to Quaternary alluvial, c00000000olluvial, lacustrine, eolian, and volcanic material. Natural Resource Conservation Service (1992) descriptions of bed basin-fill sediments are below.

- Alluvial and colluvial deposits generally occur as coalescing fans consisting of medium-grained to coarse-grained sediment sloping from main mountain masses to valley floors.
- Valley floors are underlain by lakebed deposits from Lake Bonneville and poorly developed alluvial floodplains and are described as deposits consisting mainly of clay and silt and some sand and gravel. Floodplain deposits include a more evenly distributed range of sediment sizes of clay, silt, and sand and some gravel.
- Playa deposits of saline evaporites and mud flats and eolian sediments also underlie the valley floor.

Lake Bonneville, a large freshwater lake, covered much of western Utah and adjacent parts of Idaho and Nevada during the Pleistocene (Stephens and Sumsion 1978). Preserved segments of two major Lake Bonneville shorelines, the Bonneville and Provo, are evident in the eastern portion of DPG near English Village (Sack 1993). The Bonneville shoreline is the highest of the lake's shorelines, its elevation varied

across Skull Valley from about 5,230 to 5,310 feet in southern to northern portions of the valley, respectively (Sack 1993). The maximum elevation of Lake Bonneville at DPG has been estimated to be 5,135 feet, or about 875 feet above the present-day basin floor (Ebasco Services Incorporated 1995).

During the recession of Lake Bonneville, the Old River Bed, located in the southeastern portion of DPG, carried drainage from the Sevier Desert toward the Great Salt Lake Desert (Stephens and Sumsion 1978). Steiger and Freethey (2001) indicate that the thickness of basin-fill deposits in the DPG area is not well known. Few wells have penetrated the basin-fill deposits and reached underlying consolidated rock.

Lithologic data recorded during the drilling of several English Village water supply wells indicate that the upper 500 feet of sediment in this area consists predominantly of sand and gravel, and sediments below this depth consist primarily of fine-grained clay, tuffaceous sand, and volcanic ash. Well logs from Ditto water supply wells indicate that sediments in this area consist primarily of lacustrine clay with lesser amounts of sand and gravel to a depth of about 330 feet. Sand and gravel were predominately identified in a Carr water supply well, drilled to a total depth of 320 feet (U.S. Army Environmental Hygiene Agency 1987).

Recent hydrogeologic studies in the Ditto and Carr area indicate that basin-fill deposits in this area consist of silty sand units interbedded with clay layers. The upper interbedded sand and clay unit hosts shallow groundwater and is referred to as the shallow waterbearing zone. A persistent clay layer exists about 90 feet below ground surface and is between 65 to 80 feet thick in this area. This layer is continuous throughout Ditto and Carr areas. This clay layer acts as a barrier to vertical groundwater movement and is referred to as the confining-clay layer. The lower sand is the regional aquifer in this area and is the potable source of groundwater for Ditto and Carr areas (Parsons Engineering Science 2000).

Baker water supply wells also encountered predominantly sand and gravel in the upper 300 feet and primarily clay with small amounts of gravel below this depth. Bedrock was not encountered in the deepest well borehole drilled at DPG. This borehole was drilled to a total depth of 1,003 feet at Baker (U.S. Army Environmental Hygiene Agency 1987).

Unique Geologic Features

Two unique geologic features have been identified at DPG, Granite Peak and the Devil's Postpile. Both features were identified by The Nature Conservancy in a 1993 inventory of natural areas and special features on DPG land. The Nature Conservancy ranked Granite Peak as the highest priority area and characterized it as geologically unique and deserving of consideration as a National Natural Landmark. The Devil's Postpile was ranked fifth out of 17 identified special features/natural areas at DPG.

Granite Peak is composed of two primary rock types, dark-colored layered granitic rock (foliated granodiorite) and light-colored granite (leucogranite). The presence of these metamorphic and igneous rocks is interesting because such rocks are known from only a few areas in Utah. A striking feature of Granite Peak is the presence of pegmatite dikes. A pegmatite is an unusually coarse-grained igneous rock, and a dike is an igneous intrusion that cuts across pre-existing rock. These pegmatite dikes are visible as bold white streaks that form intricate patterns. Rhyolite and andesite dikes also cut the various rocks of Granite Peak (Clark and Christiansen 2006). According to Fowles (1964, cited in Callister *et. al*. 2001), pegmatites of Granite Peak are by far the most spectacular pegmatites found in the state of Utah. They constitute a very large percentage (10 to 15 percent) of the total rock volume of Granite Peak and are unique.

3.2.3 Mineral Resources

The following discussion of mineral resources is taken from Dugway Proving Ground (2001). Several small ore deposits, sand/gravel pits, and two unique geologic features have been identified at DPG.

Metallic Minerals
Mining at Granite Peak started before 1898. Early mining and exploration focused on silver, gold, lead, and copper in this mountain. Later mining concentrated on mica associated with granite gneiss and beryl and fluorite associated with pegmatite dikes. Seven small prospects have been identified on Granite Peak. A prospect is an untested mineral occurrence that may or may not contain a concentration of some mineral. Five of the prospects are polymetallic vein and replacement deposits in which copper, fluorite, lead, and/or silver have been identified as commodities. Two of the prospects are beryllium vein deposits in which beryllium, copper, fluorite, lead, and/or mica have been identified as commodities (Tripp *et al*. 1989). Amethyst, beryl, tourmaline, quartz, hematite, and pyrite are also found at Granite Peak (Higginbotham 1990).

Two mining districts with similar ore deposits are located in close proximity to DPG. The Dugway mining district is located to the south of DPG in the northern portion of the Dugway Range. The Wildcat Mountain mining district is located to the north of DPG in the Air Force-controlled portion of the Utah Test and Training Range-South. Since its discovery in 1869, the Dugway mining district has sporadically produced lead-zinc-silver ores. Seven mines or prospects are located in the Dugway mining district with copper, fluorite, lead, zinc, and/or silver identified as commodities. The northern end of Wildcat Mountain contains deposits of fluorite, silver-copper ore, and traces of gold. One mine was located at Wildcat Mountain with barium, copper, fluorite, and silver identified as commodities (Tripp *et al*. 1989).

Non-metallic Minerals
Salines, silica and undifferentiated gypsum/silica dune deposits, and sand/gravel deposits are among the nonmetallic mineral resources identified at DPG. Smith (1987) has indicated that salines (such as brines, salt, potash, and others) may be found within the Great Salt Lake Desert portion of DPG. Salines are the most valuable nonmetallic resource extracted in Utah (Smith 1987). However, there is no evidence that exploration or production of salines has occurred in the past at DPG.

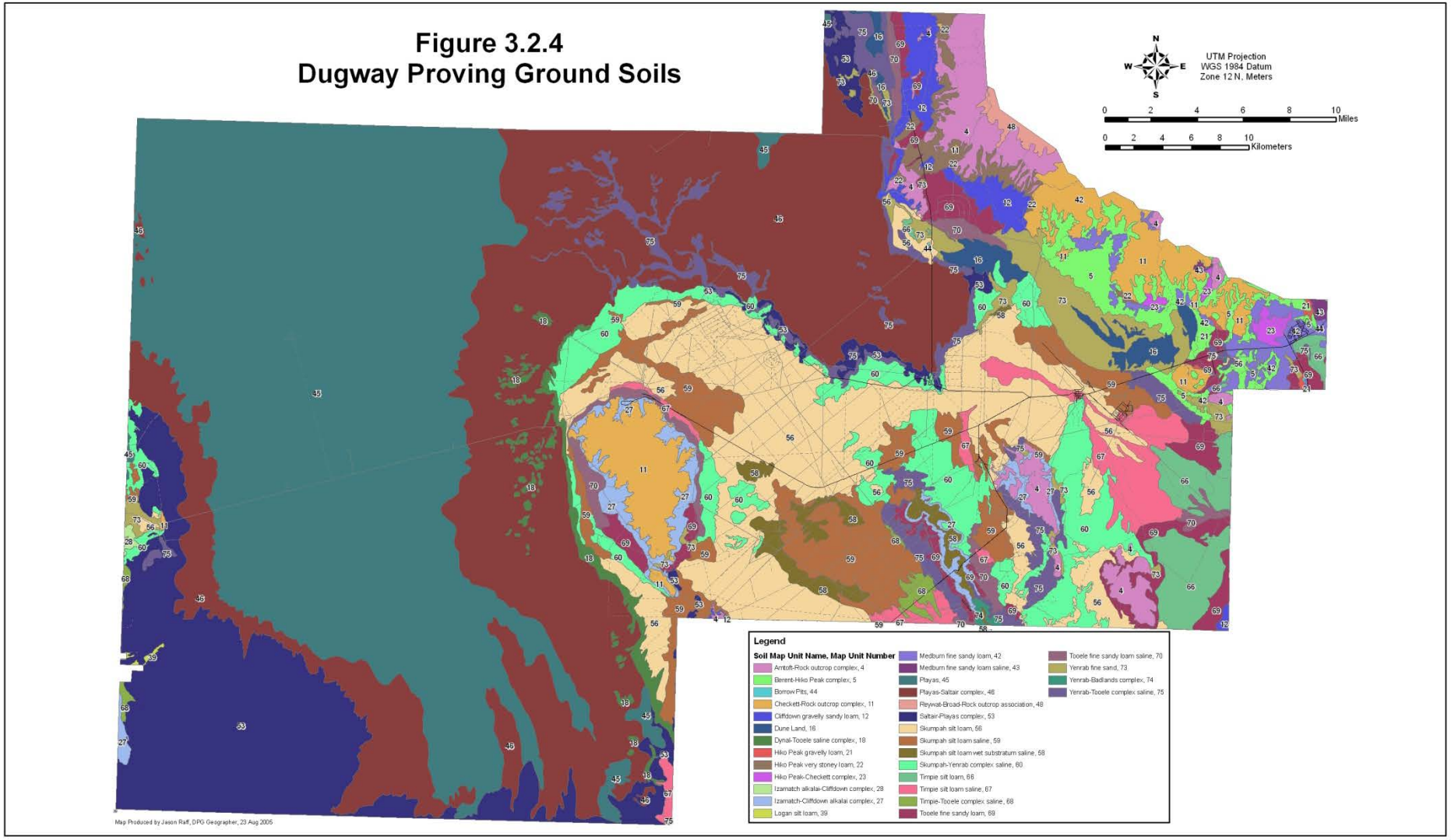
Silica dune deposits have been identified at DPG, to the north, northeast, and northwest of Ditto. Silica dune deposits are also located to the east of DPG in Skull Valley and north of DPG in the Utah Test and Training Range-South Air Force. The silica sand has been eroded from parent rock material in nearby mountains, including quartzite, sandstone, and other siliceous rocks. Undifferentiated gypsum/silica dune deposits have also been identified at DPG, to the north and west of Granite Peak and west, south, and southeast of Camels Back Ridge. Similar dune deposits are located north of DPG in the Utah Test and Training Range-South Air Force. Gypsum dunes formed as wind piled up gypsum crystals released from sulfate-rich Lake Bonneville sediments (Tripp *et al*. 1989). Eolian action apparently has segregated silica dunes from gypsum dunes in many areas. No production is known to have occurred from these dune deposits (Tripp *et al*. 1989).

Several non-metallic mineral resources occur near Camels Back Ridge at DPG. A very large sand and gravel resource occurs to the east and northeast of DPG. Although alluvial sand and gravel deposits are significant, lacustrine deposits are the chief resource (Tripp *et al*. 1989). Eleven approved sand/gravel pits are located at DPG, generally along the northeastern and northwestern flanks of Granite Peak and northeast of Camels Back Ridge. Four gravel pits with unknown status are also located at DPG, north and west of Camels Back Ridge. New locations are also being explored for suitable aggregate material for future projects, including the MAAF runway. Used gravel is disposed at one designated location at DPG, west of Camels Back Ridge (Bever 1989).

3.2.4 Soils
The following discussion of soils is taken from Dugway Proving Ground (2003a). Thirty-three map units have been identified at DPG (Figure 3.2.4). A map unit represents an area dominated by one or more major kinds of soil or water. Thirty-two of the 33 map units are soil map units and are described in Table 3.2.4,

including percent slopes, permeability, runoff potential, water erosion hazard, wind erosion hazard, and percent of the total area that each soil map unit covers at DPG.

Figure 3.2.4 Dugway Proving Ground Soils



Three map units cover about 58 percent of the total area at DPG. These include the Playas (27 percent), the Playas-Saltair Complex (22 percent), and the Saltair-Playas Complex (9 percent). The Playas map unit is found on lake plains that are relatively barren, undrained basins subject to repeated inundation by water and salinization by evaporation of accumulated water. The soil material in this map unit is strongly calcareous, stratified silt, clay, and sand containing sufficient amounts of salt to limit or prohibit the growth of vegetation. The Saltair map unit is a very deep and poorly drained soil that is also found on lake plains. This soil type is formed in alluvium and lacustrine sediments derived from mixed rock sources (Natural Resource Conservation Service 1992).

Table 3.2.4 Description and Extent of Soil Types at Dugway Proving Ground

Map Unit Name	Percent Slopes	Permeability	Runoff Potential	Water Erosion Hazard	Wind Erosion Hazard	Map Unit Percent of Total Area
Amtoft-Rock Outcrop Complex	30 to 70	Moderately rapid	Very rapid	Severe	Slight	2.11
Berent-Hiko Peak Complex	2 to 15	Moderately rapid to rapid	Very slow to medium	Slight to moderate	Slight to severe	1.59
Checkett-Rock Outcrop Complex	10 to 40	Moderate	Very rapid	Severe	Slight	3.03
Cliffdown Gravelly Sandy Loam	2 to 15	Moderately rapid	Medium	Slight	Moderate	1.01
Dune Land	*	*	*	*	*	0.79
Dynal-Tooele Saline Complex	0 to 15	Moderately rapid to rapid	Very slow to slow	Slight	Moderate to very severe	0.86
Hiko Peak Gravelly Loam	2 to 15	Moderately rapid	Medium	Moderate	Slight	0.03
Hiko Peak Very Stony Loam	2 to 8	Moderately rapid	Medium	Slight	Slight	0.65
Hiko Peak-Checkett Complex	2 to 40	Moderate to moderately rapid	Moderate to very rapid	Moderate to severe	Slight	0.19
Izamatch Alkali-Cliffdown Complex	2 to 15	Moderately rapid to rapid	Very slow to medium	Slight	Slight to moderate	0.04
Izamatch-Cliffdown Alkali Complex	2 to 8	Moderately rapid to rapid	Very slow to medium	Slight	Slight to moderate	1.05
Logan Silt Loam	0 to 1	Slow	Slow	Slight	Moderate	0.02
Lundy-Dateman-Rock Outcrop Association	30 to 70	Moderate	Very rapid	Severe	Slight	0.00
Medburn Fine Sandy Loam	2 to 8	Moderately rapid	Medium	Moderate	Moderate	0.71
Medburn Fine Sandy Loam Saline	2 to 4	Moderately rapid	Slow	Slight	Moderate	0.09
Pits	*	*	*	*	*	0.01
Playas	*	*	*	*	*	26.78
Playas-Saltair Complex	0 to 1	Slow	Slow	Slight	Moderate	22.12
Reywat-Broad-Rock Outcrop Association	30 to 60	Moderately slow	Very rapid	Severe	Slight	0.20
Saltair-Playas Complex	0 to 1	Slow	Slow	Slight	Moderate	8.85
Skumpah Silt Loam	0 to 2	Moderately slow	Slow	Slight	Moderate	9.37
Skumpah Silt Loam Saline	0 to 2	Moderately slow	Slow	Slight	Moderate	4.13
Skumpah Silt Loam Wet Saline	0 to 1	Moderately slow	Slow	Slight	Moderate	0.83
Skumpah-Yenrab Complex Saline	0 to 15	Moderately slow to rapid	Very slow to slow	Slight	Moderate to severe	4.55
Timpie Silt Loam	0 to 3	Moderately slow	Slow	Slight	Moderate	1.50
Timpie Silt Loam Saline	0 to 4	Moderately slow	Slow	Slight	Moderate	1.65
Timpie-Tooele Complex Saline	0 to 5	Moderately slow to moderately rapid	Slow	Slight	Moderate	0.27
Tooele Fine Sandy Loam	0 to 5	Moderately rapid	Slow	Slight	Moderate	2.03
Tooele Fine Sandy Loam Saline	0 to 5	Moderately rapid	Slow	Slight	Moderate	0.98
Yenrab Fine Sand	2 to 15	Rapid	Very slow	Slight	Very severe	1.79
Yenrab-Badlands Complex	2 to 15	Rapid	Very slow	Slight	Very severe	0.08
Yenrab-Tooele Complex Saline	0 to 15	Moderately rapid to rapid	Very slow to slow	Slight	Moderate to severe	2.69
Total						**100.00**

* Information is not available or not applicable.

The remaining area at DPG is covered by 27 soil map units and three miscellaneous area map units. The 27 soil map units cover about 41 percent of the total area at DPG. However, individually, each soil map unit covers less than 5 percent of the total area at DPG, with exception of the Skumpah Silt Loam, which covers about 9 percent of DPG. The three miscellaneous area map units cover about 1 percent of the total area at DPG. The *Soil Survey of Tooele Area, Utah, Tooele County and Parts of Box Elder, Davis, and Juab Counties, Utah, and Parts of White Pine and Elko Counties, Nevada* (Natural Resource Conservation Service 1992) describes these soil and miscellaneous area map units.

Cryptogamic Crusts

Cryptogamic crusts are a soil microcommunity consisting of fungi (Basidiomycetes), lichens, soil algae, and mosses typically occurring in semiarid regions. Cyanobacteria-dominated soil crusts are readily observed in chenopod communities of Dugway. The soil crust forms when the sticky sheath of the moving bacteria forms a web of fibers. The fiber web fuses the soil together and allows for accumulation of moisture for plants in an otherwise dry climate (Belnap 1998).

Soil crusts are widespread on the installation and throughout many vegetation communities. These crusts serve as an important soil stabilizer and source of nitrogen fixation in the soil. Great Basin soils are nitrogen-limited, and cryptogams are essential sources for this plant nutrient (White 1993). Additionally, soil crusts moderate effects of wind- and water-caused erosion. Cryptogammic crusts are extremely fragile and sensitive to disturbances. Specifically, any soil compaction, such as human foot traffic, native game animals or livestock, or tracked vehicles may severely degrade the nitrogen-fixation capacity (Johansen *et. al*. 1998). Restoration of nitrogen-fixation may require 5-15 years before attaining the pre-impacted capacity (Belnap 1998, Johansen *et. al*. 1998).

3.2.5 Water Resources

3.2.5.1 Surface Water

The following discussion of surface water resources is taken from Dugway Proving Ground (2003a). DPG is located within portions of four surface water drainage areas: Skull Valley, Dugway Valley-Government Creek area, Fish Springs Flat area, and the Great Salt Lake Desert. The Skull Valley drainage basin covers about 560,000 acres from Lookout Pass northward to the southwestern shore of the Great Salt Lake (Hood and Waddell 1968). About 9,600 acres of the drainage area lie within DPG. Surface water runoff within this portion of the drainage area predominately flows to the northeast towards the center of Skull Valley.

The Dugway Valley-Government Creek drainage area covers about 570,000 acres. Dugway Valley is separated from the Government Creek area by a topographic divide that extends from Simpson Mountains northwest to Simpson Buttes and Camels Back Ridge. Northwest from Camels Back Ridge, the two valleys merge into the Great Salt Lake Desert. About 290,000 acres of this drainage area lies within DPG. The general direction of surface water runoff in the DPG portion of this drainage area is to the northwest toward the Great Salt Lake Desert. There are local deviations from this general flow direction caused by local variations in topography. The Old River Bed, located along DPG's southern boundary, is a prominent trench crossing the divide between the Sevier Desert drainage and the Great Salt Lake Desert drainage. The river that formed the trench was a connecting link between two major parts of Lake Bonneville during the Pleistocene (Stephens and Sumsion 1978).

The Fish Springs Flat drainage area covers about 380,000 acres from a topographic high area connecting Swasey Mountain and the Little Drum Mountains northwest to the Great Salt Lake Desert (Bolke and Sumsion 1978). The general direction of surface water runoff in the DPG portion of this drainage area is to the northwest toward the Great Salt Lake Desert.

Western and northwestern portions of DPG lie within the Great Salt Lake Desert and cover about 470,000 acres. Surface water drainage is internal within the Great Salt Lake Desert (Gates and Kruer 1981).

Natural surface water features on DPG include surface water drainages, springs, ponds, playas, and wetlands. Constructed surface water features include wastewater lagoons, evaporation ponds, an excavated pond, a bermed pond, and roadside ditches. There are also 10 guzzlers that have been installed, augmenting the natural drinking water supply for wildlife. Both natural and constructed surface water features located at DPG are shown in Figure 3.2.5.1 and described below.

Baker Sewage Lagoon - perennial, constructed, 1.1 acres, located in Baker, receives domestic wastewater from Baker, enclosed by a fence.
Black's Pond - perennial, constructed, 2.0 acres, located northwest of Ditto, excavated depression that intercepts groundwater, includes wetland.
Bitter Springs - intermittent, natural, 0.59 acres at the northern seep and 0.17 acres at the southern seep, located in Cedar Mountains, northern seep is not considered a wetland, a second seep identified southeast of the northern seep area.
Cane Springs – perennial, natural, 0.029 acres at the spring and 0.25 acres of wetland, located in Cedar Mountains, the wetland area includes one spring, two seeps, and a perennially saturated drainage.
Carr Facility Sewage Lagoon - perennial, constructed, 1.5 acres, located in Carr, receives domestic wastewater from Carr, enclosed by a fence.
Cedar Springs - perennial, natural, unknown acreage, located in Cedar Mountains.
Ditto/Avery/Michael Army Airfield Sewage Lagoons - perennial, constructed, three cells of 0.66 acres each, receives domestic wastewater from Ditto/Avery/Michael Army Airfield, enclosed by a fence.
DPG Playa - intermittent, natural, 485,000 acres, located in western and northwestern portions of DPG, covered annually with a shallow layer of storm water runoff and snowmelt, regarded as a "special aquatic site" because it is a mudflat and has special ecological characteristics that can be easily disrupted, migrating shore birds may feed on brine flies and brine shrimp found at the playa.
Downwind Grid Playa - intermittent, natural, unknown acreage, located in the Downwind Grid.
English Village Wastewater Treatment Facility - perennial, constructed, three cells of 3.15 acres each and a discharge area of 0.9 acres, located south of Fries Park, receives domestic wastewater from English Village and Fries Park, enclosed by a fence, pond and runoff area for effluent located west of the lagoon.
Government Creek - ephemeral, natural, surface area is variable, located in the vicinity of Ditto and Carr.
Hazardous Waste Management Unit 33 Sewage Lagoon, North Baker Test Facility - ephemeral, constructed, 0.63 acres, located in Baker, used for disposal of sanitary and laboratory waste from various facilities in Baker, inactive since 1997, enclosed by chain-link fence.
Hazardous Waste Management Unit 47 Sewage Lagoon, South of Fries Park - ephemeral, constructed, eastern lagoon 12 acres and western lagoon 9 acres, located south of Fries Park, receives sanitary waste from English Village and Fries Park, eastern and western lagoons inactive, surrounded by a single cable-wire fence.
Hazardous Waste Management Unit 51 Evaporation Pond - ephemeral, constructed, 0.74 acres, located southwest of Carr, originally used to dispose of liquids from the Defensive Test Chamber and decontamination system, retrofitted with a double liner and leachate detection system between 1987 and 1988, inactive, surrounded by a chain-link fence.
Hazardous Waste Management Unit 58 Evaporation Pond – ephemeral, constructed, 0.15 acres, located southeast of Carr, originally used to dispose of decontaminated waste solutions, retrofitted with a double liner, leachate detection system, and berms between 1986 and 1988, inactive, surrounded by a chain-link fence.
Hazardous Waste Management Unit 158 Evaporation Pond - ephemeral, constructed, 1.2 acres, located north of Ditto, designed to receive and evaporate liquid waste from Hazardous Waste Management Unit 162, surrounded by a chain-link fence.

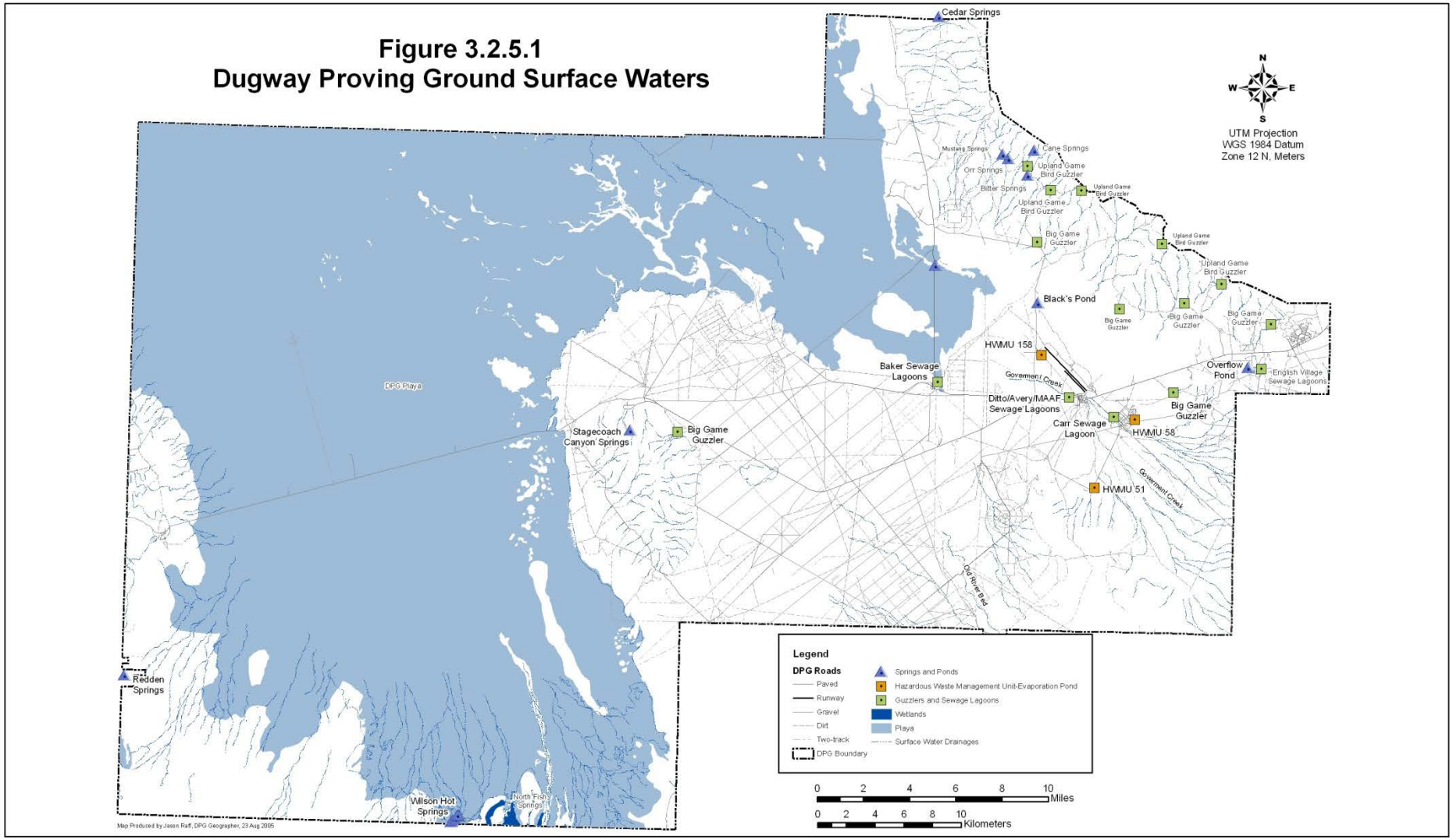
Mustang Springs - perennial, natural, 0.15 acres, located in Cedar Mountains, includes a small pond with an adjacent wetland area.
North Fish Springs - perennial, natural, unknown acreage, located north of Fish Springs National Wildlife Refuge, dependent on flow from Fish Springs National Wildlife Refuge.
Old River Bed - ephemeral, natural, surface area is variable, located southwest of Camels Back Ridge, remnant of an ancient drainage.
Orr Springs - perennial, constructed, natural, 0.04 spring and 0.03 pond acreage, located in Cedar Mountains, a well is located downgradient from the spring that taps groundwater, a pipe carries water from the well to a circular pond, the pond is not considered a wetland.
Redden Springs - perennial, natural, unknown acreage, located along the western boundary of DPG.
Roadside Dtches - ephemeral, constructed, surface area is variable, located along constructed roadways predominantly in developed portions of DPG.
Stagecoach Canyon Springs - perennial, natural, unknown acreage, located at the northern end of Granite Peak.
Unnamed Drainages - ephemeral, natural, surface area is variable, located throughout DPG, well-defined drainages are predominantly located along mountains and in the Dugway Valley-Government Creek drainage area.
Wilson Hot Springs - perennial, natural, unknown acreage, located along the southern boundary of DPG, contains thermal springs and discharges to the surface through six dome-shaped vents. The Nature Conservancy and Utah Department of Natural Resources (1993) identified Wilson Hot Springs as one of 16 noteworthy natural areas or special features on DPG. Given what is now known about the site, it would certainly be elevated several notches from the 1993 listing (electronic communication, J. Banta USFWS, comment on Draft Final INRMP, December 13, 2006). Several current NRO studies have analysed temperature and water quality aspects at Wilson Hot Springs.

In undeveloped portions of DPG, surface water runoff occurs as overland flow or moves through natural drainages. Surface water that flows overland in an arid region spreads as a thin, continuous layer over a large area rather than being concentrated into well-defined drainage channels. Government Creek is one of the most well-defined natural drainages at DPG. The drainage enters DPG along the southeastern boundary and trends northwestward passing to the west of Carr and through Ditto. The drainage loses definition west of Ditto.

In the developed portions of DPG, surface water runoff generally moves via roadside ditches. In general, these ditches are not interconnected. Storm water sewers are located in portions of Avery, Baker, and Ditto. The storm sewers outfall into nearby drainage ditches or into Government Creek.

Several thermal springs are located in the vicinity of DPG's southern boundary. Fish Springs National Wildlife Refuge, located south of DPG's southern boundary, covers about 18,000 acres and includes five major springs, several lesser springs, and seep flow from a faultline at the base of the eastern front of the Fish Springs Mountain Range (Fish Springs National Wildlife Refuge 1994). Groundwater that discharges at the refuge is saline, with temperatures ranging from 71 to 81◦ Fahrenheit (F) (Banta 1996, personal communication in Dugway Proving Ground 2003a). Wilson Hot Springs is located along DPG's southern boundary and contains six dome-shaped vents trending northeast to southwest that discharge very saline groundwater. In July 1967 the temperature of the hottest measured spring in the group was 141 °F at the edge of the pool and 168 °F in the center of the pool. Temperature probes have been placed in the various springs and are currently collecting temperature data. The estimated rate of groundwater discharge is 0.223 cubic feet per second. Big Springs is located about one mile southeast of Wilson Hot Springs, south of DPG's southern boundary.

Figure 3.2.5.1 Dugway Proving Ground Surface Waters



Both springs appear to be associated with the fault zone that has been identified at the refuge. Groundwater that discharges at Big Springs is similar in temperature to that found at the refuge (Mundorff 1970). The proposed Nevada water project that would tap into the Carbonate Aquifer could potentially have negative impacts to the springs near Fish Springs National Wildlife Refuge.

3.2.5.2 Groundwater

The following discussion of groundwater is taken from Dugway Proving Ground (2003a). DPG is located within a portion of the Great Salt Lake and the Great Salt Lake Desert regional groundwater flow systems. The regional flow systems are recharged by water from mountains and plateaus at the eastern edge of the Basin and Range Physiographic Province and from mountains within the province. Movement of groundwater within Great Salt Lake and Great Salt Lake Desert flow systems is along flow paths toward the Great Salt Lake and Great Salt Lake Desert, respectively (Gates and Bedinger 1987).

Several groundwater flow systems underlie portions of DPG, including local, intermediate, and regional systems. Evidence of a regional groundwater flow system is found in the southwestern corner of DPG. This portion of DPG is underlain by a carbonate-rock aquifer. Much of the water moving in carbonate rocks near the Utah-Nevada border is believed to discharge from two groups of large springs, Blue Lake Springs and Fish Springs (Gates and Bedinger 1987). Blue Lake Springs is northwest of DPG along the western boundary of the Utah Test and Training Range-South Air Force. Fish Springs is located to the south of DPG's southern boundary in the Fish Springs National Wildlife Refuge.

Intermediate and local flow systems that underlie DPG include basin fill aquifers that are found in Skull Valley, the Dugway Valley-Government Creek area, and the Great Salt Lake Desert area. Western and northwestern portions of DPG lie within the Great Salt Lake Desert. Three groundwater aquifers have been identified within portions of the southern Great Salt Lake Desert, including a shallow-brine, an alluvial-fan, and a basin-fill aquifer (Gates and Kruer 1981).

The easternmost portion of DPG overlies the Skull Valley Aquifer, which is part of the Great Salt Lake regional flow system. Eastern and central portions of DPG overlie the Dugway Valley-Government Creek Aquifer, which is also part of the Great Salt Lake Desert regional flow system. Dugway Valley, Old River Bed, Government Creek Valley, and the Fries Park area form subareas of the groundwater system south, southeast, and east from the main part of the Great Salt Lake Desert. A surface water divide and consolidated rock, overlain by a thin layer of alluvium, separate the English Village area from the Dugway Valley-Government Creek area. The English Village area is part of the much larger Skull Valley groundwater system to the east and northeast.

In the eastern portion of DPG, within the Skull Valley Aquifer, groundwater is classified as Class II using the State of Utah's groundwater classification system. Class II groundwater is considered to be drinking water quality. In eastern and central portions of DPG, within the mid-level aquifer of the Dugway Valley-Government Creek area, groundwater is classified as Class II. Groundwater quality in the shallow aquifer generally decreases to the west, and classes II, III, and IV have been identified. Class IV is considered to be saline. Groundwater contamination has occurred in some areas of DPG from past waste management practices. Ongoing investigations are studying the nature and extent of potential groundwater contamination within DPG (Dugway Proving Ground 2001a).

3.2.6 Climate

Meteorological data were recorded at several on-installation weather stations (Surface Atmospheric Measurement System locations). DPG is in a semi-arid, continental, steppe region, or high desert known as the Great Basin Desert. This region is often referred to as a cold desert due to its mid-latitude location. Typically, winters are cold; summers are hot and dry with a high evaporation rate; and most precipitation falls in the spring (Dugway Proving Ground 2003a).

Other weather characteristics typical of the DPG area include frequent electrical storms and occasional dust storms in summer and temperature inversion conditions in winter. Temperature inversion conditions occur when cold Arctic air spills into the area, wind speed is low, and contrary to the normal pattern, air temperature increases with height above the ground surface. Surface airflow is reduced and any tendency toward reduced air quality is aggravated under these conditions (Dugway Proving Ground 2003a).

Weather patterns at DPG are influenced by terrain. Most of DPG is relatively flat because it consists of a former lake bed (the former Lake Bonneville of which the Great Salt Lake is a small remnant). Interspersed in the flat terrain are abrupt, often pinnacle-like mountains, which are cooler and receive more precipitation than surrounding flatlands. They influence local weather patterns by channeling winds and promoting up- and down-slope conditions in mornings and evenings, respectively (Dugway Proving Ground 2003a).

Local wind patterns are governed by differential heating and cooling of higher elevations relative to flatlands and by regional weather. These patterns usually include the onset of southeasterly or southerly downslope flow at night that persists into morning, which transitions into northwesterly through northerly flow with daytime heating. There are two periods of relative atmospheric stability in early morning and early evening hours. These patterns are marked in summertime but weak or absent in winter, due to differences in the amount of heat in the form of solar radiation received seasonally and the tendency of snow to reflect solar radiation away during winter (Dugway Proving Ground 2003a).

Monthly average temperatures for the Ditto Technical Center for the period 1950 to 1998 range from 77.9° F in July, which is the hottest month, to 27° F in January, which is the coolest. Daily extremes for each month show a substantial range. For example, for July the daily extreme high is 109° F and the extreme low is 37° F. Similarly, the daily extreme range for January is 91° F. Large temperature fluctuations recorded between day and night and seasonally are typical of the area's arid continental climate (Dugway Proving Ground 2003a).

Precipitation data for the Ditto Technical Center for the period 1950 to 1998 show that mean annual precipitation is about 8 inches with a low of about 3 inches and a high of about 15 inches. Wettest months are March, April, and May, followed by October. Snowfall occurs November through March; however, snow may persist at mountain elevations for much longer periods than on flatlands (Dugway Proving Ground 2003a).

The average warmest month is July, and January is the average coldest month. The highest recorded temperature was 109° F in 1998, and the lowest recorded temperature was -29° F in 1989. May is the average wettest month. Monthly weather parameters collected by the U.S. Weather Service (www.weather.com) for Dugway Proving Ground, Utah are shown in Table 3.2.6.

Unusual or severe weather conditions, such as fog and cloud ceilings, which limit visibility, occur most often during winter. Thunderstorms or electrical storms occur during summer (Dugway Proving Ground 2003a).

Table 3.2.6 Summary of Dugway Proving Ground, Utah Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	40°F	47°F	56°F	64°F	75°F	87°F	96°F	94°F	82°F	68°F	52°F	41°F
Avg. Low	14°F	21°F	28°F	34°F	43°F	52°F	60°F	58°F	47°F	34°F	25°F	15°F
Mean	27°F	34°F	42°F	49°F	59°F	70°F	78°F	76°F	65°F	51°F	38°F	28°F
Avg. Precip.	0.60 in	0.66 in	0.95 in	0.82 in	1.19 in	0.50 in	0.56 in	0.63 in	0.72 in	0.89 in	0.62 in	0.49 in
Record High	66°F 1953	71°F 1995	80°F 1971	88°F 1992	99°F 1997	107°F 1954	109°F 1998	108°F 1972	102°F 1995	91°F 1996	78°F 1973	69°F 1995
Record Low	-25°F 1984	-29°F 1989	-6°F 1952	11°F 1997	21°F 1997	31°F 1976	37°F 1968	33°F 1992	22°F 1970	9°F 1971	-8°F 1952	-27°F 1990

3.3 Biological Resources

3.3.1 Flora

3.3.1.1 Vegetation Types

Vest (1962) described eight different vegetation communities at DPG: Pickleweed, Greasewood, Shadscale-gray Molly, Shadscale-gray Molly-greasewood, Shadscale-bud Sage, Vegetated Dunes, Juniper Brush, and Mixed Brush. HDR Engineering, Inc. and Dugway Proving Ground (2004) modified vegetation types from Vest (1962) and categorized 10 different vegetation community types. The types were patterned after and modified from the terrestrial system, the physiognomic formation level, and the floristic alliance and association levels in *The National Vegetation Classification System: Development, Status, and Applications* (The Nature Conservancy 1998). HDR Engineering, Inc. and Dugway Proving Ground (2004) described community types (formations) at DPG as follows:

- Open Woodland
- Great Basin Arid Shrubland
- Great Basin Cold Desert Chenopod Shrubland
- Great Basin Vegetated Dune
- Great Basin Unvegetated Dune
- Exotic Vegetation - Ecosystem Stressors
- Great Basin Cold Desert Perennial Grassland
- Great Basin Cold Desert Playa
- Great Basin Cold Desert Lowland Riparian
- Great Basin Cold Desert Wetland

Vegetation communities are shown at Figure 3.3.1.1, and acreages for each community type are shown at Table 3.3.1.1. By far, the most common community type identified was the Cold Desert Playa, occupying nearly 50% of DPG. The Cold Desert Chenopod Shrubland is the next most common occupying 27% of DPG. A description of each vegetative community is in Appendix 3.3.1.1.

Table 3.3.1.1 Vegetation Community Types on Dugway Proving Ground

Community Type	Acres	Percent of DPG
Open Woodland	24,557	3.1
Great Basin Arid Shrubland	29,875	3.7
Great Basin Cold Desert Chenopod Shrubland	216,920	27.0
Great Basin Vegetated Dune	68,233	8.5
Great Basin Unvegetated Dune	2,175	0.3
Exotic Vegetation – Ecosystem Stressors	58,621	7.3
Great Basin Cold Desert Perennial Grassland	2,269	0.3
Great Basin Cold Desert Playa	397,046	49.4
Great Basin Cold Desert Lowland Riparian	19	0.0
Great Basin Cold Desert Wetland	831	0.1
Developed Areas	3,140	0.4
Total	803,686	100

3.3.1.2 Potential Threats to Vegetative Communities

Threats to various community types are similar in nature. The variation in threats to each community type often depends on such factors as the amount of fuel accumulation, proximity to or extent of existing invasion of aggressive exotic species, soil chemistry, and slope. Some potential and man-induced threats and their impacts that are relatively common to many community types are listed below (HDR Engineering, Inc 2004).

Wild Fires

- Removal of vegetative overstory.
- Removal of vegetative understory.
- Potentially more difficult to fight if occurs on a steep slope.
- Sterilization of natural seed bank and microflora in soil.
- Removal of natural competition and opening of habitat for exotic invasion.
- Acceleration of natural fire cycles.
- Change in ecosystem nutrient cycling.

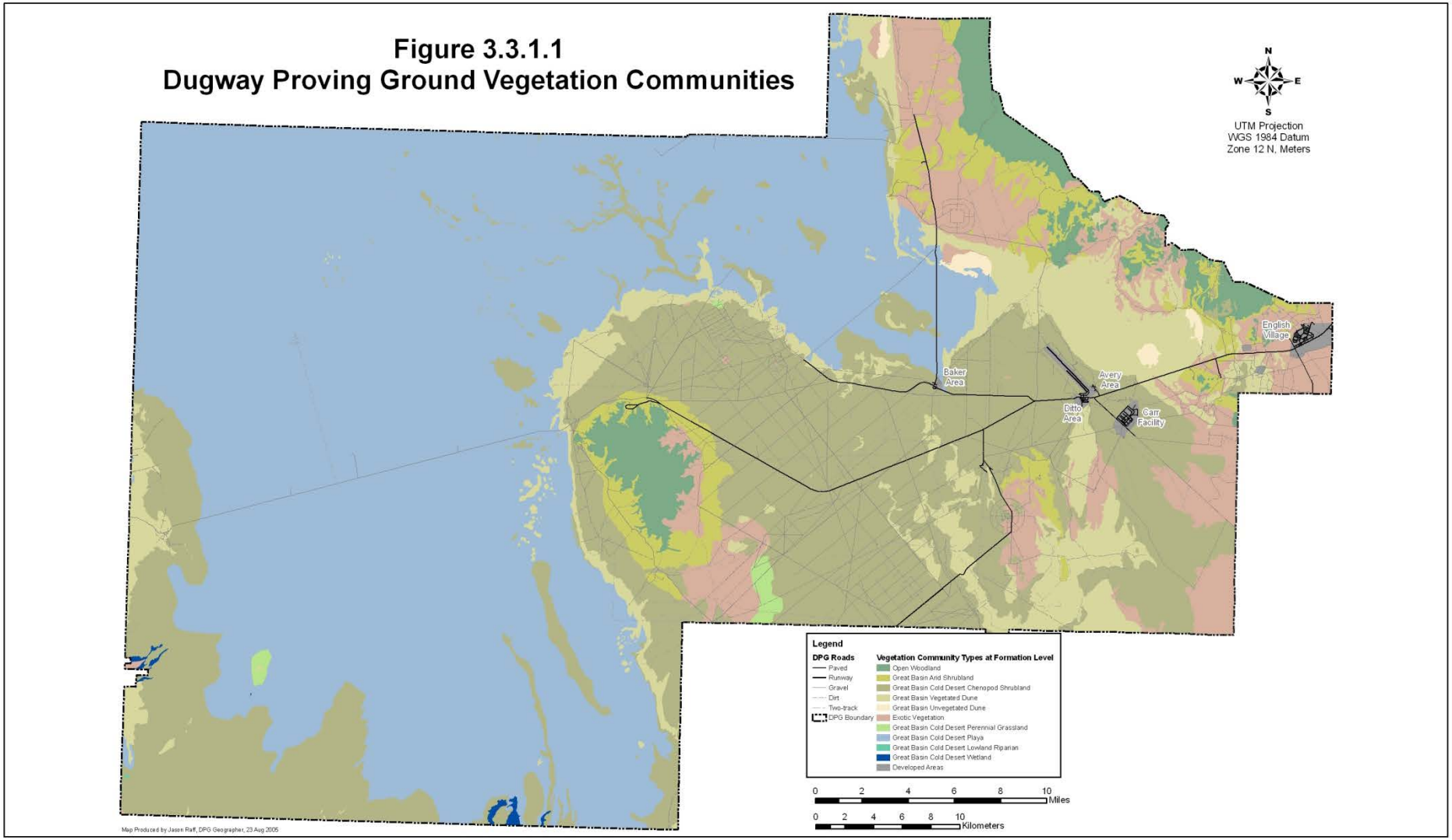
Mechanical Disturbance

- The more accessible the topography, the greater the likelihood of incurring mechanical disturbances.
- Disturbance of soil surface.
- Destruction of soil structural integrity (including cryptobiotic crust).
- Change in the natural hydrology.
- Accelerate wind and water erosion.
- Destruction of native vegetation.
- Opening of habitat for invasion of exotic species.

Military Testing and Training Activities

- Potential for mechanical disturbance of soils (see above).
- Potential for fires (see above).
- Accumulation of training materials, by-products of spent training materials and vehicular emissions, chemical and biological contaminants.

Figure 3.3.1.1 Dugway Proving Ground Vegetation Communities



- Detonation of munitions, concussions and noise.

Proximity to Highly Disturbed Areas Invaded with Exotics

- Proximity provides viable seed bank of exotic species in native community which will readily establish following the slightest physical or chemical disturbance to native areas.
- In the case of tumbleweeds, probability for wide ranging seed dispersal, but much more importantly, a massive accumulation of fuel potentially leading to a much hotter than usual fire.

Climatic Extremes

- Removal of mature, seed producing native stock (by drought or flood).
- Removal of natural competition and opening of habitat for exotic invasion (by drought or flood).
- Drying of vegetation, increasing potential for wildfires (drought).

3.3.1.3 Invasive Species

Twenty-two weed species that merit management consideration have been identified on DPG (Brigham Young University and Dugway Proving Ground 2004). Of those 22 species 7 are classified as noxious, indicating that legal authorities mandate management action. The remaining 15 weed species are termed nuisance, indicating an absence of legal authority but whose prevalence in the DPG environs suggest potential detrimental environmental effects. Table 3.3.1.3a lists invasive species occurring on DPG. Figure 3.3.1.1 shows exotic vegetation on DPG.

Table 3.3.1.3a Non-native Invasive Species on Dugway Proving Ground

Scientific Name	**Common Name**
Aegilops cylindrical	Jointed Goatgrass
Bassia hyssopifolia	Five-hook Bassia
Bromus rubens	Red Brome
Bromus tectorum	Cheatgrass
Cardaria draba *	White Top
Carduus nutans *	Musk Thistle
Centaurea virgata var. *squarrosa* *	Squarrose Knapweed
Cirsium arvense *	Canada Thistle
Cirsium vulgaris *	Bull Thistle
Convolvulus arvensis *	Field Bindweed
Descurainia Sophia	Tansy Mustard
Eleagnus angustifolia	Russian Olive
Halogeton glomeratus	Halogeton
Lactuca serriola	Prickly Lettuce
Lepidium perfoliatum	Pepper Cress
Onopardum acanthium *	Scotch Thistle
Ranunculus testiculatus	Bur Buttercup
Salsola tragus (kali)	Russian Thistle
Sisymbrium altissimum	Tumbling Mustard
Tamarix chinensis	Tamarisk
Tribulus terrestris	Puncture Vine

* Species with noxious designation

Based on the potential to restrict military land use, non-native invasive species have been prioritized as shown in Table 3.3.1.3b. Ranking is based on three categories: invasiveness, habitat replacement potential, and critical nature of infested area.

Cheatgrass ranks highest among invasive plant species at DPG. It is important to note that cheatgrass was widespread before noxious weed laws came into effect, and since eradication was no longer a realistic goal, it has never been listed as noxious. However, that does not reverse the detrimental impact cheatgrass has to the environment. Of all invasive species at DPG, cheatgrass has been the most problematic. It has replaced extensive tracts of native habitat and has altered the natural fire cycle to the detriment of native wildlife (Brigham Young University and Dugway Proving Ground 2004).

Table 3.3.1.3b Priority of Invasive Species on Dugway Proving Ground

Scientific Name	Common Name	Invasive Potential Ranking 0-4 (4-highest)	Habitat Replacement Potential 0-4 (4-highest)	Critical Nature of Infested Area 0-4 (4-most critical)	Ranking 4-12 (12-highest)
Bromus tectorum	Cheatgrass	4	4	4	12
Centaurea virgata var. *squarrosa*	Squarrose Knapweed	4	4	3	11
Tamarix chinensis	Tamarisk	3	4	4	11
Salsola tragus (kali)	Russian Thistle	4	3	3	10
Aegilops cylindrical	Jointed Goatgrass	3	3	2	8
Cirsium arvense	Canada Thistle	3	4	1	8
Convolvulus arvensis	Field Bindweed	3	4	1	8
Onopardum acanthium	Scotch Thistle	3	3	2	8
Bromus rubens	Red Brome	3	3	2	8
Cirsium vulgaris	Bull Thistle	3	2	3	8
Eleagnus angustifolia	Russian Olive	3	3	2	8
Sisymbrium altissimum	Tumbling Mustard	2	3	2	7
Bassia hyssopifolia	Five-hook Bassia	3	2	2	7
Halogeton glomeratus	Halogeton	3	3	1	7
Descurainia Sophia	Tansy Mustard	2	2	2	6
Ranunculus testiculatus	Bur Buttercup	4	1	1	6
Lepidium perfoliatum	Pepper Cress	3	1	1	5
Cardaria draba	White Top	2	1	2	5
Carduus nutans	Musk Thistle	2	2	1	5
Tribulus terrestris	Puncture Vine	3	1	1	5
Lactuca serriola	Prickly Lettuce	2	1	1	4

3.3.1.4 Land Condition and Vegetation Trends

Vest (1962) described eight different vegetation communities on DPG (Section 3.3.1.1, *Vegetation Types*). The vegetation communities or habitat types on DPG are part of a dynamic system. Since dates of earlier DPG inventories, the landscape has changed significantly in some places. For example, in some areas, portions of these natural habitat types have been converted from native plants to exotic species, which ultimately act as ecosystem stressors. This evolution from native perennial trees, shrubs, and grasses to invasive exotic vegetation has primarily occurred after wildfires and other disturbances (HDR Engineering, Inc. and Dugway Proving Ground 2004).

Vegetation data collected by Vest in the Ecology and Epizoology reports of the 1950s and 1960s recorded the presence of cheatgrass but never in great abundance. By the late 1970s aerial photographs revealed large monocultures of cheatgrass. Following several fires during the 1990s cheatgrass expanded to become a dominating community type at DPG and has exerted such a competitive effect as to completely exclude recruitment of native species back into the environment. Cheatgrass is highly fire adapted and becomes a

monoculture after fire removes the native component of a plant community. Especially sensitive to extirpation, are juniper and sagebrush which provide important wildlife habitat. Conversion of native plant communities to cheatgrass monocultures is not unique to DPG but prevalent throughout much of the Great Basin. As native habitat in the Great Basin disappears, more pressure is directed towards protecting remaining habitat necessary to sustain native wildlife (Brigham Young University and Dugway Proving Ground 2004).

3.3.1.5 Floral Inventory

Vegetation surveys at DPG have identified 346 species of vascular plants. There are also several varieties of cryptobiotic crusts found at DPG. Knowledge about DPG microflora is limited. The *Multiple Species Habitat Management Plan* (HDR Engineering, Inc. and Dugway Proving Ground 2004) contains a complete listing of floral species known to occur on DPG. DPG vegetation types and invasive weeds are discussed in sections 3.3.1.1 and 3.3.1.3 respectively. Studies referenced in these sections contributed greatly to DPG's knowledge of floral resources.

3.3.1.6 Special Status Flora

There are no plant species known to occur on DPG that are federally-listed as threatened or endangered. The USFWS threatened Ute ladies'-tresses (*Spiranthes diluvialis*) is known to occur close to DPG; however, little or no suitable habitat exists on DPG. There are some plant species on DPG designated by resource agencies as species of concern, such as the BLM-listed Cooper's hymenoxys (*Hymenoxys cooperi*), helleborine (*Epipactis helleborine*), king's snagdragon (*Sairocarpus kingii*), and Pohl's milkvetch (*Astragilis lentiginosis* var. *pohlii*) (HDR Engineering, Inc. and Dugway Proving Ground 2004).

3.3.1.7 Areas of Special Interest

The *Natural Areas and Special Features Inventory of U.S. Army Dugway Proving Ground* (The Nature Conservancy and Utah Department of Natural Resources 1993) identified 16 noteworthy natural areas or special features on DPG. These areas, ranked in order of importance, are Granite Peak Mountain, East Dugway Dunefield, North Baker Sand Island, Southwest Gypsum Dunefield, Devils Post Pile, Dry Lake, North Wig Mountain Dunefield, East Cheriat Dunefield, Wilson Hot Springs, Old River Bed, Cedar Mountains Crags, Northeast Simpson Butte, West Sapphire Mountain, November Road Dune, Southcentral Gray Molly, LCTA Winterfat, and Between The Spring Hill.

The first 10 sites might be considered the jewels of DPG. Granite Peak Mountain, Devils Post Pile, and Old River Bed could be tentatively regarded as unique in the context of the whole Great Basin. Granite Peak Mountain is geologically unique and deserves full consideration as a Natural Landmark candidate (The Nature Conservancy and Utah Department of Natural Resources 1993).

Wilson Hot Springs should also be considered as either a Natural Landmark candidate or perhaps designated as a Research Natural Area based on recent research by Northern Arizona University. Initial investigations included the isolation of a broad range of extremely halophilic microorganisms, many of which appear unique and indicate a great diversity of microorganisms throughout themajor hot springs and surrounding areas of this isolated hypersaline marsh environment. Many of the Wilson Hot Springs microbes may be novel and could provide new insights into the physiology and ecology of extremely halophilic microorganisms (Polsgrove *et. al*. 2005).

The *Great Basin: An Ecoregion-based Conservation Blueprint* (Nachlinger *et. al*. 2001) identifies 358 potential conservation areas encompassing almost 28.5 million acres that fully represent the ecological systems, natural communities, and species characteristic of the region. This document identifies several DPG sites, however, sites are not ranked and DPG sites are not part of the top 20 priority sites. Four areas on or immediately adjacent to DPG are listed as areas within larger ecological systems targeted as potential

conservation areas; East Dugway Dunes (one endemic plant, one endemic bee, and a parasitic bee with limited ecoregional distribution), North Wig Sand Dunes (one endemic parasitic bee), Dugway Range, and Fish Springs (one mollusk and fish with limited ecoregional distribution (Nachlinger *et. al*. 2001). This document will be consulted when planning management activities on DPG.

In addition to those areas identified above, several other important and unusual habitat areas merit special management consideration. All dune areas, ephemeral playas, cryptogammic soil crust areas, wetlands and springs, and Eagle nests and buffer areas around those nests are a few examples.

3.3.1.8 Wetlands

The U.S. Congress enacted the Clean Water Act in 1972 to *restore and maintain the chemical, physical, and biological integrity of the Nation's waters*. Section 404 of the Clean Water Act delegates jurisdictional authority over wetlands to the Corps of Engineers and the Environmental Protection Agency. Waters of the United States protected by the Clean Water Act include rivers, streams, estuaries, and most ponds, lakes, and wetlands. The Corps of Engineers and the Environmental Protection Agency jointly define wetlands as *.. areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas*.

The USFWS defines wetlands to include a variety of areas that fall into one of five categories:

- areas with hydrophytes and hydric soils, such as those commonly known as marshes, swamps, and bogs;
- areas without hydrophytes but with hydric soils, such as flats where drastic fluctuation in water levels, wave action, turbidity, or high concentration of salts may prevent the growth of hydrophytes;
- areas with hydrophytes but nonhydric soils, such as margins of impoundments or excavations where hydrophytes have become established but hydric soils have not yet developed;
- areas without soils but with hydrophytes, such as the seaweed-covered portion of rocky shores; and
- wetlands without soils and without hydrophytes, such as gravel beaches or rocky shores without vegetation.

"Waters of the U.S." are defined at 33 CFR 328.3 as:

- all waters that are currently used, or were used in the past, for interstate or foreign commerce, including all waters that are subject to the ebb or flow of the tide;
- all interstate waters, including interstate wetlands;
- all other waters, such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sandbars, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds;
- all impoundments of waters otherwise defined as waters of the U.S.;
- tributaries of waters identified in the first and fourth definitions above;
- the territorial seas; and
- wetlands adjacent to waters listed in all of the above.

Wetland functions and values include but are not limited to the following: ground water recharge, ground water discharge, flood flow alteration, sediment stabilization, sediment or toxicant retention, nutrient removal or transformation, production export, wildlife diversity/abundance, aquatic diversity/abundance, uniqueness/heritage, and recreation. Executive Order 11990, *Protection of Wetlands* (1977) and the Clean Water Act (1977) require no net wetland losses on federal lands in the United States.

Environmental Science Associates (1994) conducted a non-jurisdictional wetlands study that investigated Cane Springs, Bitter Springs, Mustang Springs, North Fish Springs, Orr Springs, Black's Pond, the sewage lagoons at the English Village Wastewater Treatment Facility, and the DPG Playa. The field study followed wetland delineation criteria developed by the U.S. Army Corps of Engineers (Cowardin *et al*. 1979). This study identified Cane Springs, North Fish Springs, Orr Springs, and a portion of Black's Pond and Mustang Springs as wetlands. The study identified DPG Playa and a portion of Black's Pond as "waters of the U.S."

Lichvar *et al*. (1995) studied the DPG Playa. U.S. Army Corps of Engineers wetlands delineation criteria (Cowardin *et al*. 1979) were used to delineate wetlands. Ordinary high water marks defined in 33 CFR 328.3 were used to delineate "waters of the U.S." This study identified both wetlands and "waters of the U.S." on the DPG Playa.

In 2004 the DPG JAG issued a legal opinion[11] on the applicability of the Clean Water Act to DPG. The conclusion of the opinion was that the Clean Water Act is not applicable to DPG since the act applies to "navigable water" and DPG does not have any of the five categories of water included in the definition. Furthermore, based on the decision that the Clean Water Act does not apply, there are no "Waters of the United States" on DPG. And because wetlands fall under the legal jurisdiction of the Clean Water Act, wetland designations may also not apply to DPG. However, the opinion specified that DPG should request that the U.S. Army Corps of Engineers conduct a review of DPG waters to determine if they are Clean Water Act waters.

The Utah Water Quality Act, UCA 19-5-101 *et seq*. governs both surface water and groundwater. DPG disagrees with the state on whether the Act applies to the installation, because the federal Clean Water Act waives sovereign immunity based on navigable waters of which DPG does not have any of the applicable categories of water. The state and DPG are in agreement that the installation should not have to get a Clean Water Act stormwater permit for the municipal Subtitle D solid waste landfill. However, the matter has been forwarded to the Environmental Protection Agency, Region 8, and a response is pending.

3.3.2 Fauna

DPG has a diversity of habitats that support a rich and diverse array of fauna. Wildlife known to occur on DPG consists of both year-round resident and migratory/transient species. Fauna observed at DPG consists of 221 species of birds, 54 species of mammals, 16 species of reptiles/amphibians and at least 1,450 identified species of invertebrates.

Planning level surveys are being conducted for invertebrates, and it is expected that thousands of species will be represented, some of which may be endemic only to Dugway. Information on fauna species commonly found in the different vegetation community types of DPG is included in Appendix 3.3.1.1. Of the habitat types occurring on DPG, vegetated dunes have the greatest variety of fauna species.
No fish species are known to occur on DPG. A list of wildlife species known to occur on DPG is in Appendix 3.3.2 (HDR Engineering, Inc. and Dugway Proving Ground 2004). Special status fauna species are discussed in Section 3.3.2.5, *Special Status Fauna*.

3.3.2.1 Mammals

Mule deer and pronghorn are the only two ungulates on DPG. Both are found predominantly in the eastern portion of the installation. Mule deer numbers are highest on DPG during the breeding season, with most bucks being migrating onto or through DPG. After the fencing of the English Village cantonment area in

[11]Memorandum for Director, EP, *Responding to 2 Dec 03 Email Inquiry Regarding the Applicability of the Clean Water Act to Dugway and the Possible Need to Update Spill Prevention Control and Countermeasure (SPCC) Plans for Dugway*, Jack C. Skeen, Attorney-Advisor (Environmental), 13 July, 2004.

2002, the mule deer and pronghorn numbers within the Village became unnaturally high, with as many as 100 pronghorn and 200 deer in late summer and early fall. Between 2006-2008, NRO staff removed all deer and pronghorn from the Village. Since 2008, individual animals have entered the village and NR deals with them on a case-by-case basis.

Feral horses (*Equis cabellus*) have been on DPG since the 1960s and are managed jointly by the BLM and DPG. The BLM periodically performs roundups to remove excess horses from the installation. The Humane Society of the U.S. in collaboration with BLM and the Nature Conservancy extended its 5 year study for one more year to continue to monitor the effectiveness of PZP vaccines in the Cedar Mountains. Mares rounded up in 2012 were treated and released. BLM efforts to gather more horses compared to the 2008 roundup proved to be successful, however, more work needs to extend onto DPG. Monitoring continues on the health of the herd, population size, foal recruitment, and group associations. The effects of the vaccine for treated mares in 2013 showed good results. The foal population for both the BLM and Military side of the Herd Management Area resulted in only 41 foals compared to the 100+ foals typically observed yearly in this herd area. Of the 143 mares treated in 2012 only 15 mares, newly treated and re-treated, produced foals. Data in 2014 will be critical to determine the continued efficacy of the vaccine and NRO will contue to coordinate with the BLM on this topic.

Some of the predators occurring on DPG are mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), coyote, kit fox (Vulpes macrotis), badger (*Taxidea taxus*), and red fox (*Vulpes vulpes*). Coyotes and bobcats are the most numerous of these predators. AGEISS Environmental, Inc. (2001) conducted a 2-year carnivore study using radio-collared kit fox and coyotes. Scent stations, transects, and spotlight surveys were also used. Kit fox dens were located, documented, and classified to compare characteristics that kit fox may use to select dens. Kit fox were once found to be most abundant in the flatter, small shrub habitats; now, a significant number of them den in previously unexploited areas at higher elevations. Pressures from an increasing coyote population, increased human activitiy and presence on range, and the loss of native vegetation are likely causes. The study found that a major cause of mortality for kit foxes is predation, especially by coyotes.

A kit fox-coyote-water usage project was conducted from December 2010 to December 2014. Both kit fox and coyotes were captured, radio-collared, and regularly monitored in and adjacent to the Eastern portion of Dugway Proving Ground. A total of 63 individual coyotes and 85 individual kit foxes were captured, resulting in a total accumulation of 30,000 canid spatial locations during the course of the project. Water visitations of collared canids were monitored at 10 guzzlers, two sewage lagoons, and one pond. Preliminary water visitation results suggests that kit foxes water use at Dugway is minimal, coyote use is moderate, and coyotes use of non-guzzler water sources is much higher than guzzler sites. Small mammals and leporids were also monitored during the project using trapping and spotlighting, respectively. Initial findings reveal that jackrabbit abundance increased during the course of the project, which may be related to changes in precipitation and primary productivity. Small mammal trapping, canid space use, and canid demography data are currently being analyzed.

In addition to species mentioned above and in Appendix3.3.1.1, *Vegetation Types*, several species of bats are known to occur on the installation. AGEISS Environmental, Inc. (1996c) documented 10 species of bats, two being new species records for DPG, the hoary bat (*Lasiurus cinereus*) and Townsend's big-eared bat (*Plecotus townsendi*).Western small-footed myotis (Myotic ciliolabrum), pallid bat (*Antrozous pallidus*), and Western parastrellus (*Parastrellus hesperus*) are likely the most common bat species at DPG. Mammals known to occur on DPG are listed in Appendix 3.3.2.

Vest (1962) described small mammal communities associated with each vegetation community. AGEISS Environmental, Inc. (1997 and 1998) repeated Vest's work to compare historical distributions with present day small mammals. It was determined that a significant change in the quantity and structure of the rodent

population occurred since the 1950s. Species richness and diversity declined from historical numbers. Loss of native vegetation is the most widely concurred upon theory to explain the declines. From this sampling, the following observations were made.

- Deer mice were the most dominant species in all habitats.
- Declines were observed in habitat-specific species, such as the white-tailed antelope ground squirrel (*Ammospermophilus leucurus*), Great Basin kangaroo rat, Ord's kangaroo rat, dark kangaroo mouse (*Microdipodops megacephalus*), and desert woodrat (*Neotoma lepida*).
- Vegetated dunes were found to have the most diverse species of small mammals as well as the least amount of intrusion by exotic annuals, such as cheatgrass, peppercress, bur buttercup, tumbleweed, and musk mustard.
- The decline in the Ord's kangaroo rat was strongly correlated to the increase in cheatgrass (AGEISS Environmental, Inc. 1997).

Black-tailed jackrabbits and mountain cottontails occur on DPG, and desert cottontails may also occur. Survey data show a decrease in the rabbit population from historical numbers. AGEISS Environmental, Inc. (2001) reported a significantly declining trend in the leporid population since the mid 1960s for the entire region. Historical leporid numbers ranged from a low in 1985 of 0.17 leporid/km to a high in 1971 of 4.96 leporid/km. The highest number of leporids recorded on DPG (1.03 leporid/km) was during surveys in August 2000 (AGEISS Environmental, Inc. 2001). In 2006, black-tailed jackrabbits and cottontail rabbit counts on land surrounding DPG were at a 15 year high (electronic communication, J. Banta USFWS, comment on Draft Final INRMP, December 13, 2006).

One species of note, the desert shrew, (*Notiosorex sp*.) was documented on Dugway Proving Ground in 2010 on Granite Mountain during herpetofaunal pitfall trap array sampling. Through this existing herpetological pitfall trap study, six shrews have been documented on other habitats at Dugway such as dune rabbit brush, greasewood flats, and invasive cheat grass. Desert shrews are not known to occur this far north in UT (McAliley et al. 2007 & Baker et al. 2003), thus the significance of this find represents a new geographical range expansion or possibly a new species of desert shrew. DNA analysis of the six shrew specimens are currently underway.

3.3.2.2 Birds

It is estimated that around 50 percent of avian species identified on DPG are migratory, particularly waterfowl and shorebirds. A number of avian species are also residents on the installation. Resident raptors include species such as the Red-tailed Hawk (*Buteo jamaicensis*), Ferruginous Hawk (*Buteo regalis*), and Golden Eagle (*Aquila chrysaetos*). Chukar (*Alectoris chukar*) are the dominant resident upland game birds. Other resident birds include such species as the Great Horned Owl (*Bubo virginianus*), Hairy Woodpecker (*Picoides villosus*), Horned Lark (*Eremophila alpestris*), Black-billed Magpie (*Pica pica*), Common Raven (*Corvus corax*), Rock Wren (*Salpinctes obsoletus*) , American Robin (*Turdus migratorius*), House Sparrow (*Passer domesticus*), House Finch (*Carpodacus mexicanus*), and Song Sparrow (*Melospiza melodia*). Most species of waterfowl and shorebirds documented at DPG are migrants that stop at sewage lagoons and ephemeral ponds on the salt flats during migration. DPG is an important resource to many rare and sensitive migratory bird species, such as those listed in Table 3.3.2.5. Bird species known to occur on DPG are listed in Appendix 3.3.2.

3.3.2.3 Reptiles and Amphibians

Fifteen species of amphibians and reptiles are known to occur on DPG (Appendix 3.3.2). The Great Basin spadefoot toad (*Spea intermontanus*) is the only documented amphibian and its population is largely driven

by precipitation events.The great basin whiptail lizard (*Aspidoscelis tigris*), side-blotched lizard (*Uta stansburiana*), leapord lizard (*Gambelia wislizenii*), Great Basin collared lizard (*Crotaphytus bicinctores)*, and short-horned lizard (*Phrymosoma douglasii*) are the most common lizards and the bull snake (*Pituophis melanoleucus*), desert whip snake (*Masticophis taeniatus*) and Great Basin rattlesnake (*Crotalus viridis lutosus*), are the most common snakes that have been identified on DPG.

3.3.2.4 Invertebrates

Invertebrate species on DPG are more numerous than any other faunal group. Information on insect species occurring at DPG are from historical accounts dealing with disease dissemination among biotic communities (Woodbury 1964) and from incidental capture information. Historical inventories identified 1,300 insect and 150 arachnid species at DPG (Woodbury 1964). In addition, insect information from owl pellet collections has been analyzed by Brigham Young University (Kremer-Goodell 1999), and a moth survey was undertaken by the ITAM program in 1999. Currently 3 invertebrate sampling projects are being conducted. 1) Three hundred invertebrate pitfall traps were deployed in 2011 at five major vegetation habitat types throughout Dugway to obtain baseline invertebrate data on ground-dwelling invertebrates in response to military impacts. 2) Moth and nocturnal insect surveys have been integrated with bat surveys as part of the Legacy bat project. 3) Aquatic insects are being sampled at all water features, including ponds, springs, big game guzzlers and sewage lagoons as part of a water quality testing study. Additional planning level surveys of invertebrates are currently underway.

Invertebrates occur in all vegetation community types on DPG, but vegetated dunes are particularly important for these species. New species of invertebrates are being found on DPG, particularly in these dune areas. The tiger beetle (*Cicindela decemnotata*); three fly species, two *Aphoebantus spp.* and one *Epacmus sp.*; and two bee species, *Dianthidium* and *Hesperapis*, are new species that have been discovered on the installation. The abundance and diversity of invertebrates are evidenced by a study of bees at DPG (Wilson *et al*. 2005), which yielded over 5,000 specimens from 38 localities. Special status invertebrate species are discussed in Section 3.3.2.5, *Special Status Fauna*.

3.3.2.5 Special Status Fauna

Federally-designated threatened or endangered species are plant and animal species that are proposed for listing or are currently listed as threatened, endangered, or candidate species by the USFWS. There are no species of wildlife known to occur on DPG that are federally-listed as threatened or endangered. The previously federally-threatened Bald Eagle (*Haliaeetus leucocephalus*) is considered to have a potential for occurrence as a winter visitor particularly since they are common wintering birds on Fish Springs National Wildlife Refuge. The Bald Eagle is no longer listed as threatened. Is was delisted due to recovery (USFWS site). The peregrine falcon (Falco peregrinus) was federally listed but has since been delisted due to successful recovery efforts. Two peregrine falcon nesting territories have been documented on DPG. The federal-candidate Yellow-billed Cuckoo (*Coccyzus americanus*) is the "Western" Yellow-billed Cuckoo, a distinct population segment throughout its western range (www.fws.gov). A Yellow-billed Cuckoo would be considered a rare visitor on DPG. The greater sage-grouse was petitioned for listing and the determination is currently on hold. Greater sage-grouse are known to occur south and east of DPG, but surveys conducted 2012-2015 have not produced any evidence that they occur on DPG.

Some species occurring on the installation are designated by resource agencies as species of concern. Species included on the Utah sensitive species list and additional species of conservation concern that are listed by UDWR, Utah Partners in Flight, or BLM are listed in Table 3.3.2.5. This table has been updated to reflect changes since it was presented by HDR Engineering, Inc. and Dugway Proving Ground (2004). Rare, protected, and newly identified species not included on previous sensitive species lists are included as DPG focus management species of concern.

Table 3.3.2.5 Sensitive Fauna Potentially Occurring on Dugway Proving Ground

Common Name	Scientific Name	Status				
		USFWS	UDWR	BLM	UPIF	DPG
Birds						
American Avocet	*Recurvirostra Americana*				P	
American White Pelican	*Pelecanus erythrohynchos*		SPC	SPC	P	
Bald Eagle	*Haliaeetus leucocephalus*	BCC	SPC	SPC		
Black Rosy-Finch	*Leucosticte atrata*	BCC			P	
Black-necked Stilt	*Himantropus mexicanus*				P	
Black-throated Gray Warbler	*Dendroica nigrescens*				P	
Bobolink*	*Dolichonyx oryzivorus*		SPC	SPC	P	
Brewer's Sparrow	*Spizella breweri*	BCC			P	
Broad-tailed Hummingbird	*Selasphorus platycercus*				P	
Burrowing Owl	*Athene cunicularia*		SPC	SPC		SCC
Eared Grebe	*Podiceps nigricollis*	BCC				
Ferruginous Hawk	*Buteo regalis*	BCC	SPC	SPC	P	
Golden Eagle	*Aquila chrysaetos*	BCC				SCC
Grasshopper Sparrow*	*Ammodramus savannarum*		SPC			
Gray Vireo	*Vireo vicinoir*				P	
Greater Sage-grouse*	*Centrocercus urophasianus*	C	C	C		SCC
Green-tailed Towhee	*Pipilo chlorurus*	BCC				
Lewis's Woodpecker	*Melanerpes lewis*	BCC	SPC	SPC	P	
Loggerhead Shrike	*Lanius ludovicianus*	BCC				
Long-billed Curlew	*Numenius americanus*	BCC	SPC	SPC	P	
Marbled Godwit	*Limosa fedoa*	BCC				
Northern Goshawk	*Accipiter gentilis*		CS	SPC		
Peregrine Falcon	*Falco peregrinus*	BCC				
Pinyon Jay	*Gymnorhinus cyanocephalus*	BCC			P	
Sage Sparrow	*Amphispiza nevadescens*	BCC			P	
Sage Thrasher	*Oreoscoptes montanus*	BCC				
Short-eared Owl	*Asio flammeus*		SPC	SPC		
Snowy Plover	*Charadrius alexandrines*	BCC				SCC
Virginia's Warbler	*Vermivora virginae*	BCC				
Willow Flycatcher	*Empidonax traillii*	BCC				
Mammals						

Dark kangaroo mouse	*Microdipodops megachephalus*		SPC	SPC		
Kit fox	*Vulpes macrotis*		SPC	SPC		SCC
Preble's shrew *	*Sorex preblei*		SPC	SPC		
Pygmy rabbit *	*Brachylagus idahoensis*		SPC	SPC		SCC
Fringed myotis	*Myotis thysanodes*		SPC	SPC		
Townsend's big-eared bat	*Corynorhinus townsendi*		SPC	SPC		
Spotted Bat*	*Euderma maculate*		SPC	SPC		
Western Red Bat*	*Lasiurus blossevillii*		SPC	SPC		
Allen's Big-eared Bat*	*Idionycteris phyllotis*		SPC			
Amphibians						
Columbia spotted frog *	*Rana luteiventris*		CS	CS		
Invertebrates						
California floater *	*Anodonta californiensis*		SPC			
Eureka mountainsnail*	*Oreohelix eurekensis*		SPC			
Lyrate mountainsnail *	*Oreohelix haydeni*		SPC			
Southern Bonneville springsnail *	*Pyrgulopsis transversa*		SPC			
Utah physa *	*Physella utahensis*		SPC	SPC		
Badlands Tiger beetle	*Cicindela decemnotata*					SCC

Table updated April 2014

KEY

BCC	Birds of Conservation Concern
C	Candidate for Listing
P	Partners in Flight Priority Species
SPC	Wildlife Species of Concern
SCC	Species of Conservation Concern
UPIF	Utah Partners in Flight
CS	Conservation Species, Species receiving special management under a conservation agreement in order to preclude the need for federal listing

* - Indicates potential but currently not known to occur on DPG

3.4 Human Environment

3.4.1 Cultural Resources

Cultural Resources include, but are not limited to, buildings, structures, prehistoric and historic archeological sites, native sacred sites, and cemeteries.

3.4.1.1 Cultural Resources Inventory

As of 2014, about 203,000 acres (~25%) of DPG has been systematically inventoried for cultural resources. There have been 426 prehistoric, 23 historic, and 13 multi-component sites documented on DPG. No traditional cultural properties (a National Historic Preservation Act historic property eligible for the National Register due to cultural or religious significance to Native American people or other cultural groups) have been recorded on the installation (Callister *et. al*. 2001). Appendix 3.4.1.1 contains information relative to cultural resources site location hypotheses and probability areas for cultural resources occurrence on DPG.

3.4.1.2 National Register of Historic Places Eligibility

Eligibility of archeological sites for inclusion in the National Register of Historic Places (NRHP) is the principal criterion determining management prescriptions. Generally, sites fall into one of three categories with regard to NRHP eligibility.

- ***Eligible***: These sites have been determined eligible for the NRHP and therefore are subject to protection. They should not be affected without consultation per Section 106 of the National Historic Preservation Act and development of a plan to mitigate adverse effects.
- ***Ineligible***: These sites have been determined ineligible for the NRHP and do not require protection from adverse effects.
- ***Potentially eligible***: Further investigation is required to determine NRHP eligibility. Therefore, these sites are potentially eligible for the NRHP and require protection until determinations of eligibility can be made.

The historic buildings and structures planning level survey performed for DPG focused exclusively on historic buildings and structures and did not include historical archeological sites. A literature and records search, review of Army historic contexts, writing of a historic context for DPG, and a field inventory of properties at DPG were conducted during 1998.

The second part of the survey identified buildings and structures eligible or potentially eligible for the NRHP. These included pre-DPG, World War II, and Cold War facilities. Twenty-nine properties were determined eligible or potentially eligible for the NRHP. Property types included test and evaluation facilities, control and instrumentation buildings, a training grid, World War II operational support facilities, research and development laboratories, and non-military sites (Callister *et. al*. 2001).

3.4.2 Land Uses

3.4.2.1 Activity Centers and Facilities

Activity Centers

There are five activity centers at DPG: Avery, Baker, Carr, Ditto, English Village. In addition, Five Mile Hill and Fries Park are often used as locational references when describing facilities or activities on DPG. However, Five Mile Hill and Fries Park are not considered DPG activity centers. Each DPG activity center has a specific purpose, and supports a different facet of the overall DPG mission. DPG activity centers are shown at Figure 3.4.2.1.

Avery Technical Center. Avery consists of 40 acres adjacent to Ditto and immediately south of Michael Army Airfield. Avery is the historic site of radiological testing laboratories at DPG. DPG leases Avery, including a hangar, to the Air Force.

Baker Area. Baker consists of 24 acres located about 5 miles west of Avery and Ditto. DPG's biological defense testing laboratory functions are based at Baker. The Lothar Salomon Life Sciences Test Facility and a variety of additional support facilities are located at Baker.

Carr Facility. Carr consists of 140 acres located about 2 miles southeast of Ditto and Avery. Carr is a primary storage location for materials and equipment required to support the various testing, training, and support activities conducted at DPG. Carr also contains several test facilities including the Bushnell Materiel Test Facility and the Chemical Agent Test Chamber. Munitions, explosives, and chemical agents are some materials stored in secured areas at Carr, and such equipment as special chambers used to test military equipment reliability, durability, and climatic ability is located at Carr.

Ditto Technical Center. Ditto is where the first buildings were constructed at DPG in 1942 and is located adjacent to the southeast quadrant of Michael Army Airfield on about 160 acres. Ditto is the primary mission support center for DPG activities. Main administrative and test support functions for all West Desert Test Center testing activities are conducted at Ditto. Chemical defense testing activities are conducted in the Combined Chemical Test Facility. Support activities based at Ditto include airfield operations, meteorology and modeling, instrumentation, range control, security, and work clothing preparation.

English Village. English Village consists of about 650 acres at the eastern edge of DPG. English Village was originally constructed in the 1950s. Most 1950s era buildings have been remodeled one or more times, and since 1987, construction includes a number of new houses, a Child Development Center, and a fitness center. Administrative, personnel, community, and installation activities are conducted at English Village to support DPG's private and public sector requirements. These activities include housing, medical clinic, retail sale stores, schools, public works, and community and recreational areas for installation personnel. Administrative offices for a variety of support activities are at English Village, including environmental support, fire fighting, and utilities.

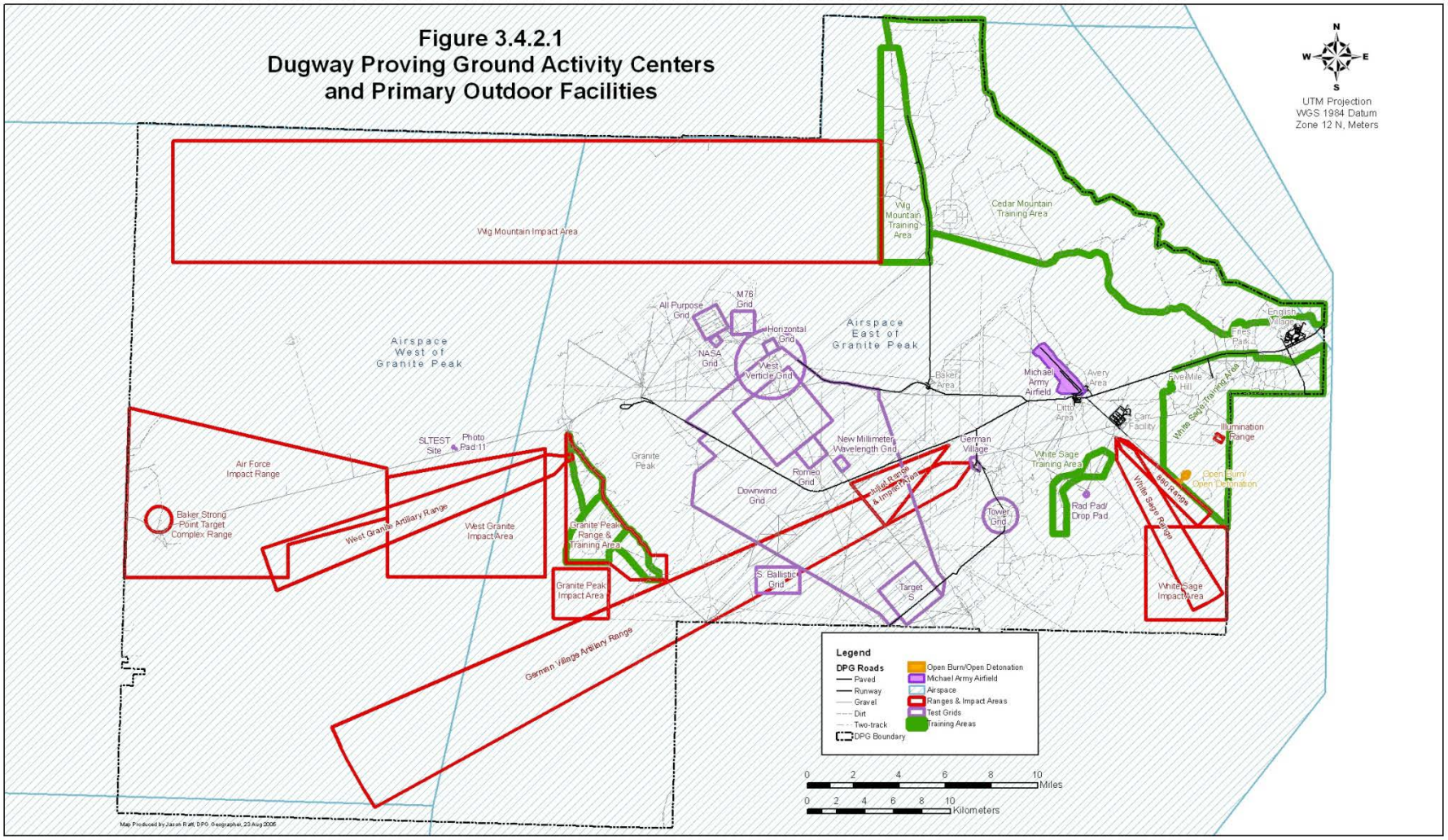
Five Mile Hill and Fries Park. Five Mile Hill consists of 365 acres adjacent to the Cedar Mountains. The Central Hazardous Waste Storage Facility and several cosmic ray research activities and facilities are located in the area around Five Mile Hill.

Fries Park consists of about 140 acres. Constructed to provide temporary housing for construction workers building English Village, most of the original buildings at Fries Park were demolished in 1998. The Fries Park site is being repurposed for use as a recycling center and a tree farm/vegetation nursery.

Primary Indoor Facilities

Primary indoor facilities located at or near DPG activity centers include BangBox™; Bushnell Materiel Test Facility; Central Hazardous Waste Storage Facility; Chemical Agent Test Chamber; Cryofracture Test Facility; Defensive Test Chamber; German Village; Igloo G; Lothar Salomon Life Sciences Test Facility; Open Detonation/Open Burn, Improved; Reginald Kendall Combined Chemical Test Facility; Hazardous Material Test Facility, andRapid Integration and Acceptance Center Hangers located at Michael Army Airfield. Dugway Proving Ground (2003a) provides descriptions and details about the structure and controls of these facilities.

Figure 3.4.2.1 Dugway Proving Ground Activity Centers and Primary Outdoor Facilities



Primary Outdoor Facilities

Primary outdoor testing, training, and material/waste management facilities at DPG include airspace, Michael Army Airfield, open burn/open detonation, ranges and impact areas, test grids, training areas, JLENS testing sites, and PMUAS runways (Figure 3.4.2.1).

Airspace. By various agreements between the Air Force and Army, there are two airspaces above DPG: the airspace west of Granite Peak, and the airspace east of Granite Peak and west of Five Mile Hill. The Utah Test and Training Range has priority of use of the airspace west of Granite Peak, and routinely uses this airspace for test and/or training activities. The Air Force manages the Utah Test and Training Range as a test and training facility for high performance aircraft, which are principally based out of Hill Air Force Base, Utah. DPG has priority of use of the airspace east of Granite Peak, and routinely uses this airspace in support of testing and training activities.

Michael Army Airfield. Michael Army Airfield occupies 680 acres of land on the northeast side of Ditto. DPG Plans and Operations Division's Aviation Branch operates the airfield. The airfield's hard surfaced runway is 13,125 feet by 200 feet, and can accomodate a variety of aircraft. A decontamination taxiway and a 90,000-square foot decontamination pad are at the northwestern end. Facilities at the airfield include an office building, a 20,014-square foot Army hangar, a control tower that has been condemned and is no longer use, and several RIAC and PMUAS program hangers. Portable control towers are deployed to support major active and reserve component training and testing exercises. Additional resources include a helicopter pad and fuel storage and aircraft maintenance facilities.

Dugway Thermal Treatment Facility. The facility is an oval shaped area of about 1,800 by 1,300 feet. The area has been operational for 30 years (previously referred to as the open burn/open detonation area) and is located in the southeastern portion of DPG.

Ranges and Impact Areas. Ranges are areas designated for testing or training. Impact areas are areas designated for testing or training where artillery, mortar, or missiles are targeted to impact. All impact areas are marked with warning signs, barriers, and/or guards. Passing any of these hazard warnings without Range Control permission is forbidden. Instrumentation provides in-flight measurements of test munitions. Some ranges or impact areas may coincide with training areas where munitions are fired. Nine ranges and four impact areas are used for ground activities at DPG (Figure 3.4.2.1). Table 3.4.2.1a summarizes information about ranges and impact areas on DPG.

Table 3.4.2.1a Ranges and Impact Areas at Dugway Proving Ground

Range or Impact Area	General Location	Most Common or Frequently Performed Activity	Acres
880 Range	South of Carr and east of White Sage Range	Conventional munitions testing	4,113
Baker Strong Point Target Complex range	West of Granite Peak, about 1 mile from DPG's west boundary	Strafe and inert ordnance, laser training, surface-to-air-missile site	7,680
German Village Artillery Range	South of Baker	Smoke and obscurant testing, conventional munitions testing	33,331
Granite Peak Impact Area	Southwest of Granite Peak	Impact area for firing from West Granite Peak training area	2,226
Granite Peak Range	West side of Granite Peak	Conventional munitions testing	6,452
Illumination Range	Southeast of Carr	Conventional munitions testing; smoke, obscurant, and illuminant testing	1,788
Juliet Range	South of Baker	Conventional munitions testing	3,777
Mine Testing Range	West of Ditto	Anti-personnel and anti-tank mines testing	258
West Granite Artillery Range (Causeway Artillery Range)	West of Granite Peak and south of Goodyear Road	Conventional munitions testing and training	21,077
West Granite Impact Area	West of Granite Peak	Conventional munitions testing and training; impact area for firing from Granite Peak firing points	19,637

Range or Impact Area	General Location	Most Common or Frequently Performed Activity	Acres
White Sage Impact Area	Southeastern corner of DPG	Conventional munitions testing; smoke, obscurant, and illuminant testing; impact area for firing from White Sage training area	19,335
White Sage Range	South of Carr	Conventional munitions testing and training; smoke, obscurant, and illuminant testing	6,554
Wig Mountain Impact Area	West of Wig Mountain	Conventional munitions testing; impact area for firing from Wig Mountain and Cedar Mountain training areas	26,736

Test Grids. Test grids are designated areas where outdoor field tests are performed, most often involving chemical or biological simulants. Grids are constructed as necessary to accommodate the test and the data that are needed. Sampling positions are established to permit fast and efficient collection of air samples. Eighteen test grids are used at DPG (Figure 3.4.2.1). Table 3.4.2.1b summarizes information about each test grid.

Table 3.4.2.1b Test Grids at Dugway Proving Ground

Grid	General Location	Most Common or Frequently Performed Testing Activity	Acres	Dimensions (width and length or diameter in feet)
945 Northwest Grid	North and east of Granite Peak	Smoke and obscurant	400	Diameter 4,747
Aerial Spray Grid	Defined center point north of Stark Road in Downwind Grid	Atmospheric dispersion and ground level deposition for aircraft and ground spray trails	Not available	Undefined
All Purpose Grid	Northeast of Granite Peak	Biological and chemical defense, smoke and obscurant, conventional munitions	773	5,590 by 6,059
Downwind Grid	East of Granite Peak	Biological and chemical defense, smoke and obscurant	45,327	78,587 by 49,418
RAD Pad/Drop Pad	North of Simpson Buttes	Physical	16	Diameter 938
German Village	West of Camels Back Ridge	Biological and chemical defense; smoke, obscurant, and illuminant; conventional munitions	77	2,155 by 1,573
Horizontal Grid	Northeast of Granite Peak	Biological and chemical defense, modeling and assessment, smoke and obscurant	734	5,963 by 5,353
M76 Grid	Northeast of Granite Peak	Conventional munitions, smoke and obscurant	467	4,878 by 4,240
Multiple Impact Grid	East of Granite Peak between Burns Road and Stark Road	Biological and chemical defense, conventional munitions, obscurant	6,947	19,692 by 15,448
NASA Grid	Northeast of Granite Peak	Chemical defense, conventional munitions, smoke and obscurant	237	Diameter 3,607
Romeo Grid	East of Granite Peak and south of Multiple Impact Grid	Conventional munitions, smoke and obscurant	216	3,009 by 3,290
New Millimeter Wavelength Grid	East of Granite Peak and south of Multiple Impact Grid (next to Romeo Grid)	Conventional munitions, obscurant	83	1,772 by 1,995
Photo Pad 11	East of SLTEST site on the northern side of Goodyear Road	Biological defense, modeling and assessment	Not available	Not available
SLTEST Site	West of Granite Peak; SAMS Number 18	Biological defense, modeling and assessment	Not available	Varies according to test
South Ballistic Grid	North of Dugway Range	Conventional munitions, obscurant	2,055	13,610 by 6,641
Target S Grid	Southeast portion of Downwind Grid	Conventional munitions, modeling and assessment	453	5,226 by 3,883
Tower Grid	West of Camels Back Ridge	Biological and chemical defense, conventional munitions, modeling and assessment	1,891	10,266
West Vertical Grid	Northeast of Granite Peak	Biological and chemical defense, smoke and obscurant	13,243	Diameter 27,105

Training Areas. Large portions of DPG are designated for training purposes. Figure 3.4.2.1 shows locations of DPG training areas and their associated impact areas. There are four ground training areas at DPG: Cedar

Mountain Training Area, Wig Mountain Training Area, White Sage Training Area, and West Granite Peak Training Area.

- Cedar Mountain Training Area is within the Cedar Mountains, and its several interconnecting roads are useful for truck convoy/ambush scenarios.
- Wig Mountain Training Area is south-southwest of the northern portion of the Cedar Mountain Training Area and east/northeast of the Wig Mountain Impact Area. This training area includes a series of raid sites and associated firing fans, which have been designated and constructed for troop training.
- White Sage Training Area includes two noncontiguous areas to the north and northwest of the White Sage Impact Area. The White Sage Training Area is used primarily for artillery and Combat Service Support field operations.
- West Granite Peak Training Area, also known as Causeway, is about 25 miles west of Ditto, south of Goodyear Road, and just west of Granite Peak. This training area is used primarily for artillery and Combat Services Support operations.

The *Environmental Assessment for Range Capabilities Improvements in Support of Training at U.S. Army Dugway Proving Ground 2012* esablished new and expanded training areas as well as development of FPAs in all the Training Areas with unrestricted movement of tactical vehicles within their designated boundaries as well as the following projected changes:

- Construction of a new road using the alignment of an existing vehicle track/trail in WMTA
- Construction of a demolition range within GPTA
- Construction of a Hand Grenade Familiarization Range at OP1in WMTA
- Improvements to X-Ray firing points
- Improvements to the TAA within CMTA
- Construction of new firing points in WMTA for use of 40mm HE rounds
- Construction of FARPs in GPTA, CMTA, Callao Gravel Pit, and the former Easy Strip DZ
- Construction of firing pads West Granite OP2 and OP3, as static firing points within the expanded GPTA
- Construction of a Sapphire Mountain OP4 static live firing point within the expanded GPTA
- Positioning of a demilitarized helicopter hulk at suitable sites within the Sapphire Mountain portion of the expanded GPTA for use in combat search and rescue/downed aircraft training scenarios.
- Use of tactical vehicles (wheeled and tracked) off road in the expanded training areas
- Improvements to Granite Tunnel, Suppressive Shield, and Bang Box training facilities
- Improvements to existing roads and trails connecting training areas and facilities
- Development of the Dunes Training and Maneuver Area within the expanded CMTA to support patrol sized unit tactical wheeled vehicle maneuver and convoy route training.
- Development of the proposed North Wig Cross Country Maneuver Area (CCMA) for wheeled tactical vehicles
- Recovery vehicle entry onto all Drop Zones
- Use of Ranger, Kathy, and Insecto DZs for drops of fuel bladders and JPADS

3.4.2.2 Hunting Area

The hunting area consists of 22,177 acres immediately south of the northeastern boundary of DPG (Figure 3.4.2.2). Details of hunting on DPG are presented in Section 5.4.2, *Hunting*.

3.4.2.3 Projected Changes to Facilities

Facilities proposed for construction in the Installation Master Plan should not significantly affect natural resources or management activities. Lands designated for new building construction will be inventoried for natural resources impacts. Project review through NEPA will assure that projects creating new footprints or possibly affecting natural resources get complete review for environmental concerns. A major reconstruction of Michael Army Airfield was completed in 200?. The mining of aggregate necessary for any new construction activities such as this are likely to impact natural areas on DPG.

3.4.3 Public Services and Utilities

3.4.3.1 Transportation System

Road System

The off-installation roadway network accessing DPG consists of several secondary routes and four principal links. The four principal links are three state roads, SR 199, SR 196, and SR 36, and I-80. Utah SR 199 and SR 196 intersect just east of DPG's main entry gate. Both are two-lane asphalt roads maintained by the Utah Department of Transportation. Utah SR 199 proceeds northeast across Skull Valley to the unincorporated community of Terra, UT. Utah SR 196 proceeds north through Skull Valley for about 37 miles where it connects to I-80 at Rowley Junction. I-80 is the major east-west commercial highway through the region, connecting to Salt Lake City, Omaha, Nebraska, and Chicago to the east and Reno, NV, and San Francisco metropolitan areas to the west.

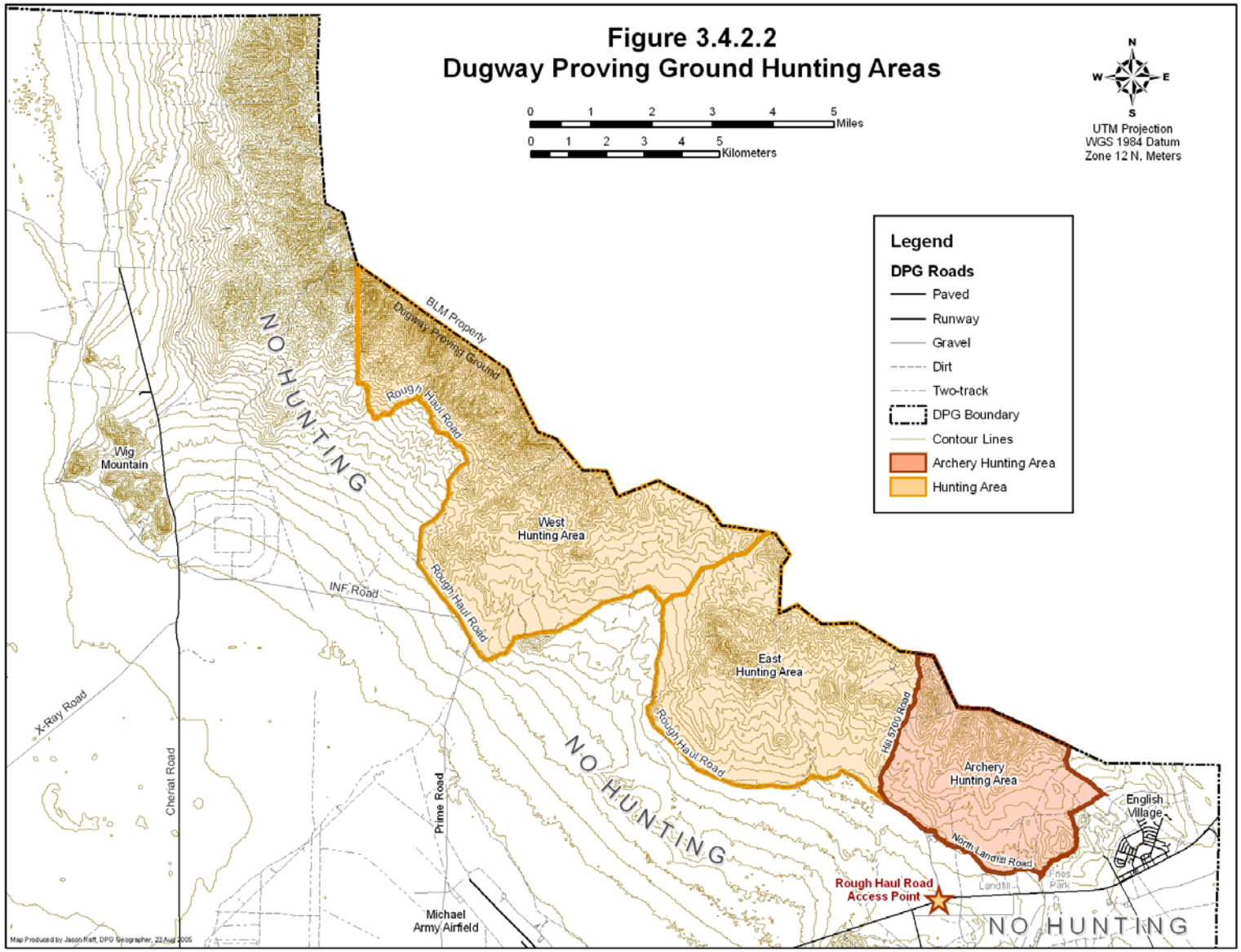


Figure 3.4.2.2
Dugway Proving Ground Hunting Areas
0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
N
W E
S
UTM Projection
WGS 1984 Datum
Zone 12 N, Meters
Legend
DPG Roads
Paved
Runway
Gravel
Dirt
Two-track
DPG Boundary
Contour Lines
Archery Hunting Area
Hunting Area
NO HUNTING
BLM Property
Dugway Proving Ground
Rough Haul Road
Wig Mountain
West Hunting Area
INF Road
East Hunting Area
Hill 5700 Road
Archery Hunting Area
English Village
North Landfill Road
Landfill
Fnes Park
X-Ray Road
Cherriat Road
Prime Road
Rough Haul Road Access Point
Michael Army Airfield
Map Produced by Jason Kart, DPG Geographer, 22 Aug 2006

Several secondary unpaved roads serve DPG. These roads are open to public travel, but they are remote and are not all-weather routes. These routes begin just outside the main gate, with a single road extending southward that intersects the Pony Express Trail. About 10 miles south, this road intersects another unpaved road that leads toward Lookout Pass and also intersects the Pony Express Trail. To the south and west, the Pony Express route provides access to the Fish Springs National Wildlife Refuge and various public lands administered by the BLM. To the east, the route crosses the Onaqui Mountains over Lookout Pass before descending into the Rush Valley and intersecting with several other highways and roads.

The primary access to DPG is via Utah SR 199, with the main entry gate and security checkpoint located on DPG's eastern boundary. All vehicles and occupants entering DPG are subject to inspections, prior to being allowed entry. Other gates along DPG's perimeter can provide secondary access to remote locations and testing grids. These gates are locked, requiring that access be gained from DPG's Law Enforcement and Security Division.

The main road within DPG's boundaries is known as Stark Road. It is a paved, two-lane road that serves as the central arterial road for DPG. From the main gate, it proceeds generally to the west, linking English Village, Ditto, and areas in the western portion of DPG. A network of paved roads, providing access to other activity centers and serving the local circulation needs within those centers, connects to Stark Road at various locations. A total of 130 miles of paved roadways are located within DPG.

In addition to the paved roadway network, there are about 120 miles of secondary roads on DPG. Secondary roads are graded, but unpaved. These roads provide access to many test ranges and are used by active and reserve military units during training activities conducted at DPG. The DPG road network also includes unpaved trails open to motor vehicle travel. Historically, many trails were established as a result of informal, but repeated, travel between existing roads and other destinations, some of which occurred as part of training and testing activities.

Railway System
The Union Pacific Railroad is the predominant Class I railroad company in Utah, and several of Union Pacific's lines are located in Tooele County. However, no direct rail service is provided to DPG.

Aircraft Facilities
Regional public airports include Salt Lake City International, Salt Lake City Municipal Airport #2, Tooele-Bolinder Field, and Wendover-Tooele County Airport. Hill Air Force Base provides military aircraft operational support.

Michael Army Airfield provides military operational support at DPG. Numerous helipads are located at DPG, one of which is at English Village. Helipads support DPG's security needs and training activities. Helipads can also facilitate emergency medical transportation from the DPG Health Clinic to the military hospital at Hill Air Force Base or civilian facilities located elsewhere along the Wasatch Front.

3.4.3.2 Water Supply
Groundwater is used for drinking and irrigation purposes at DPG. Potable water at DPG is withdrawn from the Skull Valley Aquifer in the English Village area and from the mid-level aquifer in the Dugway Valley-Government Creek area. Six DPG water supply wells produce potable water (Wells 3, 5, 26, 27, 28, and 30), and four wells produce nonpotable water (Wells 10, 18, 19, and 32). Groundwater withdrawn from the two nonpotable wells at English Village is used for irrigation between March and October. Well 18 supplies irrigation water for the grounds in the central portion of English Village, north of Stark Road. Well 19 supplies irrigation water for the grounds at the English Village golf course, south of Stark Road.

Groundwater withdrawn from the two nonpotable wells located in the vicinity of Granite Peak is used for dust suppression and sanitary purposes.

3.4.3.3 Waste Water System

The English Village Wastewater Treatment Facility receives domestic wastewater from English Village and Fries Park. Other activity centers have their own treatment facilities. Natural resources impacts of these facilities relate to the wastewater lagoons, which supply a surfacewater source on DPG. Section 3.2.5.1, *Surfacewater* discusses these resources.

3.4.4 Outdoor Recreation

Hunting has been the primary outdoor recreational pursuit on DPG. Hunting is discussed in Section 5.4.2, *Hunting*. Other outdoor recreation activities have been extremely limited due to security and safety concerns.

3.4.5 Renewable Energy

The Environmental Assessment for a solar array at DPG was completed in 2014 and a contract has been awarded. Scoping is currently underway for wind power development.

DPG plans to construct, operate and maintain solar energy systems (SES) onsite at DPG in order to meet its current and emerging mission and operational energy needs. The SES would also include the requisite infrastructure to integrate the solar array generation facilities into the DPG electrical supply system.

The purpose and need of the action is to allow DPG to meet increasing energy demand for its current and emerging mission and operations. Furthermore, such onsite capability will enable DPG to fulfill existing mandates for energy security, as well as promote initiatives for environmental sustainability: increasing use of renewable energy, lowering greenhouse gas (GHG) emissions, and reducing the Army's reliance on fossil fuels.

The Department of Defense's Quadrennial Defense Review (QDR) acknowledges that climate change has national security implications and must be addressed by DoD and its partners. The SES is a major investment in renewable energy and will decrease DPG's carbon footprint through increased energy efficiency. Electricity produced using solar energy emits no greenhouse gases (GHGs) or other pollutants and reduces DPG's use of fossil fuels.

4.0 NATURAL RESOURCES MANAGEMENT

> *Army natural resources are the essential elements of ecosystems that provide realistic, sustainable assets for military missions. These same ecosystems contribute toward regional biodiversity and provide habitat for endangered, threatened, proposed, sensitive, and native plants and animals. The Army is required by law to manage natural resources. The Sikes Act direction is to "provide for the conservation and rehabilitation of natural resources on military installations.*[12]

This chapter includes those programs that are implemented specifically for natural resource conservation. Some, such as fire management, pest management, and cantonment area management, may be within responsibilities of organizations other than the PWEP, but items discussed in this INRMP emphasize those facets of these programs that are conducted by the Conservation/Preservation Division.

Programs are described in terms of their status and recent history (**Current Management**) followed by proposed project(s) (**Proposed Management**), if appropriate. These projects are intended to integrate implementation of this INRMP to the budget process (see Section 7.5.2).

Projects are described in a goal(s)-objective(s) format to provide process descriptions that are compatible with adaptive management analyses and overall INRMP implementation monitoring processes. All goals and objectives are summarized in tabular format in Appendix 7.4.

Each project has a summary description at the beginning of the Proposed Management section. The format is as follows:

Project: Title
Driver: Laws, regulations, or policy compliance (*e.g*., participation in regional initiatives; Sikes Act, Endangered Species Act, AR 200-1, stewardship)
Project Timing: Dates to be accomplished, by objective (*e.g*., 2016, 2016-20, indefinitely, uncertain)
Regulatory Coordination: Agencies with whom coordination is required

NRO Project Definition Worsheet (PDW) forms also contain Mission support details and objectives for each of the INRMP supported projects and study initiatives. The NRO Manager through coordination with State and Federal partners developes the needed objectives to support a diverse DPG mission-set and these details and objectives are containined with the project specific PDW form(s).

4.1 Ecosystem Management Coordination and Planning

4.1.1 Ecosystem Management Coordination

4.1.1.1 Current Management

Natural resource management on military installations must be coordinated in support of the Army mission as well as DoD stewardship responsibilities. At DPG this coordination is accomplished by the PWEP, Conservation and Preservation Division in cooperation with Base Operations and the West Desert Test Center.

[12] DODI 4715.03, March 18, 2011. Subject: Natrual Resources Conservation Program Management.

As discussed in Section 2.3, *Other Federal Agencies*, Section 2.4, *State Agencies*, Section 2.7, *Other Interested Parties*, DPG has much in common with other federal and state agencies and other parties interested in DPG ecosystems. Cooperating with other organizations to manage and protect DPG and surrounding ecosystems is a significant commitment. DPG is one of several agents who have cooperatively developed ecosystem and resource management agreements. These agreements include memorandums of understanding, such as to *Foster the Ecosystem Approach* (ongoing between several agents); *Ecosystem-based Management of Fish, Wildlife, and Plant Resources on Military Lands* (DoD and USFWS for the period 1999-2004); *Conservation and Management of Fish and Wildlife Resources* (DoD and Department of Interior, ongoing); *Wild Horse Management on DPG* (DPG and BLM, ongoing); and a cooperative agreement for *Wildfire Management on DPG* (DPG and BLM, ongoing).

Under authority of the Readiness and Environmental Protection Initiative (within Section 2811, FY 2003 National Defense Authorization Act), installations may enter into formal agreements to form partnerships of various federal, state, and private organizations to protect and manage land around military installations. Usually, a non-governmental organization, such as The Nature Conservancy or The Trust for Public Lands, acquires either the land or easements on the land from willing sellers on behalf of the partnership. If an easement is purchased, landowners can usually remain on the land and conduct their preferred lifestyle, whether it is forest management, ranching, or whatever activities are compatible with the military mission on adjoining Army lands. These lands will be managed in perpetuity in a manner to conserve the ecosystem and limit urbanization along military installation boundaries.

Notable successes with this process are at Fort Bragg, North Carolina, Fort Carson, Colorado, and Fort Huachuca, Arizona. The program is being implemented on a large number of other installations, including Camp Pendleton, Camp Lejeune, and Marine Corps Air Station Beaufort. With regard to encroachment, the Readiness and Environmental Protection Initiative has limited applicability to DPG since most surrounding lands are under federal ownership and cooperative agreements have been developed. However, DPG could consider requirements and feasibility for using this mechanism to provide for mitigation. If mitigation banking and/or conservation agreements are considered, there must be early involvement of USFWS and other agencies. Such agreements could include mechanisms by which future Section 7 consultations and accompanying biological opinions will direct mitigation requirements. For example, terms and conditions of future biological opinions that involve the set-aside or special management of habitat would draw on a mitigation bank or conservation agreement to allow comprehensive long-term mitigation planning, rather than project-specific or activity-specific mitigation.

4.1.1.2 Proposed Management

Project: Ecosystem Management Coordination
Driver: Participation in regional initiatives, Endangered Species Act compliance, mitigation and monitoring measures for land use (Dugway Proving Ground 2003a, 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*), stewardship
Project Timing: All objectives - ongoing indefinitely
Regulatory Coordination: None required

Goal 1. Use coordinated planning to manage natural resources to sustain military mission capability.

Goal 2. Promote and participate in regional planning for natural resources conservation at scales larger than DPG.

Objective 1. Coordinate natural resources planning with planning for the sustainment of the military mission.

Objective 2. Coordinate with and support regional planning and programs.

Objective 3. Coordinate with and support military regional planning and programs.

Objective 4. Consider requirements and feasibility for using such mechanisms as the Readiness and Environmental Protection Initiative to provide a possible mechanism for mitigation on DPG.

The following objectives are mitigation and monitoring measures for land use identified in Dugway Proving Ground (2003a and 2003b).

Objective 5. Coordinate with BLM on land use issues, such as DPG ground training impacts and regional land use.

Objective 6. Continue coordination with the BLM regarding DPG ground training, fire management and the spread of invasive plants, such as cheatgrass (2003a and 2003b). In addition, DPG will attempt to include the U.S. Air Force, Fish Springs National Wildlife Refuge, State of Utah School and Institutional Trust Lands Administration, UDWR, and adjacent private landowners in this effort.

Objective 7. Continue coordination with the USFWS on Fish Springs National Wildlife Refuge issues and impacts.

Objective 8. Continue consultation with Native American tribes on potential cultural resources site locations.

Objective 9. Coordinate with local federal agencies on land use issues.

4.1.2 Integrated Natural Resources Management Planning

4.1.2.1 Current Management

This INRMP must be reviewed annually by DPG, as stipulated in AR 200-1 (Department of the Army 2007). The list of goals and objectives (Appendix 7.4) can be used to guide the review and adjust programs, per the adaptive management process. This INRMP must be reviewed and approved at least every five years or when major changes are made to the natural resources program. The next major update is scheduled for FY 18 with implementation to begin in FY 197.

4.1.2.2 Proposed Management

Project: Integrated Natural Resources Management Planning
Driver: Sikes Act compliance, AR 200-1, stewardship
Project Timing: Objective 1 - annually; Objective 2 - 20186
Regulatory Coordination: USFWS and UDWR

Goal. Use coordinated planning to fully integrate the natural resources program at DPG.

Objective 1. Internally review this INRMP annually using project goals and objectives to guide reviews; revise projects and budgets as required; coordinate significant changes with the USFWS and UDWR.

Objective 2. Review the INRMP at least every five years or when major changes are made to the natural resources program; coordinate this review and update, if needed, with the USFWS and UDWR. (This will require the next INRMP major review, and potential update, to begin in 2020.)

4.2 Natural Resources Management-related Mitigation

The *Final Environmental Impact Statement for Activities Associated with Future Programs at U.S. Army Dugway Proving Ground* (Dugway Proving Ground 2003a) included mitigation and monitoring measures to allow implementation of identified activities associated with the future programs. A Record of Decision was prepared and published in the *Federal Register* that documented the final decision made regarding the proposed action, which was full implementation.

Implementation of mitigation and monitoring measures is required by law. Many agreed-upon mitigation and monitoring measures have natural resources implications or are natural resources-related. Table 4.2a shows natural resources-related mitigation and monitoring measures identified by Dugway Proving Ground (2003a). These measures are included as objectives within proposed management sections of the appropriate individual project section of this INRMP. For example, coordination-related mitigation measures from Dugway Proving Ground (2003a) and Dugway Proving Ground (2003b) are included in Section 4.1.1, *Ecosystem Management Coordination* as objectives 5-9. This document is attempting to address all INRMP mitigation measures in the goals and objectives within this chapter.

Table 4.2a Natural Resources-related Mitigation and Monitoring Measures Identified in the Dugway Proving Ground Environmental Impact Statement*

Resource	Subtopic/Issue	Mitigation and Monitoring Measure
Geology and Soils	**Physical Quality**	Continue implementation of the Army ITAM program.
		When possible, limit tracked vehicles and prohibit cross-country use.
		When possible, without jeopardizing realistic training, vary intensity of training and testing seasonally to reduce the impact on vegetation and to avoid high fire conditions.
		When possible, use only existing roads, or if new roads need to be created, place in areas that would minimize impacts to vegetation.
		When feasible, construct new buildings and roads in current built-up areas.
		Rotate use of training areas to allow a 4-7 year rest period.
		Continue to monitor established photopoints in impact areas for seasonal and yearly comparison of habitat.
		Focus ground training in areas with existing high ground disturbance; other areas used should follow compensation guidelines within the Maneuver Training Area Management Plan and the INRMP. (*To date the Maneuver Training Area Management Plan has not been completed*.)
		Implement management of the Paladin Weapons System, as described in the Maneuver Training Area Management Plan.
		Manage all fires in accordance with the DPG Fire Management Plan.
		Complete greenstrip firebreaks established by ITAM and test with new and better fire resistant and site-adapted species.
		Obtain financial compensation from training missions for fire management or revegetation according to the Maneuver Training Area Management Plan and the INRMP. (This technique has not been very successful but it is a useful technique whein it is successful)
	Chemical Quality	Continue the Installation Restoration Program to address contaminated soils at Hazardous Waste Management Units and Solid Waste Manamagement Units.
		Implement investigation of testing and training ranges in use when they become inactive.
		Include appropriate monitoring for Semivolatile Organic Compounds in soil.
	Geologic Features and Resources	Continue to prohibit and development and/or use of mineral resources at Granite Peak.
		Continue enforcing restrictions in the vicinity of the Devil's Postpile from use by ground troops.
Surface Water	**Quantity**	Implement best management practices, such as installing metering devices at lagoons, and periodically calibrating and maintaining them.
		Use silt fences and berms during construction projects to minimize surface water runoff and soil erosion.
	Quality	Enforce restrictions regarding bivouacking and ground training near springs.
		Continue use of wildlife guzzlers that DPG has established in the area near springs in the Cedar Mountains.

Resource	Subtopic/Issue	Mitigation and Monitoring Measure
		Conduct periodic water quality monitoring of springs in the Cedar Mountains.
		Conduct periodic water quality monitoring at springs near the playas, including monitoring support at Fish Springs National Wildlife Refuge, and at select locations within the playa.
Air	**Quality**	Evaluate substitutes for military-specific materials that potentially impact air.
		Investigate fugitive dust control methods for military training on unpaved roads and in training areas.
		Prepare models of fugitive dust generated from training exercises to better understand its effects on ambient air quality values.
		Manage all fires in accordance with the DPG Fire Management Plan.
		Obtain financial compensation from training missions for fire management according to the Maneuver Training Area Management Plan and the INRMP.
Biological Resources	**Vegetation**	Continue implementation of the Army ITAM program.
		Educate users of DPG lands on protecting, preventing damage, and mitigating damage to natural resources.
		When possible, limit tracked vehicle use and prohibit cross country use.
		When possible, without jeopardizing realistic training, vary intensity of training and testing seasonally to reduce the impact on vegetation and to avoid high fire conditions.
		When possible, use only existing roads, or if new roads are needed, place in areas that would minimize vegetation impacts.
		When feasible, construct new buildings and roads in current built-up areas.
		Obtain financial compensation from training missions for fire management or revegetation according to the Maneuver Training Area Management Plan and the INRMP.
		Rotate use of training areas to allow a 4-7 year rest period.
		Establish a fuel break system as outlined in the Dugway Fire Management Program
		Establish more permanent vegetation plots in training areas to study changes in vegetation.
		Continue to monitor established photopoints in impact areas for seasonal and yearly comparison of habitat.
		Depending on need, maintain and use existing quarry sites and permanently close others.
		Focus ground training in areas with existing high ground disturbance; other areas used should follow compensation guidelines within the Maneuver Training Area Management Plan and the INRMP.
		Manage all fires in accordance with the DPG Fire Management Plan.
		Complete greenstrip firebreaks established by ITAM and test with new and better fire resistant and site-adapted species.
		Clean up spills immediately and monitor all sites.
		As part of test planning and where appropriate, monitor dispersion clouds to validate models and monitor biological resources.
		Limit use of fog oil on extremely windy days.
		Minimize the spread of weeds through noxious and nuisance weed management.
		Minimize ground disturbance as specified in the INRMP.
		Implement biomonitoring program at the landscape level.
		Quantitatively assess vegetation using permanent sample plots.
	Wildlife	Avoid using ordnance or testing near permanent surface water sources.
		As part of test planning and where appropriate, monitor dispersion clouds to validate models and monitor biological resources.
		Limit use of fog oil on extremely windy days when large dust particles may be present.
		Investigate fugitive dust control methods for military training on unpaved roads and in training areas.
		Identify and protect important habitats for each species, where possible.
		Use temporary closures to avoid training and testing in areas of high wildlife population concentrations, nesting sites, or wintering ranges.
		Minimize ground disturbance as specified in the INRMP.
		Monitor patterns, trends, and health of wildlife species, as needed, on both a local scale and installation-wide scale.
		Create a new vegetation map every five years to monitor vegetation changes.
		Implement a biomonitoring program at the landscape level.
		Minimize vehicular-caused animal deaths by enforcing speed limits.
		Report all injured or dead large animals immediately to DEP.
		Minimize disturbance areas from construction of new buildings and roads.

Resource	Subtopic/Issue	Mitigation and Monitoring Measure
	Special Status Species	Enforce restrictions regarding bivouacking and ground training near springs and stable dunes.
		Continue to protect Wig Mountain Cave and abandoned mines on Granite Peak.
		Protect Granite Peak and the winterfat-gray molly vegetation community.
Land Use	**Uses and Ownership**	Coordinate with BLM on land use such issues as DPG ground training impacts and regional land use issues.
	Quality	Continue coordination efforts with BLM regarding effects of DPG ground training, fire management, and the spread of invasive plants, such as cheatgrass.
		Continue implementation of the Army ITAM program.
		Adopt and protect the natural areas and special features on DPG land identified by The Nature Conservancy.
		Implement a range management program for the rehabilitation of the desert environment in and around DPG.
		Continue coordination efforts with the USFWS on Fish Springs National Wildlife Refuge issues and impacts.
	Construction and Demolition Activities	Consider topography, soils, drainage, water, vegetation, cultural resource location, access, utilities, and noise in all decisions regarding construction of new buildings and facilities.
Cultural Resources	**Paleontologic Resources**	Require notification of DEP regarding discovery of any observable paleontologic resource prior to construction work in the area.
	Unsurveyed Sites	Comply with guidelines and procedures in the Integrated Cultural Rresources Management Plan and associated standard operating procedures to reduce potential for significant impacts.
		Continue use of the priority system in determining cultural resource site locations to reduce potential for damage or loss of resources.
	National Register of Historic Places-Eligible	Comply with guidelines and procedures in the Integrated Cultural Rresources Management Plan and associated standard operating procedures to reduce potential for significant impacts.
		Continue use of the priority system in determining cultural resource site locations to reduce potential for damage or loss of resources.
	Sacred Native American Sites	Comply with guidelines and procedures in the Integrated Cultural Rresources Management Plan and associated standard operating procedures to reduce potential for significant impacts.
		Once sites are identified, protect them through the Integrated Cultural Rresources Management Plan and federal legislation.
		Continue consultation with Native American tribes on potential cultural resources site locations.
	Access to Resources	Make all employees, contractors, tenant personnel, and other persons with access to DPG land aware of Integrated Cultural Rresources Management Plan and associated standard operating procedures protecting cultural resources.

* Dugway Proving Ground 2003a

The *Draft Environmental Assessment, Future Active and Reserve Components Training, U.S. Army, Dugway Proving Ground, Dugway, Utah* (Dugway Proving Ground 2003b) identified mitigation measures to allow for implementation of future training activities. A Finding on No Significant Impact was prepared and published for future Active and Reserve components training. Implementation of mitigation measures is required by law. Many specified mitigation measures have natural resources implications or are natural resources-related. Table 4.2b shows natural resources-related mitigation measures identified by Dugway Proving Ground (2003b). These measures are included as objectives within proposed management sections of the appropriate individual project section of this INRMP. For example, coordination-related mitigation measures from Dugway Proving Ground (2003b) and Dugway Proving Ground (2003a) are included in Section 4.1.1, *Ecosystem Management Coordination* as objectives 5-9.

Table 4.2b Natural Resources-related Mitigation Measures Identified in Dugway Proving Ground Environmental Assessment*

Resource	Mitigation Measure
Soils and Geology	Continue implementation of the Army ITAM program.
Water	Implement best management practices.

Resource	Mitigation Measure
Air Quality	Continue implementation of the Army ITAM program.
Biological Resources	Continue implementation of the Army ITAM program.
	Limit tracked use to existing roads and minimize cross-country use.
	Rotate training and firing areas.
Land Use	Coordinate with local and federal agencies on land use issues.
Cultural Resources	Comply with guidelines and procedures in the ICRMP.
	Conduct surveys as needed to reduce loss of information.
	Comply with comprehensive agreement or plan of action.

*Dugway Proving Ground 2003b

4.3 Soils Management

4.3.1 Current Management

DPG has a complete inventory of soil resources; the *Soil Survey of Tooele Area, Utah, Tooele County and Parts of Box Elder, Davis, and Juab Counties, Utah, and Parts of White Pine and Elko Counties, Nevada* (Natural Resource Conservation Service 1992). A description of DPG soils is in Section 3.2.4, *Soils*. No additional general soils surveys are required during the next five years.

Current soils management on DPG occurs primarily through fire management and activity restrictions, such as minimizing off-road travel, which minimizes disturbance to vegetation and soils. Revegetation of damaged areas has occurred on the installation with varying degrees of success. Most soils management is undertaken by the ITAM program, specifically the Land Rehabilitation and Maintenance (LRAM) component. The current emphasis of LRAM at DPG is implementation of a trail management plan. LRAM is discussed in Section 5.1.2, *Land Rehabilitation and Maintenance.*

Cryptogammic soil crusts are an invaluable component of arid region ecosystems. Cryptogammic soil crusts are widespread on DPG, and occur throughout many vegetation communities. These crusts are important soil stabilizers and sources of nitrogen fixation in the soil. They also moderate effects of wind- and water-caused erosion. The soil stabilization properties of cryptogammic crusts are an important factor in limiting the spread of invasive plant species on the installation. However, cryptogammic crusts are extremely fragile and sensitive to disturbance. Therefore, protection from disturbance is imperative. Cryptogammic soil crusts are discussed in Section 3.2.4, *Soils*. DPG harvested soil crusts from one area and established a sample research plot in an area with soil disturbance where inoculated spores were introduced. This effort appears to be successful, but further monitoring is necessary to fully measure success.

4.3.2 Proposed Management

Project: Soils Management
Driver: Maintaining the capability of training lands to support the military mission (Sikes Act), compliance with the Clean Water Act, mitigation and monitoring measures for geology and soils (Dugway Proving Ground 2003a, 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*), stewardship
Project Timing: Objectives 1-4, 7-24 - ongoing indefinitely; Objectives 5 and 6 - uncertain
Regulatory Coordination: None required

Goal. Repair damaged soils and use soil parameters to manage military activities, protect soil stability, restore testing and training lands, and conserve wildlife habitat.

Objective 1. Use soil inventory data to make decisions regarding land use, rehabilitation options, and wildlife habitat management options.

Objective 2. Use site-specific soil testing for training land rehabilitation and erosion control and natural resources projects.

Objective 3. Support implementation of the LRAM plan to manage roads and repair road-related erosion problems.

Objective 4. Support revegetation efforts of damaged areas and ensure the use of non-invasive species for revegetation.

Objective 5. Survey and monitor cryptogammic soil crust communities and determine short- and long-term effects of mission and tenant activities on them.

Objective 6. Develop a management plan for cryptogammic soil crusts including possible practices, such as inoculating disturbed areas that previously were crusts to investigate the potential to slow invasion of invasive species in such areas.

The following objectives are mitigation and monitoring measures for geology and soils identified in Dugway Proving Ground (2003a and 2003b).

Objective 7. Continue implementation of the Army ITAM program.

Objective 8. When possible, limit tracked vehicles and prohibit cross-country use.

Objective 9. When possible, without jeopardizing realistic training, vary intensity of training and testing seasonally to reduce the impact on vegetation and to avoid high fire conditions.

Objective 10. When possible, use only existing roads, or if new roads need to be created, construct them in areas that would minimize impacts to vegetation.

Objective 11. When feasible, construct new buildings and roads in current built-up areas.

Objective 12. Rotate use of training areas to allow a 4-7 year rest period.

Objective 13. Continue to monitor established photopoints in impact areas for seasonal and yearly comparison of habitat.

Objective 14. Depending on need, maintain and use existing quarry sites and permanently close others.

Objective 15. Focus ground training in areas with existing high ground disturbance; other areas used should follow compensation guidelines within the Maneuver Training Area Management Plan and the INRMP.

Objective 16. Develop and implement management of the Paladin Weapons System, as described in the Maneuver Training Area Management Plan.

Objective 17. Manage all fires in accordance with the DPG Fire Management Plan.

Objective 18. Complete greenstrip firebreaks as outlined in the Dugway Fire Management Plan through the use of fire resistant and site-adapted species.

Objective 19. Obtain financial compensation from training missions for fire management or revegetation according to the Maneuver Training Area Management Plan and the INRMP.

Objective 20. Continue the Installation Restoration Program to address contaminated soils at hazardous waste management units and solid waste management units.

Objective 21. Implement investigation of testing and training ranges in use when they become inactive.

Objective 22. Include appropriate monitoring for semi-volatile organic compounds in soil.

Objective 23. Continue to prohibit the development and/or use of mineral resources at Granite Peak.

Objective 24. Continue enforcing restrictions in the vicinity of the Devil's Postpile from use by ground troops.

4.4 Water Resources Management

AR 200-1, *Environmental Protection and Enhancement*, (Department of the Army 1997c) establishes the following objectives for water resources on Army lands:

- Conserve all water resources.
- Control or eliminate sources of pollution to surface or ground waters through conventional or innovative treatment systems.
- Demonstrate leadership in attaining the national goal of zero discharge of water pollutants.
- Provide drinking water that meets applicable standards.
- Cooperate with federal, state, and local regulatory authorities in forming and implementing water pollution control plans.
- Control or eliminate runoff and erosion through sound vegetative and land management practices.
- Consider nonpoint source pollution abatement in all construction, installation operations, and land management plans and activities.

A DPG-specific goal, in addition to the above water resources objectives, is eradication of exotic weeds, such as salt cedar from springs on the installation.

An additional Army requirement is the preparation and implementation of a Stormwater Management Plan. Attainment of most of the above objectives is not the responsibility of Army installation natural resources programs, but some of them, especially the last two, are clearly natural resources management concerns.

4.4.1 Current Management

Monitoring

Water quality monitoring is important to measuring ecosystem health. Land-based environmental degradation eventually affects water quality and aquatic ecosystems dependent upon good water quality. It is essential to collect physical, chemical, and biological data on DPG water resources to make sound water quality and management decisions. This includes investigating physical, chemical, and biological properties and associated aquatic organisms in DPG surface waters.

Surface water and groundwater quality are compliance programs, but are not natural resources responsibilities within the Army and, thus, are not a required part of this INRMP. Surface water quality monitoring beyond those aspects that may affect the species within or that use surface waters are not natural resources responsibilities. As such, water quality is an important aspect of habitat/ecosystem function and/or quality. Innus and colleagues (2000) wrote steps to develop restoration plan: 1. inventory, 2.

classification, 3. indicators, 4. assessment and 5. eventual enhancement (restoration) of the resources. Water quality is an important indicator of wetland ecosystem function and quality; this will give a snap shot look, a benchmark for restoration goals and prioritize restoration sites. Water quality indicators include chemical, physical and biological indicators. We used 9 physical indicators (ie temperature, TDS, turbidity, ect), 13 chemical indicators (ie ammonia, nitrate, lead, ect), and aquatic invertebrates diversity and abundance were collected as a bioindicator. To average changes across differences in environmental conditions these indicators were collected from the majority of both lentic and lotic water features on all of Dugway in two to three season collection periods across three 3 years. Some of the parameters were measured with probes which collected three measurements per sampling. These three samplings were taking at the wetland edge's surface, half way to the deepest point half way between the surface and bottom, and in the deepest part of the wetland at the bottom. The other parameters only had one sample collected, but these were collected from water at each of the same parts of the wetland as collected from the other parameters with three samples as to make sure that the differences of water qualities within the spatial variation of the wetland are represented.

Several groundwater wells are used to supply DPG. Section 3.4.3.2, *Water Supply* discusses groundwater sources and uses on DPG. Section 3.2.5.1, *Surface Water* provides information on surface water features occurring on DPG.

Management

Six wells on DPG produce drinking water and reasonably high quality groundwater. Four wells produce other-use water supplies (Section 3.4.3.2, *Water Supply*). DPG intends to preserve the quality of groundwater and surface water.

Most water quality laws and regulations are not the responsibility of Army natural resources organizations and are, thus, not within this INRMP. Groundwater management consists of restoration projects associated with individual sources of pollution. These projects are not considered as natural resources management and are not included within this INRMP.

Erosion is not a significant recognized threat to water quality on DPG. Implementation of the LRAM component of ITAM (Section 5.1.2, *Land Rehabilitation and Maintenance*) has enhanced the installation's ability to protect water quality from sedimentation.

Numerous water sources have been identified on DPG (Section 3.2.5.1, *Surface Water*). However, two areas of the installation, Granite Mountain and the Cedar Mountains, are thought to have more water sources, particularly springs, than have been previously discovered. These areas should be thoroughly surveyed for surface water features, and newly discovered features should be protected. Also, in addition to restrictions regarding bivouacking and ground training near springs, the installation of fencing to exclude feral horses from springs would enhance protection efforts for these natural occurring surface water sources. Invasive species, particularly salt cedar, can be very damaging to springs. Salt cedar occurs at several locations on DPG and should be controlled in accordance with the *Integrated Weed Management Plan* (Brigham Young University and Dugway Proving Ground 2004). Section 4.4.3, *Terrestrial Habitat Management* discusses invasive species management on DPG.

Wildlife guzzlers are an important water source on DPG. The 10 established guzzlers must be upgraded and maintained as needed. Wildlife in other areas of the installation would benefit from the addition of guzzlers to supplement natural water sources. Since the summer of 2010 the NRO in cooperation with BYU have been monitoring wildlife use of guzzlers and other water sources on DPG and surrounding areas. We initially were focused on supporting the coyote-kit fox-guzzler study, but since have expanded our study questions to incorporate all mammals and birds that use water. During our studies we have found

that horses influence how other mammals and birds use water in time and space. Generally, at water sources where horses visit frequently, we have detected fewer species of both birds and mammals.

Provisions within this INRMP that will specifically reduce negative impacts to water quality or mitigate such damage are found in sections 4.4.2 - *Wetlands Management*, 4.9 - *Pest Management*, 5.1.2 - *Land Rehabilitation and Maintenance*, and 5.6 - *NEPA*.

4.4.2 Proposed Management

Project: Water Resources Management
Driver: Compliance with the Clean Water Act, mitigation and monitoring measures for water resources (Dugway Proving Ground 2003a, 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*), stewardship
Project Timing: Objectives 1-4, 7, 9-14 - ongoing indefinitely; Objectives 5, 6, 8 - uncertain
Regulatory Coordination: U.S. Army Corps of Engineers (Clean Water Act objectives)

Goal. Protect surface water quality at DPG.

Objective 1. Use site-specific water testing for natural resources projects and the ITAM program.

Objective 2. Use water quality data to make decisions regarding land use, restoration options, and wildlife habitat management options.

Objective 3. Control or eliminate runoff and erosion that could affect surface waters.

Objective 4. Consider nonpoint source pollution abatement in construction, installation operations, and land management plans and activities.

Objective 5. Survey Granite Mountain and the Cedar Mountains for springs and include newly discovered water sources in protection plans.

Objective 6. Investigate, and if suitable, implement fencing of springs to exclude feral horses.

Objective 7. Control salt cedar in surface water sources on DPG in accordance with the *Integrated Weed Management Plan* (Brigham Young University and Dugway Proving Ground 2004).

Objective 8. Investigate the establishment of wildlife guzzlers in other areas of DPG.

The following objectives are mitigation and monitoring measures for water resources identified in Dugway Proving Ground (2003a and 2003b).

Objective 9. Implement best management practices, such as installing metering devices at lagoons and periodically calibrating and maintaining them.

Objective 10. Use silt fences and berms during construction projects to minimize surface water runoff and soil erosion.

Objective 11. Enforce restrictions regarding bivouacking and ground training near springs.

Objective 12. Continue use of wildlife guzzlers that DPG has established in the area near the springs in the Cedar Mountains.

Objective 13. Conduct periodic water quality monitoring of springs in the Cedar Mountains.

Objective 14. Conduct periodic water quality monitoring at springs near the playa, including monitoring support at Fish Springs National Wildlife Refuge and at select locations within the playa.

4.5 Habitat Management

General fish and wildlife habitat management programs are described in this section, including wetland management. Programs to manage and protect sensitive and listed plant species are described in Section 4.7. Programs designed to manage special interest areas are described in Section 4.8. Cantonment Area habitat management programs are described in Section 4.11. Fire management aspects of habitat management are described in Section 4.12.

4.5.1 Current Management

Since 1993 the DEP has continued to monitor and evaluate flora and fauna, including re-establishing plots originally designated and researched by Flowers (1953) and developing new long-term biomonitoring studies. Newer ecological studies have focused primarily on biotic communities (Emrick and Hill 1999, unpublished DPG ITAM data), mammals (AGEISS Environmental, Inc. 1997, 1998), and birds. Small mammals and passerine birds were selected for study due to their strong habitat preferences, relative ease in sampling, and utility as indicators of habitat quality or habitat changes (Morrison 1986, Brown and Harney 1993, Furness and Greenwood 1993, Wilson *et al*. 1996). Other inventories or studies have included bats (AGEISS Environmental, Inc. 1996c), pronghorn and feral horses (AGEISS Environmental, Inc. 1999), kit fox and coyote (AGEISS Environmental, Inc. 2001), pollinating insects (Johnson *et al*. 2000, Jessop *et al*. 2000), birds of prey (Boise State) and a comprehensive biological inventory of the Utah Test and Training Range (Sharik 2000). Additionally, since 1989 implementation of the ITAM program has occurred on DPG.

Vegetative Mapping

The vegetation communities map (Figure 3.3.1.1) is in process of being updated. HDR Engineering, Inc. and Dugway Proving Ground (2004) contains a complete listing of floral species known to occur on DPG.

4.5.1.1 Habitat Management Plan

DPG has completed the *Multiple Species Habitat Management Plan* (HDR Engineering, Inc. and Dugway Proving Ground 2004) to provide a four-phase approach to undertake multiple-species, ecosystem-based planning for DPG. Section 3.3.1, *Flora* describes the 10 community types (formations) identified at DPG. The community-based Habitat Management Plan is intended to promote sustainable ecosystems through management for biodiversity and biointegrity by evaluating, monitoring, conserving, and improving various ecological communities on DPG. The Habitat Management Plan, as a component of this INRMP, helps formulate an installation-wide management program that provides an alternative to single-species conservation efforts by formulating a broad ranging plan that provides for multiple-species and ecosystem conservation and management. The Habitat Management Plan provides a conservation strategy that, to the maximum extent practicable, builds upon and integrates management and conservation plans already in place and currently being implemented by DPG (*e.g*., INRMP, Exotic Species, Training, Cultural Resources, Wildfire).

The Habitat Management Plan was developed as a dynamic, living plan intended as a tool for managers and decision-makers at DPG. The following goals and objectives of the Habitat Management Plan were developed and incorporated into the plan:

- Achieve a balance between the long-term conservation and recovery of natural habitats and species of concern and the continued execution of DPG's mission.
- Devise a plan for monitoring communities and possibly monitoring certain sensitive or protected species to make management decisions regarding the environmental health status of particular communities.
- Provide a habitat management strategy that is sensitive to and incorporates existing DPG management plans.
- Identify and evaluate the potential for enhancement and restoration of each habitat. Prioritize these habitat communities for relative potential of vulnerability for degradation, protective status or uniqueness (need for avoidance), and potential for enhancement (improvements).
- Establish "red flag" environmental parameter conditions that, when exceeded, would trigger the use of adaptive management techniques.

Chapter 3 of the Habitat Management Plan includes vegetative community monitoring and assessment information, discusses the use of the Index of Biological Integrity as the standard diversity and richness index, and provides monitoring requirements for the 10 community types. The Index of Biological Integrity method combines multiple metrics that incorporate both physical and biological components and reflect ecological processes. This not only is efficient and inexpensive to measure but is repeatable by different observers and easy to interpret. The below 10 metrics will be used to monitor and manage community types at DPG under the Index of Biological Integrity method.

- The Floristic Quality Index is a measure of the relative quality of the floristic makeup of a site. It does not measure the quantity of vegetation, but rather the species that are present and their individual qualities; it includes the number of floral species present as well as the percentage of species that are exotic.
- Number of vegetative life forms (moss or cryptogams, grasses, forbs, shrubs, trees).
- Level of mechanical disturbance of the soil surface (*e.g.*, disturbance in cryptogamic crusts, mechanical disturbance of vegetation, tire marks, roadways).
- Time since disturbance (0 to 1 year, 1 to 10 years, >10 years [not known]).
- Ocular estimation of total community vegetation vigor.
- Number of protected or sensitive floral and faunal species known to occur in the monitored site.
- Proximity to heavily disturbed areas (takes into account types of species, invasiveness of species, and methods of propogule dispersal [if propogules or seeds are wind dispersed, whether the site is downwind from the disturbed area]).
- Ability of a site to recover from disturbance (*e.g.*, a deep silty loam with hydrologic support, on a relatively flat slope, sheltered from prevailing winds would have a greater ability to recover than a hard pack shallow gravel on a steep slope).
- Total vegetative cover.
- Degree of wildlife activity.

Wildlife activity should be considered just one of several metrics. The Index of Biological Integrity process would be dynamic and would likely require modifications over time and with specific projects. DPG would work with partners to determine applicability and develop refinements as needed. Other information in the Habitat Management Plan is subject to change as changing conditions on DPG dictate.

Beyond community monitoring and assessment, implementation of the *Multiple Species Habitat Management Plan* (HDR Engineering, Inc. and Dugway Proving Ground 2004) entails protection (Phase II), rehabilitation (Phase III), and monitoring (Phase IV). Section 3.3.1.1, *Vegetation Types* addressed Phase

I, and Figure 3.3.1.1 shows habitat community types developed through the GIS vegetation mapping effort. Phase IV is briefly described above and in Appendix 4.5 and is a dynamic process in which management tools assess community health. Chapter 3 of HDR Engineering, Inc. and Dugway Proving Ground (2004) is in Appendix 4.5 in its entirety, as it is the habitat identification and assessment phase of the plan and, thus, is a major component of the natural resources management program at DPG.

Chapter 4 of the Habitat Management Plan includes approaches for implementation of habitat protection and rehabilitation, Phases II and III. Chapter 4 of the *Multiple Species Habitat Management Plan* (HDR Engineering, Inc. and Dugway Proving Ground 2004) is in Appendix 4.5, in its entirety, as it is a major habitat management component of the natural resources program at DPG.

Following recommendations of the Habitat Management Plan, DPG will prioritize protection or recovery efforts in the following order, beginning with lowest priority.

- If a site is determined to be degraded beyond the point of reclamation (the vegetative component is a virtual monoculture of highly tenacious invasive species), invasive species should be contained and expansion prevented. Some sites are so degraded that no amount of recovery efforts will pay off. These sites need to be identified and dealt with by containment of exotics with greenstripping and herbicide application (discussed in Section 4.4 of Appendix 4.5).
- If adjacent sites (in the same or different community type) are identified that are disturbed to a lesser degree and are determined recoverable, they should undergo recovery operations.
- If a similar pristine site within the same community type is identified, protective measures should be taken to prevent the encroachment of exotics. In pristine areas, protection should be employed. Pristine habitats that are sensitive with little potential for recovery (once degraded) should be given highest priority for protection.

Sites invaded with tenacious exotic species may appear to be receiving extensive recovery efforts, when in reality management activities are aimed at protecting adjacent sites from encroachment of exotics. Sensitive sites with a good potential for rehabilitation/enhancement should be identified for recovery, and, likewise, pristine sites need to be prioritized for protection.

Sensitive habitats with little potential for recovery (once they become degraded) should be given strong consideration for protective measures. After evaluating the three parameters of sensitivity, recoverability and management goals, the following communities are recommended as priority high or highest for protection:

- Great Basin Vegetated Dune,
- Great Basin Unvegetated Dune,
- Great Basin Cold Desert Perennial Grassland, and
- Open Woodland.

Because remaining native communities (Great Basin Arid Shrubland, Great Basin Playa, and Great Basin Chenopod Shrubland) are also considered sensitive and important to ecosystem viability and the greater ecoregion, they should also be given priority for protection.

Some community types need greater protection than others due to sensitivity and recoverability potential. Others may warrant protection due to specific management goals. When assessing priorities for recovery funds, evaluating the entire community type is much too broad and somewhat vague. Evaluation must emphasize relative benefits from recovery for specific sites within a community type.

Protection and recovery methods include avoidance, signage, green-stripping, herbicide application, and earth contouring.

Green-stripping

Green-stripping is the practice of planting vegetation in a linear strip to provide a living barrier or firebreak. This firebreak disrupts fuel continuity, reduces fuel accumulation, and maintains plants with higher moisture content (Harrison *et al.* 2002). Green-strip width can vary from as little as 30 feet to as wide as 400 feet depending on such factors as adjacent fuel load, typical speed of prevailing winds, anticipated response time of firefighters, budgetary constraints, and management objectives. Harrison *et al.* (2002) suggests the species composition of the seed mix used in a green-strip should offer the following characteristics:

- be adapted to the range site being planted,
- be competitive with annual/exotic weeds,
- be easy to establish,
- have low flammability,
- offer open canopy and spacing,
- be palatable by livestock and or wildlife (for efficient removal and control of litter and fine fuel buildup), and
- have fire resiliency and re-growth capabilities.

Some of the benefits of green-strips are the following:

- They provide a means to partition off severely degraded areas infested with exotics. This partition serves to contain the spread of exotics and keep them from encroaching into better condition adjacent lands. These particular green-stripping plantings may be considerably wider than otherwise would be used for increased fire suppression qualities.
- They improve seed coverage, allow reduced seeding rates, provide a means for accurate seed metering and calibration, and can be used to seed into stubble (Hansen *et al*. 1991).
- By precise seed placement, they provide a means to create a living protective barrier (firebreak) around pristine or otherwise sensitive areas that are vulnerable to burning and/or further encroachment of exotics.
- By precise seed placement, they provide a means to divide large tracts of land that have already been converted from native shrubs and trees to monocultures of exotic species into smaller parcels. Once these large areas are divided, firefighting efforts may be reduced. Ideally, any fires that occur may more easily be contained within smaller parcels.
- They provide a means to improve large areas of range using smaller acreage increments. Due to costs involved with improvements, this may be a method that can be implemented over time to improve large areas a small portion at a time and therefore fit into budget constraints.
- They provide increased quality of wildlife habitat, both cover and forage.

Appendix 4.5 includes further information on green-stripping, including seedbed preparation (herbicide, biosolid, mulch, and sugar application), timing of seeding activities, and seed mixes for foothills areas, around wildlife guzzlers, valley floor areas, to contain highly disturbed areas or protect higher condition adjacent areas, and for recovery of degraded vegetated dunes.

Herbicide Application

Competitive vegetative species need to be removed to prepare the seedbed properly for drill seeding. Manual removal of these weeds is not a feasible option over large areas potentially being drill seeded.

Herbicides can be used to reduce vegetative competition for seedlings to improve the chances of seeding success. Because drill seeding will likely occur over a variety of habitat types, soil types, slopes, etc., different exotic vegetation species will be encountered. The Integrated Weed Management Plan (Brigham Young University and Dugway Proving Ground 2004) will be followed regarding chemical control of vegetation.

In addition to seedbed preparation, herbicide application can be used on a small scale to control exotic species before they spread. For example, herbicide spot treating could be initiated for a small, disturbance-initiated introduction of exotic species. Spot treatment could prevent the large scale spread of invasive species from a small disturbance, potentially preventing encroachment into adjacent pristine areas.

Earth Moving

Earth moving can be performed in different community types to accomplish diverse goals. Earth moving may be used in and around disturbed sites within vegetated dunes that have been degraded to unvegetated dunes. Earth moving may be used in conjunction with a windbreak and broadcast seeding to stabilize, vegetate, and reclaim unvegetated shifting dunes. Earth moving may also be used to erect a low berm to collect sheet flow from storm events. The berms should be oriented to increase available moisture in certain areas to increase biomass production and burrowing wildlife habitat. Appendix 4.5 includes further information on earth moving, specifically contouring vegetated dunes and constructing berms.

4.5.1.2 Weed Management Plan

Ground disturbance is the single dominant factor that contributes to the spread of weeds on DPG. Ground disturbance occurs as a regular element of training exercises and is a byproduct of installation construction activities. Fire is a major cause of ground disturbance and is the largest contributing factor to epizootic disturbances. Fire is not a regular and necessary part of ecosystems in the arid Great Basin.

DPG has completed the *Integrated Weed Management Plan, Policy and Implementation Guidance for Dugway Proving Ground* (Brigham Young University and Dugway Proving Ground 2004), which supercedes a previous plan to address changing Army policy and guidance and to outline implementation and execution of weed management on the installation. DPG began concerted management of invasive weeds in 2000. From 2000-2003 a significant reduction of the installation's highest priority noxious weed, squarrose knapweed was accomplished as well as a reduction of weed species occurring at isolated springs. During FY04 and FY05 funding was limited for this effort. Section 3.3.1.3, *Invasive Species* identifies invasive species occurring on DPG and provides the priority for control based on the potential to restrict military land use. In order of decreasing importance, cheatgrass, squarrose knapweed, and tamarisk are the three highest priority species.

The Weed Management Plan establishes policy and guidance for invasive weed management at DPG in accordance with federal and state law and Army-wide policy. The Weed Management Plan adopts and modifies practices identified in a 2001 U.S. Forest Service guide to noxious weed prevention. Goals and practices that mitigate introduction or spread of weeds from a project site or program action are listed. Practices are addressed and ways DPG can implement similar practices are identified to serve as mitigating factors when undertaking projects or actions that may increase the susceptibility of the environment to exotic invasion.

Application of standards within the Weed Management Plan will ensure compliance of DPG with Executive Order 13112, *Invasive Species*. Appendix 4.5.1.2 includes the discussion of policy and guidance from the Weed Management Plan. Also taken from the Weed Management Plan, Appendix 4.5.1.2 includes goals and practices and DPG responses, which are recommendations to feature specific practices that advance integrated weed management and demonstrate conformity to multi-agency standards by DPG.

Invasive species monitoring requirements include annual monitoring of all species listed as noxious by federal, state, or county law. The Range and Training Land Assessment (RTLA) will be responsible for monitoring invasive weed species, and LRAM will be used to reduce weeds in training and testing areas to comply with Army policy guidance to "synchronize" invasive species management with the ITAM program (Brigham Young University and Dugway Proving Ground 2004). General and/or intensive monitoring may be necessary, depending on a particular species or site. Sites that are particularly sensitive to invasive species will be monitored annually regardless of the presence of invasive species.

Natural springs are extremely important because of the scarcity of water for wildlife at DPG. Several springs in the Cedar Mountains are vulnerable to invasion due to impacts of feral horses. Disturbance by horses provides a favorable environment for weed establishment, which is compounded by the spread of weed seed through fecal contamination. Springs on Granite Mountain are not as accessible to horses and are, thus, less prone to invasion. Nevertheless, tamarisk has been found in some spring areas. West End Spring (near Redding Spring) has noxious weed species reported. Other sites with high invasion potential include roadsides. The Weed Management Plan lists the following sites that require annual monitoring: Cane Springs, Orr Springs, Bitter Spring, Mustang Springs, Black Pond, Granite Mountain Springs #1 and #2, other springs on Granite Mountain, West End Spring, roadways, English Village, and Avery, Ditto, Baker, and Carr facilities. Wetlands adjacent to the Fish Springs National Wildlife Refuge, North Fish Springs should be included in annual monitoring especially since the refuge has been treating *Lepidium* species, which may have reached DPG property in this area (personal communication, J. Banta, USFWS Fish Springs National Wildlife Refuge, comment on the Draft INRMP, February 28, 2006).

The Weed Management Plan includes specific chemical, biological, and mechanical actions to target known weed populations. These eradication actions are included in Appendix 4.5.1.2.

4.5.1.3 Wetland Management

Inventory

Inventory of wetlands on DPG is discussed in Section 3.3.1.8, *Wetlands*. Some controversy has been associated with wetland determinations from previous surveys, particularly regarding the "waters of the U.S." designation for the DPG playa. DPG should coordinate with the U.S. Army Corps of Engineers on a review of DPG waters to determine if any are navigable waters or run into navigable waters. Additionally, the Redden Springs area in the southwestern portion of DPG has been and continues to be surveyed for the federally-threatened Ute ladies tresses and other species of concern; fence lines should be corrected and livestock excluded from the site; and the area should be included as a protected special interest area. Figure 3.2.5.1 shows wetlands and surface water features of DPG.

Management

Wetlands protection is required by Executive Order 11990, *Protection of Wetlands*. Protection and maintenance of habitat are the primary thrust of wetlands management on DPG. The quality of wetland watersheds affects the quality of downstream wetland plant and animal communities.

Environmental clearance review is the primary means of detecting threats to wetlands on DPG. The Conservation/Preservation Division reviews actions that may affect wetlands. If necessary, projects with potential impacts are referred to the Corps of Engineers to determine if jurisdictional wetlands are implicated, establish mitigation procedures, and/or obtain permits. Wetland-affecting projects require NEPA documentation.

Activities in wetlands that require federal permits include but are not limited to:

- placement of fill material, ditching activities when the excavated material is sidecast,
- mechanized land clearing,
- land leveling, most road construction, and
- dam construction.

The Corps of Engineers permit process requires coordination with the USFWS and the State Historic Preservation Office to allow for the assessment of potential impacts to protected species and cultural resources.

The most significant impacts to wetlands and surface water resources, depending on location, on DPG are the spread of the invasive species tamarisk, feral horses, and troop bivouacking and ground training near springs and wetlands. Other sections of this INRMP, particularly Section 4.4, *Water Resources Management*, have provisions to protect water quality and, therefore, wetlands.

4.5.2 Proposed Management

Project: Habitat Management
Driver: Maintaining the capability of training lands to support the military mission (Sikes Act); compliance with Executive Order 13112, *Invasive Species*; compliance with Executive Order 11990, *Protection of Wetlands*; mitigation and monitoring measures for biological resources (Dugway Proving Ground 2003a, 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*); stewardship
Project Timing: Objectives 3, 5, 6, 8, 9-11 - 2012-2016; Objectives 12 and 13 - 2012; Objectives 1, 2, 4, 7, 14-43 - ongoing indefinitely.
Regulatory Coordination: U.S. Army Corps of Engineers (wetlands objectives), USFWS

Goal 1. Inventory DPG floral resources and monitor species or communities that are indicators of ecosystem integrity, capability of lands to support military missions, status of sensitive species or communities, and other special interests.

Objective 1. Update the vegetation communities map as new information becomes available.

Objective 2. Update the flora inventory as new species are found during RTLA surveys, site-specific surveys, sensitive plant species surveys, and other projects.

Objective 3. Implement monitoring requirements for vegetative communities, as specified in the *Multiple Species Habitat Management Plan* (HDR Engineering, Inc. and Dugway Proving Ground 2004).

Objective 4. If plants that are federal-listed are found on DPG or if plants already known on the installation become federal-listed, develop an inventory/monitoring program for these species.

Objective 5. Implement approaches to habitat protection and rehabilitation (avoidance, signage, green-stripping, herbicide application, and earth contouring), as specified in the *Multiple Species Habitat Management Plan* (HDR Engineering, Inc. and Dugway Proving Ground 2004).

Goal 2. Prevent the introduction and/or spread of noxious or non-native invasive weed species on DPG.

Goal 3. Reduce or eliminate non-native invasive weed species on DPG.

Goal 4. Rehabilitate lands degraded by non-native invasive plant species.

Objective 7. Implement policy and guidance for weed management, as specified in the Weed Management Plan (Brigham Young University and Dugway Proving Ground 2004).

Objective 8. Monitor invasive species listed as noxious by federal, state, or county law annually using general and/or intensive monitoring depending on a particular species or site, as specified in the Weed Management Plan (Brigham Young University and Dugway Proving Ground 2004).

Objective 9. Implement DPG responses to goals and practices, as specified in the Weed Management Plan (Brigham Young University and Dugway Proving Ground 2004).

Objective 10. Implement eradication actions (chemical, biological, and mechanical) for known weed populations, as specified in the Weed Management Plan (Brigham Young University and Dugway Proving Ground 2004).

Objective 11. Annually reclaim/rehabilitate about 300 acres of areas consumed by exotic weeds.

Goal 5. Manage wetlands to ensure "no net loss" per Executive Order 11990.

Objective 12. Reassess wetlands on the installation to evaluate, verify, and definitively determine the classification of wetlands and "waters of the U.S."

Objective 13. The Redden Springs area should be surveyed for Ute ladies tresses and other species of concern; fence lines should be corrected and livestock excluded; and the area should be included as a protected special interest area.

Objective 14. Use site-specific surveys to evaluate wetland resources if potential wetland impacts are proposed.

Objective 15. Use the environmental review process to protect suspected wetlands.

Objective 16. Provide certified jurisdictional wetland delineations (and permit application, if necessary) if a project is planned in a suspected wetland.

The following objectives are mitigation and monitoring measures for biological resources (habitat management-related) identified in Dugway Proving Ground (2003a and 2003b):

Objective 17. Continue implementation of the Army ITAM program.

Objective 18. Educate users of DPG lands on protecting, preventing damage, and mitigating damage to natural resources.

Objective 19. When possible, limit tracked vehicle use and prohibit cross country use.

Objective 20. When possible, without jeopardizing realistic training, vary intensity of training and testing seasonally to reduce the impact on vegetation and avoid high fire conditions.

Objective 21. When possible, use only existing roads, or if new roads are needed, construct them in areas that would minimize vegetation impacts.

Objective 22. When feasible, construct new buildings and roads in current built-up areas.

Objective 23. Obtain financial compensation from training missions for fire management or revegetation.

Objective 24. When possible, rotate use of training areas to provide a 4-7 year rest period.

Objective 25. Avoid training in shrub and juniper areas, unless the junipers are in training areas that have protection measures in place.

Objective 26. Establish more permanent vegetation plots in training areas to study changes in vegetation.

Objective 27. Continue to monitor established photopoints in impact areas for seasonal and yearly comparison of habitat.

Objective 28. Focus ground training in areas with existing high ground disturbance; other areas used should follow compensation guidelines within the Maneuver Training Area Management Plan and the INRMP.

Objective 29. Manage all fires in accordance with the DPG Fire Management Plan.

Objective 30. Complete greenstrip firebreaks established by ITAM and test with new and better fire resistant and site-adapted species.

Objective 31. Clean up spills immediately and monitor spill sites.

Objective 32. As part of test planning and where appropriate, monitor dispersion clouds to validate models and monitor biological resources.

Objective 33. Limit use of fog oil on extremely windy days when large dust particles may be present.

Objective 34. Minimize the spread of weeds through noxious and nuisance weed management.

Objective 35. Minimize ground disturbance, as specified in the INRMP (*i.e.*, Weed Management Plan, Habitat Management Plan, off-road policy).

Objective 36. Implement biomonitoring program at the landscape level.

Objective 37. Quantitatively assess vegetation using permanent sample plots.

Objective 38. Avoid using ordnance or testing near permanent surface water sources.

Objective 39. Investigate fugitive dust control methods for military training on unpaved roads and in training areas.

Objective 40. Identify and protect important habitats for each species (Dugway Proving Ground 2003a and 2003b). The focus should more appropriately be on maintaining integrity of communities for the benefit of biodiversity.

Objective 41. Use temporary closures to avoid training and testing in areas of high wildlife population concentrations, nesting sites, or wintering ranges.

Objective 42. Monitor patterns, trends, and health of wildlife species, as needed, on both a local scale and installation-wide scale.

Objective 43. Minimize disturbance areas from construction of new buildings and roads.

4.6 Wildlife Management

Native species biodiversity conservation is a cornerstone of ecosystem management. DPG is taking appropriate steps via this INRMP and numerous studies and reports that have preceded it to ensure that overall biodiversity is not compromised at the installation. Wildlife population management directly influences populations as opposed to the soil, water, and vegetation management practices and protective measures, which indirectly affect populations, as discussed in other sections of this INRMP.

General wildlife population management programs are described in this section. Habitat management programs are described in Section 4.4. Programs to manage and protect sensitive and listed animal species are described in Section 4.7. Pest species management related to natural resources programs is described in Section 4.10.

4.6.1 Current Management

Information on species occurrence has been collected through numerous studies and projects on DPG. Section 3.3.2, *Fauna* references several studies of faunal resources, and many more have been undertaken. The ITAM program has added to wildlife-related information known for DPG. Faunal species found on DPG are discussed in Section 3.3.2, *Fauna*; Section 3.3.1.1, *Vegetation Types* discusses fauna as related to individual vegetative communities; and Appendix 3.3.2 lists wildlife species known to occur on the installation.

Mammals

Precise estimates of the number of pronghorns on DPG are not available. The magnitude of seasonal and permanent migration of pronghorn to and from DPG is also unknown. However, little migration was evident from radio-equipped pronghorn (AGEISS Environmental, Inc. 1999). Incidental observations suggest that at least some sub-population of pronghorn that use DPG at least seasonally do make migrations of at least several miles (electronic communication, J. Banta USFWS, comment on Draft Final INRMP, December 13, 2006). A 1997 one-day pronghorn count on DPG documented 214, and in 1998 at least 190 pronghorn were estimated (AGEISS Environmental, Inc. 1999). More recent counts have not occurred with any degree of precision. However, the pronghorn population is estimated to be between 250 and 300 during summer.

The number of mule deer on DPG is unknown, primarily due to topographic variation and the difficulty of surveying. However, in 2000 a mule deer survey was performed around the circumference of Granite Mountain, which documented 92 deer (Dugway Proving Ground 2001a). Migratory behavior of mule deer on DPG is not well known. However, it appears that a large portion of the buck population immigrates to DPG during the rut and begins to emigrate in about mid-January.

In 2003 a chainlink security fence was constructed around the English Village cantonment areaAfter completion of thefence, the mule deer and pronghorn numbers within English Village became unnaturally high, with as many as 100 pronghorn and 200 deer in late summer and early fall.At these levels pronghorn and mule deer were a serious nuisance, significantly impacting available habitat in the English Village area. The increased number of animals also resulted in a substantial number of animal-vehicle collisions.

It was determined that pronghorn and deer either needed unrestricted access in and out of the fenced cantonment or should be completely excluded. For security reasons DPG determined that animals within

the fenced area must be removed and excluded. Helicopter drives, collection pens, and passive means of removal were utilized between 2006-2008, when NRO staff removed all deer and pronghorn from English Village. To exclude them, doublewide cattle guards were purchased and installed. Since 2008, individual animals have entered the village and the NRO deals with them on a case-by-case basis.

Hunting assists in population control on DPG. However, big game animals are rarely found in designated hunting areas during the hunting season. Section 5.4.2, *Hunting* discusses this DPG program. Surveys/counts of pronghorn and deer need to be conducted to establish accurate recommendations for bag limits. DPG would also benefit from a telemetry study of mule deer to determine migration patterns.

The number of feral horses inhabiting DPG is unknown. Periodic roundups to remove excess horses are performed by the BLM in cooperation with DPG. The Humane Society of the U.S. in collaboration with BLM extended its 5 year study for one more year to continue to monitor the effectiveness of PZP vaccines in the Cedar Mountains. Mares rounded up in 2012 were treated and released. BLM efforts to gather more horses compared to the 2008 roundup proved to be successful, however, more work needs to extend onto Dugway Proving grounds. Monitoring continued on the health of the herd, population size, foal recruitment, and group associations. The effects of the vaccine for treated mares in 2013 showed good results. The foal population for both the BLM and Military side of the HMA resulted in only 41 foals compared to the 100+ foals typically observed yearly in this herd area. Of the 143 mares treated in 2012 only 15 mares, newly treated and re-treated, produced foals. Data collected in 2014 will be critical to determine the continued efficacy of the vaccine, unfortunately funding is currently unavailable to continue work at this time.Small mammal population surveys are performed when funding is available. Surveys are associated with plant community surveys. Grid and line transect systems have been used to survey small mammals on DPG. Rabbit surveys have been performed and consisted primarily of spotlight counts along established routes and walking transect surveys for Jack Rabbits performed in accordance with Hawkwatch protocol.

From 2011-2013 Dugway partnered with Brigham Young University to conduct surveys for pygmy rabbits, a state-listed sensitive species. Suitable habitat was identified and trapping was conducted. To date, no pygmy rabbits have been located on DPG.

Birds

Migratory birds may be surveyed annually in association with plant community surveys and NEPA actions. The availability of funding often limits the extent of migratory bird surveys. The Monitoring Avian Productivity and Survivorship protocol had been used on DPG since 1997, but has since been discontinued. DPG has partnered with UDWR through the Utah/DoD Partners in Flight program and DPG surveys neotropical birds and their nests in various plant communities, as well as monitors habitat degradation on the installation. Earlier planning level surveys have primarily focused on the Juniper-Mixed Brush habitat type. However, many species of conservation concern known to occur in the region are shrub-steppe species; thus, in 2003 DPG began surveying shrub communities. In 2013, a survey was established in the vegetated dune habitat and was conducted again in 2014. In addition, Migratory bird surveys have also been conducted at various spring locations as part of an ongoing spring study. In addition, baseline surveys were conducted in 2014 on the playa west of Granite Mountain in response to a proposed NEPA action.

Partners in Flight implementation on DPG is accomplished through a Cooperative Agreement between UDWR and DPG. It includes responsibilities for both parties for the development and implementation of a coordinated and cooperative long-term avian monitoring program.

DPG has also been working to protect raptors and other bird species from potential electrocution risks. In 2002, DPG contracted with EDM International to complete an Avian Protection Plan (EDM International,

Inc. 2002). In 2012, DPG initiated an update of that plan which was completed by EDM International in 2013. In order to update the plan, field surveys of distribution lines were performed Jan-Feb 2013. Surveys documented low-, medium, - and high-risk structures. The plan provides retrofitting recommendations for problem structures and prioritizes individual structures for retrofitting. Poles were also surveyed for evidence of mortality and raptor usage. EDM International, Inc. (2013) includes maps depicting locations of structures requiring retrofitting to reduce the possibility of raptor electrocution, and in turn, reduce the likelihood of violation of federal law regarding take of MBTA or BGEPA species. In 2013 and 2014 retrofitting hardware was acquired and will be installed by the BASEOPS contractor according to the recommended priority of high to low risk guidelines established by the Avian Protection Plan (2013). Retrofitting will continue in the future until all of DPG's power distribution network is in compliance with current avian protection guidelines established by the US Fish and Wildlife Service and the Avian Powerline Interaction Committee (APLIC). Golden eagles are common nesters on DPG, and when nesting eagles are discovered a 0.5 mile buffer zone surrounding the nest is established. The buffer zone limits Mission and other disturbance-related activities to ensure that a violation of the Bald and Golden Eagle Protection Act does not occur. Aerial surveys to locate golden eagle nests were conducted in 2007, 2007, 2010, and 2011, 2013 and 2014. Eagle nest locations are on Wig Mountain, in the Cedar Mountains west of English Village, Granite Mountain, and Simpson Butte with the majority of nests found on Camels Back Ridge. The DPG wildlife biologists and contractors annually monitor and enact protective measures for active golden eagle nests.

A large portion of DPG is playa, and a large percentage of that playa is covered with water during winter and spring. During wet years thousands of shorebirds and wading birds can visit these ephemeral wetlands during migration. Avian surveys were conducted July-October 2014 on the playa to provide a baseline survey for a proposed NEPA action. There was very little standing water during those months and no shorebirds or waterfowl were observed at or traveling between any of the survey locations. Only four species of birds were observed with the majority of observations being horned lark.

Other Vertebrates

Invertebrates

Planning level surveys conducted in vegetation communities on DPG have discovered new species of invertebrates. The tiger beetle (*Cicindela decemnotata*); three fly species, two *Aphoebantus* and one *Epacmus*; and two bee species, *Dianthidium* and *Hesperapis*, are new species that have been discovered on the installation. The vegetated dunes appear to be particularly important for these species. Distribution and life history traits for high profile species and species to be used as indicators of habitat/ecosystem integrity are currently underway.

Surveys conducted in the summer of 2011 of ground-dwelling insects and spiders in five habitats on DPG have shown that even moderate levels of military impact will have negative impacts on species diversity and thus alters the community of invertebrates. Further analysis of ground-dwelling invertebrate communities will outline key indicator species sensitive to environmental disturbances both natural and anthropogenic.

A recent taxonomic study (Knisley *et. al*. 2006) provides evidence that *C. decemnotata* includes valid and, at present, undescribed subspecies. The subspecies *C. d. vanescens* includes the populations restricted to the area of ancient Lake Bonneville, Delle and Dugway area of Utah. These populations are distinct and may have been geographically isolated since the known populatiuons are nearly restricted to the borders of this ancient lakebed (Knisley *et. al*. 2006).

Wilson *et. al*. (2005) represents the most comprehensive study of bees in the Great Basin and provides data on the distributions, range limitations, and habitat specificity of a number of bees. Bee populations at DPG appear to be spatially localized, exhibiting distinct areas of diversity. The study noted several bee species previously unknown or rare in the Great Basin Desert (Wilson *et. al*. 2005).

General Management
Protection and habitat management are the primary tools used to manage game and non-game species. Populations are seldom managed directly at DPG; however, during hunting activities, non-game species may not be willfully taken. Management activities that provide for a variety of vegetative habitats benefit wildlife species in general on DPG, consistent with ecosystem management.

A number of guzzlers have been established on DPG (Section 4.4, *Water Resources Management*) to supplement water resources for wildlife. Wildlife in other areas of the installation would benefit from additional guzzlers.

Wildlife habitat programs (Section 4.5), wetlands management (Section 4.5.1.3), water resources management (Section 4.4), LRAM (Section 5.1.2), fire management (Section 4.12), Training Requirements Integration (Section 5.1.3), and effective environmental awareness programs (sections 5.1.4 and 5.3) benefit wildlife species in general, consistent with ecosystem management strategies.

4.6.2 Proposed Management

Project: Wildlife Management
Driver: Sikes Act Compliance, mitigation and monitoring measures for biological resources (Dugway Proving Ground 2003a, 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*); stewardship
Project Timing: Objectives 1, 3, 8, 10, 14, 17, 20-32 - ongoing indefinitely; Objectives 2, 4, 11 - 2014-2018; Objectives 5, 12 - 2014-2018; Objective 6 - 2014-2016; Objective 7, 13 - 2014-2013; Objectives 9, 15, 16, 18, 19 - 2012.
Regulatory Coordination: UDWR on game species-related activities

Goal. Inventory DPG faunal resources and regularly monitor species that are indicators of ecosystem integrity and other special interests.

Objective 1. Coordinate access with UDWR to allow them to conduct surveys for pronghorn and mule deer populations to establish recommendations for bag limits.

Objective 2. Coordinate access with BLM so they may survey and manage the feral horse population on Dugway.

Objective 3. Continue surveys for bats in cooperation with the Utah Bat Conservation Coalition and the Western Bat Working Group.

Objective 4. Conduct diurnal and nocturnal surveys for small mammals.

Objective 5. Continuesurveys for reptiles and amphibians.

Objective 6. Conduct surveys for Great Basin skink, including taxonomic analysis.

Objective 7. Conduct surveys for neotropical birds and their nests in various habitat types and survey habitat composition at avian survey sites.

Objective 8. Renew the Partners in Flight Memorandum of Understanding.

Objective 9. Implement pole retrofitting recommendations of EDM International, Inc. (2013).

Objective 10. Conduct aerial surveys over the DPG playa for birds.

Objective 11. Continue surveying for raptors and their nests.

Objective 12. Continue implementation of raptor management plan in cooperation with UDWR and USFWS to include such items as golden eagle nest surveys and procedures for establishing buffers around active nests.

Objective 13. Continue surveys of invertebrates in various plant communities and perform DNA and/or morphological analyses to determine taxonomic rank of high profile undescribed species. Determine distribution and life history traits for high profile species and species to be used as indicator species.

Goal. Maintain wildlife populations at optimal levels in accordance with species priorities, population ecology, population health considerations, and habitat capacities.

Objective 14. Continue to use hunting to assist in maintaining big game populations at or slightly below carrying capacities.

Objective 15. Protect all species listed by any federal or state law from illegal harvest.

Objective 16. Investigate establishing wildlife guzzlers in other areas of DPG.

Objective 17. Perform a literature search related to the impacts of noise on wildlife.

The following objectives are mitigation and monitoring measures for biological resources (wildlife-related) identified in Dugway Proving Ground (2003a, 2003b):

Objective 18. Avoid using ordnance or testing near permanent surface water sources.

Objective 19. As part of test planning and where appropriate, monitor dispersion clouds to validate models and monitor biological resources.

Objective 20. Limit use of fog oil on extremely windy days when large dust particles may be present.

Objective 21. Investigate fugitive dust control methods for military training on unpaved roads and in training areas.

Objective 22. Identify and protect important habitats to each species where possible.

Objective 23. Use temporary closures to avoid training and testing in areas of high wildlife population concentrations, nesting sites, or wintering ranges.

Objective 24. Minimize ground disturbance, as specified in the INRMP.

Objective 25. Monitor patterns, trends, and health of wildlife species as needed on both a local scale and installation-wide scale.

Objective 26. Update the vegetation map every five years to monitor vegetation changes.

Objective 27. Implement a biomonitoring program at the landscape level.

Objective 28. Minimize vehicular-caused animal deaths by enforcing speed limits.

Objective 29. Report all injured or dead animals immediately to the Environmental Programs Division.

Objective 30. Minimize disturbance areas from construction of new buildings and roads.

4.7 Rare and Listed Species Management

4.7.1 Federal-listed Species Management Practices

The federal Endangered Species Act of 1973, as amended (Act) requires lands under the jurisdiction of the Department of the Army to conserve listed species. As defined in the Act, conservation is the use of all methods and procedures necessary to bring any listed species to the point where protections provided by the Act are no longer necessary. Section 7 of the Act requires the Army to formally consult and confer with the USFWS if any action by the Army may affect a listed species or critical habitat. As of this update, in 2015, there are currently no known listed species that occur on Dugway Proving Ground.

AR 200-1 (2007) lists a number of requirements under the Endangered Species Act. DPG is committed to meeting these requirements.

4.7.1.1 Current Management

Sections 3.3.1.6, *Special Status Flora* and 3.3.2.5, *Special Status Fauna* discuss rare and listed species occurrence on DPG. Management specific to a federal-listed species does not occur on the installation as there are currently no listed species found at Dugway. However, management activities described in other sections of this INRMP, such as 4.5 - *Habitat Management*, 4.6 - *Wildlife Management*, 4.8 - *Special Interest Area Management*, and 4.12 - *Fire Management*, benefit flora and fauna in general.

Critical Habitat

The Endangered Species Act was revised via the National Defense Authorization Act of 2004, which states that, "*The Secretary [of the Interior] shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation*. Based on this, the USFWS has determined that, where applicable, federal critical habitat designation is not warranted if the INRMP includes the following three criteria:

1. The plan provides a conservation benefit to the species. Cumulative benefits of the management activities identified in a management plan, for the length of the plan, must maintain or provide for an increase in a species' population or the enhancement or restoration of its habitat within the area covered by the plan [*i.e.*, those areas deemed essential to the conservation of the species]. A conservation benefit may result from reducing fragmentation of habitat, maintaining or increasing populations, ensuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, or testing and implementing new conservation strategies.

- Flora and fauna inventory and monitoring, habitat management, wildlife population management, non-game species protection, and numerous other projects discussed in this INRMP will provide a cumulative conservation benefit to federal-listed species, should any be discovered on DPG.

2. The plan provides certainty that the management plan will be implemented. Persons charged with plan implementation are capable of accomplishing objectives of the management plan and have adequate funding for the management plan. They have the authority to implement the plan and have obtained all necessary authorizations or approvals. An implementation schedule (including completion dates) for the conservation effort is provided in the plan.

- The Commander has the authority to implement the INRMP, which will be accomplished primarily by the DEP, as scheduled (Appendix 7.4) and budgeted (Section 7.5, *Implementation Funding Options* and Section 7.6, *INRMP Implementation Costs*).

3. The plan provides certainty that the conservation effort will be effective. The following criteria will be considered when determining the effectiveness of the conservation effort. The plan includes (1) biological goals (broad guiding principles for the program) and objectives (measurable targets for achieving the goals); (2) quantifiable, scientifically valid parameters that will demonstrate achievement of objectives and standards for these parameters by which progress will be measured are identified; (3) provisions for monitoring and, where appropriate, adaptive management; (4) provisions for reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the conservation effort are provided; and (5) a duration sufficient to implement the plan and achieve benefits of its goals and objectives.

- Goals, objectives, and long-term ecosystem needs, based on land use sustainability for the DPG mission, have been analyzed and considered extensively in collaboration with persons contacted while preparing this plan. Goals and objectives are defined for the plan as a whole (Section 1.3) and each project within the plan (chapters 4, 5, and 7, as summarized in Appendix 7.4). The INRMP will be evaluated through monitoring programs, including the Environmental Compliance Assessment System, the Environmental Quality Report, and reviews by the Northwest Region Installation Management Agency and other interested parties.

Species at Risk

Species at risk are species classified by NatureServe scientists as candidate species under the Endangered Species Act and/or critically imperiled or imperiled on a global scale. It is Army policy to proactively manage species at risk in order to prevent endangered species act listings that could severely degrade military readiness. The report "Species at Risk on Department of Defense Installations" dated July 2011 (available at http://www.denix.osd.mil/nr/upload/10-247_DOD_Species-at-Risk_July-2011-Report.pdf) found that there are 31 candidate species and over 200 other species at risk on or contiguous to Army installations. A review of Army species at risk policy and guidance and an initial species list is underway. DPG has two plant species (*Astragalus lentiginosus* var. *pohlii* and *Cymopterus acaulis* var. *parvus*) on the initial list; however, additional species have been identified (*e.g.*, *Euphilotes rita emmeli*) during more recent inventory/survey work, and some species that have yet to be described by science may also be added to the list through the review process. The review will result in a final list of Army species at risk and issuance of general Army species at risk guidance.

Western Yellow-billed Cuckoo is a candidate for listing under the Endangered Species Act and least chub is a Conservation Agreement species. However, Dugway does not have suitable habitat for either of these species and neither are known to occur on Dugway.

4.7.1.2 Proposed Management

Project: Federal-listed Species Management
Driver: Endangered Species Act
Project Timing: All objectives - ongoing indefinitely
Regulatory Coordination: U.S. Fish and Wildlife Service

Goal. At a minimum, sustain residential or migratory populations of endangered, threatened, or special status species and their habitats at current levels, with the long-term goal of conserving listed species and their habitats in accord with specific Recovery Plans and the Endangered Species Act.

Objective 1. Implement requirements of the Endangered Species Act, as stated by AR 200-1.

Objective 2. Survey for federal-listed species if any such species are determined to be likely to occur on DPG.

Objective 3. If species that are federal-listed are found on DPG or if species already known on the installation become federal-listed, consult with the USFWS and develop an inventory/monitoring program and management plan for these species.

Objective 4. Consider Army species at risk in all DPG actions in accordance with Army species at risk policy and guidance.

4.7.2 Other Sensitive Species Management Practices

4.7.2.1 Current Management

Sections 3.3.1.6, *Special Status Flora* and 3.3.2.5, *Special Status Fauna* discuss rare and listed species occurrence on DPG. Much of the management discussed in Section 4.5 - *Habitat Management*, although not specifically for sensitive species, benefit such species in general. Management activities described in other sections of this INRMP, such as 4.6 - *Wildlife Management*, 4.8 - *Special Interest Area Management*, and 4.12 - *Fire Management*, also benefit sensitive species on DPG.

Birds of Conservation Concern

Birds of Conservation Concern includes species that are of concern because of (a) documented or apparent population declines, (b) small or restricted populations, or (c) dependence on restricted or vulnerable habitats. These birds are listed with the intent of avoiding future designations of these species under the Endangered Species Act. The USFWS updates the list of Birds of Conservation Concern on a 5-year cycle. The 2008 report (USFWS) lists 28 species for the Great Basin Bird Conservation Region. Birds of Conservation Concern potentially occurring on DPG (based on its inclusion in the Great Basin Region) are listed in Table 3.3.2.5.

State- and Other Agency-listed Species

The state of Utah lists a number of species as Wildlife Species of Concern. The Utah Partners in Flight program and DPG list several species in addition to those listed by other federal or state agencies. Sensitive species potentially occurring on DPG are listed in Table 3.3.2.5.

DPG understands the importance of sensitive species that may not be federal-listed, particularly since these species have the potential to become federal-listed, potentially affecting the military mission on the installation. Thus, even though it is more difficult to justify funding specifically for the management of these species, DPG will give a secondary priority to state-and other agency-listed species.

Protection of raptors, particularly nesting raptors, is important to DPG. DPG follows guidelines and recommendations, to the greatest extent possible without significantly affecting the mission, for establishing buffers around raptor nests from the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck 2002) provided by the U.S. Fish and Wildlife Service Utah Field Office. Appendix 4.7.2.1 includes a table of nesting periods and recommended buffers for raptor species in Utah and a table of species-specific spatial buffer zones for levels and durations of activities during raptor nesting from Romin and Muck (2002).

The UDWR has completed the Comprehensive Wildlife Conservation Strategy, which is a 10 year strategy for management of species of greatest conservation need, including their associated habitats in the state. DPG supports efforts of the Comprehensive Wildlife Conservation Strategy.

4.7.2.2 Proposed Management

Project: Nonfederal-listed Species Management
Driver: Mitigation and monitoring measures for biological resources (Dugway Proving Ground 2003a, 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*); stewardship
Project Timing: All objectives - ongoing indefinitely
Regulatory Coordination: UDWR, Utah Partners in Flight, BLM

Goal. Monitor and manage nonfederal-listed, special status species on DPG during 2016-2020 to the degree possible with available funding.

Objective 1. Consider state- and other agency-listed species in all DPG actions.

Objective 2. Whenever possible, use actions designed for federal-listed species or wildlife in general to protect or manage sensitive species.

Objective 3. Continue implementing guidelines and recommendations for raptor buffer zones from Romin and Muck (2002).

Objective 4. Support the UDWR Comprehensive Wildlife Conservation Strategy.

The following objectives are mitigation and monitoring measures for biological resources (special status species) identified in Dugway Proving Ground (2003a, 2003b).

Objective 5. Enforce restrictions regarding bivouacking and ground training near springs and stable dunes.

Objective 6. Continue to protect Wig Mountain Cave and abandoned mines on Granite Peak.

Objective 7. Protect Granite Peak and the winterfat-gray molly vegetation community.

4.8 Special Interest Areas Management

Wetland management is described in Section 4.5.1.3; cultural resources protection is included in Section 5.5. Below sections describe programs to protect other special interest areas on DPG.

4.8.1 Current Management

Designation of special protection status for unique or fragile areas is an important management tool. It is more cost effective to put use restrictions on some areas to minimize damage or disturbance than to mitigate damage or disturbance.

DPG has several areas or features of special interest, including dune fields, mountains, and vegetative communities. Section 3.3.1.7, *Areas of Special Interest* discusses natural areas and special features on DPG that were identified by The Nature Conservancy as noteworthy natural areas or special features. Several areas/features have exceptional ecological or geomorphological importance, and Granite Peak Mountain, Devils Post Pile, and Old River Bed are unique in the context of the whole Great Basin (The Nature Conservancy and Utah Department of Natural Resources 1993). No special management or protection measures have been developed for these areas.

DPG has established restrictions on bivouacking and ground training near springs and stable dunes and protects Wig Mountain Cave and abandoned mines on Granite Peak. Active golden eagle nests are protected by establishment of a buffer area around nests restricting activities that could potentially cause disturbance. Several important and unusual habitats, such as all dune areas, ephemeral playas, cryptogammic soil crusts, wetlands and springs, eagle nests and buffers, and cultural resources sites benefit from establishment of protection measures and/or designation as areas of special interest.

4.8.2 Proposed Management

A specific project is not required for special interest area management as funding is within the INRMP Implementation Staffing and Training project (Section 7.2.1) and other project budgets in this INRMP. However, it is appropriate to list the following goal and objectives.

Goal. Manage special interest areas to retain and protect features and characteristics that make them special.

Objective 1. Develop a plan to protect special interest areas designating levels or priorities for management of individual areas including requirements and restrictions for use.

Objective 2. Develop a special interest areas map that indicates locations and designations of management/protection levels to allow incorporation of such information into land use planning decisions.

Objective 3. Foster scientific research and protection of Wilson Hot Springs biotic communities.

The following objectives are mitigation and monitoring measures for biological resources (special status species) identified in Dugway Proving Ground (2003a, 2003b):

Objective 4. Enforce restrictions regarding bivouacking and ground training near springs and stable dunes.

Objective 5. Continue to protect Wig Mountain Cave and abandoned mines on Granite Peak.

Objective 6. Protect Granite Peak and the winterfat-gray molly vegetation community.

4.9 Agricultural Outleases

DPG does not have an agricultural or grazing outlease program.

4.10 Pest Management

4.10.1 Current Management

Pest management on DPG is primarily the responsibility of the Division of Public Works (DPW). Installation Pest Management Coordinator responsibilities are currently delegated to the Environmental Resource Specialist in the DPG Natural Resources Office. DPG federal employees who apply or oversee the application of pesticides must be DoD-certified, and training and certification are conducted by the state for contract pest management technicians. DPW personnel provide technical advice when requested.

The *Integrated Pest Management Plan for U.S. Army Dugway Proving Ground, Utah* (Dugway Proving Ground 2015) identifies and prioritizes pests and their destructive effects to determine particular levels of protection. The plan emphasizes pest management within the English Village cantonment area and other developed activity centers.

Integrated pest management is used at DPG, and typically a combination of techniques is required to resolve pest problems. Integrated pest management includes the implementation and coordination of optimum sanitation, good structural design and maintenance of facilities, mechanical control, cultural control, biological control, and regulatory control. The integrated pest management comprehensive approach to pest control or prevention, using methods of pest control in a compatible manner, avoids damage and minimizes adverse side effects to nontarget organisms and the environment.

Pest control efforts are implemented on the basis of surveillance. Pest surveys are used to determine the type of pest, extent of problem, and pest management technique most appropriate for safe, effective, and economic control.

The DPG pest management program is consistent with the Presidential directive (Office of the President, 1994) to reduce pesticide use by using integrated pest management. Integrated pest management practices have been an important part of the DPG pest management program for many years. Chemical control is used only when non-chemical techniques are inadequate or impractical. Furthermore, chemical control will not be used as a substitute for good sanitary practices or proper building maintenance. In addition, DPG's use of mowing, grading, and other types of mechanical methods to control vegetation have attributed to less dependence on herbicides. Although the use of herbicides has increased since issuance of the Presidential directive, the amount of herbicide used is low considering the acreage of DPG and requirements for vegetation control.

DPG recognizes eight categories of pests. The list below describes in descending order pests or pest categories that have the greatest adverse effect on installation missions in terms of damage, time, money, and regulatory requirements:

- noxious and invasive plants (*e.g*. white top, Canada thistle, bull thistle, field bindweed, knapweed);
- other undesirable vegetation;
- real property pests (*e.g*. mice, pocket gopher, subterranean termites);
- bees and wasps (within housing/cantonment areas only);
- common pests found in and around buildings (*e.g*. ants, cockroaches, fleas, spiders);
- disease vectors and medically important pests (*e.g*. ticks, mosquitoes, black widow spiders);
- animal pests (*e.g*. stray dogs and cats, snakes); and
- quarantine and regulated pests (none found on DPG).

In 1994 the Army approved three Measures of Merit that defined the course of Pest Management programs. These measures mandated a current pest management plan, a 50% reduction in pesticide use during the 1994-2000 period, and having DoD pesticide applicators certified within two years of employment and contract applicators certified before the start of work. On 1 July 2004, the Assistant Deputy Under Secretary

of Defense (Environment, Safety and Occupational Health) approved a revision to the Pest Management Measures of Merit. Two Measures of Merit are essentially unchanged, the third, pesticide usage reduction, has a revised baseline changed from the original FY93 baseline usage to an average of pounds of active ingredient applied during FY02 and FY 03. The DoD made this revision to maintain the achieved pesticide usage reductions rather than strive for continued reduction.

DPG has an up-to-date Installation Pest Management Plan (Dugway Proving Ground 2015). Pesticide use has been reduced on DPG. The Pest Management Coordinator is a DoD-certified pest controller and ensures that contractors performing pest control are properly certified by the state of Utah. DPG fully supports the goals of the Measures of Merit and continues to strive to meet the objectives of the three Measures of Merit.

The DPG Pest Management Plan discusses many aspects of pest management that are not directly within the scope of this INRMP, such as control of disease vectors and protection of facilities. Below discussions of animal and plant control are specific to the management of natural resources on DPG.

Animal Pests

The number and variety of birds, mammals, and other wildlife that inhabit the installation require that outdoor applications of pesticides avoid nontarget organisms and aquatic environments. DPG minimizes spray drift and prevents pesticides from entering sensitive areas.

Nuisance wildlife may damage structures, aircraft or roadways, and pose threats to military testing and training activities. Populations and activities of nuisance wildlife are monitored, and appropriate management measures are employed to control such populations on the installation.

Coyotes can be a nuisance in residential areas and around garbage, and rabbits can damage ornamental plantings. Mule deer and pronghorn within the fenced area of English Village had reached the point of being a nuisance, leading to the 2006-2008 initiative to remove approximately 100 pronghorn and nearly 200 mule deer . Pocket gophers', voles', and ground squirrels' burrowing activities commonly cause problems in the cantonment area. Birds can be a problem when nesting on buildings. Migratory birds are protected through International Treaties and the Migratory Bird Treaty Act. Federal regulations (50 CFR) and Executive Order 13186 provide the framework for regulation of migratory bird take and possession. Federal permits are required to take, possess, transport, and dispose of migratory birds, bird parts, feathers, nests, or eggs. When necessary, application for permits will be made to the U. S. Fish and Wildlife Service Migratory Bird Permit Office in Denver, Colorado.

Nuisance wildlife in the cantonment area, such as stray animals, are captured and removed by pest management personnel, Law Enforcement and Security Division personnel, and the DPG Wildlife Biologist. Predators or other species control, if required, must be coordinated with the Environmental Programs Natural Resources Office.

Noxious and Invasive Plants

Non-native and/or noxious weeds pose threats to native habitats, endangered species, and plant community composition and diversity. More specifically, they threaten springs, wetland ecosystems, increase the frequency and intensity of wildfires, complicate land restoration projects, add to the cost of pest management, and in general, threaten ecosystem functionality. DPG is dedicated to the prevention of introduction of invasive species as well as their control, per Executive Order 13112, *Invasive Species*. A Memorandum of Understanding between the BLM, U.S. Department of Agriculture, Tooele and Juab counties, and DPG addresses surveillance for knapweed.

Control of noxious and invasive plants outside the cantonment area will be implemented following the *Integrated Weed Management Plan, Policy and Implementation Guidance for Dugway Proving Ground*

(Brigham Young University and Dugway Proving Ground 2004). Section 4.5.1.2, *Weed Management Plan* discusses implementation requirements.

4.10.2 Proposed Management

Project: Pest Management Support
Driver: Compliance with Executive Order 13112, *Invasive Species*; compliance with Presidential directive; stewardship
Project Timing: All objectives - ongoing indefinitely
Regulatory Coordination: None required

Goal. Control plant and animal species that affect natural resources management (*e.g.*, reduce ecosystem functionality, displace native species) or directly affect the military mission on DPG.

Objective 1. Update the Installation Pest Management Plan annually.

Objective 2. Emphasize integrated pest management techniques to continue to reduce the use of pesticides.

Objective 3. Ensure pesticide applicators are fully certified.

Objective 4. Control nuisance wildlife as needed to protect facilities and infrastructure and to maintain the military mission.

Objective 5. Obtain appropriate permits for the control of nuisance wildlife.

Objective 6. Prevent the introduction of and control invasive species, per Executive Order 13112, *Invasive Species*.

Objective 7. Implement the Weed Management Plan (Brigham Young University and Dugway Proving Ground 2004).

4.11 Cantonment Area Management

4.11.1 Current Management

The Division of Public Works is responsible for DPG grounds improvement, landscaping, and maintenance of roads and buildings. The Division of Public Works maintains information on grounds management, including appropriate species of grass, shrubs, and trees for planting; planting and maintenance procedures; fertilization schedules and guidelines; mowing and irrigation guidelines; disease and insect control; and sanitation. The DPW's's primary role in cantonment management is to provide technical advice when requested.

In managing natural resources in the cantonment area, DPG acknowledges its responsibilities as listed in the White House Memorandum, *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds* (Office of the President 1994). The memorandum's requirements include:

- using regionally native plants for landscaping;
- using construction practices that minimize adverse effects on the natural habitat;
- reduce pollution by reducing the use of fertilizer and pesticides, using integrated pest management, recycling green waste, and minimizing runoff;

- implementing water-efficient practices; and
- creating demonstrations of these practices to promote their use elsewhere.

The Division of Public Works will reference *Waterwise Native Plants for Intermountain Landscapes* (Mee *et al*. 2003) and consult with Natural Resources staff for specific information on appropriate plants for DPG landscaping.

4.11.2 Proposed Management

A specific project is not required for cantonment area management support as funding is within the INRMP Implementation Staffing and Training project budget. However, it is appropriate to list the following goal and objectives.

Goal. Provide support to maintain an aesthetically pleasing cantonment landscape that preserves natural ecosystem functions as much as possible.

Objective 1. Provide professional advice to assist the grounds landscaping and maintenance program, promote the use of native species, and restrict certain non-native species from being planted.

Objective 2. Manage natural resources occurring within the cantonment area to meet appropriate natural resources objectives.

Objective 3. Implement requirements listed in the 1994 White House Memorandum.

Objective 4. Limit mowing in areas with ground nesting birds during nesting seasons.

Objective 5. Coordinate with the DPG Natural Resources Office to survey areas scheduled for mowing, tree trimming, and on other potential natural resources-related issues.

4.12 Fire Management

Over the past several decades there has been a steady increase in the frequency, intensity, and severity of wildland fires at DPG. The primary cause is an increase in cheatgrass, which favors disturbed soils, which are common on DPG training ranges. Range fires are perpetuating the spread of cheatgrass, creating a positive cycle that increases both cheatgrass and fire frequency. The negative side effect of fire is the destruction of native plant communities and analogous faunal composition. Arid ecosystems of the Great Basin are composed of plant species poorly adapted to frequent wildfire. Historically, fires have produced small, patchy, and isolated burns. Today, burns cover thousand of acres and consume most standing vegetation in the landscape.

4.12.1 Current Management

The DPG Fire and Emergency Office is responsible for fire management on the installation. The primary role of the Environmental Programs Division is to provide technical advice and assistance when requested. Dugway's *Wildland Fire Management Plan* (Tierra Data? 2015) is currently in the process of being updatedand will expedite management directives to alter the fire trend and protect resources by coordinating fire response actions and rehabilitating rangelands. The Fire Management Plan sets policy for DPG operations regarding wildfire prevention, wildfire fighting, and post-wildfire reclamation. Implementation of the Fire Management Plan provides several benefits to DPG including the following:

- increased wildfire suppression abilities due to better coordination among DPG personnel and neighboring land management agencies,
- increased protection of physical property and natural and cultural resources,

- safer working conditions for fire fighting personnel,
- a reduction in size and number of large-scale wildfires by following the fuel management program,
- lower wildfire suppression costs associate with the reduction in size and number of large-scale fires, and
- efficient post fire rehabilitation work performed due to increased coordination.

Objectives of the wildland fire management program on DPG are to:

- protect human life and property and natural/cultural resources within and adjacent to DPG-administered lands;
- minimize damages and maximize overall benefits of wildland fire within the framework of land use objectives and resource management plans;
- promote an interagency approach to managing fires on an ecosystem basis;
- employ strategies to manage wildland fires that provide for firefighter and public safety, minimize cost and resource damage, and are consistent with values and management objectives;
- prevent unplanned human-caused ignitions;
- restore and rehabilitate resources and improvements lost in or damaged by fire or suppression activities;
- minimize, and where necessary, mitigate human-induced impacts to resources, natural processes, or improvements attributable to wildland fire activities;
- promote public understanding of fire management programs and objectives;
- organize and maintain a fire management capability that consistently applies the highest standards of professional and technical expertise;
- encourage research to advance understanding of fire behavior, effects, ecology, and management;
- integrate fire and management through all levels of the planning process; and
- investigate all human-caused fires.

DPG has a Memorandum of Understanding with Tooele County and a Memorandum of Understanding with BLM to cooperate on fire suppression along installation boundaries.

The Fire Management Plan includes detailed information regarding fire policy and guidelines; suppression strategy and techniques; fuel management, including green-stripping and rehabilitation/restoration procedures; and the effects of fire on vegetation and wildlife.

4.12.2 Proposed Management

A specific project is not required for fire management as funding is within the INRMP Implementation Staffing and Training project budget. However, it is appropriate to list the following goal and objectives.

Goal. Prevent and suppress wildfires to maintain ecosystem biodiversity and functionality.

Objective 1. Implement the Wildland Fire Management Plan (Tierra Data? 2015)

Objective 2. Provide natural/cultural resources management-related recommendations relative to fire management activities to DPG Fire and Emergency Office personnel.

Objective 3. Continue Mutual Aid Agreements for wildfire suppression or management for natural resource benefits.

The following objectives are wildland fire-related mitigation and monitoring measures identified in Dugway Proving Ground (2003a, 2003b).

Objective 4. When possible, without jeopardizing realistic training, vary intensity of training and testing seasonally to reduce the impact on vegetation and to avoid high fire conditions.

Objective 5. Manage all fires in accordance with the DPG Fire Management Plan.

Objective 6. Complete greenstrip firebreaks established by ITAM and test improved fire resistant and site-adapted species.

Objective 7. Obtain financial compensation from training missions for fire management or revegetation, according to the Maneuver Training Area Management Plan and the INRMP.

5.0 Natural Resources-related Programs

This chapter includes those programs that are directly related to natural resources management but are not being implemented solely for that purpose. Some, such as Integrated Training Area Management, enforcement, and outdoor recreation, are totally or partially within responsibilities of organizations other than the DEP.

Programs are described in terms of their status and recent history (**Current Management**) followed by proposed project(s) (**Proposed Management**), if appropriate. These projects may be environmental submissions or submissions through another organization's budget process (*e.g*., ITAM's Integrated Workplan Analysis Module) to integrate implementation of this INRMP to the budget process (see Section 7.5).

Projects are described in a goal(s)-objective(s) format to provide concise process descriptions that are compatible with adaptive management analyses and overall INRMP implementation monitoring processes. All goals and objectives are summarized in tabular format in Appendix 7.4.

Each project has a summary description at the beginning of the Proposed Management section. The format is as follows:

Project: Title
Driver: Participation in regional initiatives, Sikes Act, Endangered Species Act, AR 200-1, stewardship
Project Timing: Dates to be accomplished, by objective (*e.g*., 2015, 2016-17121214, indefinitely, uncertain)
Regulatory Coordination: Agencies with whom coordination is required

5.1 Integrated Training Area Management

Integrated Training Area Management (ITAM) is an Army-wide program to provide quality training environments to support the Army's military mission and help ensure no net loss of training capability (a Sikes Act requirement). The ITAM program was initiated with the realization that Army training lands that were being degraded due to continued impacts of military training, to the point where their capabilities to sustain military missions were in jeopardy. Proper management to support both the military mission and other multiple-use activities is a challenge unique to Defense among managers of public lands. The Army ITAM website address is http://srp.army.mil/ITAM/overview.aspx.

The integration of stewardship principles into training land and conservation practices ensures that Army lands support testing and training missions in a sustainable manner. Force readiness depends on the availability of high quality, realistic training lands. Several documents provide policy and procedural guidance for the ITAM program:

Army-wide Goal: The Army-wide goal for ITAM is to: "*achieve optimum, sustainable use of training lands by inventorying and monitoring land condition, integrating training requirements with land capacity, educating land users to minimize adverse impacts, and providing for land rehabilitation and maintenance*" (Department of the Army 1995b).

ITAM Program Strategy (Department of Army 1995b): The strategy describes the roles, responsibilities, and relationships among the functional proponent and supporting organizations, provides an overview of the ITAM policy and guidance, and describes the four ITAM components. The ITAM Program Strategy, along with input provided by Army conservation staff and Land Condition Trend Analysis outcomes,

provided the foundation and guidance for the ITAM Regulation (AR 350-19) (Department of the Army 2005) and the Procedural Manual (Department of the Army 1999b).

AR 350-19, The Army Sustainable Range Program (Department of the Army 2005): This regulation replaces AR 350-4, which was specific to ITAM. It assigns responsibilities and provides policy and guidance for the Army ITAM program. The regulation includes support for sustainable ranges, assessment of range sustainability, and management of automated and manual systems that support sustainable ranges.

ITAM Procedural Manual (Department of Army 1999b): This document defines Headquarters, Department of the Army, Major Army Command, and installation roles, responsibilities, and Army-wide guidance to implement ITAM. Policies, procedures, and guidance in this manual are essential to achieve and maintain the Army ITAM program. Army mechanisms for program management, review, and information exchange include Program Management Reviews, quarterly newsletters ("*The Bridge*" published by the Army Environmental Center), the ITAM website, and the annual ITAM workshop.

Scope of ITAM: The DPG ITAM program focuses on testing and training land management. ITAM funding supports the ITAM mission, goals, and objectives. ITAM funding is not intended to address or correct statutory compliance or conservation requirements, perform routine range maintenance or modification, or replace normal base operations activities on training lands normally funded by the Real Property Maintenance Account (Department of the Army 1999b).

Program Management at DPG

The ITAM program at DPG was initiated in 1989 and was the responsibility of the DEP. Proponency of the program then changed to the West Desert Test Center, Environmental Technology Office, consistent with Army-wide changes. The ITAM office is currently under the Range Operations Branch within the Directorate of Plans, Training, Mobilization and Security (DPTMS). The ITAM Coordinator reports directly to the Range Operations Officer/SRP Coordinator to ensure that all ITAM actions are coordinated with Range personnel and directly benefit the training mission.

Historically, DPG was designated a Category II installation as part of the ITAM budgetary and planning process. Category II installations were estimated to have ITAM costs of about $625,000 annually with the understanding that special circumstances may dictate changes in these numbers. This budgetary classification process was revised. DPG is now a Category VI installation, placing it at the lowest priority and therefore the lowest level of ITAM manning and project funding. At present ITAM has a DAC Program Coordinator and SRP Coordinator but is not funded to fully support core program capabilities. With the growth that is expected, the ITAM Program will need additional staff, primarily an LRAM crew and heavy equipment. The ITAM Program includes the following components:

Range and Training Land Assessment (RTLA) provides for collecting, inventorying, monitoring, managing, and analyzing tabular and spatial data concerning land conditions for each training area at DPG. Collecting and analyzing these data will assist in prioritization of land use for training as well as identifying, monitoring, and supporting the prioritization efforts of the other ITAM components.

Training Requirements Integration (TRI) integrates training requirements with land management, training management, and natural and cultural resource management processes and data derived from other ITAM components. The integration of all requirements occurs through regular consultation between the Environmental Technology Office, DEP, and other Installation Directorates, as appropriate.

Land Rehabilitation and Maintenance (LRAM) reduces long-term impacts of training and testing on DPG lands. It includes training area redesign and/or reconfiguration to meet training and testing requirements.

LRAM incorporates programming, planning, designing, and executing preventative and corrective land rehabilitation and maintenance to support and sustain the military mission.

Sustainable Range Awareness (SRA) provides a means to develop and distribute educational materials to all land users that are related to the sound environmental stewardship of natural and cultural resources, reducing the potential for inflicting avoidable impacts, while still facilitating military training to standards.

Geographic Information System (GIS) is a computer-based system that allows for multiple geographic datasets to be layered on top of each other to create custom maps, and can aid in developing land rehabilitation plans or military training strategies.

- GIS technology integrates common database operations, such as query and statistical analysis, with the unique visualization and geographic analysis benefits offered by maps.
- These abilities distinguish GIS from other information systems and make it valuable to trainers, testers, and land managers for explaining events, predicting outcomes, and planning strategies.
- The coordinated use of GIS by all components of ITAM greatly enhances the overall program, and therefore its ability to support military training.

Goals and objectives specific to ITAM are found in the *ITAM Program Strategy*, Section 2.1 (Department of Army 1995b) and AR 350-19 (Department of Army 2005). These are incorporated into objectives within this INRMP. ITAM planning involves using the Integrated Workplan Analysis Module for developing projects and providing input into the ITAM budget process.

5.1.1 Range and Training Land Assessment

The RTLA component is a long-term program to evaluate land conditions and trends on Army lands and the capability of those lands to support long-term multiple use, including military training. Primary objectives of RTLA are:

- to assist evaluation of land capability to meet multiple use demands on a sustained basis;
- to inventory conditions and monitor changes of natural resources;
- to delineate biological, physical, and regulatory limitations relative to utilization of the land for military training purposes; and
- to provide information for land management decisions.

RTLA data provides information to effectively manage land use and natural resources. The ITAM GIS provides a state-of-the-art information source for military decision makers. Accurate spatial information is available for map production or detailed site analysis. Sample data layers include ranges, training facilities, roads, observation points, landing zones, impact areas, artillery firing points, air corridors, training areas, training constraint areas, utilities, soils, vegetation, firebreaks, a military grid reference system, satellite and aerial imagery, and digital elevation models.

5.1.1.1 Current Management

The RTLA program implemented the first installation-wide, systematic floral and faunal biomonitoring at DPG. The program randomly established 100 core plots using a standard protocol, and during the subsequent three years special use plots were established throughout the installation. Core plots were designed to provide the core sample from which inferences are derived regarding conditions of site vegetation, soils, and wildlife.

Core plots were sampled using a line intercept method. Analysis included assigning a vegetation classification, based on dominant species, to each plot. Plots were then stratified according to vegetation and analyzed for vegetation integrity across sample years. Core plots were assigned a condition rating based on quantifiable percentages of "nativeness" (percent of native vegetation). Finally, an index was created using a red, amber, and green system to identify the number and percentage of plots that were defined as follows

- red: degraded or in poor condition, require management intervention to remedy the current condition, the sustainable use is compromised;
- amber: in fair condition, requires the attention of land managers, is in danger of community degradation, active management is needed for sustainable use; or
- green: in good condition, site management practices enhance sustainability, sustainable use management is functioning (Brigham Young University 2002).

An increase in training and testing at DPG exposed weaknesses in RTLA protocol. RTLA plots were not adequate in density and design, and training and testing went undetected, which led to faulty condition and use information. Most vegetative communities were not well represented by initial core plots. In 2003 a new RTLA core of 103 transects were established with 101 of these transects located in training areas and representing important vegetation communities. Changes in methodology to increase sampling efficiency and accuracy were also established. A modular approach to transect establishment was initiated due to the large number of transects needed. The protocol established three nested-circle plots 25 meters apart along each transect. Data collected are frequency by species, cover estimate by species, and density of shrub species. The 2003 protocol was reassessed in 2008 and updated in 2009.

The plots established for the 2003 module focused on Stryker vehicle areas, existing training areas, and new control transects. Native, annual, and reclaimed areas were monitored, but active training areas received first priority. Site selection was stratified within native vegetation types, reclaimed areas, and areas dominated by annual weeds. RTLA established 242 permanent observation points in 2009 and monitored 110 of those core plots in active testing & training areas. 850 additional plots were also established in open maneuver areas to acquire baseline data. During the 2010 summer field season, the remaining 132 core plots from 2009 were monitored in potential testing and training areas. A five-year RTLA plan, with relevant assessment areas, is included as appendices in the current 20112015 ITAM Plan.

Currently, DPG is in the process of expanding Firing Position Areas (FPAs) that will cover 8,529 acres. These areas encompass existing firing positions and sites used for Stryker and Paladin maneuvers and will be merged to create large, continuous maneuver areas. The intent is to manage maneuver areas with a rest-rotation strategy. To execute this management goal, an understanding of the extent and affect of current conditions is necessary. RTLA will conduct site evaluations of these open maneuver areas in response to new mission requirements for increased training and will help determine actual and potential impacts and the lands ability to sustain current and future training levels. Site monitoring is designed to evaluate existing conditions, which includes areas not previously used or with low use, and areas with extensive use. Data will be collected at defined locations and condition maps will be developed using the red-amber-green classification scheme to assist range managers in siting-decisions for rest and active use periods. Annual site monitoring will be essential initially, until the interactions of use, intensity and recovery are understood.

5.1.1.2 Proposed Management

Project: Range and Training Land Assessment

Driver: No net loss in the capability of the land to support the military mission (Sikes Act), compliance with AR-350-19, stewardship, mitigation and monitoring measures identified in Dugway Proving Ground (2003a and 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*)
Project Timing: Objective 1 - 2016, all other objectives - as needed or indefinitely.
Regulatory Coordination: None required

Goal 1. Provide trainers, testers, and land managers with assessments of changes in the condition of DPG lands.

Objective 1. Complete update to the RTLA portion of the ITAM five-year plan.

Objective 2. Establish and monitor plots using the modular protocol established for DPG.

Objective 3. Establish and monitor special use plots as needed to meet special program objectives.

Objective 4. Annually produce RTLA data analyses reports.

Objective 5. Use erosion parameters on RTLA plots to assist in prioritization of LRAM efforts.

Objective 6. Update plant collections and species lists as new species are found.

Objective 7. Use data collected during RTLA surveys to analyze changes in the distribution of noxious/invasive weeds that could impact military activities.

Objective 8. Use RTLA data to analyze the distribution of military impacts on DPG lands. Supply copies of data and reports to DEP.

The following objectives are mitigation and monitoring measures (RTLA-related) identified in Dugway Proving Ground (2003a and 2003b).

Objective 9. Continue implementation of the Army ITAM program.

Objective 10. Establish more permanent vegetation plots in training areas to study changes in vegetation.

Objective 11. Continue to monitor established photopoints in impact areas for seasonal and yearly comparison of habitat.

Objective 12. As part of test planning and where appropriate, monitor dispersion clouds to validate models and monitor biological resources.

Objective 13. Implement biomonitoring program at the landscape level.

Objective 14. Quantitatively assess vegetation using permanent sample plots.

Objective 15. Identify and protect important habitats for each species.

Objective 16. Monitor patterns, trends, and health of wildlife species, as needed, on both a local scale and installation-wide scale.

5.1.2 Land Rehabilitation and Maintenance

The Land Rehabilitation and Maintenance component consists of strategies and resource allocations to maintain and/or repair training areas. The LRAM program includes programming, planning, designing, and executing land rehabilitation and maintenance projects based on requirements and priorities identified by TRI and RTLA components of ITAM.

LRAM provides mitigation for and minimization of impacts of the military mission at DPG. LRAM projects are specifically designed to:

- maintain quality military testing and training lands;
- minimize long-term costs associated with land rehabilitation, vehicle maintenance, or additional land purchase;
- modify Army lands to enhance testing and training possibilities; and
- reduce erosion.

More specifically, LRAM can be used to achieve the following:

- improved vegetation cover to enhance the testing and training environment,
- improved vegetation cover to reduce soil loss and protect long-term soil productivity,
- improved vegetation cover to comply with air quality standards by reducing fugitive dust,
- controlled runoff to reduce soil loss and protect sensitive resources,
- repaired watershed damage for safety and to return land for training use,
- controlled sediment transport to protect sensitive resources and comply with water quality standards, and
- construction of such projects as improved and hardened trails, tactical concealment and assembly area, stabilized firing points, and others that would enhance possibilities for military training in DPG training areas.

LRAM project funding applies to damaged sites that are not currently out of compliance and were damaged by training and/or are negatively impacting training. It also applies to projects in training areas that enhance training possibilities that fall within current training constraints.

If environmental Notices of Violation are either pending or existing on a given site, the project is not eligible for LRAM funding. Likewise, if a degraded site is not affecting training capability or is not caused by military activities, the project is not eligible for LRAM funding. If land is degraded through erosion and vegetative loss not caused by training and if it is either in noncompliance with environmental laws or not affecting training, it is eligible for environmental funding.

5.1.2.1 Current Management

The LRAM program has accomplished numerous projects on DPG. Establishing greenstrips has been a significant effort for several years progressing from initial development of firebreak/greenstrip designs and implementation protocols to establish greenstrips in DPG training areas. Reclamation of disturbed areas has been accomplished on DPG with varying degrees of success, primarily due to climatic conditions. Reseeding/revegetation had been the primary focus of the LRAM program at DPG for several years, culminating in the revegetation of over 3000 acres. Trail maintenance and repair have also been accomplished. For example, a geogrid soil confinement system was installed over poor load bearing soils along 1 ¼ miles of the tracked vehicle route in 2004. The stabilized trail allowed the completion of the tracked vehicle route in the Wig training area.

Weed control has targeted such species as squarrose knapweed, white top, cheatgrass, tamarisk, and bull thistle. The LRAM program, through Brigham Young University, has provided plans to guide future

management of installation training lands, such as the *Integrated Weed Management Plan, Policy and Implementation Guidance for Dugway Proving Ground* (Brigham Young University and Dugway Proving Ground 2004) and the *Wildland Fire Management Plan(Tierra Data? 2015)* More recently, the LRAM program has focused on the multitude of trails on DPG, particularly in testing and training areas. Many trails were not designed or constructed; instead, they were established by repetitive use. As a result, many have associated erosion problems. During 2004 and 2005 the LRAM program validated classifications and surveyed the condition of trails on DPG. A trail management and execution plan was prepared as design requirements were completed, including recommendations for maintenance or closure of some trails. Hardening has been the primary mechanism used for improvement and stabilization of not only trails but also tactical concealment and assembly areas, firing position areas, resupply areas, a small arms range and a pistol range in the DPG training areas. Hardened sites are capable of withstanding more military training use than they would naturally. LRAM projects for FY 2012-FY 2016 included Artillery Firing Positions (AFP) reconfiguration, FPA Stabilization, Bivouac expansion and stabilization, Forward Area Rearming and Refueling Points (FARRP) stabilization and stabilization of specific training areas. To date ITAM has stabilized over 20 acres for multi-use training activities and has upgraded over 15 miles of tank trails.

5.1.2.2 Proposed Management

Project: Land Rehabilitation and Maintenance
Driver: No net loss in the capability of the land to support the military mission (Sikes Act), compliance with AR-350-19, stewardship, mitigation and monitoring measures identified in Dugway Proving Ground (2003a and 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*)
Project Timing: Objective 6 – 2014-17; objectives 1 - 5, and 7 - 12 - indefinitely
Regulatory Coordination: None required

Goal 1. Use LRAM to restore and maintain lands to full training and testing support capability.

Goal 2. Coordinate with adjoining land managers through DPG DEP to protect lands from the effects of military training by reducing fugitive dust, soil erosion, and sedimentation within current land management strategies.

Objective 1. Continue to repair and revegetate areas that impact or are impacted by military activities.

Objective 2. Continue implementation of the greenstrip program on DPG.

Objective 3. Support implementation of the Weed Management Plan (Brigham Young University and Dugway Proving Ground 2004) and the Fire Management Plan (Tierra Data? 2015)

Objective 4. Continue implementation of the LRAM trail management plan.

Objective 5. Implement a monitoring program of previously restored areas to determine the effectiveness of reseeding, erosion control, hardening, and other techniques and use results to ensure maintenance of previous project sites and make appropriate adjustments to future LRAM projects.

Objective 6. Purchase heavy equipment and hire a dedicated operator to accomplish LRAM projects on DPG.

Objective 7. Use private contracts for LRAM projects that exceed the internal completion capacity of DPG LRAM program.

Objective 8. Coordinate with the Directorate of Environmental Programs to ensure LRAM projects meet environmental requirements (*e.g.*, NEPA, permits, listed species, cultural resources protection).

The following objectives are mitigation and monitoring measures (LRAM-related) identified in Dugway Proving Ground (2003a and 2003b).

Objective 9. Continue implementation of the Army ITAM program.

Objective 10. Complete greenstrip firebreaks established by ITAM and test with new and better fire resistant and site-adapted species.

Objective 11. Minimize the spread of weeds through noxious and nuisance weed management.

Objective 12. Investigate fugitive dust control methods for military training on unpaved roads and in training areas.

5.1.3 Training Requirements Integration

The Training Requirement Integration component of the ITAM program is the direct interface between training requirements for land use and the capability of land and natural resources to support that training. Primary objectives of TRI are:

- develop criteria for training mission accomplishment based on land allocation by functional requirements for training as well as terrain and environmental conditions;
- develop computer-aided land design capability for landscape modification to improve natural resource conditions (*i.e.*, concealment for training);
- develop a land use classification and allocation scheme based on land suitability for training and environmental management; and
- identify decision support system interface requirements between training and land management systems.

TRI is a major land protection phase of ITAM. It uses information from RTLA and the GIS to determine viable training load carrying capacities and to locate military training exercises accordingly. Load carrying capacity takes into account the status of natural and cultural environments of training areas at the time training activities take place.

5.1.3.1 Current Management

A key to successful implementation of the ITAM program is close coordination between Range Control and the Environmental Technology Office. The ITAM Coordinator and the Training Coordinator work cooperatively within the West Desert Test Center. They initiate processes to recommend land use design and management considerations to trainers and planners and coordinate with them on scheduling and allocating land use for military training with minimum environmental damage. Interfacing land rehabilitation actions with training and testing requirements ensures mission support.

Restrictions on training are sometimes necessary for long-term sustainment of training and ecosystem protection, including environmental compliance. Restrictions on training on DPG are within DPG Regulation 350-2 (*Ranges and Training Areas*). Some restrictions are directly tied to compliance with various laws and regulations (*e.g.*, cultural/archeological resource sites), but others are implemented according to clear guidance from both Department of Defense and Department of the Army to manage natural resources for long-term sustained military use.

5.1.3.2 Proposed Management

Project: Training Requirements Integration
Driver: AR 350-19, stewardship, mitigation and monitoring measures identified in Dugway Proving Ground (2003a and 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*)
Project Timing: All objectives - ongoing indefinitely or as needed
Regulatory Coordination: None required

Goal. Improve communication between training, testing, and land management staff to facilitate the integration of DPG mission requirements for land use with the sustained capability of the land to support such use.

Objective 1. Use ITAM-generated and other military training data to find the "best fit" between military missions and facilities usage in terms of identifying training areas that can best support specific training in a sustained fashion while minimizing or mitigating environmental impacts.

Objective 2. Use training restrictions, when required, to protect sensitive natural and cultural resources and minimize damage to training areas.

Objective 3. Coordinate with Directorate of Environmental Programs personnel to ensure natural and cultural resources are fully considered when planning specific testing and training activities on DPG.

The following objectives are mitigation and monitoring measures (TRI-related) identified in Dugway Proving Ground (2003a and 2003b).

Objective 4. Continue implementation of the Army ITAM program.

Objective 5. When possible, limit tracked vehicle use and prohibit cross country use.

Objective 6. When possible, without jeopardizing realistic training, vary intensity of training and testing seasonally to reduce the impact on vegetation and avoid high fire conditions.

Objective 7. When possible, use only existing roads, or if new roads are needed, construct them in areas that would minimize vegetation impacts.

Objective 8. When feasible, construct new buildings and roads in current built-up areas.

Objective 9. Obtain financial compensation from training missions for fire management or revegetation according to the Maneuver Training Area Management Plan and the INRMP.

Objective 10. When possible, rotate use of training areas to provide a 4-7 year rest period.

Objective 11. Avoid training in shrub and juniper areas.

Objective 12. Focus ground training in areas with existing high ground disturbance; other areas used should follow compensation guidelines within the Maneuver Training Area Management Plan and the INRMP.

Objective 13. Manage all fires in accordance with the DPG Fire Management Plan (Tierra Data? 2015).

Objective 14. Clean up spills immediately and monitor spill sites.

Objective 15. Limit use of fog oil on extremely windy days when large dust particles may be present.

Objective 16. Minimize ground disturbance, as specified in the INRMP.

Objective 17. Avoid using ordnance or testing near permanent surface water sources.

Objective 18. Use temporary closures to avoid training and testing in areas of high wildlife population concentrations, nesting sites, or wintering ranges.

Objective 19. Minimize disturbance areas from construction of new buildings and roads.

5.1.4 Sustainable Range Awareness

The Sustainable Range Awareness (SRA) component improves troop awareness of environmental issues that affect field training exercises. By providing installation-specific guidance about environmental issues, severe environmental damage and its associated costs can be prevented. The SRA program uses multimedia presentations, posters, field cards, specialized maps, and handbooks designed to educate soldiers, leaders, and commanders of their responsibilities to integrate environmental and natural resources conservation procedures, policies, and requirements into mission training events. During Range Control briefings, incoming user unit leaders are presented information on protection measures and resource management requirements.

5.1.4.1 Current Management

Information relative to environmental conservation and protection is provided in presentations, formal and informal briefings, pamphlets, videos, posters, and instructional classes. Materials contain examples of appropriate and inappropriate training actions or vehicular movements along with their consequences. The major theme stressed is that environmental deterioration affects overall success of the training and/or testing mission. The uniqueness and fragility of the environment and sensitive species and features of DPG are also stressed. The following are also emphasized within the SRA program:

- adherence to federal, DPG, and DA/DoD laws and regulations and training procedures that best protect the environment, and training restrictions;
- notification on the location of areas that are off-limits, as well as areas that are environmentally sensitive or protected;
- noxious weed control/prevention information;
- means to minimize damage to vegetation and wildlife habitat (where necessary);
- establishment of a conservation ethic that also promotes the accomplishment of the military mission;
- safety issues that can lead to the loss of personnel (*i.e.*, serious injury or loss of life) and/or the loss of, or serious damage to, equipment;
- badly damaged acreage in training areas that reduces land available for quality training;
- costs resulting from damage to natural resources that place added burdens on already strained budgets (*e.g.*, lost training time, repair of damaged equipment, cleaning up training areas, litigation from adjoining landowners, fines for violations of natural resource laws/regulations); and
- damage to highly valued natural resources that can discredit the Army in the minds of local citizenry.

5.1.4.2 Proposed Management

Project: Sustainable Range Awareness
Driver: Maintaining the capability of training lands to support the military mission (Sikes Act); National Historic Preservation, Archeological Resources Protection, Clean Air and Clean Water acts; stewardship; mitigation and monitoring measures identified in Dugway Proving Ground (2003a and 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*)
Project Timing: All objectives - ongoing indefinitely or as needed
Regulatory Coordination: None required

Goal 1. Develop an awareness of values of, and requirements for, natural and cultural resources protection on DPG to support sustained military training and testing.

Goal 2. Educate military users on means to minimize impacts to the land and natural resources to sustain and enhance training and testing.

Objective 1. Provide decision makers with information needed to make judgments that affect testing and training missions.

Objective 2. Revise awareness materials (*e.g.*, field card, posters, briefing materials) as needed to maintain the accuracy and mission-relevancy of these materials.

Objective 3. Present briefings that relate to environmental awareness, conservation, and protection.

Objective 4. Develop or update awareness materials and briefings as needed to ensure support of the military mission, compliance with environmental laws (*e.g.*, NEPA, Endangered Species Act, Clean Air Act, Clean Water Act), and stewardship of public lands, while continuing, and where possible enhancing, military training and testing.

The following objectives are mitigation and monitoring measures (SRA-related) identified in Dugway Proving Ground (2003a and 2003b):

Objective 5. Continue implementation of the Army ITAM program.

Objective 6. Educate users of DPG lands on protecting, preventing damage, and mitigating damage to natural resources.

5.1.5 Geographic Information System

There are two GIS operations that directly affect implementation of this INRMP. Environmental Programs GIS is described in Section 7.3, *Data Storage, Retrieval, and Analysis*. The below describes the GIS within the ITAM program.

5.1.5.1 Current Management

Data collected provides information to effectively manage land use and natural resources. A GIS is an organized collection of computer hardware, software, spatial data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically-referenced information. Information generated is used to help prioritize potential ITAM projects.

The ITAM GIS provides a state-of-the-art information source for today's military decision makers. Accurate spatial information is available for map production or detailed site analysis. The DPG ITAM GIS has extensive data layers regarding installation soils, hydrology, wildlife, vegetation, transportation system,

topography, cultural resources, and special features involving land and natural resources management programs. The ITAM GIS also stores training- and testing-related spatial data for the DPG community and updates data layers regularly to reflect changing missions and land use.

5.1.5.2 Proposed Management

Project: Geographic Information System
Driver: Maintaining the capability of training lands to support the military mission (Sikes Act); stewardship; mitigation and monitoring measures identified in Dugway Proving Ground (2003a and 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*)
Project Timing: All objectives - ongoing indefinitely or as needed
Regulatory Coordination: None required

Goal. Provide spatial products and analyses to support ITAM program implementation; military mission planning, training, and testing; and land use decision-making.

Objective 1. Use GIS to maintain a historical record of RTLA plots and LRAM projects.

Objective 2. Update hardware/software for data collection/analysis as needed.

Objective 3. Coordinate and share GIS data layers with the Environmental Programs Division.

The following objective is a mitigation and monitoring measure (GIS-related) identified in Dugway Proving Ground (2003a and 2003b).

Objective 4. Continue implementation of the Army ITAM program.

5.2 Natural Resources Enforcement

Many aspects of natural resources management require effective environmental law enforcement (*e.g.*, protection of rare or unique species, harvest controls, protection of sensitive areas, water pollution prevention, hunting and fishing recreation).

5.2.1 Current Management

History, Authority, and Operations
The Law Enforcement and Security Division Chief serves as the DPG Provost Marshall and a Division officer has been assigned as the installation game warden. The Law Enforcement and Security Division is within Base Operations. Natural resources law enforcement is not a primary focus of enforcement activities on DPG, and Law Enforcement and Security Division personnel do not actively perform natural resources-related patrols. Complaints of violations of natural resources laws are either handled by the DPG game warden or forwarded to the UDWR. UDWR and USFWS officers are allowed access to DPG as needed. Law Enforcement and Security Division personnel monitor access to DPG for hunting purposes.

Jurisdiction
The majority of DPG has concurrent jurisdiction where laws are enforceable by federal- or state-commissioned personnel. About 12 square miles of DPG have exclusive jurisdiction where only personnel holding federal commissions can enforce laws. None of the exclusive jurisdiction areas are within hunting areas.

Enforcement Emphasis

Law Enforcement and Security Division personnel natural resources-related enforcement activities are primarily to monitor access to DPG for hunting and to assure only those areas designated for hunting are used. Periodic check points are used to check for violations during deer and pronghorn seasons. DPG is not aware of a specific natural resources-related enforcement problem.

Training
Law Enforcement and Security Division personnel do not receive specific natural resources enforcement training.

The Sikes Act mandates that DoD installations employ adequate numbers of professionally trained natural resources personnel, including law enforcement personnel to implement the INRMP. The Act authorizes DoD to enforce all federal environmental laws, including National Historic Preservation Act, Archeological Resources Protection Act, Migratory Bird Treaty Act, Clean Water Act, and Endangered Species Act when violations occur on the installation.

DPG would benefit from hiring a conservation officer or appointing an officer to conservation enforcement. However, the job is inherently dangerous as shown by officer mortality rates compared with other police officers nationwide. Therefore, adequate training is critical. The best available option for those new to the natural resources enforcement field is to attend the Natural Resources Police Training program at the Federal Law Enforcement Training Center to satisfy the need for basic training. This is an intensive, yet lengthy (81 class days) course covering the basics an incoming officer requires.

There is a generally recognized requirement for a 40-hour-minimum annual refresher training for enforcement officers. Less training opens the employer to liability risks in the event of legally debatable officer actions. The National Military Fish and Wildlife Association offers annual training for experienced wardens. This training is one week and uses highly qualified instructors.. The course is open to all of the Department of Defense and is held on various military installations. This training, along with annual weapons qualifications, ensures that officers remain fully qualified to perform their duties.

5.2.2 Proposed Management
A specific project is not required for natural resources enforcement as funding is within the Law Enforcement and Security Division (objectives 1 and 2) and the INRMP Implementation Staffing and Training project (objective 3) budget. However, it is appropriate to list the following goal and objectives.

Goal. Assure legal compliance of military and civilian activities with regard to natural resources on DPG.

Objective 1. Maintain a law enforcement program for military and civilian activities that relates to natural resources protection on DPG.

Objective 2. Coordinate enforcement activities with other agencies, particularly UDWR and USFWS.

Objective 3. Investigate hiring a conservation officer or appointing an officer to conservation enforcement, and if such hiring or appointment is made, ensure that adequate and appropriate training and equipment are provided.

5.3 Conservation Awareness
Conservation awareness is instrumental in creating conditions needed to manage natural resources. The DPG approach to awareness stresses education. It provides military personnel and the public with insights

into installation natural environments and conservation challenges. The more people know about DPG's unique and valuable natural resources, the more responsibly they feel toward them and their conservation.

Education also promotes awareness of critical environmental projects and the rationale behind them. Activities, such as land rehabilitation, wildfire suppression, etc., can be accomplished with little conservation awareness effort since installation personnel and the general public naturally support these easily understood efforts. However, issues such as protection of sensitive areas for little known plant and wildlife species and the collection of permit fees and their uses require effective conservation communication to get positive support and, perhaps more importantly, to avoid adverse reactions from various users. A conservation awareness program must be directed to both installation and external interests if it is to be effective.

The ITAM program has established the SRA program to instill a conservation ethic in military personnel and provide environmental awareness education to incoming training units (Section 5.1.4, *Sustainable Range Awareness*).

5.3.1.1 Current Management

A formal awareness program has not been developed on the installation. Regardless, some environmental/ natural resources awareness is provided by the Conservation/Preservation Division.

Use of Media

DPG's newspaper, the *Dugway Dispatch*, is the most efficient way for natural resources personnel to access the DPG community. This newspaper is occasionally used to highlight programs and gain support for their implementation. Articles target a wide range of readers but may be designed to appeal to specific categories of readers.

Natural resources personnel write seasonal articles for the *Dugway Dispatch*, and staff writers also periodically cover natural resources programs. Examples of articles include notices to be aware of pronghorn near or on roadways, sensitive species issues and programs, and special events. The DPG Community email Mail List is used a few times each year to send email regarding installation natural resources.

Other newspapers, such as the DoD newspaper *Environmental Update*, has featured DPG natural resources-related articles. News releases and interviews with outside media are coordinated with the Public Affairs Office.

DPG's natural resources program is seldom the subject of local television or radio coverage. However, it was featured on national television during the winter Olympics held in Salt Lake City.

Special Events

The Environmental Program Division provides environmental education opportunities for DPG's workforce, elementary school, high school, and Child Development Center. Conservation-Preservation Division personnel have introduced the public to wildlife and land management stewardship principles and practices through Earth Day celebrations and other organized outreach events..

5.3.1.2 Proposed Management

Project: Conservation Awareness
Driver: Stewardship, mitigation and monitoring measures identified in Dugway Proving Ground (2003a and 2003b) (see Section 4.2, *Natural Resources Management-related Mitigation*)
Project Timing: All objectives - ongoing indefinitely

Regulatory Coordination: None required

Goal. Provide information to DPG and external interested communities regarding natural resources and associated management programs at DPG.

Objective 1. Improve the general program knowledge of all persons associated with the natural resources program, particularly those who come into regular contact with interested persons.

Objective 2. Provide prepared talks, dependent upon personnel and time availability. Whenever possible, use these opportunities to explain contemporary natural resources issues and management.

Objective 3. Use newspapers, television, and radio to inform the DPG and surrounding communities of matters important to the DPG natural resources program.

Objective 4. Pursue interactions between DPG and surrounding communities and professional organizations to exchange information and knowledge on environmental subjects.

Objective 5. Participate in Earth Day and other organized events as appropriate, and evaluate other special events for their usefulness in promoting the Conservation/ Preservation Division image and/or programs.

Objective 6. Encourage DPG natural resources staff to publish and present data and study results generated at DPG.

The following objective is a mitigation and monitoring measure (conservation awareness-related) identified in Dugway Proving Ground (2003a and 2003b).

Objective 7. Educate users of DPG lands on protecting, preventing damage, and mitigating damage to natural resources.

5.4 Outdoor Recreation

5.4.1 General

DPG is a large, relatively undeveloped, open space. This open space and the outdoor recreation opportunities associated with it are perhaps the installation's best natural attributes in terms of community quality of life. Hunting has been the primary outdoor recreational pursuit on DPG; however, mountain biking and horseback riding have been allowed.

Outdoor recreation enhances the quality of life for military and civilian personnel. As such, Army lands with suitable natural resources are to be managed to allow outdoor recreational opportunities, consistent with the Sikes Act. For the purposes of this INRMP and to be consistent with DoD Directive 7400.4 (Department of Defense 1996) outdoor recreation is defined as recreational programs, activities, or opportunities that depend on the natural environment. Examples include hunting, horseback riding, picnicking, bird-watching, hiking, and camping. Developed or constructed facilities and activities, such as golf courses, tennis courts, baseball facilities, etc., are not included.

People and social uses/needs are an integral part of ecosystem management. The Outdoor Recreation Program is based on providing quality experiences while sustaining ecosystem integrity. Activities that have a direct effect on species populations, such as game harvest, will be monitored for impacts. Special

consideration will be given to protecting critical areas (*e.g.*, cultural resources sites, special interest areas) from negative impacts due to outdoor recreation.

Military Mission Considerations
The military mission has priority over outdoor recreation involving installation access. If outdoor recreational activities are to continue on DPG, this military mission priority must not be compromised. If recreational or management activities conflict with military activities, the military mission comes first.

Public Access
Limited public access has traditionally occurred on DPG. In maintaining a policy of public access, DPG relies on a responsible public to adhere to restrictions placed on installation access.

Items 9d-e on page 26 of Army Regulation 200-1, *Hunting, Fishing, and Trapping* states-- *(d) Provide for controlled recreational access where feasible at Army installations containing land and water areas suitable for recreational use. (LD: 16 USC 670a). (e) Provide access to uniformed personnel, family members, and the public to hunting, fishing, and trapping, consistent with security requirements and safety concerns.*

DPG's policies toward public access are within both the spirit and letter of Army. Due to safety and security concerns associated with the military mission, DPG restricts general access to the installation. Hunters are restricted to a small portion (22,177 acres) of DPG along the northeastern boundary (Figure 3.4.2.2). DPG also restricts the number of hunting permits available and the number of hunters allowed in the hunting area. The amount of time DPG is open to hunting is limited, and hunts are tightly controlled. Other natural resources oriented outdoor recreation is not allowed on DPG.

5.4.2 Hunting

5.4.2.1 Current Management
The DPG Commander and UDWR have dual authority over hunting activities on the installation. The Commander can prohibit hunting activities on DPG and can cancel a scheduled hunt when testing or training activities take precedence. Hunting was prohibited on DPG due to security concerns following September 11, 2001 until reinstated in 2005.

Outdoor Recreation is responsible for scheduling yearly and special hunts within hunting season dates established for the state by UDWR. The Environmental Programs Office coordinates with UDWR to set DPG bag limits. The Provost Marshall enforces installation recreational hunting regulations and other applicable laws. Species that may be hunted on DPG include the Mourning Dove, Chukar, cottontail and jackrabbit, coyote, mule deer, and pronghorn.

There have only been two pronghorn hunts in the past 10 years, with only 30 permits sold for each hunt. On average, about 30 permits per year have been sold for all other hunts (*i.e.*, deer and upland game birds) combined. DPG has experienced very little demand for upland game bird hunting.

DPG's established hunting area is not conducive to harvest of pronghorn. Much of the pronghorn home range is outside the current designated hunting area during the hunting season, early September (AGEISS Environmental, Inc. 1999). Options for expanding the hunting area are limited due to regulations regarding weapons being fired within specified distances from facilities. However, the eastern side of the DPG panhandle appears to be the most logical and operationally feasible area for expansion. A proposal for such expansion (an additional 19,724 acres) was submitted in early 2001; however, the September 11 Tragedy halted the proposal. If pronghorn populations start to burden the landscape and carrying capacity of the

habitat, a temporary or permanent expansion of the hunting area will be considered by the natural resources staff and DPG personnel.

Trapping is not allowed on DPG, but the option is maintained in the event depredation removal is needed. If trapping were used, only live traps would be authorized due to the need to protect kit fox.

Hunter Administrative Processes

Military installations usually have complex hunter control systems needed to accommodate recreational activities without interference with the military mission and to ensure safe, high quality recreational experiences. Records of permit sales and hunting trips are maintained by Outdoor Recreation. Hunters are allowed access to the hunting area after signing in at the Police Station. Hunters must also sign-out when leaving the hunting area.

Hunters wishing to hunt pronghorn on DPG must first obtain a state permit for Hunting Unit 19 (West Desert, Riverbed). DPG then pools the names of Unit 19 hunters interested in hunting on DPG and holds a lottery to determine those that will be allowed to hunt on the installation.

Hunting Regulations

The UDWR issues regulations for hunters in Utah, including those who use DPG. DPG Regulation 200-11, *Recreational Hunting and Trapping at Dugway Proving Ground* and UDWR proclamations are primary means of establishing controls on hunting on DPG. In addition, DPG may issue supplemental orders if specific needs arise. Outdoor Recreation is responsible for changes or revisions to DPG Regulation 200-11.

Dugway Proving Ground Permits

There are three categories of personnel authorized to hunt on DPG: sponsors, non-sponsor residents, and guests. Sponsors are active duty military personnel, federal civil service employees assigned/attached to DPG or its tenant activities, or employees of permanent contractors at DPG, who are at least 18 years of age, have signed the Sponsor Responsibilities Briefing, and have agreed to escort a guest hunter. Non-sponsor residents are either persons who reside on DPG but are not employed at DPG or persons that are employed at DPG but are not sponsoring a guest hunter. Non-sponsor residents may hunt unaccompanied but may not sponsor/escort a guest. Guests are persons not assigned, attached, or resident to DPG. Sponsors may bring up to four guests per day for whom they bear complete responsibility. Guests must remain in sight and within hearing distance of their sponsor at all times.

All persons desiring to hunt on DPG must purchase a hunting permit from Outdoor Recreation. Before issuance of the DPG hunting permit, a valid Utah hunting license must be shown, and sponsors and non-sponsors must provide a valid DPG identification card or copy of assignment orders. All DPG hunters must sign a safety brief/liability disclaimer at the time of permit purchase. Guests must sign this brief at the check-in point.

Hunters have the option of purchasing single or multiple season permits. Multiple season permits are for two or more hunts in a given year, such as Chukar and pronghorn, or bow and rifle for the same species. Permits cost $15 for a single season, $25 for a multiple season, and $15 for trapping. Junior, senior, and disabled persons permits cost $10 each. Juniors are persons younger than 16 years of age; seniors are persons more than 65 years of age; and disabled persons are those that are quadriplegic or permanently confined to a wheelchair. Permit revenues are used to cover administrative costs, activity fees, and game species management on DPG. A $15 permit breaks down to $1.50 for administrative costs, $7.50 for the activity fee, and $6 for wildlife conservation and management.

State Licenses
Persons are responsible for obtaining state of Utah hunting licenses before obtaining DPG permits. State licenses are not sold at Outdoor Recreation. Any federal permits (*i.e*. Migratory Bird Hunting and Conservation Stamp) must be obtained at post offices or other outlets.

Hunting Maps
DPG hunting maps are essential for recreational use of DPG hunting areas. Maps are provided to hunters along with copies of the hunting regulation when installation permits are obtained. Maps feature hunting area boundaries, off-limits areas, major roads, and other orientation features.

Safety Considerations
Hunting activities on DPG must be regulated to avoid conflicts between the military mission and recreation. Hunters are required to sign-in and -out of hunting areas at the Police Station. Range Control advises the Provost Marshall of the status of mission activities in the hunting area. Safety rules and weapons restrictions must be followed while hunting on DPG. A maximum of 50 hunters are allowed into the hunting area on a first come, first serve basis. Mule deer and pronghorn hunters must wear a minimum of 400 square inches of hunter orange material on the head, chest, and back. This does not apply to archery big game hunters except when a centerfire rifle hunt is in progress in the same area.

Hunters on DPG must comply with Utah hunter safety education regulations. All persons born after December 31, 1965 must successfully complete a hunter education course before purchasing a Utah hunting license. In addition, all DPG hunters must sign a safety brief/liability disclaimer after reading safety material provided them at the time they purchase a permit.

5.4.2.2 Proposed Management

Project: Hunting Program
Driver: Stewardship
Project Timing: Objectives 3 and 6 - 2006; all other objectives - ongoing indefinitely
Regulatory Coordination: None required except for UDWR regulatory support for hunting

Goal. Provide opportunities to the DPG community and the general public for quality, safe, and equitable hunting consistent with needs of the DPG military mission.

Objective 1. Continue the hunting program, consistent with security requirements, on DPG.

Objective 2. Coordinate with UDWR to establish seasons, bag limits, and other regulation structures for hunting considering installation exceptions for management or safety and security purposes.

Objective 3. Investigate expansion of the hunting area to include a portion of the DPG panhandle to enhance population management of pronghorn through harvest.

Objective 4. Maintain trapping as an option for removal of furbearers in the event depredation removal is necessary.

Objective 5. Use established recreation control systems to ensure safe conditions and equitable treatment of users.

Objective 6. Develop a cooperative agreement between UDWR and DPG for support for game surveys, law enforcement, and operation of check stations.

Objective 7. Update DPG Regulation 200-11 as necessary.

Objective 8. Provide hunting permits through Outdoor Recreation.

Objective 9. Evaluate the DPG hunting fee schedule periodically.

Objective 10. Provide hunting maps and regulations to hunters authorized on DPG.

Objective 11. Ensure DPG hunters follow safety requirements of the state and installation.

5.5 Cultural Resources Protection

Cultural resources management at DPG is provided in accordance with Section 106 and Section 110 of the National Historic Preservation Act (16 USC Section 470, as amended), the Archeological Resources Protection Act (16 USC Section 470aa-47011), the American Indian Religious Freedom Act (42 USC 1996-1996a), the Native American Graves Protection and Repatriation Act (25 USC Section 3001 *et seq*.), Executive Order 11593 (*Protection and Enhancement of Cultural Environment*), DoD Directive 4710.1 (*Archeological and Historic Resources Management*, 1984), and AR 200-4, *Cultural Resources Management* (Department of the Army 1997b).

5.5.1 Current Management

5.5.1.1 General

Management of DPG cultural resources is a mission of the DEP. The Cultural Resources Manager coordinates all aspects of cultural resources management, including coordination with the Utah State Historic Preservation Office, the Advisory Council on Historic Preservation, Native American tribal organizations, and the public, as appropriate. DPG has an Integrated Cultural Resources Management Plan (Callister *et. al*. 2001).

5.5.1.2 Cultural Resources Inventory

Section 3.4.1, *Cultural Resources* describes the status of cultural resources on DPG.

5.5.1.3 Native American Consultation and Coordination

Various laws and regulations require DPG to consult with Native American tribes regarding Army activities on sites within the installation. The National Historic Preservation Act requires that federal agencies consult with the Advisory Council on Historic Preservation regarding any proposed action that has the potential to affect a property on or eligible for the National Register of Historic Places. This includes consultation and coordination with the State Historic Preservation Office and interested parties, including but not limited to Native Americans tribes

The ***Archaeological Resources Protection Act*** requires that archaeological resources on public and Native American lands be protected. This includes notifying Native American tribes, in advance, of possible harm to sites with religious or cultural importance.

The ***Native American Graves Protection and Repatriation Act*** protects the ownership and control of Native American human remains and related cultural items excavated or discovered on federal lands. If human remains are discovered during projects, work must stop, and a reasonable effort must be made to protect the discovery. Appropriate Native American groups must be notified, and requirements of Section 106 of National Historic Preservation Act and the Native American Graves Protection and Repatriation Act must be followed for excavation and disposition of the remains. The Native American Graves Protection and

Repatriation Act also requires a 30-day delay period after the discovery of human remains before project work in the area of the discovery can resume. Work may resume earlier if consultation and agreement occur.

The ***American Indian Religious Freedom Act*** covers the protection of intangible, ceremonial, or traditional values and concerns not tied to specific cultural properties. DPG must establish contact with interested Native American groups during the regular course of the National Historic Preservation Act Section 106 process.

Executive Order 13007 (Indian Sacred Sites) stipulates that if a federal-recognized tribe or representative of an Indian religion identifies a sacred site on DPG, the installation commander must enter into consultation with that group or individual to provide access to and ceremonial use of the site and avoid adversely affecting the physical integrity of such sites.

Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments) states Native Americans shall have access to DoD sites and resources that are of religious importance or are important to the continuance of their cultures (*e.g.*, areas containing traditionally used plants and traditionally used hunting areas), consistent with the military mission, appropriate laws (42 USC 1996, reference (d)) and regulations, and subject to the same safety, security, and resource considerations as the general public.

Department of Defense American Indian and Alaska Native Policy (Department of Defense 1998) emphasizes that the relationship between military services and Native American tribes is to be on a *government-to-government* basis. Consultation and coordination with federal-recognized tribes is to be initiated with the heads of the tribal governments. Department of the Army guidance places the responsibility for initiating tribal consultation at the installation commander level.

5.5.1.4 Natural Resources Management Implications

Natural resources projects on DPG have the potential to affect cultural resources, just as cultural resources field investigations may impact sensitive natural resources. All projects, whether for natural or cultural resources management, will receive an environmental review through the NEPA process. Through this review, affected programs will have an opportunity to assess potential impact to resources. If natural or cultural resources may be impacted, steps must be taken to avoid or mitigate damage.

It is important to ensure that provisions of this INRMP are also consistent with the protection of cultural resources. Prior to any ground-disturbing, natural resources activity, DPG will evaluate proposed activities for compliance with all appropriate cultural resources laws and regulations.

Natural resources management practices that have potential to adversely affect archeological sites and cultural resources are outlined below.

- **Land Rehabilitation and Maintenance/erosion control.** Of all practices associated with natural resources management on DPG, LRAM/erosion control projects have perhaps the greatest potential to affect archeological sites. Projects involving excavation, earth moving, and fill deposition can damage or bury archeological sites. Generally, however, effects on archeological sites from reduced erosion are positive.
- **Road maintenance/construction.** The construction of new roads, maintenance of existing roads, and firebreaks/greenstrips involve significant ground disturbance that can damage archeological sites and promote erosion.
- **Fire management.** Wildfire has potential to affect archeological sites by denuding areas of vegetation and promoting erosion, potentially damaging archeological sites. Fire has a greater potential to adversely impact historic archeological sites with significant surface features. Fire

suppression activities have potential to damage archeological resources. Generally, however, effects on archeological sites from fire control are positive.

- **Outdoor recreation programs.** Public access associated with hunting and other potential outdoor recreation activities has limited potential to increase the risk of vandalism to archeological sites.

Even with proper review, natural resources projects still have potential to affect archeological sites through accidental discovery. DPG will avoid adverse effects to cultural resources from natural resources management through proper review and planning. Proposed projects will be submitted, as part of standard NEPA review, to the Cultural Resources Manager for approval, determinations of effect, and Section 106 consultation, as necessary.

Numerous provisions of this INRMP benefit cultural resources management on DPG. These include, *Soils Management* (Section 4.3.2), *Water Resources Management* (Section 4.4.2), *Habitat Management* (4.5.2), *Special Interest Area Protection* (Section 4.8), *Land Rehabilitation and Maintenance* (Section 5.1.2), *Natural Resources Enforcement* (Section 5.2), and *NEPA Implementation* (Section 5.6)

5.5.2 Proposed Management

Project: Cultural Resources Protection
Driver: Compliance with various cultural resources laws and regulations
Project Timing: Objective 1 - 2016; All other objectives - ongoing indefinitely
Regulatory Coordination: Utah State Historic Preservation Office, in some cases

Goal. Implement this INRMP in a manner consistent with the protection of cultural resources at DPG.

Objective 1. Update the Integrated Cultural Resources Management Plan.

Objective 2. Implement provisions of the Integrated Cultural Resources Management Plan that relate to natural resources management.

Objective 3. Consider natural resources projects when planning cultural resources surveys and use results of cultural resources surveys to assist in planning natural resources projects.

Objective 4. Avoid or mitigate adverse effects to cultural resources from natural resources through proper review and planning. Submit proposed projects, as part of NEPA review, to the Cultural Resources Manager for approval, determinations of effect, and Section 106 consultation, as necessary.

Objective 5. Take the following protective measures upon discovery of sites.

- Cease ground disturbing activities immediately and report to the Cultural Resources Manager upon discovery of potential cultural deposits.
- Consider alternatives for moving the project to another location.
- If cultural resources or human remains are determined by the Cultural Resources Manager, in consultation with SHPO and tribes, to be of no cultural significance, do no further investigation and resume the project. Protect the site until such time that it is determined ineligible for the National Register of Historic Places. If determined to be significant then avoid or mitigate effect.

Objective 6. Use natural resources techniques and projects to protect cultural resources sites.

5.6 National Environmental Policy Act Implementation

The National Environmental Policy Act was created to disclose environmental concerns with human activities and resolve them to the best degree possible. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions. NEPA regulations (32 CFR Part 651, *Environmental Analysis of Army Actions*) require mitigation or full disclosure of damage to the environment. NEPA was not legislated to stop actions. Rather, it was crafted to identify environmental problems, providing an opportunity to resolve them using planning at early stages of project development.

5.6.1 General

Responsibility

The Environmental Technology Office of the West Desert Test Center is responsible for ensuring that appropriate environmental documentation is prepared and reviewed for all mission-related actions (*e.g.*, new technology/equipment testing, military training, construction projects, and real property actions). The DEP reviews NEPA documents for all federal actions.

The proponent of an action is ultimately responsible for complying with NEPA on all proposed actions on DPG under 32 CFR Part 651. If an action is a joint effort between several federal agencies, a lead agency is designated to supervise preparation of the environmental document. With the exception of Natural Guard and Reserve training, DPG is the lead agency for all military actions. Additionally, the lead agency concerning a natural resource activity (*e.g.*, burning) depends on the area in which the action will be performed. All NEPA documents are reviewed by Army personnel and by Environmental Coordinators.

Decisive planning and coordination are essential for the military mission to be successful. NEPA is an integral part of the planning and environmental review process. Early coordination and an understanding of the proponent's requirements enhance the ability to adequately assess the potential for adverse environmental impacts, ultimately improving overall mission accomplishments while ensuring environmental compliance.

NEPA Documentation

The most common type of Army NEPA document is a Record of Environmental Consideration (REC). Some RECs utilize a Categorical Exclusion (CX). This simple documentation generally works well for routine projects where natural sites are not damaged.

When conditions for a CX are not met, the most likely scenario is preparation of a REC. If potentially more extensive or significant environmental impacts are identified, an Environmental Assessment (EA) or Environmental Impact Statement (EIS) may be required. This can happen when a large construction project is planned, when the action involves a wide geographic area, or when wetlands or other sensitive plant or animal communities may be involved. Examples include major LRAM projects, new military missions, or major construction. EAs require the Commander's approval, publishing a Finding of No Significant Impact (FONSI), and a30 day public comment period.

If a FONSI is not appropriate, the following options are available:

- modify the action to remove significant impacts;
- mitigate significant adverse impacts;
- drop the action; or
- publish a Notice of Intent to prepare an Environmental Impact Statement.

The *Integrated Natural Resources Management Plan* (Dugway Proving Ground 2001a) included NEPA analysis and documentation for the natural resources program. The EA within the 2006-2010 INRMP further fulfilled this NEPA requirement.

Mitigation
Mitigation is an excellent way to either consider less damaging options or provide means to off-set damage to the environment and should be considered throughout the NEPA process. Below are five general mitigation tactics:

Avoidance: Avoid adverse impacts on natural resources by not performing activities that would result in such impact. Confine construction or other activities to areas where no significant impact would occur to natural resources.

Limitation of action: Reduce the extent of an impact by limiting the degree or magnitude of the action. Minimize impacts of construction projects or other activities by arranging timing, location, and magnitude of actions so that they have the least impact on natural resources.

Restoration of the environment: Restore the environment to its previous condition or better. This could involve reseeding and/or replanting an area with native plants after it has been damaged by construction projects or military activities.

Preservation and maintenance operations: Design the action to reduce adverse environmental effects. This could involve actions such as monitoring and controlling pollution, contamination, disturbance, or erosion caused by construction projects or military activities that would impact natural resources.

Replacement: Replace the resource or environment that will be impacted by construction projects or other military activities. Replacement can occur in-kind or otherwise, on-site, or at another location. This could involve creation of the same type or better quality habitat for a particular impacted fish or wildlife species or creation of habitat for another species. If this strategy is used, a consideration should be that replacement for any relatively intact habitat almost without exception, results in a net loss of habitat.

Mitigation that is identified in a FONSI is a "must fund" for environmental purposes. This provides a reliable mechanism to fund mitigation included in NEPA documents.

5.6.2 NEPA and Natural Resources Management

5.6.2.1 Current Management
The Environmental Technology Office prepares NEPA documents for West Desert Test Center mission and ITAM projects. However, as part of the planning process the Environmental Technology Office conducts environmental reviews and, following the planning and decision making process, often assists in preparing the appropriate NEPA documentation. The environmental review is conducted by an interdisciplinary team that investigates the proposed action for potential impacts to land, water, vegetation, air, quality-of-life, cultural resources, etc. Recommendations for avoidance, minimization, and mitigation are made through this process.

Conservation/Preservation Division personnel are involved in the planning and design phase of many projects. Involvement at this point of the planning process allows personnel to suggest and promote alternative actions and to make recommendations for avoidance of impacts and possible mitigation scenarios. NEPA will ensure that INRMP activities are properly assessed and planned to avoid and minimize impacts.

5.6.2.2 Proposed Management

Project: Use of NEPA
Driver: Compliance with NEPA and other federal laws affected by individual projects, stewardship
Project Timing: Objectives - ongoing indefinitely
Regulatory Coordination: None

Goal 1. Use NEPA to identify projects and activities on DPG that might impact natural resources and work with project planners to resolve issues early in the planning process.

Goal 2. Use NEPA to ensure this INRMP is documented according to the spirit and letter of NEPA.

Goal 3. Help DPG comply with NEPA.

Objective 1. Document effects of implementation of this INRMP through an incorporated EA.

Objective 2. Reference this INRMP and its associated EA in descriptions of affected environment to reduce verbiage in other NEPA documents.

Objective 3. Classify mitigation as a "must fund" for budgetary purposes.

Objective 4. Ensure mitigation and monitoring measures identified in NEPA documents are implemented.

6.0 UNRESOLVED ISSUES

It is not unusual for some natural resources-related issues to be at a stage where the path to issue resolution is unknown or uncertain. Section 3.3.1.8, *Wetlands* discusses an issue regarding the applicability of the Clean Water Act to DPG. The conclusion of a 2004 leagal opinion was that the Clean Water Act is not applicable to DPG since the act applys to "navigable water" and DPG does not have any of the five categories of water included in the definition. And since the Clean Water Act does not apply there are no "Waters of the United States" on DPG. Because wetlands fall under the legal jurisdiction of the Clean Water Act, wetland designations may also not apply to DPG. DPG should request that the U.S. Army Corps of Engineers conduct a review of DPG waters to determine if there are any Clean Water Act waters on the installation. DPG should also continue to monitor related legislative developments and federal cases that are pending.

7.0 IMPLEMENTATION

This INRMP is only as good as DPG's capability to implement it. This INRMP was prepared with a goal of 100% implementation. Below are described the organization, personnel, and funding needed to implement programs described in chapters 4, 5, and 7.

7.1 Organization

The DEP can implement much of this INRMP and fulfill general goals and policies established in Chapter 1 and more specific goals and objectives within chapters 4-5. Other DPG organizations identified in Section 2.1, particularly the Environmental Technology Office, are also capable of implementing their portions of this INRMP with no organizational changes, although they may elect to make changes during 2016-2020 for improved operations efficiency.

7.2 Personnel

7.2.1 INRMP Implementation Staffing and Training

AR 200-1 states that major commands will "*Implement the INRMP by ensuring that sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP"* and installations will "*Actively [request], [receive], and [use] funds for priority projects and activities.*"

Section 107 of the Sikes Act mandates that "… *the Secretary of each military department shall ensure that sufficient numbers of professionally trained natural resources management personnel and natural resources law enforcement personnel are available and assigned responsibility to perform tasks necessary to carry out this title, including the preparation and implementation of integrated natural resources management plans*." 32 CFR Section 190.3 provides a definition of a natural resources professional.

7.2.1.1 Current Management

The following staffing is available to implement this INRMP at DPG:

Chief Environmental Programs Division
NEPA Coordinator
Wildlife Biologist
Natural Resource Specialists
Cultural Resource Manager
Geographer
ITAM Coordinator
Rangeland Ecologist/Botanist
Seasonal Technicians

DPG has a goal to continuously improve the success of natural resources management activities through professional development and information exchange. This will be accomplished by:

- maintaining staff knowledge of management strategies at the current state of the art through training and participation in workshops, research presentations, and other activities of regional and national professional natural resources research and conservation programs; and
- sharing information with natural resources experts to ensure maximum benefits of adaptive management and research efforts.

DPG plans to send one person to the following annual workshops or professional conferences as schedules and budgets allow:

- National Military Fish and Wildlife Association annual workshop (concurrent with the North American Wildlife and Natural Resources Conference),
- North American Wildlife and Natural Resources Conference,
- The Wildlife Society Conference,
- The Utah Chaptor of the Wildlife Society Meeting
- Partners in Flight national, regional, and state meetings (often in conjunction with other listed meetings),
- Northwest Region Installation Management Agency training sessions, and

Other conferences/workshops will be evaluated for their usefulness, and decisions will be made based on appropriateness to ongoing projects and funding availability. Projects that are especially useful include invasive species workshops, ecosystem restoration workshops, NEPA and GIS training.

7.2.1.2 Proposed Management

Project: INRMP Implementation Staffing and Training
Driver: Compliance with Sikes Act (implementation of INRMP) and other federal laws affected by this INRMP, support of the military mission, stewardship
Project Timing: All objectives - ongoing indefinitely
Regulatory Coordination: None directly

Goal 1. Provide staffing of natural resource management professionals required to effectively manage natural resources on DPG (Department of Army 1995a).

Objective 1. Provide staffing for the DPG natural resources program to effectively implement this INRMP.

Objective 2. Hire a rangeland ecologist/botanist, natural resources coordinator, seasonal natural resources technician, and GIS analyst.

Goal 2. Provide training to natural resources personnel implementing this INRMP.

Objective 3. Encourage natural resources personnel to join professional societies and their state/regional chapters as well as be active in them.

Objective 4. Send at least one person to each of the annual workshops or professional conferences discussed above.

Objective 5. Evaluate other conferences/workshops for their usefulness as training tools, and send personnel to those most justified, based on current training needs and those most related to DPG activities.

Objective 6. Ensure that natural resources personnel obtain the one-time or occasional refresher training needed to fulfill job requirements (*e.g*., GIS user training, wildland fire training, NEPA training, endangered species documentation/consultation training).

Objective 7. Actively participate in training sessions to disseminate knowledge learned at DPG.

7.2.2 External Assistance

7.2.2.1 Current Management

The rapid development of natural resources management combined with military personnel cutbacks have resulted in the highest need ever for outside assistance with natural resources programs. The growth of environmental compliance requirements has increased many of these needs and added considerably to the need for specialized external assistance in other areas, including on-the-ground personnel support. It is impossible for DPG to hire the specialized expertise needed for some projects within this INRMP. DPG will require expertise from universities, agencies, and contractors to accomplish tasks within this INRMP. DPG will reimburse parties for much of this assistance.

Personnel Assistance

The ***Intergovernmental Personnel Act*** of 1972 is a system whereby a federal or state agency "borrows" personnel from other federal or state agencies, including universities, for a limited term and a specific job. If used, DPG would pay the borrowed employee's salary and administrative overhead. Thus, borrowed employees could cost about 25-30 percent more than inhouse employees. Major advantages are that personnel are directly supervised by the DEP, and manpower billets are not required. Intergovernmental Personnel Act agreements are used throughout DoD for assistance with research, management, and administration.

Another "borrowed personnel" option is through the ***Oak Ridge Institute of Science and Education***. Oak Ridge Institute of Science and Education involves colleges and universities and a management and operating contractor for the U.S. Department of Energy. The program offers students, post-graduates, and associate degree graduates opportunities to gain experience in their respective fields. Stipends are equivalent to salaries for employees hired with similar educational backgrounds, and a 30% overhead is added. The normal limit on individual Oak Ridge Institute of Science and Education personnel is three years. Installations may assist in the selection of Oak Ridge Institute of Science and Education personnel.

The Conservation Assistance Program of the ***Student Conservation Association*** is available to provide graduate students to work on specific projects at DPG. These programs do not require the payment of salaries but do require per diem and housing for participants.

Volunteers are another potential source of personnel assistance at DPG.

Other Agency Assistance

DPG recognizes the importance of cooperating with federal and state agencies. Sections 2.3 and 2.4 identify other agencies and organizations with whom DPG has cooperatively worked in recent years. DPG will use state and federal agencies, particularly this INRMP's signatory partners, the USFWS and the UDWR, to assist with implementation of various aspects of this INRMP.

University Assistance

Much research done on DPG is through universities (Section 2.7). Some research is used to fulfill graduate degree requirements. The Sikes Act Improvement Act facilitates the use of university research since the proposed language exempts implementation of INRMPs from provisions of the Economy Act, which requires strict competition for services.

Other Support

Contractors give DPG access to a wide variety of specialties and fields. A variety of projects could use the support of contractors in the next five years. Contractor and other sources of support will be evaluated on a case-by-case basis during the next five years.

7.2.2.2 Proposed Management

There is no requirement for a specific project for external assistance since objectives within this area are included within other projects of this INRMP. However, the below goal and objectives are appropriate to list.

Goal. Provide external specialized skills, personnel, and resources to support the DPG natural resources program.

Objective 1. Implement external support projects, which are described in more detail in appropriate sections of this INRMP.

Objective 2. Consider using Intergovernmental Personnel Act, Oak Ridge Institute of Science and Education, Student Conservation Association, and/or volunteers for personnel assistance.

Objective 3. Use state and federal agencies, particularly INRMP signatory partners, the USFWS and UDWR to assist with implementation of this INRMP.

Objective 4. Use universities to assist with implementation of this INRMP.

Objective 5. Use contractors to assist with implementation of this INRMP.

7.3 Data Storage, Retrieval, and Analysis

The capability to store, retrieve, and analyze data is central to professional management of natural resources, and it is essential to implementing the adaptive management aspect of ecosystem management. DPG is committed to providing efficient, cost-effective systems for data storage and analysis.

7.3.1 Current Management

Microcomputer System

Microcomputers are essential to the routine operation of efficient natural resources management organizations. The volume of data is too substantial to handle without computers, and routine administrative tasks are accomplished considerably more efficiently with computers.

The Conservation/Preservation Division is well-equipped with regard to microcomputers, having quality personal computers with appropriate printers and other peripherals. There are no major needs with regard to this system beyond normal upgrades and replacement of hardware and software.

Geographic Information System

A GIS allows users to manipulate spatial data (*e.g.* maps, aerial photos, satellite images) in a similar fashion as a data management program allows the analyses and presentation of mathematical data. Data can be purchased and converted into most software formats, or it can either be scanned or digitized directly from maps or aerial photographs. A GIS can analyze different map layers to show the relationship of one map layer to another.

The DEP has a GIS with a full time operator. The system uses ESRI software. Numerous data layers have been developed on the DEP GIS. The GIS program has continued to evolve and provides a significant amount of analysis as opposed to simply generating maps. The ITAM program also has a full time GIS operator which provides support to mission and training activities per the SRP/ITAM mission.

Remote Imagery
The oldest aerial imagery of portions of DPG is from 1939 from the BLM. These have been digitized into the DEP GIS. In 2001, 3-foot orthorectified, color, 1: 6,000 scale aerial photos were made available digitally. In 2009 commercial aerial photography of Dugway Proving Ground was collected and made available in 1-meter ground resolution for the entire installation and 25-centimeter resolution for select locations within the installation. These are true-color, georectified, and available as a GIS layer. Plans are currently in place to update the digital imagery within the near future.

7.3.2 Proposed Management

Project: Data Storage, Retrieval, and Analysis
Driver: Sikes Act (implementation of INRMP) and other federal laws affected by this INRMP, support of the military mission, stewardship
Project Timing: All objectives - ongoing indefinitely
Regulatory Coordination: None

Goal. Store, analyze, and use data in an efficient, cost-effective manner.

Objective 1. Upgrade microcomputer hardware and software as needed.

Objective 2. Develop or obtain databases needed to support DPG natural resources programs, such as areas of sensitivity.

Objective 3. Provide desktop GIS to all appropriate natural resources personnel.

Objective 4. Continue to make use of analytical capabilities of the DPG GIS to provide natural resources management options.

Objective 5. Create user-friendly interfaces to enable a wider use of GIS databases specific to needs of installation users.

Objective 6. Regularly replace or upgrade GIS and imagery hardware and software to maintain the capability to use developing GIS technology.

Objective 7. Require all spatially related data be stored on, or accessible to, the GIS.

Objective 8. Provide periodic on-site, system support to guarantee minimal downtime.

Objective 9. Provide periodic system support for hardware security and communications including data backups and network communications.

Objective 10. Use remote imagery for improved decision-making for military activities, environmental management, and natural and cultural resources management and protection.

Objective 11. Update aerial photographs and/or other imagery as needed.

7.4 Project/Program Summary

Projects, goals, and objectives within this INRMP can be used to monitor the effectiveness of natural resources management at DPG. Appendix 7.4 contains a list of projects, goals, and objectives for this INRMP in the order they appear. Goals and objectives are abbreviated from chapters 4, 5, and 7.

7.5 Implementation Funding Options

Natural resources management relies on a variety of funding mechanisms, some of which are self-generating and all of which have different application rules. Below are general discussions about different sources of funding available to implement this INRMP.

7.5.1 Sikes Act Funds

Sikes Act funds are collected via sales of licenses to hunt, fish, and trap. They are authorized by the Sikes Act and regulated via AR 200-1, Chapter 4 (Department of the Army 2007). These funds may be used only for the protection, conservation, and management of fish and wildlife on the installation where they are collected, in accordance with this INRMP. They have no year-end (unobligated funds carry over on 1 October). DPG annually generates a small amount of Sikes Act funds. Army policy encourages self-sufficiency with regard to managing game populations on military lands. DPG will periodically examine options to increase Sikes Act income to maintain the hunting program.

7.5.2 Environmental Funds

Environmental funds are a special subcategory of Operations and Maintenance funds. They are set aside by the Department of Defense for environmental purposes but are still subject to restrictions of Operations and Maintenance funds. Compliance with laws is the key to getting environmental funding. Environmental funds are most commonly used for projects that return the installation to compliance with federal or state laws, especially if noncompliance is accompanied by Notices of Violation or other enforcement agency actions.

"Must fund" classifications include mitigation identified within *Findings of No Significant Impact* and items required within Federal Facilities Compliance Agreements. This INRMP is a Federal Facilities Requirement Agreement, and some projects and programs within it are used to mitigate various military activities. In addition, 1997 amendments to the Sikes Act require implementation of INRMPs, which make implementation of this INRMP a priority for funding. Section 1.4.1, *Sikes Act* contains specific Sikes Act-listed requirements for this INRMP.

Table 7.5.2 lists projects and environmental funding requests submitted by DPG DEP for implementation of this INRMP during 2016-2020.

Table 7.5.2 Environmental Funds Projects

Project	INRMP Section	FY 16*	FY 17*	FY 18*	FY 19*	FY 20*	
Ecosystem Management Coordination	4.1.1	Funded within INRMP Implementation Staffing and Training project					
Integrated Natural Resources Management Planning	4.1.2	Funded within INRMP Implementation Staffing and Training project					
Soils Management	4.3.2	Funded within INRMP Implementation Staffing and Training project or by another organization					
Water Resources Management	4.4.2	Funded within INRMP Implementation Staffing and Training project					
Habitat Management (Biodiversity index)	4.5.2	Funded within Habitat Management and Wildlife Management projects					
Wildlife Management (Big game/urban) (PLS vertebrates) (PLS avian) (PLS invertebrates)	4.6.2	Funded within Habitat Management and Wildlife Management projects					
Federal-listed Species Management**	4.7.1	Funded within INRMP Implementation Staffing and Training project					
Nonfederal-listed Species Management	4.7.2	Funded within Habitat Management and Wildlife Management projects					
Special Interest Area Management	4.8	Funded within INRMP Implementation Staffing and Training project					
Pest Management Support	4.10	Funded within INRMP Implementation Staffing and Training project or by another organization					
Cantonment Area Management Support	4.11	Funded within INRMP Implementation Staffing and Training project					
Fire Management	4.12	Funded within INRMP Implementation Staffing and Training project or by another organization					
Natural Resources Enforcement	5.2	Funded within INRMP Implementation Staffing and Training project or by another organization					
Conservation Awareness	5.3	Funded within INRMP Implementation Staffing and Training project					
Outdoor Recreation	5.4	Funded within INRMP Implementation Staffing and Training project or by another organization					
Cultural Resources Protection	5.5	Funded within INRMP Implementation Staffing and Training project					
Use of NEPA	5.6	Funded within INRMP Implementation Staffing and Training project					
INRMP Implementation Staffing Training Invasive Species Management	7.2.1 7.2.1 4.5.2	Funded within INRMP Implementation Staffing and Training project					
External Assistance	7.2.2	Funded within INRMP Implementation Staffing and Training project					
Data Storage, Retrieval, and Analysis	7.3	Funded within INRMP Implementation Staffing and Training project or by another organization					

*Funding needs would increase if these species were discovered or a known species status changed.

7.5.3 Operations and Maintenance Funds

Certain projects within this INRMP are either partially or fully funded with Operations and Maintenance Funds, through the Directorate of Installation Support. *Pest Management* (Section 4.10) is in this category. Most general pest management is not a part of this INRMP, and the Pest Management program maintains their own Integrated Pest Management Plan

7.5.4 Training Funds

Historically, DPG was a Category II installation with regard to ITAM implementation and funding. However, under AR 350-19, the classification process is currently being revised. ITAM funding requests are submitted via the Integrated Workplan Analysis Module (IWAM).

7.5.5 Other Funding

The portions of the outdoor recreation program that are not directly involved with hunting are funded through the nonappropriated funds and are not included within the INRMP costs.

7.6 Command Support

Command support is essential to implementation of this INRMP. Many projects for natural resources management within the next five years require command support. The Commander is personally liable for noncompliance with environmental laws, if he willfully or carelessly violates those laws, such as those affected by this INRMP. Thus, he has a personal interest in ensuring that this INRMP is properly implemented.

This INRMP has the support of the Dugway Proving Ground Commander and other personnel in command positions who are needed to implement this INRMP. The Command is dedicated to implementation of this INRMP as required by the Sikes Act and other federal laws. Just as importantly, the Command is dedicated to maintaining and improving the military mission at Dugway Proving Ground. Implementation of this INRMP is a means to that end.

8.0 ENVIRONMENTAL CONSEQUENCES

This section of the document assesses known, potential, and reasonably foreseeable environmental consequences related to implementing the INRMP and managing natural resources at DPG. Section 8.1, *Impacts Common to Both Alternatives* lists areas where neither the No Action Alternative (***Management before 2006***) (*i.e.*, the DPG INRMP would not be implemented and current natural resource management practices at DPG would continue as described in the previous INRMP (Dugway Proving Ground 2001a)) nor the Preferred Alternative (***Proposed Management***) (*i.e.*, implementation of the INRMP) would discernibly affect resources. Section 8.2, *Environmental Consequences Analyses* addresses implementation of both alternatives on other environmental resources. This assessment considered implementation of management measures in their entirety (as summarized in Appendix 7.4). Cumulative effects are discussed in Section 8.3, *Cumulative Impacts*. A summary of potential environmental consequences associated with the No Action Alternative and the Preferred Alternative is presented in Section 8.4, *Summary of Potential Environmental Consequences*.

As discussed in Section 1.6.4, *Alternatives*, the environmental assessment addresses two alternatives: ***Proposed Management*** (Preferred Alternative) and ***Management before 2006*** (No Action Alternative). Other management alternatives were considered during the screening process (Section 1.6.5, *Issues Not Considered to Be Potentially Significant*) but eliminated because they were economically infeasible, ecologically unsound, or incompatible with requirements of the military mission.

The DPG INRMP is a living document that focuses on a 5-year planning period based on past and present actions. Short-term management practices included in the plan have been developed without compromising long-range goals and objectives. Because the plan must be reviewed and approved at least every five years or when major changes are made to the natural resources program, additional environmental analyses may be required as new management measures are developed over the long-term (*i.e.*, beyond 5 years).

8.1 Impacts Common to Both Alternatives

The Preferred Alternative is the professionally-guided evolution of programs within the No Action Alternative. Thus, both alternatives are similar in their effects with the primary difference being one of improvements in managed resources under the Preferred Alternative with many impacts to resources being similar.

No discernable adverse effects were identified or anticipated for the No Action Alternative or the Preferred Alternative for the following environmentally-related areas: Physiography, Topography, and Geology; Petroleum and Minerals; Climate; Air Quality; Noise Environment; Hazardous and Toxic Materials; Facilities, Public Services, and Utilities; Socio-economics; Environmental Justice; and Environmental Health and Safety Risks for Children (Section 1.6.5, *Issues Not Considered to Be Potentially Significant*).

8.2 Environmental Consequences Analyses

Expected consequences of the No Action and Preferred alternatives for each resource area are presented in the following paragraphs.

8.2.1 Soils

Under both alternatives, soil integrity is managed and protected through planning via the NEPA, implementation of appropriate vegetation management practices, and the ITAM program. Examples of actions that would create significant impacts to soils on DPG would be unrestricted off-road vehicle travel and construction activities (*e.g.*, expanded test centers, cantonment area, improved roads). Neither alternative would create conditions that lead to significant impacts to soils.

No Action Alternative (Management before 2006)
Beneficial effects would be expected to continue under the No Action Alternative. However, the No Action Alternative offers a less comprehensive program for the control and repair of damaged soils than the Preferred Alternative. Implementation of the No Action Alternative would involve more reactive management to problems after their occurrence, rather than managing the resource to prevent impacts or to minimize the extent of unavoidable impacts.

Preferred Alternative (Implementation of the INRMP)
Beneficial effects would be greater under the Preferred Alternative. This Alternative offers a more comprehensive program for the control and repair of damaged soils than the No Action Alternative. For example, the LRAM program has potential for improvement; particularly as the road management plan is completed and implemented, thus reducing road- and trail-related erosion. The potential fencing of springs to exclude feral horses would reduce damage to spring areas and other sensitive resources, such as cryptogammic crusts. Proposed research and protection of cryptogammic crusts would further understanding and potential management of these unique resources.

8.2.2 Water Resources
Under both alternatives, surface water quality requirements are met through planning via NEPA and the LRAM component of the ITAM program. Groundwater and surface water quality are maintained through various pollution prevention programs as well as treatment and control of discharges.

Since surface waters and related wetlands are regulated by executive order and federal and state laws and regulations, significance criteria are determined by compliance with these legal mandates as well as stewardship responsibilities associated with public lands.

Activities affected by both alternatives have some potential to affect surface waters and wetlands (*e.g.*, improper road maintenance, oil spills) but not to the degree of other activities at DPG, such as military training. Neither alternative is more prone than the other to such impacts. Neither alternative would create conditions that lead to significant impacts to surface waters, wetlands, or water quality.

No Action Alternative (Management before 2006)
Beneficial effects would be expected to continue. However, the No Action Alternative offers a less comprehensive program than the Preferred Alternative for the control and repair of damaged or naturally highly erodible areas. Consequently, surface waters would be affected to a greater degree than under the Preferred Alternative. Under the No Action Alternative, brief periods of increased erosion, and possibly minor waterway sedimentation, would occur during damaged site maintenance and rehabilitation activities, but these potential surface water impacts would be more than compensated through increased environmental awareness while training; use of hardened roads, trails, and firing points; training restrictions for vehicle movement and areas of operation; and including natural resources implications in military project planning. The No Action Alternative would not affect groundwater.

Preferred Alternative (Implementation of the INRMP)
Beneficial effects would be expected. The Preferred Alternative offers a more comprehensive program for the control and repair of damaged or naturally highly erodible areas than the No Action Alternative. Consequently, sedimentation of surface waters would be decreased under the Preferred Alternative. Under the Preferred Alternative, brief periods of increased erosion, and possibly minor waterway sedimentation, would occur during damaged site maintenance and rehabilitation activities, but these potential surface water impacts would be more than compensated through increased environmental awareness while training; use of hardened roads, trails, and firing points; training requirements for vehicle movement and areas of operation; and including natural resources implications in military project planning. The Preferred

Alternative offers effective protection and mitigation for damages incurred to surface water via soil erosion due to the Army mission. The Preferred Alternative would not affect groundwater.

8.2.3 Flora

Native plant species and communities are managed and protected through planning via NEPA, habitat management, invasive species management, and other programs described in this INRMP. Protection and management of native plant species and communities at DPG are influenced by ecosystem management and biodiversity conservation principles, federal laws and executive orders, and general stewardship requirements associated with public lands, upon which significance criteria are determined. Examples of actions that would create significant impacts to native plant species and communities on DPG include:

- fragmentation, loss, or degradation of high quality natural areas or sensitive sites;
- long-term net loss of sensitive vegetative communities;
- local extirpation of rare or sensitive plant species; and/or
- the introduction or increased prevalence of undesirable non-native species.

Both alternatives have the same requirements to comply with federal laws (*e.g.*, Sikes Act, Endangered Species Act) and regulations, executive orders 11990 (*Protection of Wetlands*) and 13112 (*Invasive Species*), and policy requirements to conserve native species biodiversity to maintain ecosystem functionality. Neither alternative would create conditions that lead to significant impacts to flora.

No Action Alternative (Management before 2006)

General. Beneficial effects would be expected to continue. However, the No Action Alternative would be less effective than the Preferred Alternative since it has less reliance on adaptive management. Management would achieve compliance with laws, but it would not provide as many benefits to biological resources as an updated INRMP.

Special Status Flora and Special Interest Areas. Special status flora and sites designated as special interest areas would be afforded protection under the No Action Alternative. Therefore, there would be beneficial effects regarding protection of special status flora and special interest areas as a result of implementing this alternative. However, designation of additional special interest areas would not occur and plans for protection and/or management would not be developed.

Wetlands. If wetland designations were determined to apply to DPG, beneficial effects would be expected. DPG would minimize impacts that could result from training and other mission-related activities using the NEPA process and fully comply with wetland protection requirements.

Preferred Alternative (Implementation of the INRMP)

General. Beneficial effects would be expected. The Preferred Alternative would use newer technology and scientific information and rely heavily on adaptive management to improve flora protection and restoration projects. Implementation of the INRMP under this alternative would include responses to current needs to support the military mission as well as site-specific responses to environmental compliance. It would implement natural resources monitoring, as well as proactive, long-term programs to more systematically improve floral resources in general. Improvements in the use of more native species would improve flora restoration programs. Implementation of improvements to invasive species management would improve floral resources in this ecosystem.

Special Status Flora and Special Interest Areas. Special status flora and sites designated as special interest areas would be afforded protection under the Preferred Alternative. Therefore, there would be beneficial effects regarding protection of special status flora and special interest areas as a result of implementing this alternative. Protection of existing special interest areas would continue, and additional areas would be designated for protection and/or management plans would be developed.

Wetlands. If wetland designations were determined to apply to DPG, beneficial effects would be expected. DPG would minimize impacts that could result from training and other mission-related activities using the NEPA process and fully comply with wetland protection requirements.

8.2.4 Fauna

The management of wildlife at DPG is influenced by ecosystem management and biodiversity conservation principles, federal laws and executive orders, state laws, and general stewardship requirements associated with public lands, upon which significance criteria are determined. Examples of actions that would create significant impacts to wildlife on DPG include:

- local population-level impacts (*e.g.*, potential to reduce local populations below self-sustaining levels, or long-term loss or impairment of substantial portions of local habitat [species-specific]);
- direct impacts/disturbance to birds protected by the Migratory Bird Treaty Act; and/or
- direct impacts/disturbance to sensitive species (Table 3.3.2.5).

Neither alternative would create conditions that lead to significant impacts to fauna.

No Action Alternative (Management before 2006)

General. Beneficial effects would be expected to continue to both game and nongame species. However, under the No Action Alternative, the health and condition of wildlife populations would be less improved, and management measures to increase the abundance and biodiversity of wildlife at DPG would be implemented to a lesser degree. In addition, management measures to protect and enhance wildlife habitats would be implemented to a lesser extent, thereby increasing the quality and complexity of habitats to a lesser degree. Above discussions involving soils, water resources, and flora would also apply to native fauna that require good soils, unpolluted waters, and quality habitat.

Special Status Fauna. Beneficial effects would be expected to continue for special status species not federal-listed. However, the No Action Alternative provides less extensive measures for the protection and management of these species (such as management plans for special interest areas with these species). There would be few, if any, studies and surveys for these species. Federal-listed species management would be identical under both alternatives due to legally mandated requirements associated with the Endangered Species Act.

Preferred Alternative (Implementation of the INRMP)

General. Beneficial effects would be expected for both game and nongame species. Compared to the No Action Alternative, implementation of the Preferred Alternative would improve the health and condition of wildlife populations to a greater degree, and management measures to increase the abundance and biodiversity of wildlife at DPG would be improved. In addition, management measures to protect and enhance wildlife habitats would be improved, further increasing the quality and complexity of habitats. Removal of deer and pronghorn from the English Village cantonment area would benefit both these game species and cantonment habitats. Above discussions involving soils, water resources, and flora would also apply to native fauna that require good soils, unpolluted waters, and quality habitat.

Special Status Fauna. Beneficial effects would be expected for special status species not federal-listed. Compared to the No Action Alternative, the Preferred Alternative provides more extensive measures for the protection and management of these species. The Preferred Alternative includes provisions to identify threats to nesting and migratory birds to prevent or minimize these threats. There would be surveys for these species, and chances for incidental findings as a part of other surveys would be enhanced. Federal-listed species management would be identical under both alternatives due to legally mandated requirements associated with the Endangered Species Act.

8.2.5 Cultural Resources

Since cultural resources and their protection/management are regulated by federal laws and national policy, significance criteria are determined by compliance with these laws and policies. An example of an action that would create significant impacts to cultural resources on DPG is irretrievable or irreversible damage to a prehistoric or historic site that is listed or is eligible for listing on the National Register of Historic Places. Neither alternative would create conditions that lead to significant impacts to cultural resources.

No Action Alternative (Current Management)

The No Action Alternative would have slightly beneficial effects on cultural resources. DPG must comply with laws and policies related to cultural resources, and in this respect both alternatives would be similar in their effects. However, the amount of erosion control, which has the potential to protect cultural resources, would be lessened as a result of fewer projects under the No Action Alternative.

Preferred Alternative (Implementation of this INRMP)

The Preferred Alternative would have slightly beneficial effects on cultural resources. DPG must comply with laws and policies related to cultural resources, and in this respect both alternatives would be similar in their effects. However, the amount of erosion control, which has the potential to protect cultural resources, would be greater under the Preferred Alternative.

8.2.6 Outdoor Recreation

DPG is required by the Sikes Act to provide sustainable use by the public of natural resources to the extent that use is not inconsistent with the needs of fish and wildlife resources or requirements to ensure safety and military security. Significance criteria are determined by compliance with the Sikes Act. An example of an action that would create significant impacts to recreation opportunities on DPG is a substantial decrease in the availability of recreational resources relative to historic baselines. Neither alternative would create conditions that lead to significant impacts to outdoor recreation.

No Action Alternative (Current Management)

Beneficial effects would be expected to continue, particularly for game species related to hunting. Game management programs are established and, when allowed to be conducted, are done so in cooperation with UDWR.

Preferred Alternative (Implementation of this INRMP)

Beneficial effects would be expected, particularly regarding game species related to hunting. Game management programs are established and, when allowed to be conducted, are done so in cooperation with UDWR. Potential expansion of the hunting area would improve the use of these renewable resources under the Preferred Alternative. Since the Preferred Alternative provides more benefits to DPG ecosystems, in general, the case could be made that outdoor recreation that uses natural environments would be generally improved.

8.2.7 Summary

No Action Alternative (Current Management)
The DPG natural resources program, as previously and currently conducted, has no significant negative impacts to environmental and related resources. However, there are areas where improvements could be made, and some programs could take advantage of new scientific information and improved technologies. Therefore, implementation of the No Action Alternative in 2006 was not favored.

Preferred Alternative (Implementation of this INRMP)
The DPG natural resources program has areas where improvements could be made, and some programs could take advantage of new scientific information and improved technologies. The Preferred Alternative achieves these improvements. Therefore, implementation of the Preferred Alternative was favored. These findings are consistent with goals of the natural resources management program to maintain ecosystem functionality and ensure the sustainability of desired military testing and training conditions. The nature of the management measures recommended by the INRMP, if implemented, would directly and positively affect the health and condition of natural resources at DPG.

8.3 Cumulative Impacts

A cumulative effect is defined as an effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place locally or regionally over a period of time.

Implementation of the INRMP has resulted in a comprehensive environmental strategy for DPG that represents compliance, restoration, prevention, and conservation; improves the existing management approach for natural resources on the installation; and meets legal and policy requirements consistent with national natural resources management philosophies. Implementation has improved environmental conditions at DPG, both in the short- and long-term, as shown by the potential for beneficial effects in Table 8.4. Over time, adoption of the Preferred Alternative has enabled DPG to achieve its goal of maintaining ecosystem viability and ensuring sustainability of desired military testing and training conditions. Any cumulative effects of implementing either alternative would be beneficial.

This INRMP, by design, incorporates current installation planning documents and management plans and is to be reviewed and updated routinely. INRMPs are designed to follow an ecosystem approach, which involves establishing partnerships with federal, state, and local groups. These actions further reduce the possibility for cumulative effects arising that are not already considered within the INRMP. By their nature, integrated planning, ecosystem management, and partnering are cumulative effects issues. As new, relevant issues or initiatives arise, either on or off-DPG, or within the state, local or regional community, they would be incorporated into the INRMP at either the annual review or five-year review periods. In this way, the INRMP is maintained as an active reference document that describes DPG's planned natural resources management for the current five-year period.

Outside of the actions included in the INRMP, there exists the possibility of several general actions that may result in cumulative effects. For example, major changes in the DPG military mission and/or major funding and/personnel reductions could interact with natural resources management initiatives at DPG and result in cumulative effects. The No Action Alternative, which would have continued natural resources management at the status quo, would have been less able to respond effectively to significant changes in military mission and/or funding cuts that interact with installation resources, so the Preferred Alternative was implemented.

The Preferred Alternative takes advantage of lessons learned during implementation of the current INRMP as well as new advances in science and technology of natural resources management. The Preferred Alternative contains sufficient flexibility in its initiatives to allow managers to modify, as necessary, their implementation approaches, schedules, etc. or to accommodate changes outside of their immediate control. Changes in mission or funding and/or personnel reductions would be readily accommodated and would be incorporated into the subsequent update of the INRMP. The updating of the INRMP could realign management intensities to better correspond to current needs and account for cumulative effects.

8.4 Summary of Potential Environmental Consequences

Table 8.4. Summary of Potential Environmental Consequences

Resource Area	Environmental Consequence*	
	No Action Alternative	**Preferred Alternative**
Physiography, Topography, and Geology	No Effect	No Effect
Petroleum and Minerals	No Effect	No Effect
Noise Environment	No Effect	No Effect
Climate	No Effect	No Effect
Facilities, Public Services, and Utilities	No Effect	No Effect
Hazardous and Toxic Materials	No Effect	No Effect
Socioeconomic Environment	No Effect	No Effect
Environmental Justice	No Effect	No Effect
Protection of Children	No Effect	No Effect
Soils	Beneficial	More Beneficial
Water Resources	Beneficial	More Beneficial
Air Quality	Less Beneficial	Beneficial
Flora (General)	Beneficial	More Beneficial
Special Status Flora and Special Interest Areas	Beneficial	More Beneficial
Wetlands	Beneficial	Beneficial
Fauna (General)	Beneficial	More Beneficial
Special Status Fauna	Beneficial	More Beneficial
Cultural Resources	Slightly Beneficial	Slightly Beneficial
Outdoor Recreation	Beneficial	Beneficial
Cumulative Impacts	Beneficial	More Beneficial

* No Effect: Actions have no known demonstrated or perceptible impacts
Beneficial: Actions have apparent beneficial effects
Negative: Actions have apparent negative effects
(Note: The terms “less”, “slightly”, or “more” may be added to the terms “beneficial” or “negative” for comparison purposes between alternatives.)

8.5 Conclusions

8.5.1 INRMP Summary

This document reflects the commitment set forth by the Army to conserve, protect, and enhance natural resources necessary to provide realistic military testing and training on DPG. The primary purpose and objective of this document is to present an implementable INRMP that guides DPG in meeting mission requirements, achieving natural resource management goals, and complying with environmental policies

and regulations. In addition, the NEPA analysis required for undertaking this major federal action (*i.e.*, implementation of this plan) is embodied within the INRMP. The resultant "planning assessment" includes a comprehensive description, evaluation, and assessment of environmental conditions and natural resources at DPG.

This INRMP is the plan that will direct the natural resources management program at DPG from 2016 through 2020. An ecosystem approach was used to develop management projects for each resource area. Implementation of management projects will maintain, protect, and enhance the ecological integrity of Army lands and biological communities inhabiting them. In addition, natural resources management measures described in this plan will protect DPG ecosystems and their components from unacceptable damage or degradation and identify and restore previously degraded habitats.

8.5.2 NEPA Findings and Conclusions

The proposed action to implement the 2006-2010 INRMP for DPG was analyzed by comparing potential environmental consequences against existing conditions. Findings indicated that potential consequences would result in either no significant adverse effects or beneficial effects on each resource area (see Section 8.2). The affected environment would not be significantly or adversely impacted by proceeding with INRMP implementation. Additionally, no significant cumulative effects would be expected.

Based on the 2006-2010 environmental assessment, full implementation of this INRMP would have no significant environmental or socioeconomic effects. Because no significant effects would result from implementation, preparation of an environmental impact statement was not required, and preparation of a Finding of No Significant Impact was appropriate.

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DISTRIBUTION LIST

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U.S. Fish and Wildlife Service, Fish Springs National Wildlife Refuge, Fish Springs, UT
Utah Department of Natural Resources, Salt Lake City, UT

ACRONYMS

AR	Army Regulation
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CX	Categorical Exclusion
DEP	Directorate of Environmental Programs
DPG	Dugway Proving Ground
DoD	Department of Defense
EA	Environmental Assessment
EPR	Environmental Program Requirements
F	Fahrenheit
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
ITAM	Integrated Training Area Management
IWAM	Integrated Workplan Analysis Module
LCTA	Land Condition Trend Analysis
LRAM	Land Rehabilitation and Maintenance
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
PL	Public Law
RTLA	Range and Training Land Assessment
SHPO	State Historic Preservation Office
SRA	Sustainable Range Awareness
TRI	Training Requirements Integration
UDWR	Utah Department of Wildlife Resources
U.S.	United States
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

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INTEGRATED NATURAL RESOURCES

MANAGEMENT PLAN

DUGWAY PROVING GROUND, UTAH

APPENDICES

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Appendix 1.4.5: Regulatory Instruments that Affect Natural Resources Management on Dugway Proving Ground

Below is a list of the most significant federal laws and regulations and other regulatory instruments that may govern implementation of this Integrated Natural Resources Management Plan.

Federal Laws

American Indian Religious Freedom Act (42 United States Code (USC) 1996-1996a)
Americans with Disabilities Act of 1990 (PL 101-336; 42 USC 12101)
Archaeological and Historic Preservation Act of 1974 (PL 93-291; 16 USC 469 *et seq*.)
Archaeological Resources Protection Act of 1979 (PL 96-95:16 USC 470aa-11)
Assimilative Crimes Act (18 USC 13)
Bald and Golden Eagle Protection Act (PL 86-70, as amended)
Clean Air Act (as amended through 1990) (42 USC 7401-7642)
Clean Water Act of 1978 (33 USC 1251-1387)
Conservation and Rehabilitation Program on Military and Public Lands (PL 93-452)
Conservation Programs on Military Reservations (PL 90-465)
Endangered Species Act of 1973 (PL 95-632, as amended)
Erosion Protection Act (33 USC 426e-426h)
Federal Facilities Compliance Act of 1992 (PL 102-386; amending 42 USC 6961)
Federal Insecticide, Fungicide and Rodenticide Act (7 USC 136 *et seq*.)
Federal Land Policy and Management Act of 1976 (PL 94-579)
Federal Water Pollution Control Act Amendments of 1972 (PL 92-522)
Fish and Wildlife Conservation Act of 1980 (PL 96-366; 16 USC 2901)
Fish and Wildlife Coordination Act (PL 85-624)
Fish and Wildlife Conservation and Natural Resource Management Programs on Military Reservation (Amends Public Law 86-797 (Sikes Act) (PL 96-561)
Hunting, Fishing and Trapping on Military Lands (an update to the Military Construction Authorization Act 10 USC 2665)
Migratory Bird Conservation Act (Chapter 257; 45 Stat 1222; 16 USC 715 *et seq*.)
Migratory Bird Treaty Act (PL 65-186; 16 USC 703 *et seq*.)
Mineral Leasing Act of 1920 (30 USC 181 *et seq*.)
Native American Graves Protection and Repatriation Act (25 USC, Section 3001 *et seq*.)
National Environmental Policy Act of 1969 (as amended, PL 91-190; 42 USC 4321 *et seq*.)
National Historic Preservation Act of 1966 (as amended, PL 89-665; 16 USC 470 *et seq*.)
Native American Graves Protection and Repatriation Act (25 USC, Section 3001 *et seq*.)
Non-game Act (PL 93-366)
Noxious Plant Control Act (PL 90-583)
Outdoor Recreation on Federal Lands (16 USC 4601{1})
Plant Protection Act of 2000 (replaces Federal Noxious Weed Act of 1973 (PL 93-629))
Sikes Act (PL 105-85, as amended through 2004; 16 USC 670 *et seq*.)
Watershed Protection and Flood Prevention Act (PL 92419;68 Stat 666, as amended & 86 Stat 667; 16 USC 1001)

Executive Orders and Presidential Memoranda

Executive Order 11593, Protection and Enhancement of the Cultural Environment
Executive Order 11987, Exotic Organisms
Executive Order 11988, Floodplain Management
Executive Order 11989, Off-Road Vehicles on Public Lands
Executive Order 11990, Protection of Wetlands

Executive Order 11991, Protection and Enhancement of Environmental Quality: Amends Executive Order 11514
Executive Order 12898, Environmental Justice
Executive Order 13007, Indian Sacred Sites
Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks
Executive Order 13148, Greening the Government through Leadership in Environmental Management
Executive Order 13175, Consultation and Coordination with Indian Tribal Governments
Executive Order 13112, Invasive Species, 1999
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds
Executive Order 13352, 69 Federal Register 52989, August 26, 2004
Presidential Memorandum, Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds (April 26, 1994)
Presidential Memorandum, Government-to-Government Relations with Native American Tribal Governments

Department of Defense (DoD) Directives/Instructions/Guidance
DoD Directive 4150.7, DoD Pest Management Program
DoD Directive 4700.4, Natural Resources Management Program
DoD Directive 4710.1, Archaeological and Historic Resources Management
DoD Instruction 4715.1, Environmental Security
DoD Directive 4715.1E, Environment, Safety, and Occupational Health (ESOH)
DoD Instruction 4715.3, Environmental Conservation Program
DoD Instruction 4715.9, Environmental Planning and Analysis
DoD Instruction 5000.13, Natural Resources
DoD Directive 6050.1, Environmental Effects in the United States of DOD Actions
DoD Directive 6050.2, Use of Off-Road Vehicles on DOD Lands
DoD Directive 7310.5, Accounting for Production and Sale of Forest Products
Department of Defense, American Indian and Alaska Native Policy
DoD Memorandum, Implementation of Ecosystem Management in the DoD (August 1994)
Implementation of Sikes Act Improvement Act, Updated Guidance (Oct 2002 Memorandum)

Army Regulations (AR)
AR 200-1, Environmental Protection and Enhancement (Department of the Army 2007)
AR 200-4, Cultural Resources Management (Department of the Army 1997b)
AR 200-5, Pest Management (Department of the Army 1999a)
AR 215-1, Morale, Welfare, and Recreation Activities and Nonappropriated Fund Instrumentalities (Department of the Army 1998b)
AR 350-19, The Army Sustainable Range Program (Department of the Army 2005)
AR 350-28, Army Exercises (Section III, 4-15)
Army Policy Guidance for Invasive Species Management (2001)
Environmental Analysis of Army Actions (32 CFR Part 651), Federal Register Vol. 67, No. 61, March 29, 2002).

Dugway Proving Ground Regulations/Policy
DPG 200-11, Recreational Hunting and Trapping at Dugway Proving Ground
DPG 350-2, Range and Training Area Regulation
DPG Policy #19-03, Environmental Stewardship (2003)

Memorandum of Understanding (MOU) and Cooperative Agreements (CA)

MOU to Foster the Ecosystem Approach (CEQ, USDA, DA, DOC, DoD, DOE, DOHUD, DOI, DOJ, DOL, DOS, DOT, EPA, OSTP; ongoing)

MOU for Ecosystem-based Management of Fish, Wildlife, and Plant Resources on Military Lands (DoD and USFWS; 1999-2004)

MOU for the Conservation and Management of Fish and Wildlife Resources (DoD and DOI; ongoing)

MOU for Wild Horse Management on DPG (DPG and BLM; ongoing)

CA for Wildfire Management on DPG (DPG and BLM; ongoing)

Miscellaneous Guidance

Defending Our Natural Heritage: Natural Resources in the Department of Defense (DENIX: https://128.174.5.51/denix/Public/Library/Heritage/ toc.html)

DoD Biodiversity Initiative

Conserving Biodiversity on Military Lands: A Handbook for Natural Resources Managers (The DoD Biodiversity Initiative; DENIX: https://128.174.5.51/denix/Public/ES-Programs/Conservation/ Biodiversity/biodiversity.html)

Resources for INRMP Implementation: A Handbook for the DoD Natural Resources Manager (DENIX: http://www.denix.osd.mil/ denix/Public/ES-Programs/Conservation/Legacy/INRMP/inrmphb.pdf)

DoD Commander's Guide to Biodiversity (DENIX: https://128.174.5.51/ denix/Public/ES-Programs/ Conservation/Guide/guide.html)

Installations Environmental Program Management Guide (http://aec.army.mil/usaec/publications/ iepmguide02.pdf)

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APPENDIX 2.3.1: Items of Cooperation Between the U.S. Fish and Wildlife Service, Utah Department of Natural Resources, and Dugway Proving Ground, Utah

PURPOSE: The purpose of this document is to specifically list items to be provided by the Utah Department of Natural Resources (UDNR), U.S. Fish and Wildlife Service (USFWS), and Dugway Proving Ground (DPG) for cooperative implementation of the DPG Integrated Natural Resources Management Plan (INRMP). Items not specifically listed will generally be the responsibility of DPG unless the other agencies agree to assist with their implementation.

AUTHORITY: In accordance with the authority contained in Title 10, U.S. Code, Section 2671, and Title 16, U.S. Code, Section 670a, the Department of Defense, Department of Interior, and the State of Utah, through their duly designated representatives whose signatures appear on the DPG INRMP, approve the INRMP and the below specific items of cooperation among the three agencies.

MUTUAL AGREEMENT:

- Persons hunting the lands of DPG shall be required to pay a permit fee unless exempt by DPG regulations. Funds derived from these fees will be used exclusively for the implementation of the fish and wildlife portions of the DPG INRMP in accordance with Army regulations and the Sikes Act. The exception is to reimburse administrative costs to DPG Outdoor Recreation for organizing hunts and printing permits and other associated documents. Fees charged shall be established by the installation in accordance with Army regulations. Persons guilty of violating the requirement for these permits may be prosecuted under 10 USC 2671(c).
- Persons hunting the lands of DPG must purchase state licenses, tags, and stamps as required by UDNR, unless exempt by UDNR regulations.
- All hunting on DPG will be in accordance with federal and state game laws.
- Representatives of the UDNR and the USFWS will be admitted to the installation at reasonable times, subject to requirements of military necessity and security.
- The UDNR and USFWS shall furnish technical assistance for development and implementation of professionally sound natural resources programs on DPG in accordance with the Sikes Act, provided funding for such support is available.
- DPG shall furnish assistance and facilities to the UDNR and/or USFWS for mutually agreed upon natural resources research projects. It shall be the policy of the DPG Commander to encourage and support research conducted by the participating agencies. To this end, suitable land areas, animals, facilities, and personnel may be made available at the Commander's discretion, when requested, providing the proposed studies are compatible with, and in no way limit, accomplishment of the military mission.
- No exotic species of fish or wildlife will be introduced on DPG lands without prior written approval of the Army, UDNR, and the USFWS.
- The UDNR shall establish season and bag limits for harvest of game species on DPG. DPG may make special requests for such regulations according to procedures established by UDNR. Requests for regulations not in accordance with those established statewide will be based on data specific to DPG or designed to meet DPG's testing and training schedules.
- Hunting on DPG will be authorized and controlled by the installation commander in accordance with locally published installation regulations promulgated in compliance with applicable federal and state laws, Army regulations, military requirements, and the INRMP.
- DPG and/or UDNR will operate biological check stations to collect harvest data. The UDNR may collect additional data on wildlife resources at DPG with approval of DPG for access.

- Public access for hunting is approved under a system of controls established by DPG in cooperation with UDNR.
- Hunting will be allowed only in areas where there is no conflict with military testing and training activities and no unreasonable safety hazard to participants, military personnel and dependents, or Army civilian and contract employees. Certain areas will be closed to hunting including, but not limited to, impact areas containing unexploded ordnance.
- DPG has primarily concurrent enforcement jurisdiction where laws are enforceable by federal- or state-commissioned personnel. Enforcement of natural resources laws will be a joint responsibility of DPG, the UDNR, and the USFWS. A portion of DPG has exclusive jurisdiction where laws are enforceable only federal-commissioned personnel. DPG will be the lead enforcement entity in these areas.
- DPG agrees to cooperate with USFWS and UDNR for management of threatened or endangered species, migratory birds, and raptors residing on the installation. Such efforts will be in compliance with federal and state laws and applicable Army regulations.
- The UDNR and the USFWS will provide technical and professional advice on all matters concerning wildlife management when necessary.
- DPG has the option to directly transfer funds to the UDNR and USFWS for implementation of this INRMP.
- It is understood that implementation of this INRMP requires certain latitude with regard to professional decisions. However, DPG agrees that any land use change, which significantly impacts natural resources must include modification of this INRMP in addition to any other environmental compliance requirements.

LIMITATIONS:

The military mission of DPG supersedes natural resources management and associated recreational activities, and such activities must be compatible with the military mission. However, where there is conflict between the military mission and provisions of the Endangered Species Act, the Sikes Act, or any other law associated with natural resources conservation, such conflicts will be resolved according to statutory requirements.

REQUIRED REFERENCES:

- Nothing contained in this agreement shall modify any rights granted by treaty to any Native American tribe or to members thereof.
- The possession of a special permit for hunting migratory game birds will not relieve the permittees of the requirements of the Migratory Bird Stamp Act, as amended.
- This INRMP is a Federal Facilities Compliance Agreement.
- As required by the Sikes Act, the following agreements are made:

(1) This DPG INRMP is the planning document required by the Sikes Act, as amended. This INRMP contains those items specifically required by law. In the event the Sikes Act is amended after this INRMP is signed, this plan will be amended to conform with new requirements within the Sikes Act, if needed.

(2) This plan will be reviewed by the UDNR, USFWS, and DPG on a regular basis, but not less often than every five years.

(3) No land or forest products from land on DPG will be sold under Section 2665 (a) or (b), Title 10 USC and no land will be leased on DPG under Section 2667 of such Title 10 unless the effects of such sales or leases are compatible with the purposes of the INRMP.

(4) With regard to implementation and enforcement of the DPG INRMP, neither Office of Management and Budget Circular A-76 nor any successor circular thereto applies to the procurement of

services that are necessary for that implementation and enforcement, and priority shall be given to the entering into of contracts for the procurement of such implementation and enforcement services with federal and state agencies having responsibility for the conservation or management of fish or wildlife.

(5) The DPG INRMP is not, nor will be treated as, a cooperative agreement to which Chapter 63 of Title 31, United States Code applies.

(6) This INRMP will become effective upon the date subscribed by the last signature and shall continue in full force for a period of five years or until terminated by written notice to the other parties by any of the parties signing this agreement. This agreement may be amended or revised by agreement between the parties hereto. Action to amend or revise may originate with any of the other participating agencies.

Appendix 1.6.6 Comments from Agencies that reviewed the 2016-2020 Updated INRMP

Comment/Response Matrix
for
May 2016 Draft INRMP

Dugway Proving Ground Integrated Natural Resources Management Plan (2016-2020)
(Reviewer comments abbreviated, full text of comments included above)

Page	Section/ Para./ Sentence	Reviewer	#	Comment	Response

Page	Section/ Para./ Sentence	Reviewer	#	Comment	Response

Page	Section/ Para./ Sentence	Reviewer	#	Comment	Response

Comment/Response Matrix
for
2016 Draft Final INRMP

Dugway Proving Ground Integrated Natural Resources Management Plan (2006-2010)

Page	Section/ Para./ Sentence	Reviewer	#	Comment	Response

Page	Section/ Para./ Sentence	Reviewer	#	Comment	Response

Appendix 3.3.1.1 Vegetation Community Descriptions

Great Basin Cold Desert Playa

Great Basin Cold Desert Playa occupies about 397,046 acres, almost 50%, of DPG, primarily west of Granite Mountain, and north into the panhandle. The playa community is a sparsely vegetated saline area with little diversity of either flora or fauna. One of the only plant species adapted to live in the playa is pickleweed or iodine bush (*Allenrolfea occidentalis*). Pickleweed is a halophytic plant that occurs in sandy hummocks situated atop more clayey-textured and higher-saline playas.

This habitat typically occupies the lowest elevations found on DPG. Soils are usually clay, poorly drained with a high salt content. The topography is flat, with extensive areas of bare ground, or occasionally with low sandy hummocks vegetated with pickleweed. Also found on these sandy hummocks are the occasional mound saltbush (*Atriplex nuttallii*), greasewood (*Sarcobatus vermiculatus*), and inland saltgrass (*Distichlis spicata*).

Typically, this habitat is an open mosaic of sparsely to non-vegetated areas, low shrub communities, and patchy grasslands on sandy hummocks. The most well-defined limiting factor of plant abundance in the playa community is the salt content of clay soils. Compositional variation of vegetation in this habitat are related to changes in the depth (or height) of sand accumulation, allowing these halophytic plants to germinate in lower saline microhabitats. Pickleweed itself often times cannot tolerate the salinity of the playa flats, which can reach 5%. In order for pickleweed to germinate, salinity <0.1% is required. Thus, pickleweed is found on sand-sandy clay loam hummocks raised up to 30 inches above the salt encrusted "salt flats." This habitat is often bordered by dunes and salt desert shrub habitat. The transition between playa and dune may be either abrupt, or more of a mosaic of playas, salt grass meadows, and dunes with salt desert and or arid shrubs.

Dominant wildlife species found perennially in the playa community are the deer mouse (*Peromyscus maniculatus*), Ord's kangaroo rat (*Dipodomys ordii*) (Vest 1962), and the kit fox (*Vulpes macrotis*). The playa community has little diversity of flora, mammals, and herpto-fauna. The single mammalian wildlife species that occurs with any degree of regularity appears to be the deer mouse (Dugway Proving Ground 2001b). However, there is considerably more diversity observed among invertebrates and avian fauna, at least seasonally. Many avian species utilize playas for feeding and resting during spring migrations. The main food supply for many of these migratory waterfowl is invertebrates, especially brine shrimp.

Great Basin Cold Desert Chenopod Shrubland

Chenopod-dominated shrublands on DPG are found below foothills and scattered on lower elevational flat-gradient soils that border salt playas (which are also vegetated with chenopods). Higher in elevation toward the foothills, chenopods transition into a mosaic with arid shrubs that ultimately become dominant in the rolling foothills. This habitat type occupies about 216,920 acres of DPG making it the second most dominant type on the installation. It dominates all valley bottoms east of Granite Mountain.

Chenopods include saltbushes, such as shadscale (*Atriplex confertifolia*), Gardner's saltbush (*A. gardneri*), and four-wing saltbush (*A. canescens*), as well as greasewood, winterfat (*Ceratoides lanata*), gray molly (*Kochia americana*), hopsage (*Grayia spinosa*), pickleweed, and Torrey's seepweed (*Suaeda torreyana*). Other plants found in Chenopod Shrublands are forb species, such as Utah cryptantha (*Cryptantha utahensis*), flixweed tansymustard (*Descurainia sophia*), prairie pepperweed (*Lepidium densiflorum*),

halogeton (*Halogeton glomeratus*), Duglas chaenctis (*Chaenactis douglasii*), tumbleweed (*Salsola iberica*), tumbling mustard (*Sysimbrium altissimum*), hoary aster (*Machaeranthera canescens*), summer cypress (*Kochia scoparia*), bur buttercup (*Ranunculus testiculatus*), and bassia (*Bassia hyssopifolia*). Grasses that may occur with chenopods are perennials, such as inland saltgrass, Indian ricegrass (*Oryzopsis hymenoides*), alkali sacaton (*Sporobolus airoides*), and cheatgrass (*Bromus tectorum*).

Fauna species typically associated with the Chenopod Shrublands are mostly rodents and lagomorphs. In shadscale-gray molly-dominated areas, the prevalent animal is the deer mouse. In shadscale-bud sage-dominated areas, the prevalent animal is the chisel-toothed kangaroo rat (*Dipodomys microps*) .

Great Basin Vegetated Dune

Vegetated dunes on DPG are found at the East Dugway Dunefield, East Cherait Dunefield, Southwest Gypsum Dunefield, Baker, Camels Back, North Wig Mountain Dunefield, and the November Road Dune. This habitat type occupies about 68,233 acres of DPG and is found scattered from a narrow band west and north of Granite Mountain, through the northern panhandle, and on southern foothills of the Cedar Mountains, as well as east of the old river bed in the southeastern portion of DPG. Of the habitat types occurring on DPG, vegetated dunes have the greatest variety of both flora and fauna.

Seral stage climax shrub species found on DPG vegetated dunes are generally a mix of both arid and chenopod species, and are typically taller than average. These shrubs include four-wing saltbush, low rabbitbrush (*Chrysothamnus visicidiflorus*), littleleaf horsebrush (*Tetradymia glabrata*), hopsage, broom snakeweed (*Gutierrezia sarothrae*), and greasewood. Indian ricegrass is the dominant grass (Vest 1962). During summers, after many annuals and grasses have senesced, greasewood and four-wing saltbush retain foliage longer than other shrubs. Additionally, four-wing saltbush will often produce seeds when other shrubs senesce in an attempt to survive. Seeds from four-wing saltbush provide food for many species of rodents.

Trees occupying the vegetated dunes include Utah juniper (*Juniperus osteosperma*), which is scattered on most vegetated dunes at DPG. Russian olive (*Eleagnus angustifolia*) is found near the northern border in the DPG pan handle and salt-cedar (*Tamarix ramosissama*) is found in the Cherait Dunes south of INF Road.

Some dominant herbaceous species on vegetated dunes include forb species, such as scurfpea (*Psoralidium lanceolatum*), coin buckwheat (*Eriogonum nummulare*), cushion buckwheat (*Eriogonum ovalifolium*), pale evening-primrose (*Oenothera pallida*), Munro's globemallow (*Sphaeralcea munroana)*, purple three-awn (*Aristida purpurea*), and desert princess plume (*Stanleya pinnata*). Grasses commonly occurring on dunes include Sandberg bluegrass (*Poa secunda*), Indian ricegrass, needle and thread grass (*Stipa comada*), sand dropseed (*Sporobolus cryptandrus*), bearded bluebunch wheatgrass (*Agropyron spicatum*), galleta grass (*Hilaria jamesii*), squirrel-tail (*Sitanion hystrix*), and cheatgrass.

The least chipmunk, little pocket mouse (*Perognathus longimembris*), dark kangaroo mouse (*Microdipodops megacephalus*), Ord's kangaroo rat, chisel-toothed kangaroo rat, Western harvest mouse (*Reithrodontomys megalotis*), deer mouse, and grasshopper mouse (*Onychomys leucogaster*) are commonly found in vegetated dune areas on DPG. Black-tailed jackrabbit (*Lepus californicus*), cottontail rabbit (*Sylvilagus nuttallii*), coyote (*Canis latrans*), and kit fox also occur in vegetated dune areas.

Exotic Vegetation

The communities labeled as "Exotic Vegetation - Ecosystem Stressors" are typically large tracts of land that originally were healthy open woodlands, shrublands, or grasslands. These once-pristine areas have undergone some sort of disturbance, such as overgrazing, fire, pedestrian/vehicle traffic, recontouring, and total vegetation removal. These disturbances have upset the natural balance of vegetation, reducing or removing native species. Native vegetation has been replaced with exotic species, such as cheatgrass, Russian thistle – tumbleweeds, halogeton, bur buttercup, Russian olive, and salt-cedar. This habitat type occupies about 58,621 acres of DPG and is found in the southeastern portion of DPG and surrounding English Village. Where fires have removed the perennial vegetation, this community type has replaced the natural community, primarily in foothills of the Cedar Mountains.

Fauna that frequent Exotic Vegetation areas are the deer mouse, Western harvest mouse, and several species of beetles, grasshoppers, and Mormon crickets. Additionally, avian and mammalian carnivores that prey upon these smaller species are often found in this community type.

Great Basin Arid Shrubland
Arid shrublands are commonly found on steep rocky slopes of various mountains along with open woodland species, such as Utah juniper. Various types of sagebrush make up the largest group of plants that are found in Great Basin Arid Shrubland. This habitat type occupies about 29,875 acres of DPG and is primarily found on foothills between juniper open woodlands and valley bottoms.

Arid Shrublands on DPG are dominated by such species as big sage (*Artemesia tridentata*), black sage (*A. nova*), bud sage (*A. spinescens*), rabbitbrush (*Chrysothamnus nauseosus*), low rabbitbrush, Nevada ephedra (*Ephedra nevadensis*), broom snakeweed, Nuttal horsebrush (*Tetradymia nuttallii*), litteleaf horsebrush, and hopsage. This region harbors few cacti, either in numbers of individuals or species. The two genera of cacti that are represented on DPG are hedgehog cactus (*Echinocereus*) and pricklypear (*Opuntia*).

Arid Shrublands provide cover and foraging potential for many mammalian species, including several species of rodents, such as the least chipmunk (*Tamias minimus*), Townsend's ground squirrel (*Spermophilus townsendii mollis*), Ord's kangaroo rat, chisel-toothed kangaroo rat, deer mouse, and Great Basin pocket mouse (*Perognathus parvus*). The fauna (rodent) population consists mainly of deer mouse and chisel-toothed kangaroo rat, which are found in the areas with more loamy soil. In more sandy areas, Ord's kangaroo rat appears to be the most plentiful.

Open Woodland
The primary Open Woodland habitat type is dominated by Utah juniper. This habitat type occupies about 24,557 acres of DPG and is found on foothills, steeper rocky slopes, in dunes east of Ditto, and mountain tops, dispersed across DPG. Some juniper open woodlands are also found dispersed on deeper soils and in vegetated dunes.

Open Woodland is also often associated with a combination of mixed warm and cool desert shrubs, such as various species of sagebrush (*Artemisia*), ephedra (*Ephedra*), horsebrush (*Tetradymia*), and rabbitbrush (*Chrysothamnus*). Open Woodland vegetation types are commonly found with understory of annual grasses, such as cheatgrass and sixweeks fescue (*Festuca octoflora*), and perennial grasses, such as dropseed (*Sporobolus* spp.), Sandberg bluegrass (*Poa secunda*), inland saltgrass, needle and thread grass, and Indian ricegrass. Forbs that may be present include various species of buckwheat (*Eriogonum*), scarlet globemallow (*Sphaeralcea coccinea*), Nevada onion (*Allium nevadense*), and storksbill (*Erodium*

cicutarium). Open Woodlands in better condition usually have an understory of perennial grasses and forbs, and poorer-condition Open Woodlands or those that have undergone some sort of disturbance or introduction of exotics more likely have an understory of annual grasses and forbs. Junipers are important for big game animals, providing shade during summer.

Great Basin Cold Desert Perennial Grassland

Great Basin Cold Desert Perennial Grasslands are areas where the dominant vegetation is lower herbaceous grasses that are perennial and usually native. These areas are often near edges of dunes, on lower mountain slopes, and in foothills, where the soil texture is somewhat of a sandy loam. Perennial grasslands are found in proximity to dunes and mixed shrublands on DPG. This habitat type occupies about 2,269 acres on DPG and is southeast of Granite Mountain, east of Sapphire Mountain, and west of the old river bed in the valley floor.

Great Basin Cold Desert Perennial Grasslands native perennials include species, such as Indian ricegrass, alkali sacaton, sand dropseed, Sandberg bluegrass, bearded bluebunch wheatgrass (*Agropyron spicatum*), needle and thread grass, galleta grass (*Hilaria jamesii*), and squirreltail (*Elymus elymoides*). Various species of perennial grasses are often found in association with shrubs or trees. These shrubs may be chenopods, arid shrubs, or a combination of both. Annual grasses may also be found within perennial grassland-dominated communities.

Fauna that frequent perennial grasslands are many species of invertebrates, small rodents, such as pocket gopher (*Thomomys bottae*), Western harvest mouse, and deer mouse, reptiles, such as the gopher snake (*Pituophis melanoleucus*) and long-nosed snake (*Rhinocheilus lecontei*), and mammals and birds that prey upon them.

Great Basin Unvegetated Dune

Great Basin Unvegetated Dunes are also known as active or shifting dunes, reflecting their obvious lack of vegetation. Sand dunes are constantly being eroded and reformed by the prevailing wind. Large dunes are often barren at their tops due to shifting sand and an unreachable water table. Unvegetated dunes on DPG are on the northern side of Stark Road at about Five-Mile Pass and on the southern side of INF road in the Cherait Dunes. This habitat type occupies about 2,175 acres of DPG and is found mainly within vegetated dunes in the northern panhandle and southern foothills of the Cedar Mountains.

Unvegetated sand dunes often contain unique habitats around the periphery as some early colonizers become established. Two of the first pioneer species are scurfpea and buckwheat (*Eriogonum dubium*).

Fauna species that frequent the Unvegetated Dunes are mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), various canids, rabbits, rodents, and birds, as well as several species of beetles and wasps. With there being little vegetative cover, several species of birds also utilize this area, preying upon the invertebrates as they emerge from the sand.

Great Basin Cold Desert Wetland

Great Basin Cold Desert Wetlands are found around perennial springs, and on DPG they are found along the southern border near Fish Springs and occupy about 831 acres. Great Basin Cold Desert Wetlands on DPG are typically vegetated with nondrought-tolerant, low growing, perennial herbaceous vegetation. These areas are dominated by such plants as reed canarygrass (*Phalaris arundinacea*), cattail (*Typha latifolia*), wiregrass (*Juncus* spp.), and sedges (*Carex* spp.). Soils are typically loamy with a higher organic content than typical soils found on DPG.

While only providing a small percentage of the total land area of DPG, these wetlands are ecologically important. Wetlands have high diversity of aquatic invertebrates and provide habitat for many species of waterfowl, if only on a transient basis. Additionally, wetlands provide water for many species of wildlife both on and off DPG that make a regular trips to springs to survive.

Great Basin Cold Desert Lowland Riparian

Great Basin Cold Desert Lowland Riparian areas are found near perennial flowing springs that provide adequate hydrology year-round to sustain this vegetation type. These lowland riparian areas are found mainly on the western border DPG near the southern border and occupy about 19 acres.

Great basin cold desert lowland riparian areas are topographically very flat. The overstory species is Fremont cottonwood (*Populus fremontii*). The understory is composed of low growing, herbaceous, perennial species, such as wiregrass, sedges, rushes, and mesic grasses. This Lowland Riparian area differs somewhat from wetlands in that there is running water flowing in a small channel with bed and bank development, as well as tall woody trees. Hydrological sources for this flowing water are perennial springs that daylight in the immediate vicinity. Soils are loamy and contain significantly more organic matter than typical soils on DPG.

These riparian areas provide habitat for many different families of wildlife. Many avian species utilize the area for nesting, feeding, and roosting. Additionally, the area provides ample habitat for rodents, reptiles, and amphibians. Usage patterns suggest regular utilization by big game and smaller non-game animals.

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Appendix 3.3.2: Faunal Species Known to Occur on Dugway Proving Ground

MAMMALS

Order	Family	*Genus species*	Common Name
CHIROPTERA	**VESPERTILIONIDEA**	*Myotis volans interior*	Long-legged myotis
		Pipistrellus Hesperus	Western pipistrelle
		Plecotus townsendi	Townsend's big-eared bat
		Antrozous pallidus	Pallid bat
		Myotis ciliolabrum	Western small-footed myotis
		Eptesicus fuscus	Big brown bat
		Lasionycteris noctivagans	Silver-haired bat
		Lasiurus cinereus	Hoary bat
		Myotis californicus	California myotis
		Myotis leibii	Eastern small-footed myotis
		Myotis lucifugus	Little brown myotis
	MOLOSSIDAE	*Tadarida brasiliensis*	Brazilian free-tailed bat
CARNIVORA	**BASSARISCIDAE**	*Bassariscus astutus*	Ringtail
	PROCYONIDAE	*Procyon lotor*	Common raccoon
	MUSTELIDAE	*Mustela frenata nevadensis*	Long-tailed weasel
		Taxidea taxus	American badger
		Mephitis mephitis	Striped skunk
		Spilogale gracilis	Western spotted skunk
	CANIDAE	*Canis latrans*	Coyote
		Vulpes vulpes	Red fox
		Vulpes macrotis nevadensis	Kit fox
	FELIDAE	*Puma concolor*	Mountain lion
		Lynx rufus	Bobcat
RODENTIA	**SCIURIDAE**	*Marmota flaviventris*	Yellow-bellied marmot
		Spermophilus variegatus	Rock squirrel
		Spermophilus townsendii mollis	Townsend's ground squirrel
		Ammospermophilus leucurus	White-tailed antelope squirrel
		Tamias minimus	Least chipmunk
		Tamis dorsalis	Cliff chipmunk
	GEOMYIDAE	*Thomomys bottae*	Botta's pocket gopher
	HETEROMYIDAE	*Perognathus longimembris*	Little pocket mouse
		Perognathus parvus	Great Basin pocket mouse
		Chaetodipus formosus	Long-tailed pocket mouse
		Microdipodops megacephalus	Dark kangaroo mouse
		Dipodomys microps	Chisel-toothed kangaroo rat
		Dipodomys ordii	Ord's kangaroo rat
	MURIDAE	*Reithrodontomys megalotis*	Western harvest mouse

Order	Family	*Genus species*	Common Name
		Peromyscus crinitus	Canyon mouse
		Peromyscus maniculatus	Deer mouse
		Peromyscus truei	Pinyon mouse
		Onychomys leucogaster	Northern grasshopper mouse
		Neotoma lepida	Desert woodrat
		Neotoma cinerea	Bushytail woodrat
		Mus musculus	House mouse
		Microtus montanus	Montane vole
		Microtus longicaudus	Long-tailed vole
	ERETHIZONTIDAE	*Erethizon dorsatum*	Common porpcupine
LAGOMORPHA	**LEPORIDAE**	*Lepus californicus*	Black-tailed jackrabbit
		Sylvilagus nuttallii	Mountain cottontail
		Sylvilagus audubonii	Desert cottontail
ARTIODACTYLA	**CERVIDAE**	*Odocoileus hemionus*	Mule deer
	ANTILOCAPRIDAE	*Antilocapra americana*	Pronghorn
	EQUIDAE	*Equis caballus*	Feral horse

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BIRDS

Family Species	Common Name	Occurrence Status	When	Breed Status
GAVIIDAE	**Loons**			
Gavia immer	Common Loon	Vagrant	Spring	No
PODICIPEDIDAE	**Grebes**			
Podiceps nigricollis	Eared Grebe	Vagrant	Spring	No
Podilymbus podiceps	Pied-billed Grebe	Vagrant	Spring	No
PELECANIDAE	**Pelicans**			
Pelecanus erythrorhynchos	American White Pelican	Vagrant	Spring	No
ARDEIDAE	**Herons**			
Ardea Herodias	Great Blue Heron	Vagrant	Spring	No
Egrete thula	Snowy Egret	Vagrant	Spring	No
Nycticorax nycticorax	Black-crowned Night Heron	Vagrant	Spring	No
Bubulcus ibis	Cattle Egret	Vagrant	Spring	No
Botaurus lentiginosus	American Bittern	Vagrant	Spring	No
Ardea alba	Great Egret	Transient	Spring	No
THRESKIORNITHIDAE				
Plegadis chihi	White-faced Ibis	Transient	Spring	No
CICONIIDAE				
Mycteria americana	Wood Stork	Vagrant		No
ANATIDAE				
Cygnus columbianus	Tundra Swan	Vagrant	Spring	No
Branta canadensis	Canada Goose	Transient	Spring	Yes
Chen caerulescens	Snow Goose	Transient	Spring	No

Family Species	Common Name	Occurrence Status	When	Breed Status
Anas platyrhynchos	Mallard	Summer		No
Anas strepera	Gadwall	Transient	Spring	No
Anas acuta	Northern Pintail	Transient	Spring	No
Anas crecca	Green-winged Teal	Transient	Spring	No
Anas discors	Blue-winged Teal	Transient	Spring	No
Anas cyanoptera	Cinnamon Teal	Transient	Spring	No
Anas clypeata	Northern Shoveller	Transient	Spring	No
Anas americana	American Wigeon	Transient	Spring	No
Aythya americana	Redhead	Transient	Spring	No
Aytha collaris	Ring-necked Duck	Vagrant		No
Aythya valisineria	Canvasback	Transient	Spring	No
Aythya affinis	Lesser Scaup	Transient	Spring	No
Bucephala clangula	Common Goldeneye	Transient	Spring	No
Bucephala albeola	Bufflehead	Transient	Spring	No
Oxyura jamaicensis	Ruddy Duck	Transient	Spring	Yes
Mergus serrator	Red-breasted Merganser	Transient	Spring	No
CATHARTIDAE				
Cathartes aura	Turkey Vulture	Summer		No
ACCIPITRIDAE				
Accipiter gentiles	Northern Goshawk	Transient	Spr-Fall	No
Accipiter striatus	Sharp-shinned Hawk	Trans./Summer	Spr-Fall	No
Accipiter cooperii	Cooper's Hawk	Trans./Summer	Spr-Fall	No
Buteo jamaicensis	Red-tailed Hawk	Resident		Yes
Buteo swainsoni	Swainson’s Hawk	Summer		Yes
Buteo lagopus	Rough-legged Hawk	Winter		No
Buteo regalis	Ferruginous Hawk	Resident		Yes
Aquila chrysaetos	Golden Eagle	Resident		Yes
Haliaeetus leucocephalus	Bald Eagle	Winter		No
Circus cyaneus	Northern Harrier	Trans./Res.		Yes
PANDIONIDAE				
Pandion haliaetus	Osprey	Transient	Spr-Fall	No
FALCONIDAE				
Falco columbarius	Merlin	Summer		No
Falco sparverius	American Kestrel	Resident		Yes
Falco peregrinus	Peregrine Falcon	Transient	Spr-Fall	No
Falco mexicanus	Prairie Falcon	Resident		Yes
TETRAONINAE				

Family Species	Common Name	Occurrence Status	When	Breed Status
Centrocercus urophasianus	Greater Sage Grouse	Resident		Yes
PHASIANINAE				
Alectoris chukar	Chukar	Resident		Yes
Phasianus colchicus	Ring-necked Pheasant	Vagrant		No
GRUIDAE				
Grus canadensis	Sandhill Crane	Transient	Spring	No
RALLIDAE				
Porzana carolina	Sora	Transient	Spring	No
Fulica americana	American Coot	Trans./Summer	Spring	No
Rallus limicola	Virginia Rail	Hypothetical		
CHARADRIIDAE				
Charadrius alexandrinus	Snowy Plover	Summer		Yes
Charadrius vociferous	Killdeer	Summer		Yes
Charadrius montanus	Mountain Plover	Transient	Spr-Fall	No
SCOLOPACIDAE				
Numenius americanus	Long-billed Curlew	Trans./Summer	Spring	No
Limosa fedoa	Marbled Godwit	Transient	Spring	No
Tringa melanoleuca	Greater Yellow-legs	Transient	Spring	No
Actitis macularius	Spotted Sandpiper	Transient	Spring	No
Tringa semipalmata	Willet	Transient	Spring	No
Limnodromus scolopaceus	Long-billed Dowitcher	Transient	Spring	No
Gallinago delicata	Wilson's Snipe	Transient	Spring	No
Calidris melanotos	Pectoral Sandpiper	Transient	Spring	No
Calidris minutilla	Least Sandpiper	Transient	Spring	No
Calidris mauri	Western Sandpiper	Transient	Spring	No
Calidris alba	Sanderling	Transient	Spring	No
RECURVIROSTRIDAE				
Himantopus mexicanus	Black-necked Stilt	Transient	Spring	No
Recurvirostra americana	American Avocet	Transient	Spring	No
PHALAROPODINAE				
Phalaropus tricolor	Wilson's Phalarope	Transient	Spring	No
Phalaropus lobatus	Red-necked Phalarope	Transient	Spring	No
LARIDAE				
Larus delawarensis	Ring-billed Gull	Transient	Spr-Fall	No
Larus californicus	California Gull	Trans./Summer	Spr-Fall	No
Larus philadelphia	Bonaparte's Gull	Vagrant	Spr-Fall	No
Hydroprogne caspia	Caspian Tern	Transient	Spr-Fall	No
Chlidonias niger	Black Tern	Transient	Spring	No

Family Species	Common Name	Occurrence Status	When	Breed Status
Larus pipixcan	Franklin's Gull	Hypothetical		
COLUMBIDAE				
Columba livia	Rock Pigeon	Resident		Yes
Zenaida macroura	Mourning Dove	Summer		Yes
STRIGIDAE				
Bubo virginianus	Great Horned Owl	Resident		Yes
Athene cunicularia	Burrowing Owl	Summer		Yes
Aegolius acadicus	Northern Saw-whet Owl	Resident		No
Megascops kennicottii	Western Screech-Owl	Resident		No
Asio otus	Long-eared Owl	Summer		Yes
Asio flammeus	Short-eared Owl	Resident		No
CAPRIMULGIDAE				
Chordeiles minor	Common Nighthawk	Summer		No
Phalaenoptilus nuttallii	Common Poorwill	Summer		No
APODIDAE				
Aeronautes saxatalis	White-throated Swift	Summer		No
TROCHILIDAE				
Archilochus alexandri	Black-chinned Hummingbird	Summer		No
Selasphorus platycercus	Broad-tailed Hummingbird	Summer		No
Selasphorus rufus	Rufous Hummingbird	Transient		No
ALCEDINIDAE				
Ceryle alcyon	Belted Kingfisher	Transient	Spr-Fall	No
PICIDAE				
Colaptes auratus	Northern Flicker	Resident		Yes
Sphyrapicus nuchalis	Red-naped Sapsucker	Resident		No
Picoides villosus	Hairy Woodpecker	Resident		No
Picoides pubescens	Downy Woodpecker	Resident		No
Melanerpes erythrocephalus	Red-headed Woodpecker	Vagrant		No
Order PASSERIFORMES	**Perching Birds**			
TYRANNIDAE	**Flycatchers**			
Tyrannus tyrannus	Eastern Kingbird	Summer		No
Tyrannus verticalis	Western Kingbird	Summer		Yes
Myiarchus cinerascens	Ash-throated Flycatcher	Summer		Yes
Sayornis saya	Say's Pheobe	Summer		Yes
Contopus sordidulus	Western Wood-Pewee	Summer		No
Contopus cooperi	Olive-sided Flycatcher	Summer		No
Empidonax traillii	Willow Flycatcher	Transient		No
Empidonax oberholseri	Dusky Flycatcher	Transient		No
Empidonax wrightii	Gray Flycatcher	Transient		No
Empidonax hammondii	Hammond's Flycather	Transient		No

Family Species	Common Name	Occurrence Status	When	Breed Status
ALAUDIDAE	**Larks**			
Eremophila alpestris	Horned Lark	Resident		Yes
HIRUNDINIDAE	**Swallows**			
Tachycineta thalassina	Violet-green Swallow	Transient		No
Tachycineta bicolor	Tree Swallow	Summer		No
Riparia riparia	Bank Swallow	Transient		No
Hirundo rustica	Barn Swallow	Summer		Yes
Petrochelidon pyrrhonota	Cliff Swallow	Summer		Yes
CORVIDAE	**Crows, Jays**			
Aphelocoma californica	Western Scrub-Jay	Resident		Yes
Pica hudsonia	Black-billed Magpie	Resident		Yes
Corvus corax	Common Raven	Resident		Yes
Corvus brachyrhynchos	American Crow	Transient	Spr-Fall	No
Cyanocitta stelleri	Steller's Jay	Vagrant		No
Gymnorhinus cyanocephalus	Pinyon Jay	Vagrant		No
PARIDAE	**Chickadees & Titmice**			
Poecile atricapillus	Black-capped Chickadee	Resident		Yes
Poecile gambeli	Mountain Chickadee	Resident		Yes
Parus inornatus	Plain Titmouse	Resident		Yes
Psaltriparus minimus	Common Bushtit	Resident		Yes
SITTIDAE	**Nuthatches**			
Sitta canadensis	Red-breasted Nuthatch	Resident		No
CERTHIIDAE	**Creepers**			
Certhia americana	Brown Creeper	Resident		No
TROGLODYTIDAE	**Wrens**			
Troglodytes aedon	House Wren	Summer		No
Thryomanes bewickii	Bewick's Wren	Summer		No
Cistothorus palustris	Marsh Wren	Resident		Yes
Catherpes mexicanus	Canyon Wren	Resident		Yes
Salpinctes obsoletus	Rock Wren	Resident		Yes
REGULIDAE				
Regulus calendula	Ruby-crowned Kinglet	Resident		Yes
Regulus satrapa	Golden-crowned Kinglet	Transient		No
SYLVIIDAE				
Polioptila caerulae	Blue-gray Gnatcatcher	Winter		Yes
MIMIDAE	**Mimicks**			
Mimus polyglottos	Northern Mockingbird	Summer		Yes
Oreoscoptes montanus	Sage Thrasher	Summer		Yes
MUSCICAPIDAE				
Turdus migratorius	American Robin	Resident		Yes
Ixoreus naevius	Varied Thrush	Vagrant		No

Family Species	Common Name	Occurrence Status	When	Breed Status
Catharus fuscescens	Veery	Vagrant		No
Catharus guttatus	Hermit Thrush	Vagrant		No
Sialia currucoides	Mountain Bluebird	Resident		Yes
Myadestes townsendi	Townsend's Solitaire	Winter		No
MOTACILLIDAE	**Pipits**			
Anthus rubescens	American Pipit	Transient	Spr-Fall	No
BOMBYCILLIDAE	**Waxwings**			
Bombycilla cedrorum	Cedar Waxwing	Trans.Winter		No
LANIIDAE	**Shrikes**			
Lanius ludovicianus	Loggerhead Shrike	Resident		Yes
Lanius excubitor	Northern Shrike	Winter		No
STURNIDAE				
Sturnus vulgaris	European Starling	Resident		Yes
VIREONIDAE	**Vireos**			
Vireo solitarius	Blue-headed Vireo	Transient		No
Vireo gilvus	Warbling Vireo	Transient	Spr-Fall	No
Vireo vicinior	Gray Vireo	Summer		No
PARULIDAE	**Warblers**			
Vermivora celata	Orange-crowned Warbler	Transient	Spr-Fall	No
Vermivora ruficapilla	Nashville Warbler	Transient	Spr-Fall	No
Vermivora virginiae	Virginia's Warbler	Transient	Spr-Fall	No
Dendroica petachia	Yellow Warbler	Trans./Summer		Yes
Dendroica coronata	Yellow-rumped Warbler	Transient	Spr-Fall	No
Dendroica nigrescens	Black-throated Gray Warbler	Transient	Spr-Fall	No
Seiurus noveboracensis	Northern Waterthrush	Transient	Spr-Fall	No
Oporornis tolmiei	MacGillivray's Warbler	Transient	Spr-Fall	No
Geothlypis trichas	Common Yellowthroat	Transient	Spr-Fall	No
Icteria virens	Yellow-breasted Chat	Transient	Spr-Fall	No
Wilsonia pusilla	Wilson's Warbler	Transient	Spr-Fall	No
Setophaga ruticilla	American Redstart	Vagrant		No
PASSERIDAE				

Family Species	Common Name	Occurrence Status	When	Breed Status
Passer domesticus	House Sparrow	Resident		Yes
ICTERIDAE				
Dolichonyx oryzivorus	Bobolink	Vagrant		No
Sturnella neglecta	Western Meadowlark	Resident		Yes
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	Summer		Yes
Agelaius phoeniceus	Red-winged Blackbird	Summer		Yes
Icterus parisorum	Scott's Oriole	Summer		Yes
Icterus galbola	Baltimore Oriole	Summer		Yes
Euphagus carolinus	Rusty Blackbird	Vagrant		No
Euphagus cyanocephalus	Brewer's Blackbird	Summer		Yes
Molothrus ater	Brown-headed Cowbird	Summer		Yes
THRAUPIDAE				
Piranga ludoviciana	Western Tanager	Transient	Spr-Fall	No
FRINGILLIDAE				
Pheucticus melanocephalus	Black-headed Grosbeak	Transient	Spr-Fall	No
Passerina amoena	Lazuli Bunting	Vagrant		No
Coccothraustes vespertinus	Evening Grosbeak	Winter		No
Carpodacus cassinii	Cassin's Finch	Vagrant		No
Pinicola enucleator	Pine Grosbeak	Vagrant		No
Carpodacus mexicanus	House Finch	Resident		Yes
Leucosticte australis	Brown-capped Rosy-Finch	Vagrant/Win.	Winter	No
Leucosticte atrata	Black Rosy-Finch	Vagrant/Win.	Winter	No
Leucosticte tephrocotis	Gray-crowned Rosy-Finch	Vagrant/Win.	Winter	No
Carduelis pinus	Pine siskin	Trans./Winter		Yes
Carduelis tristis	American Goldfinch	Winter		No
Carduelis psaltria	Lesser Goldfinch	Winter		No
Pipilo chlorurus	Green-tailed Towhee	Summer		Yes
Pipilo maculates	Spotted Towhee	Resident		No
Calamospiza melanocorys	Lark Bunting	Transient		No
Passesrculus sandwichensis	Savannah Sparrow	Transient		No
Chondestes grammacus	Lark Sparrow	Summer		Yes
Amphispiza bilineata	Black-throated Sparrow	Summer		Yes
Amphispiza nevadensis	Sage Sparrow	Summer		Yes
Junco hyemalis	Dark-eyed Junco	Trans./Winter		No
Spizella arborea	American Tree Sparrow	Winter		No
Spizella passerine	Chipping Sparrow	Summer		No
Spizella breweri	Brewer's Sparrow	Summer		No
Ammodramus savannarum	Grasshopper Sparrow	Transient		No
Pooecetes gramineus	Vesper Sparrow	Transient		No
Zonotrichia querula	Harris's Sparrow	Transient	Spr-Fall	No

Family Species	Common Name	Occurrence Status	When	Breed Status
Zonotrichia leucophrys	White-crowned Sparrow	Trans./Winter		No
Zonotrichia atricapilla	Golden-crowned Sparrow	Transient	Spr-Fall	No
Passerella iliaca	Fox Sparrow	Transient	Spr-Fall	No
Melospiza lincolnii	Lincoln's Sparrow	Transient		No
Melospiza melodia	Song Sparrow	Resident		No
Calcarius lapponicus	Lapland Longspur	Vagrant/Wint.		No
Calcarius ornatus	Chesnut-collared Longspur	Vagrant/Wint		No

HDR Engineering, Inc. 2004 (note: corrected to follow A.O.U. nomenclature)

Transient: Residing or staying temporarily.
Vagrant: Wandering, not residing or staying.
Hypothetical: Known to occur on neighboring sites and habitat used by this species is present on DPG.

REPTILES and AMPHIBIANS

Family Species	Common Name
Order SALIENTIA	
PELOBATIDAE	
Scaphious intermontanus	Great Basin spadefoot toad
Order SQUAMATA	
IGUANIDAE	
Crotophytus insularis bicinctores	Great Basin collared lizard
Crotaphytus wilslizenii	Long-nosed leopard lizard
Sceloporus occidentalis	Western fence lizard
Sceloporus graciosus	Sagebrush lizard
Uta stansburiana	Side-blotched lizard
Phrynosoma platyrhinos	Desert horned lizard
Phrymosoma douglasii	Short-horned lizard
TEIIDAE	
Cnemidophorus tigris	Great Basin whiptail
SCINCIDAE	
Eumeces skiltonianus utahensis	Great Basin skink
COLUBRIDAE	
Masticophis taeniatus	Striped whipsnake
Pituophis melanoleucus	Gopher snake
Rhinocheilus lecontei	Long-nosed snake
VIPERIDAE	
Crotalus viridis lutosus	Great Basin rattlesnake

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Appendix 3.4.1.1: Cultural Resources Site Location Hypotheses and Probability Areas

A planning level survey for prehistoric sites has not been undertaken as part of the Integrated Cultural Resources Management Plan (Callister *et. al*. 2001) due to numerous inventories being completed for Section 106 compliance on DPG and on adjacent land within the Bonneville Basin. A predictive model for the distribution of prehistoric sites on DPG was determined to be of greater value. Lindsay and Sargent (1979) and a compilation of known data were used to derive the following hypotheses about prehistoric site locations on DPG.

- Sites on mountain slopes and on alluvial fans away from watercourses are likely to be limited regardless of plant community.
- Mid-elevation sites will likely be clustered at mouths of canyons and along major watercourses. Since the presence of water in many of these channels has varied through time, the current absence of water is not likely to be a consistent guide to the presence or absence of sites. Short stream courses in low elevation ranges, such as Camels Back Ridge and Wig Mountain, probably did not structure site locations. On the other hand, long stream channels with large catchment basins, such as Government Wash and the Old River Bed, and short-stream courses from larger ranges, such as Granite Peak and the Cedar Range, probably did support foraging sites. This will be particularly true where canyon mouth locations provide access to a variety of vegetational communities within a short distance.
- There is a high probability of sites in and adjacent to past and present marsh and spring areas.
- Dune localities probably structured the location of foraging sites regardless of geomorphological location. This is likely due to the presence of ephemeral grasses, such as Indian rice grass, which are common to these localities. Site density is likely to be higher in locations near or adjacent to marsh areas and/or playa margins where pickleweed and other productive seed resources are found.
- Playa locations likely have a very low site probability, but care needs to be exercised in making this determination. Where marshes and/or dunes were once built across the surface of lake deposits and have now weathered away, deflated archaeological materials may occur.
- Cliff-forming locations, where rockshelters and caves may occur, will likely contain sites. However, the presence of sites in these locations is probably structured by transportation costs. That is, sites in caves and rockshelter are most likely where such features are found in close proximity to the high probability locations described above. Where cliffs occur away from stream channels or at elevations well above valley floors, they are much less likely to contain archaeological deposits.

A map predicting site locations based on high, medium, and low probability was developed using the above hypotheses. However, site probabilities for each area were determined to be more complex than the tripartite scheme suggested. Therefore, a more detailed predictive model determining priority areas was developed using geographic information system data layers. A comprehensive map was developed assigning four degrees of priority to areas of DPG. This map incorporates probability for cultural resources, military use areas, and previously inventoried areas. The four probability areas are described below.

- Priority One Areas. These areas have a high potential for cultural resources and are currently being used for mission and tenant activities. Class III intensive inventories (pedestrian surveys with no less than 15 meter transects) of these areas should be completed as soon as possible to ensure

compliance with federal preservation laws. Seventeen areas of DPG fall into this category, and total about 90,000 acres.

- Priority Two Areas. These are areas of high potential for cultural resources and are 1) in medium probability areas that are currently being used for military activities, 2) high probability areas adjacent to areas currently being used for military activities, and 3) high probability areas likely to be used in the near future for military activities. These areas should under go Class III intensive inventory as soon as high priority areas have been inventoried. These areas account for about 132,000 acres.
- Priority Three Areas. These areas have medium potential for cultural resources and are in locations not currently being used for DPG mission and tenant activities. Surveys should be undertaken but only after Priority One and Priority Two areas have been inventoried. These areas account for about 97,000 acres.
- Priority Four Areas. These areas have a medium potential for cultural resources and are not likely to be used for future mission and/or tenant activities. These areas account for about 112,000 acres.
- Other Areas. The remaining areas of DPG fall into three categories. The first category includes those areas that have a low probability for cultural resources, are not currently being used for military activities, and are not likely to be used for military activities in the near future. The second category includes areas that have previously undergone a cultural resource inventory. The final category includes areas that contain hazardous materials or unexploded ordnance, such as the White Sage and Wig Mountain impact areas.

Appendix 4.5: Select Sections of the Multiple Species Habitat Management Plan

Note: Wildlife activity should be considered just one of several metrics. The Index of Biological Integrity process would be dynamic and would likely require modifications over time and with specific projects. DPG would work with partners to determine applicability and develop refinements as needed. Other information in the Habitat Management Plan is subject to change as changing conditions on DPG dictate.

Chapter 3
Habitat Monitoring and Assessment

3.1 Introduction

This multi-species habitat management plan (HMP) has delineated community types within Dugway Proving Ground (DPG). Traditionally, habitat managers have been charged with protecting and conserving an area's *contents*—the habitat and biota within an area's boundary. DPG is a small portion of a much larger ecosystem. D.H. Janzen (1983) wrote, "No park is an island." This concept applies to communities within DPG, as well as DPG in the larger context of its location within the Bonneville Basin portion of the Great Basin ecosystem. Methods of analysis included in this report reflect the concept of managing DPG and included communities, in their *context*, where they sit in the landscape, and how they interact with other communities, especially their relationships in space to disturbed communities.

Regardless of how large an area is to be protected, and regardless of how many habitats or community types the area contains, the area is still an element of a larger landscape. This protected community experiences some interchange and interaction with its surroundings. The nature of those interchanges and interactions depends on a great many features that include even such details as the direction of the prevailing wind or the exact geometry of the border between communities (Forman 1997). Any area defined as sensitive and designated by managers as needing protection or special management should be identified within the parameters of the management goals and take the following characteristics into account: community structure, soils, ability for post-disturbance recovery or restoration, the area's interaction with adjacent community types, and juxtaposition to disturbed areas and need for buffer zones.

For DPG, a map has been developed to identify community types on post (see Figure 2.1, Vegetation Distribution on DPG). The mapping effort has used existing data, GAP analysis, aerial photo-interpretation, and "ground truthing." Due to DPG's large area, an exhaustive inventory and mapping effort is not possible without considerable effort and cost. Therefore, this is a dynamic process, not only because the area is large and landscape ecology is dynamic, but also because disturbance can rapidly change the nature of the area and the closely associated communities within its area of influence. In order to monitor and manage the health of any one community type, one must understand what is out there, sample the community, and determine which direction this community is headed (toward degradation and loss or toward health and recovery). Monitoring and sampling can help the manager answer some of these questions. Again, due to DPG's large area, the management question arises, "What is a cost-effective method for sampling and analyzing community types in their *context*?"

Several methods may be applied depending on the manager's goals and objectives: methods to determine community composition, methods to indicate biodiversity or biointegrity, and methods employing indicator

species as a shortcut to indicate a community's or landscape's "health." The question "What are we monitoring or assessing and why?" is fundamental to selecting the appropriate indicators (Noss 1990).

The focus of the manager may be the entire assemblage of plant and animal species, and the concern being the "health" of the assemblage with respect to (1) a highly visible process that may affect its robustness e.g. fire, training exercises, munitions detonation, (2) more cryptic stresses (drought), or (3) simply the conservation guidelines in place (ESA, INRMP, etc.). The focus may be more landscape-based in order to understand the "ecological integrity" of the landscape or a particular patch of it. Ecological integrity encompasses not only the biota, but also may include ecological interactions and processes with which the biota interacts. These are overwhelming questions for a manager to ask. Poiani et al. (2000) and McGeoch (1998) suggest that responses of ecological indicator species or ecological indicator groups (guilds) of species to stresses will reflect responses of other species and ecological processes. Feinsinger (2001) suggests that easily quantified ecological process be included with the ecological indicators chosen for monitoring.

3.1.1 Guild or Single Species Indicator Approach

Target species (although useful in and of themselves as management goals) may include charismatic species, protected or vulnerable species, or keystone species that need special management. Indicator species or guilds (a group of species that use the same kind of resource in a similar way) may be selected based on its (their) ability to satisfy the following criteria:

> **1. Sampling.** The indicator should be one that can be measured efficiently and objectively through direct observations. This observation should involve the minimum amount of expensive equipment, and procedures and should be capable of providing a large number of replicates per unit time. The indicator should be common and equally active or accessible at all seasons when sampling may occur.
>
> **2. Familiarity.** The natural history and taxonomy of the indicator should be well known to the manager or accessible through the literature.
>
> **3. Sensitivity.** Data from local experts or peer-reviewed studies should already demonstrate that the indicator ultimately selected by the manager is sensitive to factors of management concern. Additionally, the indicator should respond consistently to environmental change over time in a fashion similar (positive indicator) or directly opposite (negative indicator) to much of the associated biota.

As will be discussed in the text below, no single species is currently being recommended for monitoring as a bio-indicator or keystone species for any community type. The dynamic characteristic of such large ecosystems intuitively discourages characterizing the status of an entire community from the results of monitoring of only one species. However, single species may require monitoring for reasons other than community health characterization. For example, legal mandates and laws (Federal, State, or County), executive orders, policy directives, or memorandums of agreements, may require monitoring of specific species over one or many community types. Some suggested species that may fall into one or more of the above listed categories are included in each of the specific community type descriptions (Section 3.2.2).

This HMP is a dynamic tool for the Environmental Manager of DPG. As such, if a manager chooses to use the single-species or guild approach, any choice of indicator species or guilds may change as management goals change (that is, a species in a certain community is listed as protected and becomes the main goal of habitat management, or DPG training exercises dictate the use of a habitat).

If a guild approach is used, understory species are good indicators of the health of many community types. This report suggests that a single-species approach to monitoring the health of these communities is not sufficient. An understory guild approach would be more efficient and would provide more information about the health of the community, in particular about the biointegrity of the community. However, using a multi-metric biointegrity index may provide the manager with even *more* information about the health of communities or the relative health of specific sites within a community type.

3.1.2 Biodiversity or Biointegrity Approach

The simplest biodiversity index is species richness, or the number of species occurring within a community. However, this index does not consider whether species are rare or abundant or whether species are native or exotic. Many attempts have been made to combine an "evenness" component with species richness in a diversity index (Washington 1984; Solow et. al 1993). However, diversity and richness indices have often met with criticism over the years.

Biological integrity refers to a system's wholeness, including the appropriate presence of elements and processes specific to that community. A biota with high integrity reflects natural evolutionary and biogeographic processes. The most referenced definition of biointegrity was proposed by Frey (1975) and Karr and Dudley (1981). The concept was defined as "the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of a natural habitat of the region". A distinction between biodiversity and biointegrity was described by Reid and Miller (1989) as diversity only describes elements in a community, but integrity reflects both elements and processes that generate or maintain those elements. Thus, assessment of biointegrity should account for the influence of processes at multiple organizational levels and multiple spatiotemporal scales (Angermeier and Karr 1994). Angermeier and Karr (1994) go on to say "biological integrity can be assessed through diagnostic attributes or indicators, which ideally are sensitive to a range of stresses, able to distinguish stress-induced variation from natural variation. In practice, elements are used more frequently than processes as indicators of biointegrity because elements are typically more sensitive to degredation, more fully understood, and less expensive to monitor." Therefore, In order to assess biointegrity of a community, many biodiversity elements can and should be used as indicators.

This section presents two indices as alternatives to standard diversity and richness indices that use several elements as biointegrity components: the Index of Biotic Integrity and the Floristic Quality Index.

3.1.2.1 Index of Biological Integrity (IBI)

The IBI can be developed for a specific monitoring situation. The most common approach is a multi-metric approach. In this method, metrics are considered to be attributes within a system known by research (or hypothesized) to be correlated with disturbance. The original IBI (Karr 1991) was developed for use with warm-water streams in the central United States. Since the original metric was proposed, a number of metrics have been developed and tested in field assessments (Karr 1991; Fore et. al, 1994; Simon and Lyons 1995). Many researchers argue that a multi-metric index of biological integrity better indicates disturbance on communities than using principal components analysis (PCA) of species composition or using a single-species indicator (Fore et. al, 1996; Karr and Chu 1998).

Managers should consider the following when developing a monitoring project using a multi-metric approach:

- Select metrics that are known to be correlated with disturbances of interest to the manager.
- Select metrics that are inexpensive and easy to measure.
- Select metrics that represent a range of biologic organizational levels (condition, abundance, structure, richness, etc.).

At DPG the IBI is an ideal method for monitoring health of communities. The Center for Environmental Management of Military Lands (CEMML, no date) defines resiliency of a community as "The inherent capability of the land to support intensive military training and testing while sustaining the existing ecological system (physical-biological complex)". The IBI method suggested herein combines multiple metrics that incorporate both physical and biological components and reflect ecological processes. This not only is efficient and inexpensive to measure, it is repeatable by different observers, easy to interpret, but also meets the CEMML intent on monitoring military lands. This report suggests using the following ten metrics to monitor and manage the community types at DPG using the IBI method.

1. The Floristic Quality Index (FQI). The FQI is a measure of the relative quality of the floristic makeup of a site. It does not measure the quantity of vegetation; rather the species that are present and their individual qualities; it includes the number of floral species present as well as the percent of species that are exotic (see section 3.1.2.2 for further explanation on FQI methodology).
2. Number of vegetative life forms (moss or cryptogams, grasses, forbs, shrubs, trees).
3. Level of mechanical disturbance of the soil surface (for example, disturbance in cryptogamic crusts, mechanical disturbance of vegetation, tire marks, roadways).
4. Time since disturbance (0 to 1 year, 1 to 10 years, >10 years [not known]).
5. Ocular estimation of total community vegetation vigor.
6. Number of protected or sensitive floral and faunal species known to occur in the monitored site.
7. Proximity to heavily disturbed areas (take into account types of species, invasiveness of species, and methods of propogule dispersal [if propogules or seeds are wind dispersed, are you downwind from the disturbed area?]).
8. Ability of a site to recover from disturbance (for example, a deep silty loam with hydrologic support, on a relatively flat slope, sheltered from prevailing winds would have a greater ability to recover than a hard pack shallow gravel on a steep slope).
9. Total Vegetative Cover.
10. Degree of Wildlife Activity.

Each metric should be assigned a point value from 1 to 5, where 1 indicates the greatest level of disturbance and 5 indicates that the system has little or no disturbance. An intermediate system would receive a 3 (as described in section 3.2.1 Monitoring).

Other metrics can be assigned by the manager within each community type, depending on management goals and knowledge of the specific communities and response to disturbance.

Using these ten metrics, a system's biointegrity score would range from 10 (worst) to 50 (best) (as noted above, site comparisons can be made only between sites within the same community type, or monitor progress of one site through time).

3.1.2.2 Floristic Quality Index (FQI)

In 1988, Wilhelm and Ladd suggested a conservation index for plants. This method is based on simple presence and absence of species; no abundance information is required. It does, however, require knowledge of ecological characteristics of all species within a local flora in order to assign meaningful "coefficients of conservatism" to each species. In this Floristic Quality Index (FQI), each species present in a community type is assigned a coefficient of conservatism ranging from 0 to 10. A 0 indicates that this species is typical of highly disturbed habitat; a 10 indicates endemic, or typical of pristine habitats.

The number of species occurring in the community is counted (*N*), each is assigned a coefficient of conservatism (*CC*) (from 0 to 10), and all these coefficients are added. This sum is divided by *N* and then multiplied by the square root of *N*.

$$FQI = \left(\frac{\sum CC}{N} \right) \sqrt{N}$$

When used to monitor a specific site within a community where the sample size remains constant, the index will be sensitive to changes in species occurrence, and it may follow a normal distribution suitable for standard statistical techniques (Elzinga et. al 2001). As the number of species at a sampling site decreases, and/or the "pristine-ness" of the community decreases, the FQI will also decrease (as noted above, site comparisons can be made only between sites within the same community type, or monitor progress of one site through time). This technique may be used in conjunction with the IBI (described above) and applied to data already collected with the IBI efforts. The FQI is sensitive to changes in communities with few or many species, and should be used only when ascertaining the relative differences among permanent plots over time (i.e., following recovery efforts, or disturbances that are being monitored) or to compare among different samples from the same community type.

3.1.3 Why Monitor?

"What are we monitoring and why?" (Noss 1990). Several conditions may warrant monitoring specific sites within a community type (comparisons can be made only between sites within the same community type):

1. Knowledge of impending disturbance to an area and a desire to quantify the degree of impacts (pre- and post-disturbance) and potentially correlate the degree of disturbance with the degree of impact.
2. Desire to monitor an area in close proximity to disturbance to establish red-flag parameters which, if exceeded, would require management intervention.
3. Awareness of a single species of interest (protected, charismatic, etc.) that uses this community type and desire to manage this community type for this species.
4. Need to assess the trend of a community type over time.
5. Need to monitor the success of recovery efforts (following a disturbance).

For any of these conditions, the IBI or the FQI would be applicable.

Section 3.2, Community Analysis, presents the 10 community types identified in Chapter 2, Ecosystem Analysis, and any single species that may be important to monitor as regulations may warrant. As this HMP is designed to be dynamic, the choice of any single species may change with the Environmental Manager's knowledge of the resource or with a shift in management goals. Additionally, any given metric used in the IBI for a community type may change according to management knowledge or goals. This section also suggests tools to analyze data, success parameters, and red-flag parameters (adaptive management strategies).

3.1.4 Analysis

Again, to understand what we are comparing, and to decide which tools to use to analyze the collected data, we must ask, "What are we monitoring and why?" (Noss 1990). Several conditions may warrant the monitoring of specific sites within a community type, depending on a manager's goals (remember, site comparisons can be made only between sites within the same community type, or between time periods at the same sample site):

- Knowledge of impending disturbance to an area.
- Desire to monitor an area in close proximity to disturbance.
- Desire to manage a community type for a single species of interest.
- Need to assess the trend of a community type over time.
- Need to monitor the success of recovery efforts.

Knowing the monitoring goals in advance helps a manager select monitoring techniques and analysis tools (statistical analysis methods). For all the management goals listed above, one is looking for differences between sites. These differences can be temporal (one site changes over time following disturbance, following recovery efforts, or following natural climate changes) or spatial (comparing one site following a treatment [recovery efforts or disturbance] to a site in the same community type that has not been disturbed [control]). Comparisons can include both temporal and spatial components (monitoring a pristine site of interest in close proximity to a heavily disturbed site to monitor any natural invasiveness into a pristine community over time).

Caution must be used when analyzing multi-metric indices such as the IBI. While IBI indices may be appropriately analyzed by standard analysis techniques (Fore et al, 1994), the assumption of normal or binomial distribution of the data may be violated by a small sample size. If this is the case, resampling methods of the two treatment sites being compared must be employed. Initial tests of the FQI suggest that it may follow a normal distribution and be suitable for standard analysis techniques (Elzinga et al, 2001).

Once normal or binomial distribution of data is confirmed, several statistical tests can be used, depending on the comparisons to be made. These tests are common tests and can be found in many statistical analysis texts or software packages.

If one is comparing a single site over time, and the site is permanently marked for resampling, then the data are said not to be independent. In this case, if comparing 2 years of data and a paired t-test, or if comparing 3 or more years of data, a Repeated-Measures Analysis of Variance (R-M ANOVA) may be appropriate. However, if the data are independent (not paired), the independent t-test or the ANOVA (for three or more means) may be appropriate.

3.1.4.1 Monitoring Period

Again monitoring periods may vary according to management goals. However, in slow growing habitats with low precipitation, monitoring may take several years. Low lying desert areas of the Great Basin typically receive less than 10 inches of precipitation annually. DPG is no exception. Under conditions such as these, changes in vegetation composition are slow to observe, and may require multi-year monitoring. Exceptions to long-term monitoring may include management goals such as a simple documentation of the disturbance that vehicular maneuvers or munitions testing may have on a system. A one year base-line and a one-sample post-disturbance sample period may be adequate to characterize the level of disturbance to a system. However, even in this case, more than five years may be necessary to fully understand the introduction of non-native plant species, and this impact on the overall bio-integrity of the community.

It is therefore suggested that in communities that are slow growing, such as those found on DPG, a one-year base line pre-disturbance or pre-treatment is sufficient. Following treatment a three to five year annual monitoring is necessary. An even longer term monitoring may be necessary, depending on treatment. Unpublished data (Borden, Black 2002) suggest that with some revegetation efforts and treatments (such as the application of fertilizers and bio-solids), ecosystem stabilization isn't recognized until 7-10 years following the treatment. Natural revegetation by native volunteer plants in harsh growing conditions also may not be recognizable for 7-10 years following disturbance (Borden, Black, in press).

Dependent upon management goals the following monitoring periodicity is suggested:

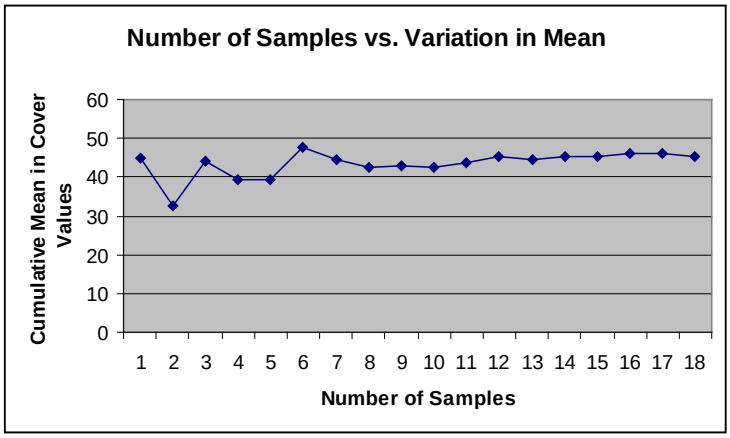
Management Goal	Pre-treatment Baseline	Post-Treatment Monitoring
Characterizing the Nature of a Planned Disturbance	Spring & Fall monitoring for one year	Spring & Fall monitoring for 5 consecutive years
Monitor Natural Recovery and Revegetation Post-Disturbance	Spring & Fall monitoring for one year	Spring & Fall monitoring for 5 consecutive years. Plus one peak-growing season monitoring (early summer) for 3-5 additional years.
Monitoring Success of Treatment (Revegetation, Reseeding, Herbicide, Fertilizations, Mulching)	Spring & Fall monitoring for one year	Spring & Fall monitoring for 5 consecutive years. Plus one peak-growing season monitoring (early summer) for 3-5 additional years.

3.1.4.2 Number of Monitoring Plots and Plot Size

Sample size and number of sample plots has been discussed in the literature for many decades (Stoddart, et. al, 1943 (reprinted in 1975); Kershaw, 1966, (reprinted in 1984); Montgomery, 1976 (reprinted in 1984); Greig-Smith, 1983; Bonham, 1989; Cook and Stubbendieck, 1986; Tilman 1988; Coulloudon, et. al, 1999; Elzinga et. al, 1998; Elzinga et. al, 2001).

The general consensus is that as the number of samples taken increases, variability in the data is reduced. There are several techniques to assure adequate data samples; but each case should be decided

independently. It is obvious that sample size (and even shape) comes into play in reducing variability. The method suggested for this habitat management plan is to take a sample point, and calculate a mean value for one parameter (species richness, overall vegetative cover, or even IBI for example), then plot the value of the mean against number of sample sites. Add sample points, one at a time, calculating the mean for the total number of sample sites each time. The variation among means will decrease as number of samples increase. There will be a point (graphically) where that variation is acceptable to the researcher, and this is the number of sample points that should be taken in that community type (see example below).



In this example, the parameter measured was aerial cover estimation. The Cumulative Mean (y-axis values) shows considerable variation until about sample number 8. This would indicate that for this example, 8 sample points would be adequate to characterize this community.

Appropriate plot (sample) size and shape also varies by community type. Rules of thumb are simple, the bigger the stature of the vegetation sampled and the more clumped the individuals are, and the larger the sample plot should be. It is suggested for communities with trees (juniper, Russian olive, cottonwood) a sufficient size sample should be a circular sample area of 50 m (333 ft) diameter. For communities dominated by shrubs (sagebrush, saltbush, greasewood) a sufficient size sample should be a circular sample area of 30 m (200 ft) diameter (HDR 2003). With smaller stature plants (grasses), or on newly seeded areas, a series of 1 m square quadrats is suggested.

3.1.5 Success

Success implies response of a community over time to recovery or restoration efforts. It could also be applied to success of efforts to protect an area from impending disturbance or proximity to exotic species. Both of these scenarios imply monitoring performance over periods longer than two monitoring events.. The question to ask is whether there is an overall trend in the community (increase, decrease, or stability in community health as indicated by the IBI). Biological communities undergo natural fluctuations in many metrics, from natural variation in the environment to population cycles. Evaluating such trends involves route regressions, which is a variation on linear regressions (Hatfield et al, 1996) that is frequently used in monitoring for assessing aggregate trends.

Lesica and Steele (1996) showed in terrestrial vegetative studies that many trend analyses have the power to detect a modest (>20%) variation within only two sites. The manager should set success criteria and, through the dynamic monitoring process, should use parametric statistical tools and trend analysis to

determine if the trend is significantly positive. Although the method seems to be sensitive to changes >20% in IBI, this is only true over short periods of time. As described above, DPG is located in a very low precipitation, high evapo-transporation climate, and has very poor soils. This report therefore suggests that progress toward success may be measured if a 10% increase in measured metrics (IBI) towards management goals is detected over 5 to 7 years and is determined to be statistically significant. Standard ANOVA or t-tests should be adequate to determine statistically significant differences among the multimetric IBI indices proposed herein, if the number of sample points is sufficient to reduce variation (see Section 3.1.4).

3.1.6 Red Flags

The other side to measuring success is to measure failure. Red-flag conditions may be set up to warn the manager as to when to intervene and take management actions in a monitored community. This may follow a downward trend in community health following a measured disturbance, or a failure following a restoration effort. Methods applied to success criteria should be applied to red-flag criteria also. The manager should set red-flag criteria and, through the dynamic monitoring process, should use parametric statistical tools and trend analysis to determine if the trend is significantly negative. This report suggests a short and a long term set of red flag parameters. Natural systems may exhibit fluctuations in growth, delays in establishment, and delays in establishing equilibrium with the environment, especially if the environment is less than favorable for establishment of vegetation (Borden and Black 2002, Borden and Black, in press). In order to tease out this natural variation in the short-term, and allow the manager to respond to potential red-flag conditions, it is suggested that a short-term red-flag condition be established. If there is a statistically significant change of 20% or more in the IBI, or in any other single metric the manager feels is critical to monitor (i.e., if management goals are to increase vegetative cover as a means to reduce erosion, then aerial cover may be the appropriate metric to measure) in a trend away from management goals in any one year, management should take corrective measures. For example, one year following the recovery efforts, if the IBI of a specific site is 43, and the following year there is a small reduction in the IBI, say to 40 or 39, this may simply be indicative of a natural population fluctuation, or a response to environmental conditions, not necessarily to the lack of success of the efforts. However, if the IBI dropped from 43 to 34 or less, this may indicate a more drastic need for a manager to intercede. If cover is deemed to be the appropriate metric, if the target is a 50% cover of seeded species in a recovery effort, and that has been established the first year following treatment, but the second year there is only 30% cover of the desired species, then immediate action needs to be taken by management to correct this failure. Over the long term, if the IBI (or cover of selected species) fluctuates approximately 10% up and down for several years, it would appear to be stable. However, if there is a trend over several years (5-7 years) that shows a movement away from management goals of a 10% in the desired metric, this could indicate a slow response to the environment away from the management goals, and should also be considered a red-flag condition, and management actions should be taken to interrupt and correct this downward trend.

Standard ANOVA or t-tests should be adequate to determine statistically significant differences among the multimetric IBI indices proposed herein, if the number of sample points is sufficient to reduce variation (see Section 3.1.4).

3.2 Community Analysis

This section suggests methods to be employed in monitoring sites in the 10 community types (Formations) that are found on DPG. Additionally analytical methods for interpreting the monitoring results are presented herein. This section also provides lists of specific charismatic, sensitive, or protected species that could be inventoried and monitored over time if these species are targeted as a management goal. No monitoring methods are suggested for specific species; this report assumes that, when researchers and managers are

dealing with specific species, they will use industry-accepted protocols and sampling methods for those species.

3.2.1 Monitoring

Following earlier discussions in this section (3.1) of the efficiency and adequacy of various monitoring philosophies, a conjoining of the IBI and FQI monitoring procedures are suggested for use at DPG. Application of these methods and suggested analytical processes are also presented.

In the IBI methods as described in section 3.1.2.1, ten (10) metrics were proposed. For all of the 10 community types found on DPG, it is suggested that the following 10 parameters be used in evaluating relative health of a community (over time, or among sites within the same community type). Suggested sample plot size, number of sample plots per community, and season of sampling are specific to community type, and are presented for each community type below starting with section 3.2.2). Best scientific judgment must be used when applying a one to five (1 – 5) rating for each metric. Each of the following ten metrics were chosen for ease of data collection, for contribution to total biointegrity of a site, and as parameters that would also in total infer and integrate ecological processes into the total IBI. Remember this method can only be applied to compare two sites within the same Community Type, or of one site over time following disturbance or recovery efforts. So if one is to attempt to recover a previously disturbed site that is now a mono-culture of Cheat grass (*Bromus tectorum*) the results will only be compared pre- and post recovery efforts. If one is comparing the biointegrity of two separate sites dominated by Cheat grass, only two sites within the Exotic Vegetation – Ecosystem Stressors Community Type will be compared.

Application of each parameter is also included below (A sample data sheet is included in Appendix D):

1. Floristic Quality Index (FQI)

Species richness (number of floral species) and percent of species that are exotic or native are incorporated in the FQI. This is the most time consuming parameter simply because the data collector must identify each species and assign it a "coefficient of conservatism" (CC) ranging from 0-10; a 0 indicates that this species is typical of a highly disturbed habitat; a 10 indicates an endemic, or typical of pristine, non-disturbed habitats. Native species that proliferate with disturbance (i.e., *Gutierrezia*) would be given an intermediate value depending on its aggressiveness. This requires the data collector to have knowledge of the local flora that occurs in each community type, and an idea of its CC.

To calculate this parameter, first calculate the FQI of the plot by summing the CCs of each species identified within the sample plot. Divide this sum by N, the number of species identified, and then multiply by the square root of N.

$$FQI = \left(\frac{\sum CC}{N} \right) \sqrt{N}$$

For example: an Open Woodland community is being monitored over time before and after a fire and the first sampling period identified the following species and their associated CC (remember, abundance is not measured – only presence or absence):

Pre-fire	Post-fire

(Species – CC)	(Species – CC)
Utah juniper – 10	Utah juniper – 10
Wild onion – 10	Cheat grass – 1
Herbaceous sage – 10	Broom snakeweed – 3
Utah locoweed – 8	Bull thistle - 1
Foxtail brome – 7	Prickly lettuce -2
Rubber rabbit brush – 9	Pepper grass – 3
Utah thistle – 1	
Douglas chaenactis – 9	
Fleabane – 5	
Storksbill – 3	
Prickly pear – 4	
Squirreltail - 4	
Moss – 10	

FQI for the pre-fire treatment is calculated by summing the CCs (90), dividing by N= 13 (number of species) = 6.9. Multiply 6.9 by square root of 13, and the FQI for this treatment = 24.9.

FQI for the post-fire treatment is calculated by summing the CCs (20), dividing by N= 6 (number of species) = 3.3. Multiply 3.3 by square root of 6, and the FQI for this treatment = 8.2.

Following the calculation of the FQI – an index of 1 – 5 must be assigned; 1 being representing high disturbance vegetation, 5 more pristine vegetation component. The following table is a suggested distribution of FQI ranges over this 1-5 index range:

Index Range	**FQI value**
1	0-5.0
2	5.1-10.0
3	10.1-15.0
4	15.1-20.0
5	>20.0

The pre-fire treatment receives an index of 5, and the post-fire treatment receives an index of 2.

2. Number of vegetative life forms (moss or cryptogams, grasses, forbs, shrubs, trees).

Again – using the Open Woodland example above, in the pre-fire treatment, the number of observed life forms are 5 (moss, grasses, forbs, shrubs, and trees); in the post-fire treatment, the shrub component and the moss component were lost and the index is 3 (trees, forbs, and grasses).

3. Level of mechanical disturbance of the soil surface (for example, disturbance in cryptogamic crusts, mechanical disturbance of vegetation, tire marks, roadways).

This is a subjective call by the observer. If an area does not appear to have been disturbed in anyway, the site would receive a 5. If the study plot had roads cris-crossing the area, very little cryptogamic crust cover and the vegetation physically disrupted, the area would receive a 1.

Continuing the above example, if the pre-fire treatment had a few minor tire tracks through the site, it would receive a 3 or a 4 (let's say a 3). The post-fire treatment would be (by definition) a 1.

4. Time since disturbance (0 to 1 year, 1 to 10 years, >10 years [not known]).

This would require either some pre-knowledge of the site (disturbance history, fire history, training history, etc.) or the observer's professional judgment. Remember that on DPG, the precipitation is low, and the natural communities develop slowly. If the disturbance is recent (0-1 year) the area has had little to no time to naturally recover, and receives an index of 1. If the area was disturbed over 10 years prior to observation, some natural regeneration could have occurred, and the site would receive an index of 5. An intermediate disturbance interval (1-10 years) would receive a 3.

Example: The pre-fire site had some tire tracks that occurred during maneuvers 4 years ago. This site would receive an index of 3. The post-fire site would receive a 1.

5. Ocular estimation of total community vegetation vigor.

This is a relatively easy qualitative analysis. The vigor of a community addresses the relative health of the vegetation. In the example above, if all the vegetation (native and exotic) looked as though they had extremely good annual growth, seed production was high flowering was phenomenal, etc., then it would receive an excellent vigor rating (an index of 5); if the vegetative community on a whole looked stressed (wilted, chlorotic, no growth) it would receive a poor vigor rating (an index of 1). The intermediate steps along this continuum would be fair (2), average (3), and good (4).

Example: In the pre-fire site, the vegetation appears unstressed, but no better than any other Open Woodland community – an "average" vigor index of 3 would be assigned. In the post-fire condition, if the juniper and the native components appear stressed, but invasive species appear healthy, a "fair" vigor index of 2 may be assigned.

In extreme cases where the native vegetation may be completely replaced with invasive exotic species and these exotic species are very vigorous, this index may be artificially high. However, it is still a valid metric to be used in the IBI, since there are 10 component metrics that are integrated into one biological index. It is still valid to use a high vigor index if the site has become dominated by exotic species that are doing well, because the biological processes at that site are functioning well for this new vegetative component condition. Several of the other metrics in the IBI will be reduced significantly to drop the total IBI for the site, and this artificially high vigor index will be compensated for with the other nine IBI components.

6. Number of protected or sensitive floral and faunal species known to occur in the monitored site.

Another simple qualitative analysis. If there are no known sensitive or protected species in this community type, the site would receive an index of 1. One species – a 2, two species – a 3, three species – a 4, and four or more species would receive an index of 5.

Example: In the pre-fire Open Woodland community described, lets say there is a Loggerhead shrike known to breed here, as well as a Red-tailed hawk nest identified; this site would receive an index of 3. Following the burn – no birds were identified as breeding at this site – an index of 1.

7. Proximity to heavily disturbed areas (take into account types of species, invasiveness of species, and methods of propogule dispersal [if propogules or seeds are wind dispersed, are you downwind from the disturbed area?]).

It is suggested that if the study site is adjacent to within 100 m of a heavily disturbed site, it receive an index of 1. The index increases with every 100 m of the disturbed site (2=101-200m, 3=201-300 m, 4=301-400m, 5=>400m.). This can be adjusted by the observer to account for any known wind patterns, or vehicular traffic that may modify the ability of propogules to be transported into the study area.

Example: As this example is the same site being investigated over time, the index for both treatments would be the same. In this case let us imagine a site 350 m from a disturbed cheat grass community. However, instead of receiving an index of 4, the Open Woodland site is along a road that is used by vehicles which traverse the cheat grass site, and exit through the Open Woodland, the site would receive an index downgrade from a 4 to a 3 (for both treatments).

8. Ability of a site to recover from disturbance (for example, a deep silty loam with hydrologic support, on a relatively flat slope, sheltered from prevailing winds would have a greater ability to recover than a hard pack shallow gravel on a steep slope; additionally, if one is attempting to recover an area already dominated by pernicious vegetation or aggressive exotics that are tenacious and are difficult to displace, these sites would fair more poorly in recovery attempts than those sites that have these species as only a minor component in their understory.).

Again this metric is a qualitative assessment, subjective to the observer's point of view. One may argue that the post-disturbance (post –treatment) is based on the pre-disturbance conditions. In part this may be true, however, the pre-disturbance conditions and the post-disturbance conditions may vary in several important aspects related to this metric; i.e. loss of soil, increase in exotic species, loss of hydrologic support, loss of organic matter in soil, etc. The following guidelines are an attempt to take some of the subjectivity out of this index metric.

Things to think of when assigning a number from one to five for the ability of a site to recover from disturbance is soil quality (depth, texture, organic matter content, saline content), hydrologic support (even too much water may be a problem), slope, erosiveness of site, tenacity of vegetative components, presence of toxins or chemicals following a disturbance, presence of non-biological components on ground (trash).

Example: In our example, our site is on a low precipitation, poor soil quality, foothill, with a moderate slope. The only hydrologic support is from precipitation. This would receive a 2 or a 3. Let's say a 2.5 (why not use intermediates, if the observer can not pin it down?). Following the burn, the site looses moisture holding capacity, and perhaps is eroded a bit. The index could be a 1 or 2 (1.5).

9. Total Vegetative Aerial Cover of a plot can be made by ocular estimation. Cover Classes have been suggested in the Daubenmire Method (Daubenmire, 1959) and the Braun-Blanquet Releve method (Braun-Blanquet, 1932; Barbour, et. al 1987).

This is a rapid method, and since the ranges are broad, it is quite repeatable among observers. Once the total ocular plant cover is estimated at the sample plot site, its associated Index is recorded. On DPG ten general Community Types (Formations) have been identified. For each of these community types, an optimal cover class range has been identified. The Natural Resources Conservation Service has published Ecological Site Descriptions for sites across the nation. These have been published by state and county and ecological region. Within each community type, an optimal total plant cover (trees, shrubs, grasses, and forbs) has been estimated using Tooele County, Utah data (as DPG falls exclusively within Tooele County). These data are published on the Natural Resources Conservation Service web page under "electronic Field Office Guide".

For the ten general Community Types found on DPG, the Natural Resources Conservation Service data bases were referenced and optimal cover class indices were assigned for each Community Type. The range of percent cover classes presented for each Community Type represents knowledge of the DPG habitat types and is to be considered as dynamic.

The range of percent cover classes for each Community Type and the associated Cover Class (Index) are presented below:

1. Open Woodland (Optimal Cover: 60-75%)

	Cover Class (Index)	Range of % Cover	Midpoint
degradation	1	0-5	2.5
	2	5-20	12.5
	3	20-45	32.5
	4	45-60	52.5
Optimal	5	60-75	67.5
	4	75-85	80
degradation	3	85-95	90
	2	95-100	97.5

2. Great Basin Arid Shrubland (Optimal Cover: 60-75%)

	Cover Class (Index)	Range of % Cover	Midpoint
de	1	0-5	2.5

degradation		2	5-20	12.5
		3	20-45	32.5
		4	45-60	52.5
	Optimal	5	60-75	67.5
		4	75-85	80
		3	85-95	90
		2	95-100	97.5

3. Great Basin Cold Desert Chenopod Shrubland (Optimal Cover: 45-60%)

		Cover Class (Index)	Range of % Cover	Midpoint
degradation		1	0-5	2.5
		2	5-15	10
		3	15-30	22.5
		4	30-45	37.5
	Optimal	5	45-60	52.5
		4	60-75	67.5
degradation		3	75-95	85
		2	95-100	97.5

4. Great Basin Vegetated Dune (Optimal Cover: 65-85%)

		Cover Class (Index)	Range of % Cover	Midpoint
degradation		1	0-5	2.5
		2	5-25	15
		3	25-45	35
		4	45-65	55
	Optimal	5	65-85	75
		4	85-90	87.5
degrad		3	90-95	92.5

		2	95-100	97.5

5. Great Basin Unvegetated Dune

An Unvegetated Dune by definition has no vegetation growing on it. If vegetation growing on these dunes exceeds 10%, this dune should be considered a vegetated dune, and therefore, only two cover classes are identified.

	Cover Class (Index)	Range of % Cover	Median
	3	0-5	2.5
Optimal	5	5-10	7.5
	Veg. Dune	>10	

6. Exotic Vegetation – Ecocystem Stressors
   (No Optimal Cover Defined)

The health of a Community Type defined as being dominated by exotic vegetation would be defined in an inverse relation to other communities. However, the biological integrity of such a system would rely more upon the species composition (the greater the dominance of exotics, the poorer the integrity of the system) than on an optimal vegetative cover. Therefore, this Index will not be used in the total IBI for Exotic Vegetation Communities. As only sites within a Community Type can be compared

(or one site over time), removing one index from the total IBI will not impact this comparative analysis in any way.

7. Great Basin Cold Desert Perennial Grasslands
(Optimal Cover: 35-50%)

	Cover Class (Index)	Range of % Cover	Midpoint
degradation	1	0-5	2.5
	2	5-15	10
	3	15-25	20
	4	25-35	30
Optimal	5	35-50	42.5
	4	50-75	62.5
degradation	3	75-95	85
	2	95-100	97.5

8. Great Basin Cold Desert Playa (Optimal Cover: 40-55%)
(This Optimal Cover refers to the vegetative cover of individual vegetated hummocks)

	Cover Class (Index)	Range of % Cover	Midpoint
degradation	1	0-5	2.5
	2	5-15	10
	3	15-25	20
	4	25-40	32.5
Optimal	5	40-55	47.5
	4	55-70	62.5
degradation	3	70-95	82.5
	2	95-100	97.5

9. Great Basin Cold Desert Lowland Riparian (Optimal Cover: 50-60%)

	Cover Class (Index)	Range of % Cover	Midpoint

	1	0-5	2.5
	2	5-20	12.5
	3	20-35	27.5
	4	35-50	42.5
Optimal	5	50-60	55
	4	60-75	67.5
	3	75-95	85
	2	95-100	97.5

degradation

degradation

10. Great Basin Cold Desert Wetland (Optimal Cover: 75-90%)

	Cover Class (Index)	Range of % Cover	Midpoint
	1	0-5	2.5
	2	5-25	15
	3	25-50	37.5
	4	50-75	62.5
Optimal	5	75-90	82.5
	4	90-100	95

degradation

If the optimal Cover Class is not achieved, it is assumed that the biological, or physical conditions are less than perfect for this community and a lower Cover Class is assigned. Likewise if the optimal Cover Class is exceeded, it is assumed that species not native to this community have been introduced, or in some way the community is out of balance from what is considered to be its optimal condition, and a lower Cover Class is assigned. Additionally, the degradation in Cover Class Index resulting from an increase in cover may not degrade from a 5 all the way to a 1, but rather a 2, in most cases. This is because a vegetated community still provides erosion control, wildlife habitat, and adds to the biological integrity of the area. Additionally, it is assumed that as exotics increase in a community, that there is still a strong component of the original community type present, otherwise this community type would be considered in the Exotic Vegetation – Ecosystem Stressors community type.

Example: In the pre-treatment area if the total area was estimated to be 55% it would receive a index of 4. Following the burn, if the cover was estimated to be 15%, the index assigned would be a 2. (If following a burn, cheat grass came in and the aerial cover was estimated to be 95%, the area would also receive and index of 2 for the Vegetative Cover Index.).

10. Indication of Wildlife Activity

Wildlife activity can be inferred from the number and types of burrows observed, the number of scat observed, degree of wildlife trails noted, degree of grazing/browsing observed, numbers of birds observed and if necessary, spotlighting for nocturnal wildlife. These data can be qualitatively interpreted and assigned an index valuing from 1 – 5. Some more specific guidelines as to qualitatively ranking a site may include:

- Size of burrow mound
- Number of rodent entrances
- Species occupying burrow
    - Rodents – low
    - Lagomorphs – moderate
    - Mustelid or Canine – High
    - Avian Species
        - Horned lark – moderate
        - Burrowing owls – high
- Active burrows obviously would rank higher than inactive burrows.

Example: If in the pre-burn monitoring, several large active rodent mounds were identified, and coyote scat was identified, insect burrows were observed in some of the sandier areas, and several birds were observed in the area, the index assigned could be a 3.5 (relatively high). Following the burn, the rodent mounds were still there, but appeared to be inactive. Some pronghorn scat was discovered, but other than that, the wildlife usage appeared to be minimal. The index assigned could be a 2.

Example Summary
Remembering that with 10 indices (each with potential values from 1 to 5), equally rated for this IBI, the potential range of values span from 10 to 50 (Exotic Species only uses nine indices, with values ranging from 9 to 45). Totaling the indices for all 10 parameters in this example, the pre-burn site receives a 35.0, but following the burn the same site rates an 18.5. Remember this method can compare the same permanent sample site over time, pre and post treatment, or it can compare two sample sites within the same community type in order to determine which area is healthier, and has a higher biointegrity.

It is suggested that the IBI and FQI methods are dynamic. Other metrics can be assigned by the manager within each community type, depending on management goals and knowledge of the specific communities and response to disturbance.

The method suggested for use at all 10 community types described on DPG is the above mentioned ten parameter process. Using these ten metrics, a system's biointegrity score could range anywhere from 10 (worst) to 50 (best). Data sheets are included as Appendix D (Sample Data sheets), and an electronic data sheet that performs all relevant calculations is included on the enclosed CD (Appendix E CD with Electronic Report and Indices Calculators). Remember, as noted above, site comparisons can be made only between sites within the same community type; either the same permanent study plot over time (following a treatment or disturbance) or between two plots within the same community type, at different locations, for comparison.

3.2.2 Ten Specific Community Descriptions and Monitoring Requirements

This section lists the 10 community types described to occur on DPG. General monitoring requirements are described in section 3.2.1, above. A short description of each community type will be outlined in each following sub-section, as well as suggested single species that may need to be monitored, regulated, or watched according to the legal mandates governing the management of natural resources as outlined in section 1.3, and includes:

- Laws (Federal, State, County)
- Executive Orders
- Regulations
- Policy Directives
- Memorandums of Understanding (MOUs) and Cooperative Agreements (CAs)
- Miscellaneous Agreements

Note: [*Single species management is not suggested as a substitute for biointegrity monitoring as described above. However, management may wish to monitor a single species due to their protection status from legal mandates as listed above.*]

Single species monitoring is also dynamic, subject to updated information about a species, its habitat, or DPG's missions and goals. Some of this modified information may include (but is not limited to):

- New listing of a species
- De-listing of a species
- Agency consultation and document reviews
- Literature updates on the species biology, physiology, life history, or habitat requirements
- New discovery of species on DPG
- Newly discovered or described species, not yet known to science.
- Management object changes for DPG

3.2.2.1 Open Woodland (Utah Juniper)

On DPG, the primary Open Woodland habitat type is that dominated by *Juniperus osteosperma* (Utah juniper). On DPG, this habitat type occupies about 24,557 acres and is found on foothills, steeper rocky slopes, in dunes east of Ditto, and mountain tops, dispersed across DPG. Some juniper open woodland are also found dispersed on deeper soils and in vegetated dunes.

The immediate understory of undisturbed stands of junipers is often rich with a variety of shrubs, grasses, and forbs. However, once the understory is disturbed (especially by overgrazing or fire), desirable native species are often unable to compete with non-natives and to re-establish themselves. Additionally, Utah juniper–dominated open woodlands that have an existing poor-condition understory or that are in close proximity to disturbed areas with exotics are particularly susceptible to invasion by these non-native species. Re-establishing a healthy understory may be very difficult, if even possible.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

- Porcupine
- Loggerhead shrike
- Broad-tailed hummingbird
- Raptors
- Gray vireo
- Black rosy-finch

3.2.2.2 Great Basin Arid Shrubland

On DPG, arid shrublands are commonly found on the steep rocky slopes of the various mountains along with open woodland species such as Utah juniper, and are found down to the lower-elevation foothills. Various types of sagebrush make up the largest group of plants that are found in Great Basin Arid Shrubland. In fact, the presence or absence of some of these plants, along with their size, is used to define boundaries between the various types of vegetation. On DPG, this habitat type occupies about 29,875 acres and is primarily found on the foothills between the juniper open woodlands, and the valley bottoms.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

- Loggerhead shrike
- Brewer's sparrow
- Sage sparrow
- Kit fox
- Raptors

- Helleborine
- Short-eared owl
- Burrowing owl
- Ord's kangaroo rat

3.2.2.3 Great Basin Cold Desert Chenopod Shrubland

On DPG, chenopod-dominated shrublands can be found below the foothills and scattered on lower elevational flat-gradient soils that border the salt playas (which are also vegetated with chenopods). Moving up in elevation toward the foothills, the chenopods transition into a mosaic with arid shrubs that ultimately become dominant up in the rolling foothill topography with its less saline soils. On DPG, this habitat type occupies about 216,920 acres. Outside of playa, this community type is the dominant type on DPG and is found dominating all the valley bottoms east of Granite Mountain.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community*.]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

- Dark kangaroo mouse
- Loggerhead shrike
- Brewer's sparrow
- Sage sparrow
- Helleborine
- Kit fox
- Ord's kangaroo rat
- Burrowing owl
- Raptors

3.2.2.4 Great Basin Vegetated Dune

Of the habitat types occurring on DPG, the vegetated dunes have the greatest variety of both flora and fauna. Vegetated dunes are found scattered about DPG at the East Dugway Dunefield, East Cherait Dunefield, Southwest Gypsum Dunefield, Baker, Camelback, North Wig Mountian Dunefield, and the November Road Dune. On DPG, this habitat type occupies about 68,233 acres and is found scattered from a narrow band west and north of Granite Mountain, through the northern panhandle, and on the southern foothills of the Cedar Mountains, as well as east of the old river bed in the southeastern portion of DPG.

Fauna species that frequent the vegetated dunes are quite varied (Ageiss 1997).The dominant rodents are Ord's kangaroo rat on the higher parts of the dunes and chisel-toothed kangaroo rat on the lower parts of the dunes (Vest 1962). Two other potential species may be the bee *Andrena* sp. *nov*. or the parasitic bee *Melecta alexanderi.*

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

The vegetated dunes are one of the unique habitats on DPG. This community type is unique in the Great Basin, so species diversity studies may be concentrated here. Some of the specific species that may be surveyed for and/or monitored due to their sensitivity are the following:

- Kit fox
- Brewer's sparrow
- Sage sparrow
- Virginia's warbler
- Raptors
- Burrowing owl
- Helleborine
- Ord's kangaroo rat
- Chisel-toothed kangaroo rat
- Andrena sp. nov.
- Melecta alexanderi
- Bee species
- Beetle species, such as, *Cicindela decemnotata*
- Fly species

3.2.2.5 Great Basin Unvegetated Dune

Great Basin Unvegetated Dunes are also known as active or shifting dunes, and this name reflects their obvious lack of vegetation. Sand dunes are constantly being eroded and reformed by the prevailing wind. Large dunes are often barren at their tops due to shifting sand and an unreachable water table. On DPG,

unvegetated dunes can be seen off the north side of Stark Road at about Five-Mile Pass. On DPG, this habitat type occupies about 2,175 acres and is found mainly within vegetated dunes in the northern panhandle, and the southern foothills of the Cedar Mountains.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

- Dune sunflower
- Scurfpea
- Coin buckwheat
- Andrena spp.
- Melecta spp.
- Bee species
- Beetle species, such as, *Cicindela decemnotata*
- Fly species

3.2.2.6 Exotic Vegetation – Ecosystem Stressors

The communities labeled as "Exotic Vegetation – Ecosystem Stressors" are typically large tracts of land that originally were healthy open woodlands, shrublands, or grasslands. These once-pristine areas have undergone some sort of disturbance such as overgrazing, fire, pedestrian/vehicle traffic, to recontouring and total vegetation removal. These disturbances have upset the natural balance of vegetation, reducing or removing the native species. The native vegetation has been replaced with exotic species such as *Bromus tectorum* (cheatgrass), Salsola iberica (Russian thistle – Tumbleweeds), *Halogeton glomeratus* (halogeton), *Ranunculus testiculatus* (bur buttercup), *Eleagnus angustifolia* (Russian olive), and *Tamarix ramosissama* (salt-cedar). For this report, this community type also includes agricultural areas where native vegetation has been replaced with exotic cultivated species. On DPG, this habitat type occupies about 58,621 acres and is found in the southeastern portion of DPG and surrounding English Village. Where fires have removed the perennial vegetation, this community type has replaced the natural community. This is primarily in the foothills of the Cedar Mountains.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.
No single species are suggested for monitoring in these habitats, as they are characteristic of highly disturbed areas. No sensitive species are identified for monitoring herein.

3.2.2.7 Great Basin Cold Desert Perennial Grassland

Great Basin Cold Desert Perennial Grasslands are those areas where the dominant vegetation is that of lower herbaceous grasses that are perennial and usually native. These areas are often found near the edges of dunes, on the lower mountain slopes, and in foothills, where the soil texture is somewhat of a sandy loam. Topography is varied but usually flat to slightly undulating. Areas dominated by perennial grass can also be found where the soils may be a deeper loam.

On DPG, perennial grasslands are found in proximity to dunes and mixed shrublands. On DPG, this habitat type occupies about 2,269 acres and is southeast of Granite Mountain, east of Sapphire Mountain, and west of the old river bed in the valley floor.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

- Kit fox
- Brewer's sparrow
- Raptors
- Burrowing owl
- Coyote

3.2.2.8 Great Basin Cold Desert Playa

The playa community is a sparsely vegetated saline area with little diversity of either flora or fauna. Determining the relative health of such a featureless landscape with little or no wildlife (or total biomass) presents quite a challenge. The single wildlife species that occurs with any regularity is the deer mouse. One of the only plant species adapted to live in the playa is *Allenrolfea occidentalis* (pickleweed or iodine bush). Pickleweed is a halophytic plant that occurs in sandy hummocks situated atop the more clayey-textured and higher-saline playas. On DPG, this habitat type is the largest on DPG, occupying about 397,046 acres (nearly half of the total acreage on DPG) and is found primarily west of Granite Mountain, and north, into the panhandle.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

No single species are suggested for monitoring. However, when the playa is flooded, brine shrimp hatch and become a steady food source for some bird species. Birds that may use this community include:

- American avocet
- Snowy plover
- Black-necked stilt
- White-faced ibis

3.2.2.9 Great Basin Cold Desert Lowland Riparian

Great Basin Cold Desert Lowland Riparian areas are found near perennial flowing springs that provide adequate hydrology year-round to sustain this vegetation type. The species of trees most commonly found is *Populus fremontii* (Fremont cottonwood). The other associated species are various rushes, sedges, and mesic grasses. Soils are silt loam.

On DPG, these lowland riparian areas are found mainly on the western border near the southern end. On DPG, this habitat type occupies only 19 acres and is found in an old homestead on the southwestern fringe of DPG.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community.*]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

- American avocet
- Wilson's phalarope
- Black-necked stilt
- Killdeer
- Ute ladies'-tresses
- Common yellowthroat

3.2.2.10 Great Basin Cold Desert Wetland

Great Basin Cold Desert Wetlands are found around perennial springs. These areas do not support cottonwood trees as does the lowland riparian habitat type. These areas are dominated by more marshy plants such as *Phalaris arundinacea* (reed canarygrass) and *Typha latifolia* (cattail). Soils are typically loamy to silty clay loam. On DPG, the wetlands are found along the southern border near Fish Springs and occupy about 831 acres.

Suggested Single Species for Monitoring

Note: [*Single species monitoring is not suggested for use as an indicator for the health of an entire community*.]

The IBI (described above) is designed to monitor a multiplicity of simple indices which incorporate biological processes and biogeochemical processes to estimate the community's health. One parameter which may not be incorporated into the IBI is the impact of noise and concussion on faunal species. If this is of concern to the manager at any one site, species of concern to monitor may be identified from the list below. Additionally, species of concern may be identified through federal, state or county laws, or other regulations, executive orders, and or memorandum of agreements and miscellaneous guidelines as species that may need extra protection. Additional species that a manager may want to monitor are simple charismatic species (such as raptors, ungulates, porcupines, etc.) This type of monitoring is again, separate from the above described IBI – community biointegrity analysis. If any of the below listed species are identified through any of the above mentioned avenues, funding needs to be made available for the monitoring of, protection of, and any mitigation for impacts to these species and their habitats.

- American avocet
- Wilson's phalarope
- Black-necked stilt
- Killdeer
- Ute ladies'-tresses
- Bobolink

- Common yellowthroat
- Various charismatic waterfowl

Chapter 4
Habitat Protection and Recovery

This community-based Habitat Management Plan (HMP) is intended to promote sustainable ecosystems through management for biodiversity and biointegrity by evaluating, monitoring, conserving, and improving various ecological communities on DPG. Implementation of the HMP is to take place through four phases as follows: Phase I - Habitat Identification, Phase II – Protection, Phase III – Rehabilitation, and Phase IV – Monitoring. Section 2.4 Community Descriptions addressed Phase I – Habitat Identification, and habitat community types are displayed on maps developed through the GIS vegetation mapping effort (Figure 2.1). Phase IV – Monitoring has been described in Chapter 3 - Habitat Monitoring and Assessment, as a dynamic process in which management tools to assess community health (IBI and FQI) are presented. This chapter discusses approaches to the implementation of Phase II – Protection and III – Rehabilitation.

Adaptive management is a flexible, iterative approach to long-term management of biological resources that is directed over time by the results of ongoing monitoring activities. Adaptive management is based upon the premises that ecosystems are complex and inherently dynamic. An adaptive approach is suggested to manage implementation of the HMP's four phases:

- Habitat Identification
- Habitat Assessment
- Protection (Conservation) & Rehabilitation (Recovery/Improvement) Measures
- Monitor (identify new habitat conditions) and assess success of Protection/Rehabilitation measures (then implement new measures, etc.; refer to application of *Red Flag* parameters discussed in Section 3.1.6)

Potential threats/stressors to DPG vegetation communities and potential for community improvement have been described in Chapter 2 - Ecosystem Analysis. Detailed monitoring methods outlined in Chapter 3 can be implemented to determine protection and recovery needs of specific sites and assess relative success of these measures. This chapter suggests community types for protection and recovery, as well as approaches for evaluating *which* habitats to protect or recover on a general level. Subsequently, methods on *how* to protect or recover selected sites within a habitat are also described in this chapter.

Key managers and decision makers are faced with the challenge to achieve a balance between the long-term conservation and recovery of natural habitats and species of concern and the continued execution of DPG's mission. Evaluating three parameters are suggested for approximating candidate areas for protection or recovery: habitat sensitivity, habitat condition, and habitat recoverability.

Determining which habitat areas to protect (from any, or continued disturbance) or recover is paramount to managing such vast acreages especially with a limited budget. It is suggested that in order to determine and prioritize which areas to protect and or recover, an assessment must be done to ascertain the habitats sensitivity, condition, and recoverability.

Habitat Sensitivity

Habitat sensitivity may be thought of as a habitat's ability to withstand a disturbance (vulnerability) and sustain the existing ecosystem, while independently maintaining its current condition. Several factors must be considered when assessing the sensitivity of a habitat. These factors include: vulnerability to disturbance, presence or absence of a sensitive species, and the uniqueness of the habitat relative to the Great Basin as a whole.

Vulnerability is a term used to describe the relative susceptibility to disturbance of a particular ecosystem, guild, individual etc. to a potential threat. A community's vulnerability is related to its sensitivity and ability to maintain self-sustaining condition through time.

Another criterion for sensitivity is the potential presence/absence of any threatened, endangered or otherwise sensitive species of concern. If a habitat is known to harbor sensitive species, or a different site within the same community type is identified which potentially may provide habitat for the sensitive species, then this too is considered a sensitive area.

Sensitivity also refers to the uniqueness of a particular site, as it relates to the Great Basin as a whole. For example, some foothill areas on the southeast side of Camels Back Ridge currently have some very unique communities with species such as winterfat and Stansbury's rockdaisy, seldom observed in this pristine condition anywhere in the Great Basin. Due to their rare and unique nature, these sites would be considered sensitive. Managers must then answer the question, "Is the area sensitive to disturbance and does it contain habitat that is unique in the Great Basin or critical to the ecosystem or to sensitive species?" The manager may refer to earlier sections of this document for guidance in answering that question. Section 1.5.1 discusses the sensitivity of the natural surface types within DPG lands (note that in Section 1.5.1, all natural surface types within DPG lands have been depicted as relatively sensitive). Section 2.4 describes the characteristics and potential threats to each of the 10 habitat communities. Appendix C provides information and references for the habitat needs of sensitive species that are known to occur or may potentially occur at DPG.

Therefore if a site is determined to be vulnerable to disturbance, provides habitat for a sensitive species, or is unique in its setting in the Great Basin, then it would be considered sensitive.

Habitat Condition (IBI)

Habitat condition can be thought of as an estimation of the relative health status of a particular site. Chapter 3 provides detailed methods for monitoring and assessing habitat conditions using the IBI method. Following the IBI process the manager may then have a better idea where a site lies on the continuum from pristine to degraded.

Some pristine areas may appear at first glance to be in poor condition. However, after implementing the IBI methodology, it may receive a high index score indicating good conditions.

Degradation can be defined as alteration to an ecosystem's native biodiversity and integrity in flora, fauna, and their balanced interdependencies. Poor condition habitat (degraded areas) may be within a training area or have a history of being burned. Habitat condition may also decrease after suffering the accumulated impacts of spatial proximity to degraded areas, even though it may not have ever suffered direct mechanical disturbance or fire.

Habitat Recoverability

When considering which degraded areas to spend money on trying to recover or improve, a major consideration must be the practicality or potential for successful recovery. Recovery efforts cost money. The greater the efforts required for recovery, the greater the associated costs most likely will be. Recovery dollars should be spent where they will potentially do the most good. Because a community type has established itself in similar conditions (soil type, precipitation regime, elevation etc.), it is assumed that recoverability will be quite similar among sites of any one community type. Difference in recoverability among similar community types will appear when a site is overwhelmingly invaded with very tenacious exotic species.

Management Goals

As laws and regulations change, any particular management goal may change and ultimately supersede any of the above mentioned criteria for determining which areas should be protected or recovered. As this HMP is meant to be a living document changes in priorities are expected.

4.1 Prioritization of Habitat for Recovery and Protection

As discussed throughout this document, the HMP is intended to provide a framework within which key managers integrate environmental decisions and DPG mission objectives. Chapter 3 explains how identifying sites for special management should be done within the parameters of specific management goals and takes into account several important physical characteristics: community structure, soils, the area's interaction with adjacent community types, and juxtaposition to disturbed areas and needs for buffer zones. It is recommended that prioritization for protection or recovery efforts should come in the following order:

- If a site is determined to be degraded beyond the point of reclamation (the vegetative component is a virtual monoculture of highly tenacious invasive species), it is recommended that priorities are to contain the invasive species and prevent expansion. Some sites are so degraded that no amount of recovery efforts will pay off. These sites need to be identified and dealt with by containment of exotics with greenstripping and herbicide application (discussed in section 4.4).
- If adjacent sites (in the same or different community type) are identified that are disturbed but to a lesser degree and are determined recoverable, they should undergo recovery operations.
- If a similar pristine site within the same community type is identified, protective measures should be taken to prevent the encroachment of exotics. In pristine areas, protection should be employed. Pristine habitats that are sensitive with little potential for recovery (once degraded) should be given highest priority for *protection*.

Sites invaded with tenacious exotic species may appear to be receiving extensive recovery efforts, when in actuality management activities are aimed at protecting the adjacent sites from encroachment of exotics. Sensitive sites with a good potential for rehabilitation/enhancement should be identified for recovery, and likewise pristine sites need to be prioritized for protection.

4.2 Community Types to Prioritize for Protection

Prioritization of community types for protection is based upon three main criteria. These three criteria are the sensitivity of the community, the recoverability, and management goals.

The sensitivity of a community type is assessed by evaluating three main factors. These factors are the relative vulnerability to disturbance, its potential to provide habitat to a sensitive species, and the uniqueness of the community type relative to the Great Basin as a whole. If the community type fits any one of these three criteria, then it is considered sensitive.

Recoverability is an estimation of the likelihood of successful reclamation efforts. Most any specific site within a community type will have the similar characteristics for recoverability. What makes each specific site different from any other within the same community type is the particular tenacity of the species of exotics that have invaded, as well as the amount of cover of these species.

Management Goals may be modified at any time. As protection agreements for species of concern may change, along with DPG mission activities, any particular management goal may change and ultimately take precedence over any of the above mentioned criteria for determining which areas should be protected or recovered. As this HMP is meant to be a living document changes in priorities are expected.

Condition of the community type should not be used as criteria for prioritizing protection efforts. Condition should only be considered when evaluating individual sites within a community type. Figure 4.1 Training/Conventional Munitions Testing Areas, Fire History, and Locations of Exotic Vegetation, provides a general overview of locations where site conditions may be poor. It does not however, indicate what community types these poor conditioned sites are on. Inferences from this figure should only be made regarding individual sites, not community types.

The information listed below summarizes community type information discussed in section 2.4. This summary attempts to streamline comparisons among community types and is intended to provide baseline information when evaluating and prioritizing areas for protection. Characteristics of the soils (properties) usually associated with a given a community are listed for each community type. In addition to soil characteristics, the estimated level of threat that identical stressors would place on the different community types (based on inherent properties of each community type) are listed for comparison among communities. For example, in the Open Woodland section found below, the summarized information listed can be interpreted as follows:

- The properties of the soils in which the Open Woodlands are typically found indicate that the potential for water erosion is *high*.
- The properties of the soils in which the Open Woodlands are typically found indicate that the potential for wind erosion is *slight*.
- The properties of the soils in which the Open Woodlands are typically found indicate that suitability for seeding is *very poor*.
- Inherent characteristics of the Open Woodlands (fuel accumulation, percentage vegetative ground cover, slope, etc.) make it more at risk to fire than the usual threat of fire to any of the other community types.
- Inherent characteristics of the Open Woodlands (slope, fuel accumulation, percentage vegetative ground cover etc.) make it no more or no less at risk to mechanical disturbance or military testing/training than this threat is to any of the other community types.
- Inherent characteristics of the Open Woodlands (presence/absence of soil crusts, degree of wildlife activity, slope, potential for tumbleweed accumulation, percentage vegetative ground cover, etc.) put it at higher risk of being invaded by exotic species, than this threat is to any of the other communities.

- Inherent characteristics of the Open Woodlands (mature trees having well developed root systems with food reserves, percentage vegetative ground cover, presence/absence of soil crusts etc.) put it at lower risk to climatic extremes than other community types.

Open Woodland

Water Erosion Potential	High
Wind Erosion Potential	Slight
Suitability for Seeding	Very poor
Fire	Higher threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	No different threat than to other community types
Proximity to Exotics	Higher threat than to other community types
Climatic Extremes	Lower threat than to other community types

Great Basin Arid Shrubland

Water Erosion Potential	Severe
Wind Erosion Potential	Slight
Suitability for Seeding	Very poor
Fire	Higher threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	No different threat than to other community types
Proximity to Exotics	No different threat than to other community types
Climatic Extremes	Lower threat than to other community types

Great Basin Cold Desert Chenopod Shrubland

Water Erosion Potential	Slight
Wind Erosion Potential	Moderate
Suitability for Seeding	Very poor
Fire	No different threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	No different threat than to other community types
Proximity to Exotics	No different threat than to other community types
Climatic Extremes	Higher threat than to other community types

Great Basin Vegetated Dune

Water Erosion Potential	Slight
Wind Erosion Potential	Moderate-severe
Suitability for Seeding	Very poor
Fire	Lower threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	No different threat than to other community types
Proximity to Exotics	Higher threat than to other community types
Climatic Extremes	No different threat than to other community types

Great Basin Unvegetated Dune

Water Erosion Potential	Slight

Wind Erosion Potential	Very high
Suitability for Seeding	Very poor
Fire	Lower threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	No different threat than to other community types
Proximity to Exotics	Higher threat than to other community types
Climatic Extremes	No different threat than to other community types

Exotic Vegetation – Ecosystem Stressors
Water Erosion Potential Variable, depends on location
Wind Erosion Potential Variable, depends on location
Suitability for Seeding Variable, most likely to be very poor

Any degree of disturbance that would be deleterious to healthy communities may perpetuate the dominance of these exotic community types. These community types by definition are exotic and are threats to the integrity of the natural ecosystems.

Great Basin Cold Desert Perennial Grassland

Water Erosion Potential	Moderate
Wind Erosion Potential	Slight
Suitability for Seeding	Very poor
Fire	Higher threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	No different threat than to other community types
Proximity to Exotics	Lower threat than to other community types
Climatic Extremes	No different threat than to other community types

Great Basin Cold Desert Playa

Water Erosion Potential	Moderate
Wind Erosion Potential	Slight
Suitability for Seeding	Totally not suitable
Fire	Lower threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	Higher threat than to other community types
Proximity to Exotics	Lower threat than to other community types
Climatic Extremes	No different threat than to other community types

Great Basin Cold Desert Lowland Riparian

Water Erosion Potential	Slight
Wind Erosion Potential	Moderate
Suitability for Seeding	Very poor
Fire	Lower threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	No different threat than to other community types
Proximity to Exotics	No different threat than to other community types
Climatic Extremes	Lower threat than to other community types

Great Basin Cold Desert Wetland

Water Erosion Potential	Slight
Wind Erosion Potential	Moderate
Suitability for Seeding	Very poor
Fire	Lower threat than to other community types
Mechanical Disturbance	No different threat than to other community types
Military Testing/Training	Higher threat than to other community types
Proximity to Exotics	No different threat than to other community types
Climatic Extremes	Higher threat than to other community types

Sensitive habitats with little potential for recovery (once they become degraded) should be given strong consideration for protective measures. After evaluating the three parameters of sensitivity, recoverability and management goals, the following communities are recommended for prioritization for protection:

- Great Basin Vegetated Dune
- Great Basin Unvegetated Dune
- Great Basin Cold Desert Perennial Grassland
- Open Woodland

Because the remaining native communities (Great Basin Arid Shrubland, Great Basin Playa, and Great Basin Chenopod Shrubland) are also considered sensitive and important to ecosystem viability and the greater ecoregion, they should also be given consideration for protection.

Some community types need greater protection than others due to sensitive nature, and recoverability potential. Others may warrant protection due to specific management goals. When assessing where to spend the recovery dollars, evaluating the entire community type is much too broad and somewhat vague. What needs to be evaluated is which specific sites within a community type would benefit the most from recovery efforts.

4.3 Site Selection and Recovery Efforts

Selecting a site for recovery efforts is not as simple as evaluating where the exotics are located and proceeding to eradicate them. Careful planning during site selection should allow for the most efficient use of the recovery budget. If one site has been invaded by an exotic species that is quite responsive to recovery efforts, and a different site is invaded by a very tenacious species, it may be more cost efficient to recover the site in which more recovery will be accomplished.

The IBI that was presented in chapter 3 is a guide to assist managers in assessing the condition of two sites within the same community type, or one site over a period of time. Since selection of a location for recovery efforts involves determining which of many sites within a community type should be recovered, the IBI method is appropriate.

The FQI also discussed in chapter 3 takes into account the species mix present on a site. If two sites within a community type were of apparent similar condition, the quality of the species present at each site may be the deciding factor as to which of the two sites should receive the recover dollars.

As laws and regulations change, any particular management goal may change and ultimately supersede any other criteria for determining which areas should be protected or recovered. As this HMP is meant to be a living document changes in priorities are expected.

Some examples of the above mentioned criteria are as follows:

#1. Two disturbed sites within the same community type are assessed using the IBI method. The results indicate that one site is in considerably better condition (higher IBI value) than the other. It is recommended that the site with the higher IBI value be selected by management for recovery efforts.

#2. Two disturbed sites within the same community type are assessed using the IBI method. The results indicate essentially identical IBI values. However, it is noted that one of the sites has a higher FQI value. This would indicate that of the two disturbed sites that are in similar condition (IBI), one of them has a better mix of desirable vs. undesirable species. Therefore, the site with the higher FQI would be recommended to receive the recovery efforts.

#3. Two disturbed sites within the same community type are assessed for condition using the IBI method. The results indicate identical IBI values. The FQI values are also comparable. The particular species of exotics occupying each site must then be evaluated for its tenacity in the environment (or the ability to be displaced by management activities). In this case, the site in which the exotics are more likely to be controlled by management activities would be recommended for receiving the recovery efforts.

The next logical question to answer is, what are the recommended recovery efforts if multiple sites within a community type are all equally invaded by a very tenacious exotic that responds poorly to control efforts? As discussed above, this may be a no win situation under certain circumstances. These sites may still be a high priority due to proximity to more pristine sites. The answer may be not to focus on the recovery of these very degraded sites, but the containment of the exotics invading them. Containment of exotics in a degraded site may be accomplished by placing a barrier between the heavily infested site and the more pristine site. This barrier may be in the form of a greenstrip, which is discussed in the following section.

4.4 Methods for Protection and Recovery

Protection implies a preventative action. Protection may be total avoidance of pristine areas, or a barrier between two different condition areas of the same community type. A barrier could also be placed between two totally different community types. This barrier can act as a firebreak, or as a means to reduce seed dispersal. Protection in the form of total avoidance, if practicable, would conceivably be the least expensive. It may only require the briefing of training personnel regarding the sensitive resources and instructing them of areas to avoid. As a backup to pre-training briefing, signage in key locations may also be used as a visual reminder of sensitive areas that have been designated off limits.

Recovery implies a pre-existing condition of degradation. It would not make sense to recover a pristine area. However, if it fits into management goals, one may attempt to improve an existing community, regardless of its perceived condition.

Protection and recovery methods suggested in this plan are avoidance (as mentioned above), signage (also as mentioned above), greenstripping, herbicide application, and earth contouring. Descriptions of each of these latter methods are outlined below.

4.4.1 Green-stripping

Green-stripping is the practice of planting vegetation in a linear strip for the purpose of providing a living barrier or firebreak. This fire break is accomplished by disrupting fuel continuity, reducing fuel accumulation, and maintaining plants with higher moisture content (Harrison 2002). The width of the green-strip used will vary depending on such factors as the adjacent fuel load, the typical speed of the prevailing winds, the anticipated response time of firefighters, budgetary constraints, and management's objectives. Green-strip widths can vary from as little as 30 feet to as wide as 400 feet. In order to provide fire break qualities, Harrison (2002) suggests the species composition of the seed mix used in the green-strip should offer the following characteristics:

- Adapted to the range site being planted.
- Competitive with annual/exotic weeds.
- Easy to establish.
- Low flammability.
- Open canopy and spacing.
- Palatability by livestock and or wildlife (for efficient removal and control of litter and fine fuel buildup).
- Fire resiliency and re-growth capabilities.

The apparatus of choice to install the green-strip is usually a rangeland drill. Broadcast seeding can be used in conjunction with drill seeding, provided there is some sort of seed bed preparation performed to cover the seed or compact the soil after the broadcasting. Broadcast seeding is not the sole recommended method due to the increased seeding rate needed, inconsistent placement of seed and increased potential for granivory. The rangeland drill is the preferred method due to the more precise controls over placement and seed depth into the soil. Some of the benefits of greenstrips are:

- Provides management the means to partition off severely degraded areas infested with exotics. This partition would serve to contain the spread of exotics and keep them from encroaching into better condition adjacent lands. These particular green-stripping plantings may be installed considerably wider than otherwise would be, for increased fire suppression qualities.
- Improves seed coverage, allows reduced seeding rates, and provides a means for accurate seed metering and calibration, and can be used to seed into stubble (Hansen 1991).
- By precise seed placement, provides a means to create a living protective barrier (firebreak) around pristine or otherwise sensitive areas that are vulnerable to burning and/or further encroachment of exotics.
- Also by precise seed placement, provides a means for dividing large tracks of land that have already been converted from native shrubs and trees to monocultures of exotic species, into smaller parcels. Once these large areas are divided, fire fighting efforts potentially may be reduced. Ideally any fires that occur may more easily be contained within the smaller parcels.
- Provide a means to improve large areas of range, in smaller acreage increments. Due to the costs involved with improvements, this may prove to be a method which can be implemented over time to improve large areas a little at a time and therefore fit into annual budgetary constraints.
- Provide increase quality of wildlife habitat, both cover and forage.

4.4.1.1 Seedbed Preparation

Seedbed preparation will vary somewhat depending upon factors such as the type of disturbance that has previously occurred, the soil texture, the depth of the seed that will be deposited etc. This section will present short discussion regarding the application of herbicides, biosolids, mulch, and sugar during the seedbed preparation. Some characteristics of the ideal seedbed are:

- Very firm, but not compacted below the seeding depth,
- Well pulverized and friable soil on top,
- Surface not cloddy or puddle,
- Free from live resident plant competition,
- Free from seed of competitive weed species,
- Containing moderate amounts of mulch or dead plant material within the soil surface.

Variances from these seedbed conditions may result in less than optimal results. Of the above mentioned characteristics of an ideal seedbed, one that is considered very important at DPG is that it be free from live resident plant competition. Considering the magnitude of the efforts required to accomplish this goal, manual removal of the resident plant population is typically not feasible.

Herbicide Application

The suggested method for removal of resident plant competition is the application of herbicide(s). It is anticipated that conditions between sites and the existing weedy species present will range widely. One herbicide at one concentration will not provide adequate control for all of the exotic species encountered. For specific instructions on chemical control of the various weeds, it is recommended that the existing DPG Integrated Weed Management Plan (DPG 2004) be reviewed and directions followed.

Biosolid Application

Biosolids, composted municipal sewage sludge, has been applied to the soil in several mine reclamation studies. In a study conducted at Kennecott Utah Copper's Bingham Canyon Mine (Black and Borden 2001), test sites were established on a tailings impoundment surface, on capped waste rock surfaces, and on a gravel-borrow area. The seedbeds of these test sites were prepared by disking into the ground between 10 and 30 dry tons/acre of biosolids. Results indicated in plots with high biosolid application rates, vegetative cover was high. However; the percentage of cover contributed by weedy species was increased. Additionally, when the plots were monitored, it was found that during the first 2-3 years post treatment, the seeded desirable species were dominant. But when the same areas were monitored 7-10 years post treatment, exotic species had established almost a monoculture. It is believed that biosolids can play a role in rangeland revegetation efforts. However, as suggested in the above cited study, the biosolids application rates need to be significantly reduced. The recommended application rate is approximately 2.5 dry tons per acre. The benefits of this biosolid application is intended to aid in providing a mulch-like compost, which may reduce water erosion from raindrop impacts, assist in water retention on site, and to add a source of nitrogen to the soil.

Management would be admonished to exercise extreme caution if adding significant nutrients to the soil. Seeding with the addition of biosolids at DPG would be suggested only on a small experimental trial basis. With the addition of nitrogen to the soil from the biosolids, cheatgrass and other exotics may out compete native species. Biosolid application plots would need to be monitored very closely. Herbicides or other weed control measures may need to be employed if exotics appear to have gained a competitive advantage. The worst case scenario being that of exotic species spreading to such an extent that management must resort to total eradication of all plant material within the experimental plots in order to contain further spread of exotics.

Mulch Application
The Utah Department of Natural Resources, Division of Gas and Mining (DOGM), indicates that the primary rationale for the application of mulch to a seedbed, is to reduce the amount of erosion caused by raindrop impacts (ftp://ogm.utah.gov/PUB/MINES/Coal_Related/RecMan/Reclamation_Manual.pdf). While research results may vary regarding the benefits of mulching, DOGM maintains that mulching does not significantly aid in the seedling's establishment. Mulching on DPG may only be economically practicable on a small scale, and is suggested only where management believes there is a definite need, i.e. on slopes with high erosive potential.

Sugar Application
Research on the application of sugar to the seedbed (Prober et al 2004) has indicated that the sugar is taken up by micro-organisms in the soil. Application rates by Prober et al were 0.5 kilogram of sugar/meter^2, (every three months over a 15 month test period) which converts to approximately 2.2 tons/acre. Results of the Prober et al study indicated that the growth of exotic annuals was dramatically reduced. Once these micro-organisms uptake the soil nitrogen, it is no longer available to plants. The native species in the Great Basin have evolved in an environment that is low in nitrogen. With the addition of sugar and resultant binding of nitrogen, the cheatgrass and other exotics are at a competitive disadvantage with the natives.

Due to the costs involved, the addition of sugar to the seedbed of drill-seeded areas at DPG would not be suggested at this time. If future research on other such nitrogen binding agents ultimately may prove to be cost efficient, management might consider re-evaluating this method.

4.4.1.2 Timing of Seeding Activities
The timing of the actual seeding effort needs to be during one of the two generally accepted seeding windows. One of these time periods is during the fall, the other in the spring. In Utah, the fall seeding window is September 1 to December 1 in the southern part of the state, and August 15 to November 15 in the northern part of the state (Hanson 1991).

The spring seeding window is March 1 to May 1 in the southern portion of the state and March 15 to May 15 in the northern portion of the state. Factors that will assist management in determining the proper timing of seeding would include:

- Seeding prior to a period of adequate moisture for seed germination.
- Seeding prior to an extended period of adequate moisture for early seedling growth and establishment.
- Seeding when soil temperatures are adequate for seed growth.
- Seeding prior to a period that could meet the stratification requirements of the species (a common trait of native species is cold stratification to break seed dormancy).

Fall seeding allows for the utilization of soil moisture, which is recharged during the winter. By the time conditions are dry enough in the spring to allow access for seeding machinery, part of the soil moisture buildup over the winter has been lost for seedling establishment.

The recommended time for seeding in this DPG HMP is a fall planting. With DPG situated in the northern portion of the state, the suggested seeding window is August 15 to November 15. Depending upon seasonal

fluctuations, this November 15 cutoff period may potentially be pushed back to the December 1 deadline. Precipitation data for DPG at Ditto from 1950-1998 (DPG 2001), indicates annual precipitation to be 7.86 inches per year. The range of precipitation occurring during this same time period is a low of 3.35 inches (in 1966) and a high of 15.07 inches (1982). Most of the precipitation has historically come in the winter and spring. If the seeds were sown in the fall, had been stratified over the winter, and could take full advantage of all the available spring moisture, this would be the best scenario for successful establishment.

4.4.1.3 Seed Mixes

In order to provide a variety of characteristics the seed mix should contain a combination of species. The seed mix should also be tailor made for the specific areas to be seeded as well as for the exact management goals intended for each seeded area. Naturally, as climatic and edaphic factors vary with spatial change on DPG, so too will the specific seed mix suggested. The species suggested in each mix were selected according to the growing conditions present in each area. For example, the seed mix recommended for lower elevation valley bottoms where exotics are dense and fire break is the main goal, may be considerably different than that of a foothill area with many residual native plants where exotic species are just beginning to encroach.

Listed below are a few seed mixes recommended along with rationale for their use and the areas in which they might best be suited. Several seed mixes are described below. The application rates are given in pounds per acre of pure live seed (pls). The pls is provided to allow the managers to equalize the seeding rate if a lower quality seed source happens to be used. In this fashion, adjustments can be made to ensure the correct amount of seed is being applied.

Foothills

Areas in the foothills, especially around the Cedar Mountains receive more precipitation than the valley floors. This seed mix may accommodate such areas by providing a physical barrier to further encroachment of exotic species, fire, as well as cover and forage for wildlife. A frequently used seed mix and rate of application (stated in pounds of pure live seed / acre) for green-stripping in the Intermountain west (Harrison 2002) is listed below:

Common Name	**Scientific Name**	**lbs of pls/acre**
Crested wheatgrass	*Agropyron cristatum*	2 lbs. pls/acre
Siberian wheatgrass	*Agropyron fragile*	2 lbs. pls/acre
Forage kochia	*Kochia prostrata*	1 lbs. pls/acre
Rubber rabbit brush	*Chrysothamnus nauseosus*	0.5 lbs. pls/acre
Western yarrow	*Achillea millefolium*	0.5 lbs. pls/acre
Sandberg bluegrass	*Poa secunda*	1 lbs. pls/acre
Small burnet	*Sanguisorba minor*	0.5 lbs. pls/acre
Alfalfa	*Medicago sativa*	0.5 lbs. pls/acre
Blue flax	*Linum perenne*	0.5 lbs. pls/acre
Bottlebrush squirreltail	*Elymus elymoides*	1 lbs. pls/acre
Bluebunch wheatgrass	*Pseudoroegneria spicata*	1 lbs. pls/acre
Asian beardless wildrye	*Leymus multicaulis*	1 lbs. pls/acre

A small amount of rubber rabbit brush is included in this foothill seed mix to provide for additional wildlife forage. Since one of the major objectives of greenstripping is to provide a living fire break, no other seed mix includes shrubs other than forage kochia. This foothill recommended seed mix might not be appropriate for areas receiving the least amount of precipitation. The forb species of blue flax, alfalfa, and small burnet

may not be drought tolerant enough to thrive on the valley floors. Whereas the grasses, the forb yarrow, and the sub-shrub forage kochia, would each be expected to do well on the valley floor where precipitation is less than the foothills.

One of the most critical components of this seed mix, even though the application rate is only half that of other species is the forage kochia. An introduced species from Eurasia, forage kochia is drought tolerant, competes well with weedy species, and yet is not overly aggressive to the extent that it will dominate the landscape like cheatgrass. Forage kochia is reported to resprout very well after fires, and is tolerant of normal levels of 2,4-D (Wasser 1982). This latter trait of tolerating a widely used herbicide such as 2,4-D also makes forage kochia a good choice for revegetation projects during chemical control efforts of exotic weeds. Additionally, forage kochia maintains high moisture content throughout the fire season. Pellant (1994) reports that in August forage kochia had 4 times and 10 times the moisture content of crested wheatgrass and cheatgrass, respectively. The traits of being drought tolerant, maintaining high moisture content, low stature (1-3 feet), and competitive with exotics gives forage kochia ideal characteristics for green-stripping.

Wildlife Guzzlers

There are two basic types of wildlife guzzlers in use at DPG. One type is designed to accommodate pronghorn (and other large animals); the other is designed more for upland game birds, specifically chukar. It is recommended to seed a green-strip of the '*Foothill*' mix around the wildlife guzzlers, insofar as it is practicable, depending on growing conditions present, slope etc. The purposes for these plantings are to provide a fire break around these existing physical improvements, and to provide additional wildlife forage and cover surrounding these isolated water sources.

Valley Floors

Another seed mix that may be used on DPG on the lower valley bottoms would be one similar to that used by Palazzo et al (2003) on different DoD installations, including one in Fort Carson Colorado. The seed mix recommended in these locations is:

Common Name	**Scientific Name**	**lbs of pls/acre**
Western wheatgrass	*Pasocopyrum smithii*	1 lbs. pls/acre
Slender wheatgrass	*Elymus trachycaulus*	2 lbs. pls/acre
Indian ricegrass	*Oryzopsis hymenoides*	2 lbs. pls/acre
Sand Dropseed	*Sporobolus cryptandrus*	1 lbs. pls/acre
Siberian wheatgrass	*Agropyron fragile*	2 lbs. pls/acre
Thickspike wheatgrass	*Elymus lanceolatus*	1 lbs. pls/acre
Forage kochia	*Kochia prostrata*	1 lbs. pls/acre
Western yarrow	*Achillea millefolium*	0.5 lbs. pls/acre

Forage kochia is still depended upon for fire suppression, but there is also the inclusion of various drought tolerant bunchgrasses that will also provide for some wildlife forage.

Containment of Highly Disturbed Areas / Protection of Higher Condition Adjacent Areas

Palazzo (2003) also discusses the option of seeding a monoculture
of forage kochia. This monoculture of forage kochia would be seeded (at the rate of 3-6 lbs. pls/acre), for the sole purpose of establishing a fire break. Forage kochia may be also seeded in a monoculture at much

lower rates (1 lbs. pls/acre) however, it may take six or more years to become fully established to the extent where it can stop fires. In some highly disturbed areas on DPG the fire frequency is less than every six years. This suggests that forage kochia should be seeded at higher rates in an effort to suppress fire. Rather than seed a monoculture of forage kochia, it is recommended to blend in some large bunchgrasses in with a higher than usual rate of application for forage kochia.

Common Name	Scientific Name	lbs of pls/acre
Forage kochia	*Kochia prostrata*	3-6 lbs. pls/acre
Asian beardless wildrye	*Leymus multicaulis*	1 lbs. pls/acre
Siberian wheatgrass	*Agropyron fragile*	2 lbs. pls/acre

Recovery of degraded vegetated Dunes

Species recommended for seeding in these degraded vegetated dunes would be those similar to what are normally observed as the early pioneer species colonizing the unvegetated dunes. Additionally, species that are observed in the vegetated dunes would also be appropriate. Seeding should be applied via broadcast with a cyclone type spreader. Broadcast seeding may be done in conjunction with some of the earth contouring and or windbreak erection activities. By driving/walking around on the surface of the freshly contoured and seeded area, the seed may be implanted deeper into the soil, and the seedbed will be somewhat compacted (see section 4.4.1.1 Seedbed preparation above).

Common Name	Scientific Name	lbs of pls/acre
Sand Sunflower	*Helianthus anomalus*	2 lbs. pls/acre
Lemmon scurf-pea	*Psoralea lanceolata*	1 lbs. pls/acre
Munro globemallow	*Sphaeralcea munroana*	2 lbs. pls/acre
Buckwheat	*Eriogonum nummulare*	2 lbs. pls/acre
Eight week fescue	*Festuca octoflora*	2 lbs. pls/acre
Sand Dropseed	*Sporobolus cryptandrus*	2 lbs. pls/acre
Indian ricegrass	*Oryzopsis hymenoides*	2 lbs. pls/acre

4.5 Herbicide Application

In order to prepare the seedbed properly for drill seeding, competitive vegetation species needs to be removed. Over large areas potentially being drill seeded, manual removal of these weeds is not a feasible option. Therefore to improve the chances of seeding success, it is suggested that herbicides be used to reduce the vegetative competition for the seedlings. Because drill seeding will most likely occur over a variety of habitat types, soil types, slopes, etc., different exotic vegetation species will be encountered. Rather than prescribe in this section of the document specifications regarding herbicide application, it is suggested the manager consult the most up to date Integrated Weed Management Plan (currently 2004) for instructions on chemical control of vegetation.

In addition to seedbed preparation, herbicide application can be used on a small scale to control exotic species before they spread. For example, if there was a small disturbance that initiated an introduction of exotic species, the manager could chose to spot treat the area with herbicides. This spot treatment could prevent the large scale spread of invasive species from that small disturbance, potentially preventing encroachment into adjacent pristine areas.

4.6 Earth Moving

Earth moving can be performed in different community types in order to accomplish diverse goals. Earth moving may be used in and around disturbed sites within vegetated dunes which have been degraded to unvegetated dunes. Earth moving may be used in conjunction with a windbreak, and broadcast seeding, in an attempt to stabilize, vegetate, and reclaim these unvegetated shifting dunes. Earth moving may also be used to erect a low berm to collect sheet flow from storm events. The berms would be oriented so that available moisture would be increased to certain areas for the purpose of increasing biomass production and burrowing wildlife habitat.

4.6.1 Contouring Vegetated Dunes

Disturbances that occur in vegetated dunes have the potential to remove vegetation, change micro-habitats and increase the erosive power of both wind and water. In an attempt to recover any such denuded areas, contouring of the remaining soil will assist the manager to reclaim these degraded dunes.

Once the steep micro-topography gradients are reduced with contouring, windbreaks would need to be placed to reduce wind speed and soil erosion. Due to the harsh growing conditions and slow rate of growth for suitable tree species that may work as a living windbreak such as Utah juniper, an artificial windbreak may be needed. Therefore it is recommended that structures be erected as a wind break, or barrier. After the contouring and windbreaks are in place, broadcast seeding of species that are typical pioneers of unvegetated dunes would be performed.

Brandle (no date) indicates that wind speed reductions on the windward side of a windbreak may be measurably observed for a distance of 2 to 5 times (2H to 5H), the height of the windbreak. On the leeward side (the side away from the wind), wind speed reductions occur up to 30H downwind of the barrier (depending on barrier density). For example, if a 6 ft wind break were erected, wind speed could be affected for a distance of 12-30 feet on the windward side of the barrier, and 180 feet on the leeward side. Brandle suggests that for soil erosion control, barrier density of 40 to 60% is optimal. Barrier density describes how solid, or to what degree the barrier obstructs wind. A barrier that has a density of 60% will allow 40% of the wind to pass through the barrier. The cost of barriers will vary with the type, size (height), length, density, and amount of maintenance required. If management goals are met, this may be a one-time expenditure. Managers may consider the one-time erection of windbreaks and seeding if shifting dunes become a high enough priority for them to warrant spending the money to reduce the potential destruction of shifting sand. Some foreseeable benefits of recovering these shifting dunes are:

- The sand would not shift to the same extent and potentially bury the plants that do become established.
- Mature Utah juniper trees (with an average age on DPG of 350 years) would less likely be buried by the shifting sand.
- With increased vegetative biomass production, there will also be an increase in wildlife habitat.
- Reduce the future potential for damaging any of the roads at DPG that may be at risk from shifting sand.

4.6.2 Berm Construction

Vest (1962 pp. 39 table 7, and pp. 40 table 8) investigated the growth response to additional water placed on different plant communities with high biomass production potential. A study was undertaken in which a long berm was oriented such that sheet flow was impounded. Data was collected in a Shadscale-Gray

molly-Greasewood community that had the addition of this surface moisture in comparison to the same type of community that received normal precipitation only. Five years after the construction of the berm vegetative data was collected. The community receiving normal precipitation in addition to the surface flow from adjacent lands increased new annual growth at the following rates:

- Gray molly had 1.27 times as much new growth as the community with only normal precipitation,
- Inkweed had 1.76 times as much growth,
- Shadscale had 4.32 times as much growth,
- Greasewood had 8.13 times as much growth.

In addition to the increased annual growth, the amount of seed production was also noticeably increased, although not quantified. Vest (1962) also investigated the dietary habits of several species of rodents. Some of the food caches of these rodents had a high percentage of seeds. This data could be interpreted to mean that if berm construction were successful at several locations within DPG, the potential carrying capacity for several species of granivorous animals could be increased. If this approach is implemented, care should be taken to avoid inundating the target community for extended periods of time or with greater than ~3 inches of standing water, as most of these xeric species (especially Chenopods, see section 2.4.3) are not able to tolerate excessive moisture.

Due to the relatively flat topography in the valley bottoms at DPG, berms constructed for these purposes could potentially be totally functional and be < 2 feet tall. Accurate surveying of lands slated to be improved could reduce the footprint of berms and also minimize the potential for excessive ponding of sheetflow. Disturbing as small an area as possible with the berm construction would also limit the mechanical disruption to the soil which may allow exotic species to invade. Careful broadcast seeding on the freshly turned soil would potentially aid in establishing desirable species and reducing invasion by exotics. Seed mixes used to broadcast seed on berms would need to be selected on a site by site basis. Management would need to select which species to include in the seed mix, depending on the site characteristics and overall objectives of these activities. Herbicide application may be required to spot treat any areas that are disturbed by berm construction. Additionally, berm construction should only be considered where soils are soft enough to allow burrowing rodents to take advantage of this modified habitat.

This simple technique may be a very low maintenance method for increasing vegetative productivity in an arid environment. As with other relatively unproven methods, great care and planning should be undertaken by managers to avoid untoward affects. However, some of these techniques may also prove to enhance a degraded community type, allowing for increased floral and faunal biomass to be self-sustaining.

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Appendix 4.5.1.2: Select Sections of the Weed Management Plan

Section III Policies and Guidance

General Policy

1. Actions to address non-native invasive plant species will be in accordance with installation INRMP *(Army Policy Guidance Management and Control of Invasive Species 2001).*
2. Actions to control or remedy invasive species will be undertaken only after appropriate NEPA review *(Army Policy Guidance Management and Control of Invasive Species 2001).*
3. NEPA review will consider affects of installation activities or actions that may facilitate the establishment or spread of non-native invasive plant species.
4. Actions or activities that contribute to the establishment or spread of non-native invasive plant species will be mitigated appropriately (Executive Order 13112 of 1999).
5. Non-native invasive plant species will not be used on installation landscapes (*Executive Order 13112).*
6. Partnerships with federal, state, and local agencies, tribes, and non-government organizations are encouraged *(Army Policy Guidance Management and Control of Invasive Species 2001).*
7. Practices to control non-native invasive plant species will not unduly jeopardize native plant species.
8. Off-road traffic will be minimized as appropriate to reduce the risk of weed invasion (Executive Order 11644 as amended 1977).
9. Non-native invasive weed management projects will be coordinated by DPG Natural Resources Coordinator (NRC) (*Army Regulation 203-3).*
10. Invasive weed management projects will be approved by DPG's NRC and other parties as determined by the NRC.
11. Invasive weed management projects will comply with the guidelines set forth in this plan.

Adoption and Modification of Practices Identified in USDA Guide to Noxious Weed Prevention

USDA Forest Service published a *Guide to Noxious Weed Prevention 2001*. Development of this document was in response to *Executive Order on Invasive Weeds 1999.* This guide lists goals and practices that mitigate the introduction or spread of weeds from a project site or program action. The guide is comprehensive and not applicable in all aspects of weed management at DPG. Nevertheless, it is worthwhile to address each practice and identify how DPG can implement similar practices that can serve as mitigating factors when undertaking projects or actions that may increase the susceptibility of the environment to exotic invasion. Application of these standards will ensure compliance of DPG with *Executive Order on Invasive Weeds 1999.*

*Goals and Practices are verbatim from USDA Forest Service, *Guide to Noxious Weed Prevention 2001*. Responses are recommendations supplied by DPG to feature specific practices that advance integrated weed management and demonstrate conformity to multi-agency standards.

General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs

> **Goal 1:** Incorporate weed prevention and control into project layout, design, alternative evaluation, and project decisions.

- Practice 1: Environmental analysis for projects and maintenance programs will need to assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices. Determine prevention and maintenance needs, to include the use of herbicides, if needed, at the onset of project planning.

  Response: Within the framework of NEPA, consideration will be given to the affect(s) the proposed project(s) or action(s) will have towards the introduction or spread of invasive plant species. If proposed projects or actions are deemed contributing factors to the introduction or spread of invasive plant species, practices to eliminate or significantly reduced or otherwise mitigate the invasive potential will be tendered.

  Goal 2. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- Practice 2. Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in project operating areas and along access routes. Identify what weeds are on site, or within reasonably expected potential invasion vicinity, and do a risk assessment accordingly. Control weeds as necessary.

  Response: A standard operating procedure for all ground-disturbing activities is requisite under NEPA as follows: Under the direction of the Natural Resources Coordinator, a site visit is required prior to any ground-disturbing activity to conduct a weed inventory and identify possible routes of weed invasion to and from the project site. Risk will be assessed and measures imposed to mitigate said risk when and if warranted.

- Practice 3. After completing "Practice 2" above, to reduce risk of spreading weed infestations, begin project operations in uninfested areas before operating in weed-infested areas.

  Response: Any ground disturbing activity will, if feasible, proceed first in uninfested project areas, if existent, or proceed in least infested areas and continue progressively towards the more infested areas. This practice is to reduce cross-site contamination on projects covering large areas or multiple sites.

- Practice 4**.** Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict to those periods when spread of seed or propagules are least likely.

  Response: Project staging will occur in weed free areas or areas where weed seed contamination will not significantly contribute to the overall weed composition at the project site or along travel corridors. Travel through weed infested sites may be restricted to specific seasons (i.e. excluding late Summer and Fall travel through knapweed sites) offsetting seed maturation and dissemination.

- Practice 5**.** Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean equipment before entering National Forest System lands; a Forest Officer, in coordination with the Unit Invasive Species Coordinator, needs to approve use of on-Forest

cleaning sites in advance. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway. Seeds and plant parts need to be collected when practical and incinerated. Remove mud, dirt, and plant parts from project equipment before moving it into a project area.

Response: When appropriate, project equipment or vehicles used off-road require cleaning upon entering and exiting DPG property as determined by the Natural Resources Coordinator. A cleaning station will be established and all plant material parts will be bagged and disposed of. If noxious weed seed is recovered, plant material will be incinerated. Non-noxious weed seed may be disposed at the landfill. Equipment or vehicles will be free of mud, dirt, and/or plant material including radiator or filter systems.

- Practice 6. Clean all equipment, before leaving the project site, if operating in areas infested with weeds. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Seeds and plant parts need to be collected when practical and incinerated.

  Response: If projects occur in weed infested areas, equipment/vehicle cleaning will occur at the project site.

- Practice 7. Workers need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and incinerating them.

  Response: Weed seed and plant parts cleaned from vehicles, equipment, or clothing will be properly disposed of. Noxious weed seed or plant parts will be incinerated. Non-noxious weed seed may be disposed at the landfill.

- Practice 8. Coordinate project activities with any nearby herbicide application to maximize cost effectiveness of weed treatments.

  Response: Project activities will be coordinated with ongoing weed control programs. When appropriate, herbicide application by pest management or natural resources management may target project sites when intervention is aligned with compatible tasking.

- Practice 9. Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail rights-of-way, and other areas of disturbed soils.

  Response: Control of traffic by limiting access or implementing road/trail closures may be necessary to rehabilitate vegetation. DPG will look at all options to encourage revegetation efforts including traffic flow.

Goal 3. Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest Service, contractor and cooperator operations. For practices 10 through 12 below, work with the responsible transportation agencies to voluntarily adopt these practices where county and state governments have responsibility for maintenance of roads that cross National Forest System lands.

- Practice 10. Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication, and strip and stockpile contaminated material before any use of pit material.

  Response: Material such as sand, rock, gravel, etc. will come from sites free of noxious weeds. If source material is contaminated with nuisance weed seeds, then material may only be used on sites already contaminated with those same weed species. Borrows on DPG will be monitored for weeds and actions to control weeds implemented.

- Practice 11. Inspect and document the area where material from treated weed-infested sources is used, annually for at least three years after project completion, to ensure that any weeds transported to the site are promptly detected and controlled.

  Response: Following any project where fill or borrow material is used from source outside DPG, monitoring will ensue subsequent for three years. Monitoring will occur bi-annually and invasive plant species recorded and treated. If new weed species are encountered, monitoring will occur for three years following the last known sighting.

- Practice 12. Maintain stockpiled, uninfested material in a weed-free condition.

  Response: Any stockpiled fill material or borrow will be maintained weed free by the party responsible for stockpiling.

  Goal 4. In those vegetation types with relatively closed canopies**,** retain shade to the extent possible to suppress weeds and prevent their establishment and growth.

- Practice 13. Retain native vegetation in and around project activity to the maximum extent possible consistent with project objectives.

  Response: Projects or activities will minimize degradation of the natural plant community surrounding or associated with the project.

  Goal 5. Avoid creating soil conditions that promote weed germination and establishment.

- Practice 14. Minimize soil disturbance to the extent practical, consistent with project objectives.

  Response: Projects or activities will minimize soil disturbances associated with the project.

  Goal 6. Where project disturbance creates bare ground, consistent with project objectives, re-establish vegetation to prevent conditions to establish weeds.

- Practice 15. Revegetate disturbed soil (except travelways on surfaced projects) in a manner that optimizes plant establishment for that specific site. Define for each project what constitutes disturbed soil and objectives for plant cover revegetation.

Response: Under the direction of the Natural Resources Coordinator projects or activities that cause ground disturbances will be revegetated following a prescribed plan to the extent practicable. Revegetation will utilize appropriate plant material and maintenance activities until plant establishment. Projects are required to continue revegetation efforts until desired outcome is achieved. Desired outcome may take longer than one year.

- Practice 16. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available. Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g. road embankments or landings)

  Response: To maximize revegetation success, all reclamations procedures, methods, or science will be investigated to select the best management practices (BMP's) particular to each site treated. Practices may include top soil replacement/augmentation, plant materials selection, germination enhancements, mulching, timing, etc. Native plants will be used in all seed mixes and to the relative amounts feasible and appropriate. Seed, mulches, and erosion features will be certified weed free to the extent required by law and/or available. When practicable, weed free topsoil will be stockpiled and maintained weed free for use on disturbed sites.

- Practice 17. Use local seeding guidelines to determine detailed procedures and appropriate mixes. To avoid weed-contamination, a certified seed laboratory needs to test each lot against the all-State noxious weed list to Association of Seed Technologists and Analysts (AOSTA) standards, and provide documentation of the seed inspection test. There are plant species not on State and Federal noxious weed lists that the Forest Service would consider non-native invasive weeds. Check State and Federal lists to see if any local weeds need to be added prior to testing. Seed lots labeled as certified weed free at time of sale may still contain some weed seed contamination. Non-certified seed should first be tested before use.

  Response: Seed mixes will be determined by the Natural Resources Coordinator. Seed contaminated by state listed noxious weeds will not be used. Use of seed contaminated by other weed species will be reviewed on a case by case basis to assess the risk of non-native plant introduction or spread. Non-certified seed may be used for site-adapted collections and when tests indicate a low risk of relative habitat contamination.

- Practice 18. Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least three (3) growing seasons following completion of the project. For on-going projects, continue to monitor until reasonable certainty is obtained that no weeds have occurred. Provide for follow-up treatments based on inspection results.

  Response: Ground disturbance activities in areas contaminated by noxious weeds require 5 seasons of site monitoring following completion of the project. Monitoring includes the site plus ingress-regress routes used by heavy machinery. A monitoring program includes annual documentation, a copy of which is provided to the Natural Resources Coordinator annually. Project budgets need to include a monitoring program. On-going projects require an accompanying monitoring program for the project duration and for 3-5 years following termination of the project. Three years of post-monitoring is required if no noxious weeds were documented throughout the projects activity, five years if noxious weeds were documented during that period.

Goal 7. Improve effectiveness of prevention practices through weed awareness and education.

- Practice 19. Provide information, training and appropriate weed identification materials to people potentially involved in weed introduction, establishment, and spread on National Forest System lands, including agency managers, employees, forest workers, permit holders, and recreational visitors. Educate them to an appropriate level in weed identification, biology, impacts, and effective prevention measures.

  Response: Education activities will be developed to inform and train civilian and military personnel working or temporarily assigned to DPG including U.S. Army National Guard. Education may take the form of (but not limited to) printed literature, presentation, field trips, workshop, or conferences.

- Practice 20. Provide proficient weed management expertise at each administrative unit. Expertise means that necessary skills are available and corporate knowledge is maintained.

  Response: A minimum of one in-house civilian employee will possess or be trained in the necessary skills to effectively implement weed management at DPG. Additionally, other employees (in-house or contracted) will possess adequate proficiency to carryout the objectives of this plan.

- Practice 21. Develop incentive programs encouraging weed awareness detection, reporting, and for locating new invaders.

  Response: Contracted or official DPG employees working in natural resources, ITAM, pesticide management, or others, will be encouraged to document weed occurrences whenever encountered during the course of daily activities.

Goal 8. Set the example; maintain weed-free administrative sites.

- Practice 22. Treat weeds at administrative sites and use weed prevention practices to maintain sites in a weed-free condition.

  Response: Administrative buildings and surrounding grounds as well as major roads connecting such buildings will be maintained free of weeds by Pest Management.

Aquatic Weed Prevention Practices

Goal 1. To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules.

Aquatic 1-12 (NOT APPLICABLE)

Cultural Resources

- Use the General weed prevention practices.

Response: Cultural resources issues will be dealt with under NEPA.

Fire Management
This section deals primarily with the education of firefighters and procedures used by the Forest Service and is not applicable to DPG. The Department of Defense does not have an emergency fire fund to deal with post-fire rehabilitation like the Forest Service or Bureau of Land Management. Activities carried out by the Forest Service in servicing fire and rehabilitation are similar to the section above under general weed prevention practices. The following goals of education may be beneficial.

Goal 1. Improve effectiveness of prevention practices through weed awareness and education.

- Fire 1. Increase weed awareness and weed prevention in all fire training.

  Response: An annual weed identification and implications workshop is recommended for DPG fire crew. Workshop will be coordinated by the Natural Resources Coordinator.

- Fire 2. Include weed risk factors and weed prevention practices in Resource Advisor duties on all Incident Management Teams and Burn Rehabilitation Teams.

  Response: As part of the annual weed workshop, a section should be devoted to fire fighting practices that affect weed management such as fire-breaks, prescribed fire, and equipment cleaning.

Forest Vegetation Management
Goals and practices under forest management deal primarily with timber harvest and are either not applicable to DPG or covered under the general section.

Grazing Management
Goals and practices under grazing management deal primarily with livestock allotments and are either not applicable to DPG or covered under the general section.

Lands and Special Uses
This section covers any land uses not specified. Practices under this section simply subject all special land uses to give appropriate consideration to weed prevention as outlined under the general section.

Section IX Programmed Actions

Weed Eradication

If for any reason the following plants are eradicated during the programmed control period, then monitoring will proceed for the remaining programmed monitoring duration. Any treatment will be monitored for results at least one time annually following an appropriate time span required to observe treatment results. Reevaluation of control and monitoring actions will occur following the end of the control period and again at the end of the monitoring period.

Squarrose Knapweed: Requires annual spot treatment of all plants at all discovered locations. Monitoring will occur at all known locations as well as the entire fence line and adjacent lands beginning where Duran road intersects the east boundary fences, south to the south boundary fence, and west to Simpson Buttes.

Control Duration: (3 years)

Estimated man hours per year: (40 hours)
Monitoring Duration: (10 years)
Estimated man hours per year: (40 hours)

Jointed Goatgrass: Requires annual spot treatment for next three years. Monitoring will include known location including 100 meter buffer as well as the entire length of Manookin Road and 400 meters along any tributary. Additionally Stark Road will be monitored between the front gate and Dog Area.

Control Duration: (3 years). Reevaluation in three years. If plant eradication occurs prior to 3 years then annual survey still required for duration of programmed monitoring.
Estimated man hours per year: (10 hours)
Monitoring Duration: (10 years)
Estimated man hours per year: (10 hours)

Tamarix (Salt Cedar): Tamarix control will be divided into geographical areas with control treatments prioritized by area. The following areas are thus designated by priority: A census of the entire base will be required the first year after which monitoring will commence by area following treatment and continue for 5 years/area. Because follow-up treatments will be necessary, each year the work load will increase until the third year when the first site treated should be finished.

- Cedar Mountain and Granite Mountain Springs – year one
- Fish Springs area – year two
- Black Pond and outliers – year two
- Dunes east of Cheriat Rd. – year three
- South and West Boundary – year four
- Government Creek (Ditto) – year five
- Dunes north of Wig Mountain – years six through eight
- Baker Facility– year nine
- Repeat applications (mop up) – year ten.

Control Duration: (10 years)
Estimated average man hours per year: (80-320 hours)
Average monitoring duration: (15 years)
Estimated man hours per year: (30 hours/site)

Canada Thistle: Infestation will be treated the initial year with mop-up for two more years.
Control Duration: (3 years)
Estimated man hours per year: (20 hours)
Monitoring Duration: (5 years)
Estimated man hours per year: (4 hours)

Field Bindweed: Field bind weed is a roadside weed the will be controlled by pest management. Extent of population will be reported to pest management for action the first year. Only monitoring will be required. Monitoring will be along Stark Road from the main gate to Ditto, along Manookin road, and along roads within and surrounding English Village, Dog Area, and Ditto.

Monitoring Duration: (10 years)
Estimated man hours per year: (20 hours)

Scotch Thistle: Currently extirpated requiring continued monitoring for 3 years. Monitoring area will include along Stark Road between English Village and the main gate, along the boundary fence north of the main gate, and along highway 196 north of the main gate for 5 miles. If this weed is encountered along the highway, then it will be reported to the Tooele County weed supervisor for action.

Monitoring Duration: (3 years. if weed population remains along highway right-of-way, then monitoring will continue annually until that population is exterminated)
Estimated man hours per year: (6 hours)

Bull Thistle: Bull thistle population will be spot treated annually. Care is required not to spray native thistles. Monitoring will include all known populations as well as springs or Seeps near Redden Springs.

Control Duration: (3 years)
Estimated man hours per year: (40 hours)
Monitoring Duration: (5 years)
Estimated man hours per year: (40 hours)

Russian Olive: Treatment will cover the area between Callao and West End Spring, and the east portion of DPG including the area by the north gate. Any trees planted as an ornamental tree will be excluded from treatment.

Control Duration: (5 years)
Estimated man hours per year: (100 hours)
Monitoring Duration: (10 years)
Estimated man hours per year: (40 hours)

White Top: White top is scattered over several areas but can be effectively eliminated from known locations (see map).

Control Duration: (5 years)
Estimated man hours per year: (40 hours)
Monitoring Duration: (10 years)
Estimated man hours per year: (20 hours)

Puncture Vine: Puncture vine will be controlled by Pest Management along Stark road under the direction of the Natural Resources Coordinator. Monitoring will encompass English Village and Ditto including main travel corridors around those areas.

Monitoring duration: (10 years)
Estimated man hours per year: (20 hours)

Invasive Weed Habitat Restoration

Cheatgrass, Russian thistle, red brome, tumbling mustard, five-hook bassia, halogeton, tansy mustard, bur buttercup, pepper cress, prickly lettuce: These species will be dealt with during large scale

reclamation projects. Sites will be treated to control all annual species which includes the entire pallet of species mentioned here. DPG commits to rehabilitating at least 100 acres of weed infested rangeland under this plan annually.

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Appendix 4.7.2.1 Raptor Nesting Periods and Buffer Guidelines

Nesting Periods and Recommended Buffers for Raptors in Utah

Species	Spatial Buffer (miles)	Seasonal Buffer	Incubation, # Days	Brooding, # Days Post-Hatch	Fledging, # Days Post-Hatch	Post-fledge Dependency to Nest, # Days[1]
Bald eagle	1.0	1/1-8/31	34-36	21-28	70-80	14-20
Golden eagle	0.5	1/1-8/31	43-45	30-40	66-75	14-20
N. Goshawk	0.5	3/1-8/15	36-38	20-22	34-41	20-22
N. Harrier	0.5	4/1-8/15	32-38	21-28	42	7
Cooper's hawk	0.5	3/15-8/31	32-36	14	27-34	10
Ferruginous hawk	0.5	3/1-8/1	32-33	21	38-48	7-10
Red-tailed hawk	0.5	3/15-8/15	30-35	35	45-46	14-18
Sharp-shinned hawk	0.5	3/15-8/31	32-35	15	24-27	12-16
Swainson's hawk	0.5	3/1-8/31	33-36	20	36-40	14
Turkey vulture	0.5	5/1-8/15	38-41	14	63-88	10-12
California condor	1.0	NN yet	56-58	5-8 weeks	5-6 months	2 months
Peregrine falcon	1.0	2/1-8/31	33-35	14-21	35-49	21
Prairie falcon	0.25	4/1-8/31	29-33	28	35-42	7-14
Merlin	0.5	4/1-8/31	28-32	7	30-35	7-19
American kestrel	NN[2]	4/1-8/15	26-32	8-10	27-30	12
Osprey	0.5	4/1-8/31	37-38	30-35	48-59	45-50
Boreal owl	0.25	2/1-7/31	25-32	20-24	28-36	12-14
Burrowing owl	0.25	3/1-8/31	27-30	20-22	40-45	21-28
Flammulated owl	0.25	4/1-9/30	21-22	12	22-25	7-14
Great horned owl	0.25	12/1-9/31	30-35	21-28	40-50	7-14
Long-eared owl	0.25	2/1-8/15	26-28	20-26	30-40	7-14
N. saw-whet owl	0.25	3/1-8/31	26-28	20-22	27-34	7-14
Short-eared owl	0.25	3/1-8/1	24-29	12-18	24-27	7-14
Mex. Spotted owl	0.5	3/1-8/31	28-32	14-21	34-36	10-12
N. Pygmy owl	0.25	4/1-8/1	27-31	10-14	28-30	7-14

W. Screech owl	0.25	3/1-8/15	21-30	10-14	30-32	7-14
Common Barn-owl	NN[2]	2/1-9/15	30-34	20-22	56-62	7-14

[1] Length of post-fledge dependency period to parents is longer than reported in this table. Reported dependency periods reflect the amount of time the young are still dependent on the nest site; i.e. they return to the nest for feeding.

[2] Due to apparent high population densities and ability to adapt to human activity, a spatial buffer is not currently considered necessary for maintenance of American kestrel or Common barn-owl populations. Actions resulting in direct mortality of individual birds or take of known nest sites is unlawful.

Recommended Proportion (None, Half, or Full) of the Species-specific Spatial Buffer Zones for Level and Duration of Activities During Raptor Nesting

NESTING PHENOLOGY (Risk Level)				
	Courtship and Nesting (High)	**Incubation, and Brooding (High)**	**Post-Brooding Nestling Period (Moderate)**	**Post Fledging Dependency (Moderate)**
In-Vehicle, Recreational[a] Activity: Any recreational vehicle driving off-road, or on dirt roads, and not part of a routinely used transportation corridor.				
less than 1 hour[b]	NONE	NONE	NONE	NONE
less than 1 hour[c]	HALF	HALF	NONE	NONE
greater than 1 hour	FULL	FULL	HALF	HALF
Out-of-Vehicle, Recreational Activity: including, but not limited to hiking, dispersed camping, rock climbing, birdwatching, fishing, hunting, biological surveys.				
less than 1 hour[b]	HALF	HALF	NONE	NONE
less than 1 hour[c]	FULL	FULL	HALF	HALF
greater than 1 hour	FULL	FULL	FULL	FULL
Developed Recreation: including, but not limited to ski resorts, snowmobile and off-road vehicle courses, developed campground sites, and group tour operations.				
	FULL	FULL	FULL	FULL
Industrial, Municipal, and Transportation Disturbance: including, but not limited to urbanization; mining; oil and gas development; logging; power line construction; road construction & maintenance; use of explosives; agricultural operations; fixed wing and helicopter overflights.				
less than 1 hour[b]	FULL	FULL	HALF	HALF
less than 1 hour[c]	FULL	FULL	FULL	HALF
greater than 1 hour	FULL	FULL	FULL	FULL

[a] Recreational activities are defined as those providing outdoor recreation, entertainment, or adventure.
[b] No more than 1 repetition in a 24 hour period for a duration of less than 1 hour is allowable.
[c] More than one repetition per 24 hours, spaced no less than 2 hours apart, occurs during daylight hours. Full buffer zone is required for any activities occurring during nighttime hours.

Appendix 7.4: List of INRMP Goals and Objectives

The below list of **projects** with their ***goals*** and objectives is presented in the order they appear in this INRMP. Goals and objectives are summarized; their full terminology is within Chapters 4, 5, and 7.

Section	No.	Projects/Goals/Objectives*	ONGOING Implementation	PLANNED Implementation				
				16	17	18	19	20
4.1.1		**Ecosystem Management Coordination**						
	G1	***1. Use coordinated planning to manage natural resources to sustain military mission capability.***	Most Projects. Yearly	7, 153,5,6,8,11, 16, 20, 10	7, 153,5,6,8,11, 16, 20, 10	7, 153,5,8,11,16 , 20, 10	7, 153,5,8,11,16, 20, 10	7, 153,5,8,11,16 , 20, 10
	G2	***2. Promote and participate in regional planning for natural resources conservation at scales larger than DPG.***	Most Projects. Yearly.	7, 153,5,6,8,11, 16, 20, 10	7, 153,5,6,8,11, 16, 20, 10	7, 153,5,6,8,11, 16, 20, 10	7, 153,5,6,8,11,1 6, 20, 10	7, 153,5,6,8,11, 16, 20, 10
	G1	***1. Use coordinated planning to fully integrate the natural resources program at DPG.***	1, 13, 10	7, 15, 3,4,5,11,20	7, 15, 3,4,5,11,20	7, 15, 3,4,5,11,20	7, 15, 3,4,5,11,20	7, 15, 3,4,5,11, 20
4.3.2		**Soils Management**						
	G1	***1. Repair damaged soils and use soil parameters to manage military activities, protect soil stability, restore testing and training lands, and conserve wildlife habitat.***	10	21, 22, 23, 32				
4.4.2		**Water Resources Management**						
	G1	***1. Protect surface water quality at DPG.***	10	23, 21, 22				
4.5.2		**Habitat Management**						
	G1	***1. Inventory DPG floral resources and monitor species or communities that are indicators of ecosystem integrity, capability of lands to support military missions, status of sensitive species or communities, and other special interests.***	10	9,1921,22,23, 24,25,26, 30, 31,323,5,11	93,5,11	3,5,11	3,5,11	3,5,11
	G2	***2. Prevent the introduction and/or spread of noxious or non-native invasive weed species.***	13, 10	21,22,23,24, 25,27,32				
	G3	***3. Reduce or eliminate non-native invasive weed species.***	10	21,22,23, 27				

Section	No.	Projects/Goals/Objectives*	ONGOING Implementation	PLANNED Implementation				
				16	17	18	19	20
	G4	***4. Rehabilitate lands degraded by non-native invasive plant species.***	10	21,22,23, 27				
	G5	***5. Manage wetlands to ensure "no net loss" per Executive Order 11990.***	See Legal Opinion, Pg 56, Para 4 of INRMP; Need Army COR Review	21, 22, 23, 24, 25, 26, 27, 32				
4.6.2		**Wildlife Management**						
	G1	***1. Inventory DPG faunal resources and regularly monitor species that are indicators of ecosystem integrity and other special interests.***	10	7, 9, 19, 2, 3,5,11, 20	7, 9, 3,5,11, 20	7, 3,5,11, 20	7, 3,5,11, 20	7, 3,5,11, 20
	G2	***2. Maintain wildlife populations at optimal levels in accordance with species priorities, population ecology, population health considerations, and habitat capacities.***	1, 13, 10	7,15, 9, 19, 21, 22, 23, 24, 25, 32, 3,5,8,11,16, 20	7,15, 9, 3,5,8,11,16, 20	7,15, 3,5,8,11,16, 20	7, 15, 3,5,8,11,16, 20	7,15, 3,5,8,11,16, 20
4.7.1		**Federal-listed Species Management**						
	G1	***1. At a minimum, sustain residential or migratory populations of endangered, threatened, or special status species and their habitats at current levels, with the long-term goal of conserving listed species and their habitats in accord with specific Recovery Plans and the Endangered Species Act.***	1, 13, 10	7,15, 9, 19, 23,26	7,15, 9	7,15	7,15	7,15
4.7.2		**Nonfederal-listed Species Management**						
	G1	***1. Monitor and manage nonfederal-listed, special status species to the degree possible with available funding.***	10	7,15,19,21, 22, 25, 26,5,11,16,20	7,15,5,11,16, 20	7,15,5,11,16, 20	7,15, 5,11,16,20	7,15,5,11,16, 20
4.8.2		**Special Interest Areas Management**						
	G1	***1. Manage special interest areas to retain and protect features and characteristics that make them special.***	10, 17, 24					

Section	No.	Projects/Goals/Objectives*	ONGOING Implementation	PLANNED Implementation				
				16	17	18	19	20
4.10.2		**Pest Management Support**						
	G1	***1. Control plant and animal species that affect natural resources management or directly affect the military mission on DPG.***	1, 13, 10	15,9, 19,21, 22, 23, 27 11,16	15,911,16	15,11,16	15,11,16	15,11,16
4.11.2		**Cantonment Area Management**						
	G1	***1. Provide support to maintain an aesthetically pleasing cantonment landscape that preserves natural ecosystem functions as much as possible.***	13	28, 29				
4.12.2		**Fire Management**						
	G1	***1. Prevent and suppress wildfires to maintain ecosystem biodiversity and functionality.***	10	21, 22, 25				
5.1.1.2		**Range and Training Land Assessment**						
	G1	***1. Provide trainers, testers, and land managers with assessments of changes in the condition of DPG lands.***	10	24, 25, 30, 31, 32				
5.1.2.2		**Land Rehabilitation and Maintenance**						
	G1	***1. Use LRAM to restore and maintain lands to full training and testing support capability.***	10	21, 22, 32				
	G2	***2. Coordinate with adjoining land managers through DPG DEP to protect lands from the effects of military training by reducing fugitive dust, soil erosion, and sedimentation within current land management strategies.***	13, 10	21, 22, 32				
5.1.3.2		**Training Requirements Integration**						
	G1	***1. Improve communication between training, testing, and land management staff to facilitate the integration of DPG mission requirements for land use with the sustained capability of the land to support such use.***	13, 10	24, 25, 26, 27, 17	17	17	17	17
5.1.4.2		**Sustainable Range Awarenwss**						
	G1	***1. Develop an awareness of values of, and requirements for, natural and cultural resources protection on DPG to support sustained military training and testing.***	1, 13, 10	7,27, 28, 29,4, 17	7,4, 17	7,4, 17	7,4, 17	7,4, 17

Section	No.	Projects/Goals/Objectives*	ONGOING Implementation	PLANNED Implementation				
				16	17	18	19	20
	G2	***2. Educate military users to minimize impacts to the land and natural resources to sustain and enhance training and testing.***	1, 13, 10	7,27, 28, 294	7,4	7,4	7,4	7,4
5.1.5.2		**Geographic Information System**						
	G1	***1. Provide spatial products and analyses to support ITAM program implementation; military mission planning, training, and testing; and land use decision-making.***	Geographic Information Systems Office Responsibility					
5.2.2		**Natural Resources Enforcement**						
	G1	***1. Assure legal compliance of military and civilian activities with regard to natural resources on DPG.***	1, 13, 10	15,27	15	15	15	15
5.3.1.2		**Conservation Awareness**						
	G1	***1. Provide information to DPG and external interested communities regarding natural resources and associated management programs at DPG.***	1, 13, 10	7,21, 22, 23, 28, 29,4	7,4	7,4	7,4	7,4
5.4.2.2		**Hunting Program**						
	G1	***1. Provide opportunities to the DPG community and general public for quality, safe, and equitable hunting consistent with needs of the DPG military mission.***	10					
5.5.2		**Cultural Resources Protection**						
	G1	***1. Implement this INRMP in a manner consistent with the protection of cultural resources.***	1, 13, 10	9, 19	9			
5.6.2.2		**Use of NEPA**						
	G1	***1. Use NEPA to identify projects and activities that might impact natural resources and work with project planners to resolve issues early in the planning process.***	13, 27, 10					

Section	No.	Projects/Goals/Objectives*	ONGOING Implementation	PLANNED Implementation				
				16	17	18	19	20
	G2	***2. Use NEPA to ensure this INRMP is documented according to the spirit and letter of NEPA.***	13, 27, 10					
	G3	***3. Help DPG comply with NEPA***	13, 27, 10	5,11	5,11	5,11	5,11	5,11
7.2.1.2		**INRMP Implementation Staffing and Training**						
	G1	***1. Provide staffing of natural resource management professionals required to effectively manage natural resources.***	10					
	G2	***2. Provide training to natural resources personnel implementing this INRMP***	10	7	7	7	7	7
7.2.2		**External Assistance**						
	G1	***1. Provide external specialized skills, personnel, and resources to support the DPG natural resources program.***	10	7,21,22,23, 24,25,26,27 ,28,29,30,3 1,3,24	7,4	7,4	7,4	7,4
7.3.2		**Date Storage, Retrieval, and Analysis**						
	G1	***1. Store, analyze, and use data in an efficient, cost-effective manner.***	1, 13	9, 19,25	9			

* Project title (in **bold**) follows section number; goal(s) appear in ***bold/italics***; objectives are numbered consecutively following goals. Both goals and objectives are condensed from chapters 4-7.
Implementation Columns Guide:
X = goal or objective has and will be implemented in the years marked but does not exist within a defined project.
# = provides a reference to a defined project that is specifically implementing the goal or objective in a given year. Defined projects are listed below by number.

5-Year Project List and Summaries

DPG NRO Projects 2016-2020

1. Legacy Raptor Management
2. Horse Management Program
3. Water Feature Management/Inventory at DPG
4. Sensitive Mollusk Distribution at DPG
5. Photopoint Monitoring
6. Habitat Monitoring and Restoration Project
7. Raptor Nest Inventory
8. West Vertical Artificial Nest Structure Eagle Permit and Video Monitoring
9. USFWS and UDWR Permit Maintenance
10. Special Emphasis Area Surveys
11. Snowy Plover Inventory and Use of Habitats
12. Reptile Study: Military Impact on Arthropod and Herpetofaunal Communities
13. Utah Bat Legacy Initiative
14. Dugway Natural History Collection
15. DPG Hunting Program
16. NEPA Review and Reporting
17. Training and Conference Attendance, Agency Working Groups
18. Annual INRMP Update
19. Natural Resources Office Coordination and Management
20. Urban Natural Resource Management
21. Project Definition Worksheets (PDWs)
22. Great Basin Spade-foot Toad Telemetry
23. Dune BioBlitz Monitoring
24. Rattlesnake Den Monitoring
25. Avian Protection Plan Update
26. Fire Plan Update
27. DPG Natural Resource Outreach
28. Greater Sage-Grouse Inventory

29. NRO Annual Report
30. Rough Haul Greenstrip Reseeding
31. Stark Electric Restoration Reseeding
32. Wetland Water Quality Monitoring
33. Arbor Day/Earth Day Event
34. Tree City U.S.A. Designation/Urban Forestry
35. Dugway Herbarium
36. Plant taxonomy update
37. Fuel Moisture Monitoring
38. Fire Event Monitoring
39. Tamarisk Removal
40. Jack Rabbit II
41. NTA Program Support

Overview

DPG's Natural Resources Office (NRO) has used this INRMP successfully to implement and meet many goals and objectives outlined within this document. The pages that follow outline projects completed from 2011 to 2016 and those planned for 2016 and beyond, in no particular order. Not all projects that will be completed through 2020 have been planned. Funding has been an extreme challenge; it is the belief of the NR Program Manager however, that DPG has adequately fulfilled the intent of the Sikes Act and the INRMP. Projects are presented in summary with accomplished INRMP goals and objectives; other initiatives that meet INRMP goals and objectives are outlined as well. Final reports for most projects can be found at DPG and are available upon request. As of 2009, Project Definition Worksheets (PDWs) were written to more clearly define projects and their intentions. These are provided by project if available. Planned projects have just begun or will begin in the 2016 field season. The N drive referred to in all projects is located here: Additional information for this project can be found on the N drive on the network \\dugwita7nasorg\dpg\imcom\Environmental_Programs\Private\ConservationPreservation\NaturalResources\. Project numbers correspond to those used within the INRMP Implementation Table in Appendix 7.4.

1. Legacy Raptor Management

This multi-year project, funded by a series of successful Department of Defense (DoD) Legacy Program grants, investigates the decline in the Raptor population in the Great Basin area of Utah. Mr. Robert Knight, Natural Resources Manager at DPG, noticed a decline in both the raptor population as well as their traditional food sources within the boundaries of this 890,000 acre installation. Consultation with other federal, state and non-government organizations (Hawkwatch International and Raptor Inventory and Nest Survey) confirmed that those organizations were also documenting a decline in burrowing owls, ferruginous hawks and golden eagles during their surveys. The hypothesis is that the impact of invasive cheat grass (Bromus tectorum) is

causing a reduction in the traditional native, non-invasive habitat of the raptors preferred food sources resulting in a significant decline in the prey population. The potential negative effect on Dugway's military mission is significant. If burrowing owls and/or ferruginous hawks, both Utah Species of Concern, and golden eagles (documented declining population in the Western United States) were to be listed, or relisted, as threatened or endangered species the impact on DPG's military testing and training missions could be significant and directly impact Dugway's role in the Global War on Terror. The first phase of this project is a compilation of raptor nesting data from Utah's Great Basin for the three raptors. This data will be used to more accurately estimate breeding populations, their distribution and produce initial models of the relationship between cheatgrass, prey and raptor nesting activity within the Utah MOA or Military Operational Area. The MOA includes not only DPG but the U.S. Air Forces' Utah Test and Training Range (UTTR) as well. The second phase of this project will refine the models developed in phase one to ensure sound, defensible science is used to identify and prioritize lands for military operations, required mitigation, habitat protection and habitat restoration.

2. Horse Management Program

Horses are officially managed by the BLM under the Horse and Burrow Act. DPG has done little direct management of the species on DPG land. We have supported BLM requests for area and land access for surveys and round-up events. We also coordinated extensively with Kayla Grams who was working with the Humane Society for the BLM. Ms. Grams has completed extensive surveys of the horse population in the Cedar Mountain Management Unit, of which DPG is a part.

Documentation of the horse herds in the Cedar Mountains on BLM and Dugway Proving Ground began in 2008 and continued through 2011. Information is being collected on individual horses, foal recruitment, mares treated with contraceptives, population, mortality, health of the herd and behavior. In December 2008, horses were gathered and removed. Seventy gathered mares were treated with PZP contraceptive in timed release pellets and returned to the wild. In 2011 those mares that were treated in 2008 were retreated. These methods include field darting using a remote CO_2 delivery system.

No PDWs exist for this project. Information on the network can be found here: N:\Projects\Horse Management.

In 2016 Dugway met with the BLM to initiate the next several years of surveys and initiatives. A separate project is designed to inventory the vents and springs on DPG and outline protective management actions for these sensitive water sources (the Water Feature Management Project). Also in the spring of 2016 a publication was completed and accepted in a peer reviewed journal. This project is now being managed through the Water Feature Management Project.

3. Water Feature Management Project

Dugway has many water habitats of various types scattered across its landscape. Species At Risk (SARs), such as Townsend's big-eared bat and fringed myotis, otherwise protected species like the golden eagle, and other important wildlife in the Great Basin such as mule deer, pronghorn antelope and the Great Basin spadefoot toad are dependent on riparian habitats. Aquatic habitats, including springs, ponds, lagoons and guzzlers, provide vital

ecosystem services, including supporting both alpha and gamma biodiversity. The importance of water resources as a biodiversity support is accentuated in arid environments where this resources are limited.

There are several DOD instructions, Army regulations, federal and state and Executive Orders that address the issue of aquatic resource conservation and restoration on federal lands, including E.O. 11990 "Protection of Wetlands". These regulations call for the preservation, enhancement and restoration of the function, value, biodiversity, and ecosystem services of federal land aquatic resources.

It is the NRO's goal to "protect" and "enhance", in support and cooperation with the military mission, with the focus of multiple sustained use, biological integrity and ecosystem function through sound scientific data on an ecosystem and landscape scale.

From visual observation there is hypothesized degradation of Dugway's aquatic resources due to presence of invasive plants and severe horse disturbance. Exotic plants crowd out natives and horses' constant presence and digging at the water creates large erosion problems, lack of vegetative cover, and encourages invasive plant species growth. This hypothesis cannot be confirmed until quantifiable data has been collected and analyzed.

Integrating the Conservation Management procedures in DODI 4715.3, Section F and Innus and colleagues (2000) a basic assessment and restoration procedure was developed:

1) Assess military mission.
2) Prepare detailed inventory of resources.
3) Classify resources
4) Choose indicator parameters and collect data
5) Analyze indicator data, to assess the integrity and function of the resource to determine if/what restoration is necessary
6) Analyze and assess risk to the resources.
7) Create management (restoration) plan based on assessment
8) Implement management (restoration) plan
9) Monitor and assess results.
10) Reassess inventories.
11) Reanalyze and reassess risk to resources.
12) Adjust program, as necessary.

In 2011, the military mission was assessed (#1), an inventory of resources was continued (#2), and indicators were chosen and data was collected. Indicator data collected in 2011 included presence and abundance of aquatic invertebrates and 21 water quality parameters, such as dissolved oxygen, temperature, salinity, nitrate concentration, and MPN of *E. coli*. This data is collected three times throughout the year at about 70 of Dugway's water features and will continue to be collected for three more years. Indicator data from other NRO projects will also be utilized including: bat usage from bat surveys, toad usage from toad telemetry project, fox and coyote usage from USU's coyote/kit fox telemetry study and other wildlife usage from BYU's wildlife camera study. A complete list of water feature classification and inventory of resources has been compiled. By the end of the next three year indicator data collection, the assessment will be started and a management plan will be developed and implemented, with a long term monitoring component (including photo monitoring) gauging the success of the treatments and health of the systems, including a horse exclosure research experiment.

Refer to the "Dugway Water Feature Management" project definition worksheet (N:\NaturalResources\Project Definition Worksheets\Approved PDWs) for more information, including a list of supported INRMP goals.

4. Sensitive Mollusk Distribution at DPG

There are 39 species of mollusks that are identified in Utah's Wildlife Action Plan (WAP) as sensitive (UDWR 2005). At least 6 sensitive mollusk species occur in close proximity to Dugway Proving Grounds (DPG) and may occur on DPG. Because DPG has habitats that may harbor sensitive mollusks, it is important to identify their distribution and abundance in the DPG ecosystem. In March 2009 an IMCOM funding request was validated and funded to conduct an initial baseline survey. These surveys will document presence/absence and any habitat use patterns of sensitive mollusk species populations on DPG. Habitat modeling began in the spring of 2011. Terrestrial sampling for mollusk species on DPG is currently under way with aquatic sampling planned for fall 2011. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project. The PDW for this project can be found at N:\Project Definition Worksheets\In Progress PDWs.

5. Photo Point Monitoring

This project establishes photo point monitoring sites that will capture qualitative (visual) and quantitative (percent cover, slope, elevation, distance to disturbance) data in regular, reoccurring intervals. The sites will monitor trend through time, effectiveness of project treatments, evaluate response of landscape feature from training activities, and capture site conditions. This project aligns with protocols in the 1999 LCTA II Technical Reference Manual for Ecological Monitoring on Army Lands. The objectives of this study are to

1. Inventory and monitor habitats on an ecosystem and landscape scale by establishing permanent visual references.
2. Monitor special interest areas on DPG testing and training ranges.
3. Monitor projects with potential to impact site specific resources.

A modified version of the photo monitoring protocols from the Southwest Alaska Network and USDA was completed for use in this study. For increased repeatability each photo site is staked at both the camera location and reference pole (6m from the camera location), but also the ends of the 180/360 photo so that a constant physical marker in the photo will place the edge of the photographic perspective in the same place each year. This added with the use of a tripod that corrects for parallax error, a level for evenly stitched pictures, and a constant 10 degree shift as the camera is moved around the point has produced repeatable, high quality 180 and 360 degree photos. The first year of data collection began in 2011 and will continue annually starting at each spring plant growth period. Data will be analyzed annually and concluded within an annual project status report, listing current conditions and/or trends and adaptive management recommendations.

Additional information, including a list of supported INRMP goals and objectives, can be found in "Photopoint Monitoring" project definition worksheet located at N:\NaturalResources\Project Definition Worksheets\Approved PDWs.

6. Habitat Monitoring and Restoration Project

Rehabilitation, restoration, and reconfiguration of maneuver training lands are necessary for sustained realistic, safe training conditions. A multiple use, sustained use philosophy is integrated into land rehabilitation which includes the needs for fire safety and biological conservation.

Land rehabilitation needs have produced several projects that are currently in progress or will be addressed in the near future. Current projects include Fire Management: Green Strip Plantings, 700 Series Firing Point Restoration, and Saltcedar Removal.

Fire Management: Green Strip Plantings focuses primarily on rangeland safety and biodiversity conservation. Through coordination efforts with Dugway Fire Department, this project determines key areas that are fire safety risks and critical native remnant habitat and uses BMP planting techniques that will prevent the spread of fire on the range, displace invasive weeds, and buffer native habitats from a fire event. Two green strip sites were planted in 2009 and two more will be planted in the fall/winter of 2011, with subsequent plantings being planned as critical areas are identified and planting resources are available.

The 700 Series Firing Point Restoration project was implemented when tracked vehicle maneuvering exercises severely damaged sensitive rare plant habitat outside of the 700 series firing points. Pre-treatment data was collected, treatments were implanted and post treatment data was collected in 2008 with subsequent response data collected in 2009 and 2011. The final year's data will be analyzed and the success of the project will be determined based on the treatments ability to meet rehabilitation objectives in a final project report which will be completed by end of year 2011. The monitoring transects used to collect the data will remain and will be utilized in the future to determine longer term responses.

Much of the training lands on military instillations have become over run with exotic plant populations which decrease training land areas, decrease ecosystem services and biodiversity, decreases value, decreases training land realism, and increases safety hazards. Several DOD Instructions, Army Regulations, federal and state regulations, and Executive Orders address the issue of exotic species on federal lands and emphasize the need for eradication and/or preventive measures for invasive species. Several invasive species are currently or will be focused on for management, cheatgrass, tamarisk, phragmites and Russian olive. Tamarisk (*Tamarix* sp.) populations in wetlands were cut down using chainsaws and sprayed with herbicide in 2009, with over 644 trees removed in 5 wetlands. This year tamarisk removal has changed from focused in wetlands to the south border, where tamarisk threaten to spread into Fish Springs National Wildlife Area.

Restoration projects are monitored long-term for effectiveness and success in meeting goals and specific objectives, and all projects will continue to be monitoring using a variety of methods including photomoniotring and vegetation surveys.

Refer to "Fire Management: Green Strip Restoration", "Invasive Species Control: Salt Cedar (*Tamarix* sp.)", and "700 Series Firing Points Site Restoration" project definition worksheet for more information, including a list of supported INRMP goals and objectives (N:\NaturalResources\Project Definition Worksheets\Approved PDWs).

7. Raptor Nest Inventory

Historic nesting information was available for NR staff in 2006 when current personnel first arrived. Information was considerably incomplete however. A limited nest inventory was conducted from 2007 – 2010. Several new nests were found but nest monitoring efforts to record nest status, species use, and fledgling success have been very limited outside of common raven and golden eagle nests in key operational areas. A full nest inventory

survey effort is currently underway (2011). In 2011 we also initiated a nesting database project. This database is modeled after the nesting database used by Hawk Watch International, and was fitted for Dugway by GDIT. By December 2012 all known nest sites should be recorded in the database. Since current staff started in 2007 we have added over 100 nesting locations to the nesting shapefile. This puts the current known number of nesting sites at approximately 320 (including nests of all statuses – active, inactive, gone, etc.).

Helicopter nest search flights were conducted in 2007 at Camelsback Ridge, Simpson Buttes, Wig, and and portions of Granite Mountain. Surveys were conducted again in 2010 and 2011. The 2010 effort included Simpson Buttes, Camelsback Ridge, and Granite. Survey methods for 2007 and 2010 consisted of flying the cliff faces and recording all nests and raptor observations. We also checked known nesting locations. In 2011 we changed the survey method to flying transects placed in suitable nesting habitat along Simpson Buttes, Granite, and the Cedar Mountains. After flying the transects we verified each observation and also flew closer to ideal nesting locations and recorded new nests. The transect survey design was coordinated through Boise State. In 2011 a draft a summary report of all three years was produced.

Additional information for this project can be found at N:\Projects\Raptor Surveys\Nest Monitoring. The PDW can be found below and at N:\\ProjectSummaries\. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

8. West Vertical Artificial Nest Structure Eagle Permit and Video Monitoring

A pair of golden eagles has been nesting on the historic West Vertical Grid (WVG) structure on DPG's testing grid. The pair successfully nested on the structure for several years though we have been unable to determine how long. A nest was removed from the stairwell in 2006 before current personnel were present in the NRO. A new nest was discovered in 2007 on a motor assembly unit but was not used to raise young until 2008. The pair raised one fledgling which died approximately ten days after fledging.

A scientific collection permit was applied for and received by the NRO in 2008 to relocate the nest after the conclusion of nesting season and to study the nest during the 2008 nesting season and subsequent seasons. A mobile artificial nest structure (ANS) was built to replicate the WVG stairwell the eagle pair had originally chosen for its nest. The ANS nest was active in 2009 and was monitored with video cameras by the NRO. Two chicks were hatched but died about a week later due to lack of food brought in by the adult eagles.

In early 2010 the eagles built again on the WVG structure, this time on the inner part of the upper ring, on top of nesting deterrents. The nest was never completed and was mostly blown down when visited again in October 2010. The pair also built some on the ANS nest in early 2010 but did not raise young there; it is unknown if the pair raised young elsewhere. We applied for a permit in early January 2010 to remove the new nest but did not receive one (most likely because the nest was considered active at the time of application). We applied again in late October and received the Take permit for January 2011. However, in late December 2010 it was apparent that the eagles were building again at the same location as in early 2010, so we could not move forward with the Take action. The eagles began incubation by mid March, but the nest failed around the time of hatching in mid-late April. We currently have not determined the next steps for the WVG nest site – we may decide to forgo the Take action and leave the nest in place based on the likelihood that the eagles will just come back again.

Video footage of the 2008 and 2009 active nests has been reviewed and analyzed for nesting behavior by NRO contract field biologists. All WVG eagle nest activities and observations are reported out annually on the USFWS permit (MB098117-A) report. A PDW has been prepared for the video monitoring project and is located at N:\\ProjectSummaries. Other PDWs that cover this project include the Eagle Monitoring Inventory project, Winter Raptor Surveys, and Raptor Nest Inventories. Additional project information can be found at N:\Projects\Raptor Surveys\West Vertical Grid Nests. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

Current initiatives involve the monitoring of the ANS in support of Mission activities. In 2015 two eagle pre-hatchlings were banded and satellite tracking equipment placed. Both were found dead within a short amount of time due to natural causes. In 2016 video monitoring equipment was installed on the ANS and footage and lifecycle information have been collected. Two chicks hatched and are currently being studied by the NRO.

9. USFWS and UDWR Permit Maintenance

Each year obtain Utah Division of Wildlife Resources (UDWR) Certificate of Registration permits that are applicable to our survey work. We submit an annual report and apply for the upcoming year's permits by December 31st of each year. Listed below are our UDWR CORs and the years we've had them:

- Collect/Possess/Release for Small Mammals (2007-present) (note this also includes salvage and depredation)
- Band/Release (2008-present)
- Collect/Release for Amphibians and Reptiles (2010-present)
- Banding/Collection Rattlesnakes (2015 – present)
- Collect/Possess for Bats (2015 – present)

We also have obtained several USFWS permits. These include Take permits for inactive golden eagle nests and a Migratory Bird Treaty Act (MBTA) Salvage permit. We report out permit activities by January 31st or by due date set by permit (they can vary). The permits are listed below with a brief description.

- MB098817 – Originally obtained in 2008 to allow for camera monitoring and nest relocation of the West Vertical nest. Updated in 2010 to include capturing and radio telemetry of adult golden eagles (now numbered MB098817-1). Also renewed in 2010 to extend permit end data through 2016.
- MB02730A-0 – Obtained in early 2010 to allow for Take of three inactive eagle nests located on two Mission towers. The towers were demolished due to human safety issues. We amended the original permit with the inclusion of demolition operator personnel names (MB02370A-1). As

mitigation for the Take we built an Artificial Nesting Structure (ANS) near one of the demolished towers. We did not get the ANS up before the original deadline so we got a second amendment (MB02370A-2) to extend the deadline.

- MB02370A-1– We obtained a new Take permit in early 2011 for removal of the 2010 West Vertical nest. However, the action listed on the 2011 version of MB02370A was not completed as of June 2011 and expired in 2014.
- MB02873A-1 – Migratory Bird Special Purpose Salvage.

10. Special Emphasis Area (SEA) Monitoring

Special Emphasis Areas (SEAs) are structures and areas on DPG that have been identified as Mission Critical. To meet this designation, these SEAs are structures and areas that are used most frequently by the WDTC for testing and training purposes to support the Army Mission and Dugway Proving Ground. In addition, they have been selected for focused monitoring based on the fact that they might either occur in areas where we expect to find nesting avian community members or have structures associated with them that are attractive as nesting substrate to avian community members. In some cases, some of these SEAs and testing and training activities they support have already been affected by nest building activity (West Vertical Grid, Tower Grid).

The general purpose of these monitoring surveys is to provide bimonthly updates of the status of avian use of the special emphasis areas. This information allows DPG NRO to make effective management decisions regarding natural resources while maintaining the ability for the Army to test and train on mission critical structures. Failure to understand avian pressure on mission critical structures could cause delays in testing and training due to MBTA or BGEPA clauses that state that it is illegal to "Take" avian species. Specifically, we are concerned with nesting pressures on structures that would limit Army readiness activity.

Monitoring of the SEAs began in March 2011 and continued bi-weekly until August 2011 at the end of the 2011 bird breeding season. Monitoring started again in March 2012 and has happened each year since. All NRO personnel tasked with monitoring SEAs are in charge of reporting back periodically to the NRO manager, WDTC, and other mission personnel. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project. The PDW for this project can be found at N:\Project Definition Worksheets\Approved PDWs.

11. Snowy Plover Inventory and Use of Habitats at the U.S. Army's Dugway Proving Ground and U.S. Fish and Wildlife Service's Fish Springs National Wildlife Refuge

Snowy Plover (SNPL) are a "focal species" across the USFWS region that includes the U.S. Army's Dugway Proving Ground. Moreover, in Utah, SNPL are listed as a tier III species under the Utah Comprehensive Wildlife Conservation Plan. Because of these designations, SNPL have the potential to affect the military mission at DPG. Limited information from previous surveys suggests a small population (< 200) of SNPLs breeds on DPG and uses habitats on both DPG and the United States Fish and Wildlife Service Fish Springs refuge. The available information is limited and additional work is needed given the status of SNPL as a species of concern throughout their range. Inventory of SNPL occurrence and seasonal use of habitats is of interest to DPG and the USFWS. In a cooperative agreement with Brigham Young University, two students (graduate and undergraduate) were hired to

initiate the SNPL inventory on Fish Spring National Wildlife Refuge and Dugway Proving Ground. Their main objectives are to survey previously identified habitats and identify distribution of occupied habitats, provide estimates of breeding populations on DPG and Fish Springs National Wildlife Refuge and identify habitat and disturbance features associated with probability of seasonal occurrence of SNPL. Survey efforts began Summer 2011 and will continued through 2012. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project. The PDW for this project can be found at N:\Project Definition Worksheets\Approved PDWs.

These studies have since been published and additional research is being supported by the Air Force in the MOA. Current initiatives include coordination with BYU, DGP and the UDWR.

12. Reptile Study: Military Impact Study on Arthropod and Herpetofauna Communities through Pitfall Trapping

A herpetofaunal and small mammal study was undertaken in 2008 to document potential differences in species diversity and abundance between active military operational areas and non-use areas as well as identifying differences in diversity and abundance between different vegetation habitats. An environmental assessment is in process to expand current training areas on DPG and it is essential to identify habitats where sensitive and listed species are less likely to occur thus allowing military mission objectives and native wildlife to coexist. The main objective of this project was to steer training and testing area expansion to areas where diversity and abundance of native wildlife is less common. Standard herpetofauna pitfall trap arrays complete with drift fencing were used to capture amphibians, reptiles and small mammals. The traps were placed at ten paired sites; each pair matched with a similar habitat in high - or low- military use areas. Reptile and small mammal sampling ran for three10-day stretches and checked every 48 hours. Amphibians, reptiles and small mammals were identified to species, sexed, aged and released on site. Vegetation cover and data analysis revealed inconsistent placement of traps within paired vegetation types, insufficient for statistical analysis. No significant differences of species diversity or abundance were found between military use and non-military use areas in 2008 or 2009.

In 2011 four pitfall trap sites were relocated to better represent paired vegetation types for sufficient statistical comparisons between habitats within military operational areas and habitats outside military operational areas. Vegetation data through belt transects was collected to document differences in plant cover between sites. Since invertebrates (insects, spiders & scorpions) are highly sensitive to environmental disturbances and habitat variability, invertebrate pitfall traps were deployed alongside the existing herpetofana pitfall arrays to obtain a representative sample of the invertebrate community associated with each habitat type.

Plant cover, invertebrate, herpetofana and small mammal population data from 2011-2013 was analyzed to document population trends between sites within and outside military operational areas. No significant differences in vegetation cover were documented between military use and non-use areas, including the presence of invasive vegetation such as cheatgrass. Cheatgrass cover was evenly distributed between military use and non-use areas but was variable between individual sites. Abundance of invertebrates, amphibians and reptiles, except small mammals was significantly higher in non-military use areas, but varied from year to year. Species richness of invertebrates was also significantly higher in non-military use areas with year to year variation but not found in amphibians, reptiles or small mammals. No significant differences of invertebrate, amphibian, reptile and small mammal community composition was found between military use and non-use areas. However some significant differences were noted from year to year with certain faunal groups. Further analysis confirmed the identity of specific species and or faunal groups such as; camel spiders, scorpions, camel crickets, spadefoot toads, and whiptail lizards were sensitive to the presence of invasive vegetation within military use areas, while other species and/or groups were

less sensitive such as; black widow spiders, springtails, seed bugs, side-blotched lizards and gopher snakes, which thrived in heavily disturbed environments.

Although the majority of ground-dwelling fauna population numbers appeared to favor non-military use areas, we could not identify the specific causality for this trend since we could not measure the type, frequency and severity of the military operation effects to the environment, such as fire, foot-traffic, vehicle traffic, chemical release and explosive detonations. The presence of invasive vegetation such as cheatgrass was our only indicator of environmental disturbance. However cheatgrass cover is largely the result of fire, which only 50% is caused by military operations while the other 50% is caused by lightning strikes. Three sites selected for this study containing high levels of cheatgrass cover had previously been burned in 1995 and 1997, which was the result of lightning strikes.

Plans for further long-term monitoring in specific habitat types both on and off DPG to identify specific environmental disturbances associated with military operations are currently being set in motion; along with a habitat rehabilitation study to monitor both habitat and wildlife recovery from prescribed mitigation practices. Knowledge of invertebrate, amphibian, reptile, and small mammal communities within these habitat types will provide a baseline data set of wildlife occurring on DPG and will assist NRO in making land management decisions for the expansion of military testing and training areas.

Final reports were prepared for the 2011-2013 and the 2014-2015 portions of this study. The PDW can be found below at N:\NaturalResources\Project Definition Worksheets\Approved PDWs. Previous and future project information can be found at N:\Projects\Reptile\2008 Reptile and Amphibian Study. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

13. Utah Bat Legacy Initiative and DPG Bat Management

DPG received Legacy Resource Management Program funding for three submitted projects between 2007 and 2009 which are broadly referred to as the Utah Bat Legacy Initiative. Information on this effort is available online at https://utahbats.org/Default.aspx. Note that this website was transferred to the Utah Division of Wildlife Resources (UDWR). Funding and implementation of the third project in 2009 required data collection efforts to occur throughout the state based on the Utah Bat Monitoring Protocol that was written and refined during the 2008 Legacy project. This protocol utilizes presence/absence data collected within an occupancy model framework to determine population level changes over time. Fifteen sites were chosen on or adjacent to DoD lands in the 2009 field season to collect much needed baseline data to support the DoD Bat Management Plan that was written as a deliverable for the 2009 Legacy project. This document outlines current bat status on DoD lands, bat habitat, and management recommendations to manage species present and Utah Wildlife Action Plan (WAP) Tier II species that may be using military lands.

Four of the six Tier II sensitive species were shown to occur on or near DoD lands (Townsend's big-eared bat, fringed myotis, spotted bat, and big free-tailed bat). The western red bat and the Allen's big-eared bat were not found near DoD lands within the 103 years of data collected and analyzed by this project. The 2009 field season found only the Townsend's big-eared bat on DPG and Hill Air Force Base lands. The fringed myotis was the only other Tier II species captured by mist nets in 2009, captured approximately 20 miles North of DPG lands at 8-Mile Spring. The fringed myotis was later captured again though mist netting techniques on DPG in 2011 and has been documented acoustically at several locations on DPG in 2013 & 2015.

Continued long-term monitoring of nine selected sites has been in progress since 2011 on a three year rotating cycle using the Utah Bat Monitoring Protocol. A bat invertebrate prey-base inventory and monitoring has been established to document prey-base population trend correlations with bats through time. Results are summarized in a year-end report and bat occupancy data is entered into an online data base, called BatBase, (http://www.dwrutahbats.nr.utah.gov/) which is then added to the occupancy model when the state conducts its three year re-sampling of the 65 randomly selected sites within the Utah Protocol. Since 2009 we have documented more than 279 nocturnal insects with UV-light trapping techniques and 8 species of bats through mist net captures and acoustic recorders. Twirler moths, geometrid moths and owlet moths represented the majority of the nocturnal bat prey base on DPG. The small-footed myotis, *Myostis ciliolabrum* and western pipistrelle, *Parastrellus hesperus* have consistently been the most common and abundant bat species on DPG and have been documented at every site. The townsends big-eared bat, *Corynorhinus townsendii* and fringed myotis, *Myotis thysanodes* have been the rarest only occurring at two sites infrequently.

Currently only two caves and one mine has been documented on Dugway as bat hibernacula with only one documented as a permanent bat roost. Temperature and humidity (RH) data-loggers were deployed in targeted caves and mines to document levels adequate to support growth of *Pseudogymnoascus destructans*, the fungus that causes white-nose syndrome (WNS) in bats. Currently no temp/RH levels sufficient for this fungus growth have been documented in any of the caves/mines surveyed. Caves and mines on DPG will continue to be surveyed for bats and also monitored annually to document seasonal changes in temperature and humidity for the purposes of measuring WNS susceptibility.

White-nose syndrome is being tracked. Information collected over the next couple of years will provide good baseline data if WNS reaches Utah. The Utah Bat Conservation Cooperative (UBCC) has completed a WNS Response Plan for Utah. The NRO has developed a WNS decontamination protocol applicable to all those entering caves and mines on DPG land.

The PDW can be found below at N:\ProjectSummaries\. Bat monitoring information from DoD lands can be found at N:\Project\BatMoni\. Legacy information can be found at N:\Projects\Legacy\Bat Initiative. WNS protocol can be found at N:\Projects\Bats\White Nose Syndrome\DPG WNS Policy. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

14. Dugway Natural History Collection

It is difficult to predict which specimens will be used by whom and for what purpose in the future. This project will support the mission (current and proposed) through storage of properly preserved vertebrate (reptiles, amphibians, birds and mammals) and invertebrate (insects, spiders and snails) specimens for the purpose of a reference collection of animal fauna that occur on and near DPG lands, which will be used for long term monitoring of habitat usage, population trends, indicator species, and overall health assessment of wildlife on DPG. The collection will also be used as an educational outreach component. Currently there are no reference materials other than basic descriptions and photos of animals occurring on DPG. Most other military installations with an established natural resources department contain the resources for maintaining reference collections of plants and animals. A reference collection is essential for proper identifications of animals that are frequently studied by DPG NRO and affiliated researchers and will also serve as important educational component to NRO outreach. Containing a properly preserved collection of both vertebrate and invertebrate specimens provides substantial evidence of wildlife

and the biodiversity occurring on all habitat types (Prendini et al. 2002) of DPG and will enable DPG NRO to make better management decisions of native wildlife on Dugway with increased knowledge and broad taxonomic resolution mission objectives will be supported and no net loss objectives met (Sikes Act 2001). The reference collection will also support current archaeology research by providing reference material for the identification of faunal remains found in archaeological sites, in the reconstruction of Paleo environments, and define ecological behavioral strategies. In summer of 2009 curation and proper preservation methods of salvaged animals were amended to our current COR and salvage permits. All dead reptiles, amphibians, birds and mammals previously collected under our salvage permit were inventoried and given a category of final disposition for curation based on type and condition of specimen. A series of written SOP's (standard operating procedures) were set in place as guidelines for NRO biologists to use for safely salvaging dead animals.

To date we have over 250 species of plants, 822 species of invertebrates and 170 individual vertebrate specimens comprising 9 amphibians, 27 reptiles, 42 birds and 99 mammals that have been curated and catalogued according to archival museum standards. We also have over 280 DNA tissue samples collected from various lizards and snakes on DPG.

DPG has a complete digital reference collection of invertebrate occurrence data accessible through an online data base called Symbiota Collections of Arthropod Network (SCAN). This data base is funded by the National Science Foundation and used by researchers to monitor invertebrate species occurrence records, range distributions and geographical population trends through time. Continued collaboration with the Colorado Plateau Museum of Arthropod Biodiversity (CPMAB) has enabled DPG to be included among the 53 repositories throughout the country participating in the SCAN data base.

Currently more than 839 spider and insect specimens representing 114 species from DPG have been imaged and entered into SCAN.

The PDW can be found below at N:\NaturalResources\Project Definition Worksheets\Approved PDWs. Species lists and SOP's for collecting and salvaging vertebrate specimens can be found at N:\Projects\DPG_Natural_History_Collection. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

15. DPG Hunting Program

DPG has an active but small hunting program. Hunting permits for mule deer have been handled through the UDWR with each hunter having to purchase a DPG permit as well for a nominal fee. Hunting is open to the public though persons need a DPG escort to get on base. Animals taken have remained at less than 10 since 2006 as reported by the DPG Police Department. Check-in and check-out requirements are enforced through the DPG Police Department which gathers statistics on hunting success. In 2010, DPG started to pursue its own Hunting Management Unit through the UDWR with support from COL King. DPG will be required to create its own bag limits and complete surveys in support of these recommended limits. Coordination is occurring between DPG and UDWR with frequent updates to the DPG Commander. A doe-only pronghorn depredation hunt was established at DPG by the DWR in 2010 and ten tags were allotted to the Natural Resource manager. These tags were distributed by means of a raffle with

priority given to active duty and reserve military personnel, DA civilian employees, DPG residents and Utah resident personnel with access to DPG. The hunt area was comprised of 500 feet on either side of Stark Road between ACP-2 and Ditto. At the end of a forty-five day hunt, six does were harvested. A Cooperative Wildlife Management Unit (CWMU) application was submitted by the natural resource office to the UDWR but was not supported by the UDWR due to federal and state hunting issues. More information and hunting data can be found at N:\DPG_Hunting.

16. National Environmental Policy Act: NRO Review and Reporting

A main role of the NRO at DPG is to review and assess the military's impact to the environment through National Environment Policy Act (NEPA) review. 32 CFR 651 is the Army's regulation for how to implement NEPA on army lands. The main difference from other agencies is the use of Records of Environmental Consideration or RECs. Environmental Impact Statements and Environmental Assessments are still required by the Army but are done fairly infrequently (approximately 2 EAs per year). An EIS (2003) was completed for Dugway which addressed Future Programs. EAs since 2006 have focused on large projects that include JLENS, PDTESS, the PM UAS program, and Training Area Expansion for instance. Many activities completed by the Army can be tiered from current EAs and categorically excluded (CX), however 32CFR651 requires most CXs to complete a REC that describes the activity and its relation to the landscape. This REC is then reviewed program offices with Environmental Programs including the NRO. We are able to make recommendations on whether any significant environmental impacts will be seen based on the activity presented in the REC.

The NRO reviewed 81 RECs in FY2007, 102 RECs in FY2008, 87 RECs in FY2009 and 84 RECs in FY2010. A total of 8 EAs have been completed since 2006. We take the opportunity to review current sensitive species locations and current knowledge of the area proposed for use. We are able to suggest mitigation or minimization measures when activity takes place near sensitive areas (nests, active burrows, rare plants, pristine vegetation communities, caves, mines, water sources, etc.). We recommend half mile buffers around all active golden eagle nests and closely review activity occurring around protected MBTA nests in the spring season. Small surveys are completed if knowledge about the proposed-use area is not well known or is outdated. Larger surveys are conducted for large-impact tests or EAs and are often funded by Dugway customers. The PD-TESS EA is an example for which a PDW was completed (NEPA Review: PD-TESS NR Surveys). The JLENS project is another yet larger example; surveys took place mostly in Snake Valley which is south of Dugway (see the PDW titled JLENS Natural Resource Surveys). A PDW was also completed for general NEPA Review and Reporting as well and can be found below and at N:\ProjectSummaries. Tracking of NEPA documentation can be found at N:\NEPA\NEPA Review Tracking. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

17. Training and Conference Attendance, Agency Working Groups

All members of the NRO staff attend training, conferences, and working group meetings when funding and time is available. Lists of those meetings that have been attended are below. In addition, our botanist is a certified Utah pesticide applicator. We also have put together several agency working groups for different initiatives include the Bat and Raptor Legacy projects and BSU management plan project. Funding in 2016 has again been cut off for federal travel for training and conferences and so will be limited for this year and perhaps several years from now based on the current state of the economy. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

Utah Chapter of the Wildlife Society
National Military Fish and Wildlife Association Conference
UDWR Legacy Bat Monitoring Protocol Training
Sustaining Military Readiness Conference
Restoring the West Conference
Utah Weed Control Association Conference
5th Annual Southwest Rare Plant Conference
Western Bat Working Group Conference
Army 101 Training
Raptor Research Conference
Sound Science Workshop
Raptor Handling Training
Oregon Bat Grid Training
Utah Bat Conservation Cooperative
Central Region Sage Grouse Working Group
Bonneville Basin Conservation Cooperative
WAP CAP Working Group
Utah Watershed Restoration Initiative
Intermountain Region Chain Saw Program
Field Herpetology of the Southwest
Bat Conservation and Management
Spider Identification
Bat Acoustic Monitoring Techniques
Advanced Bird Banding

18. Annual INRMP Update

The Sikes Act (as amended through 2003) directs that a program should be carried out to provide for the conservation and rehabilitation of natural resources on military lands (Section 101, 16USC670a 1.A). It further states that a plan shall be prepared and implemented (the Integrated Natural Resource Management Plan, Section 101.1.B), with cooperation from the Secretary of the Interior and the respective state agency (USFWS and UDWR, Section 101.2). All INRMPs are required to be reviewed annually with the cooperation of the FWS and State Agency. Annual reviews shall verify the

following (from Updated Guidance for Implementation of the Sikes Act Improvement Act: Coordination Requirements of the Sikes Act; available at: http://www.fws.gov/habitatconservation/sikes_act.html): Current information on all conservation metrics is available.

- All "must fund" projects and activities have been budgeted for and implementation is on schedule.
- All required trained natural resources positions are filled.
- Projects and activities for the upcoming year have been identified and included in the INRMP. An updated project list does not necessitate revising the INRMP.
- All required coordination has occurred.
- All significant changes to the installation's mission requirements or its natural resources have been identified.

A PDW available for this is titled: Annual INRMP Update. Additional information is available here: N:\Projects\INRMP. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

19. Natural Resources Office Coordination and Management

The NR office currently consists of 5 members including 2 federal civilians and 3 contractors. The goal is to effectively management, coordinate, and/or complete those items necessary to run on a daily and weekly basis, activities with the Natural Resource Office. Activities that fall under this category include educating the public and DPG personnel about wildlife and important aspects of natural resources and military conservation programs; applying for and maintaining federal and state permits (UDWR Certificates of Registration, MBTA Salvage Permits, BGEPA Take Permits, etc.); and project research, creation, coordination, and management. Articles are published in the location newsletter, The Dugway Dispatch, and over Maillist email on important NR topics throughout the year. See PDWs titled: UDWR COR Permit Maintenance, Natural Resources Office Coordination and Management, Dugway Office Support – SES, and Other Duties as Assigned. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

20. Urban Natural Resource Management

The NRO provides oversight on several NR issues within the cantonment areas of DPG. Grounds and maintenance personnel contact us prior to tree or branch removals to ensure that MBTA nests are not present. We provide public works with a list of preferred and approved native landscape plants as recommendations for new plants within cantonment areas. We have completed an urban tree inventory in all of the 5 urban areas on DPG. We completed a deer and antelope removal effort within English Village in 2006 due to unnatural conditions, overcrowding, and nuisance issues with residents. We complete coyote control when coyotes are reported to be harassing traffic (due to feeding by residents), children, pets, or otherwise being aggressive towards residents of the town. Finally, we have historically limited mowing of grasses and removal of debris piles within and around the towns to protect any nesting birds (killdeer principally). This project is continuously evolving based on the needs of different departments and residents within

the cantonment areas. Information can be found here: N:\Projects\Urban Forestry. See Appendix 7.4, List of INRMP Goals and Objectives, for goals and objectives met by this project.

21. Project Definition Worksheets (PDWs)

PDWs are provided below for the projects they have been completed for. They more clearly define goals and objectives for each project, completed and planned activity, implementation tables, and deliverables. Each project has project lead and is run independently with input from the Natural Resources Program Manger and other NRO staff. Current members of the NRO staff are:

1. Robbie Knight, Wildlife Biologist and Natural Resource Program Manager (June 2006 to present)
2. Keeli S Marvel, Wildlife Biologist (December 20, 2010 to present)
3. Robert Delph, Entomologist/Wildlife Biologist, Select Engineering Services, Inc. (August 2010 to present)
4. Lou Ogaard, Natural Resources Support Manager, Madden Technologies (October 2014 to present)
5. Heather McCarthy, Natural Resource Specialist, Madden Technologies

22. Great Basin Spade-foot Toad Telemetry

The installation of wildlife water developments such as big game guzzlers has raised many questions of how desert faunal communities may be affected, specifically non-game species for which they are intended. We have detected the presence of the Great Basin Spadefoot toad (*Spea intermontana*) at big game guzzler sites. We have captured their breeding calls with the use of external microphones attached to digital voice recorders and have observed tadpoles in guzzlers. We have also incidentally captured images of toads in guzzlers with remote trail cameras used for another ongoing guzzler study at DPG.

More than 100 spadefoot toad larvae (tad poles) have been documented developing within these guzzlers, some of which occur more than 10 miles from the nearest natural water feature. Incidentally, the guzzlers have become an essential breeding habitat for amphibians that would otherwise not occur there, thus altering the ecosystem. Little is known about the migration patterns of desert-dwelling amphibians or how they manage to find enough water for their young to develop.

This information could be vital to the appropriate management of amphibians in these areas and how guzzlers may impede on spatial usage of upland habitats. Amphibians have been declared as biological indicators of environmental health and as such are important to ecosystems where they occur (Blaustein and Wake 1990).

Plans were set for tracking adult spadefoot toads, through radio telemetry as they migrate to and from natural and artificial water features on the landscape. We attached telemetry transmitters to two adult toads that were captured from a big-game guzzler that were shut down and water removed. Small (0.31 g) LB-2x transmitters were attached with a small silk material belt around the waste with the transmitter against the lower back and antennae pointed toward the ground. The toads were released near the shutdown guzzler and tracked for several days to document migration routes to another water feature. We immediately noted changes in toad behavior as a result of the transmitter attachment. Toads immediately dug into the ground and attempted to push the transmitter off with their hind legs. Toads seemed irritated by the transmitter attachment. Three days later one toad was found on the ground surface dead and desiccated, the other still buried. After one week one toad moved 60 meters in one night following a rain storm. No further movement

was recorded during the entire summer. At the end of the summer the toad was dug up and discovered dead. Noticeable bruising and skin damage was seen at the waste where the belt was fastened.

Several toad tadpoles were collected and reared to adult size for laboratory transmitter attachment and pit-tagging experiments, to identify effective transmitter attachment techniques. We documented transmitter attachment methods and recorded changes in behavior as a result of transmitter attachments. We also documented toad recovery from pit-tag implantations. Pit-tag implantations were most successful when the pit-tag was inserted directly in the fatty tissue along the lower side of the waste. Toads healed quickly and began normal foraging behavior within 2 days. Transmitter attachments severely altered toad behavior and resulted in fatigue, noticeable skin irritation and infection. Further laboratory investigations are needed to identify effective strategies for transmitter attachments on desert-dwelling fossorial amphibians. Once an effective strategy has been documented, we will implement this method in the field.

23. Dune BioBlitz Monitoring

The natural shifting dunes on DPG represent a unique habitat containing a variety of plant and animal fauna adapted to this landscape. This unique habitat is considered sensitive as it represents a small portion of DPG, roughly 3% and is rapidly declining as invasive vegetation such as cheatgrass outcompete the interdunal vegetation surrounding shifting dunes which thrive in this unique habitat. Currently the military uses some of the remaining dunes for tactical warfare training and military vehicle maneuvering capabilities. Frequent military operations have led to the increased encroachment of cheatgrass, specifically in the interdunal complex.

In 2013 plans were set in motion to conduct a long-term monitoring and inventory of all plant and wildlife occurring on the dunes before it is lost. Two dune habitats were selected, one representing a dune habitat heavily used by the military and the other with no documented military use. A complete BioBlitz of each dune was conducted to compile a complete inventory of all plants, spiders, insects, amphibians, reptiles, birds and mammals that occur in these habitats. Each dune was divided into three sampling sites that represents the three microhabitat characteristics of a dune, which we operationally define as, (1) “interdunal zone” starting at the base of the dune, where the soil and vegetation begin to transition from stabilized dune to an unstabilized dune, (2) “slope zone” towards the middle side of the dune, where wind either blows sand upwards or cascades downward the other side and (3) “crest zone” which is the highest point or summit of the dune where wind is constantly changing the shape and size of the dune. At each site a series of vegetation transects were conducted to identify plant species and document changes in vegetation through time. We also deployed a variety of invertebrate and other wildlife trapping methods to gather both quantitative and qualitative population data, including visual surveys, observations and scat counts.

Vegetation cover and wildlife population data from 2013-2015 was analyzed to document differences in dunes heavily used by military and dune not used by military. Plant diversity was significantly higher in dunes not used by military. Diversity of vegetation on dunes heavily used by military was significantly lower and was dominated primarily by invasive vegetation such as cheatgrass, *Bromus tectorum* and Russion thistle, *Salsola tragus*. Species abundance and richness of invertebrates such as spiders and insects were also significantly higher in dunes not used by military. Similar population trends were seen with other wildlife including amphibians, reptiles, birds, rodents, carnivores and ungulates. Nearly all wildlife monitored were either more abundant or more diverse in dune habitats not used by military. Only a few species of wildlife were found to be more abundant in military use areas which were animals that otherwise benefited from invasive vegetation as a food source, such as seed bugs, grasshoppers, rabbits and horses or species that benefited from less intraspecies competition such as black widow spiders, side-blotched lizards, and ord’s kangaroo rats. Several rare or sensitives species including Species At Risk (SAR’s) animals such as the Dark Kangaroo Mouse, *Microdipodops megacephalus* was found in the interdunal complex of dunes not used by military and have not been recorded anywhere else on DPG.

Continued long-term monitoring of dunes is needed to document new species and habitat range of sensitive or endangered species that still remain on undisturbed dunes. These natural community types are supportive of military realism to testing and training. By understanding degraded or missing community types we will better support the mission and army war fighters.

24. Rattlesnake Den Monitoring

In 2011 a rattlesnake den containing over 40 individual rattlesnakes was documented on DPG less than 1km from a known military training area. The great basin rattlesnake, *Crotalus viridis lutosus* is listed as a protected species under State Rule R657-53, "Amphibian and Reptile Collection, Importation, Transportation and Possession" for the state of Utah, it is also considered a sensitive species along with many other rattlesnakes. Because rattlesnakes are venomous and create a potential hazard to people when encountered, there is a common misconception about snakes specifically venomous snakes that they are aggressive and dangerous, thus mass killings and poaching of snakes is common. Rattlesnakes are responsible for at least 80% of rodent population control in the west, making them essential in ecosystem functionality. In 2014 a conservation management plan of rattlesnakes on DPG was set in motion to minimize snake and human interactions to protect soldiers training on the landscape and reduce unnecessary mortalities of snakes. By tracking rattlesnake movements through radio telemetry we can identify migration routes, foraging areas and detect permanent snake den sites.

In 2015 four rattlesnakes were surgically implanted with a 4.5X1cm SI-2 telemetry transmitter, then released exactly at the location it was collected, after 1-2 days of recovery from the surgical procedure. Two snakes collected at a known snake den location with transmitters were tracked to identify migration routes and foraging areas. The other two snakes were captured at other areas were snake presence was common but no den sites have been detected. Daily tracking was conducted to document average distance and frequency of snake movement, which was about 200-300 meters per week. One snake died 4 days after surgery, most likely the result of initial capture from pest control as internal bruising was observed during surgery. The radio signal was lost for another snake in September, 2015, while the two snakes at the known den site traveled about 2 km south of the den then immediately made their way back to the den in October.

Continued tracking along with plans for a pit-tag reading system are currently under way to document seasonal emergence of snakes from known den sites and den emergence frequency. Rattlesnake migration routes and den emergence activity will be analyzed to document seasonal snake movement trends and patterns. Knowledge of snake dens sites and migration patterns will assist NRO in making rattlesnake conservation management plans and create avoid and minimize measures to protect soldiers during prescribed military training activities.

25. Avian Protection Plan Update

DPG has also been working to protect raptors and other bird species from potential electrocution risks. In 2002, DPG contracted with EDM International to complete an Avian Protection Plan (EDM International, Inc. 2002). In 2012, DPG initiated an update of that plan which was completed by EDM International in 2013. In order to update the plan, field surveys of distribution lines were performed Jan-Feb 2013. Surveys documented low-, medium, - and high-risk structures. The plan provides retrofitting recommendations for problem structures and prioritizes individual structures for retrofitting. Poles were also surveyed for evidence of mortality and raptor usage. EDM International, Inc. (2013) includes maps depicting locations of structures requiring retrofitting to reduce the possibility of raptor electrocution, and in turn, reduce the likelihood of violation of federal law regarding take of MBTA or BGEPA species. In 2013 and 2014 retrofitting hardware was acquired and will be installed by the BASEOPS contractor according to the recommended priority of high to low risk guidelines established by the Avian Protection Plan (2013). Retrofitting will continue in the future until all of DPG's power

distribution network is in compliance with current avian protection guidelines established by the US Fish and Wildlife Service and the Avian Powerline Interaction Committee (APLIC).

26. Fire Plan Update

The FMP implementation schedule includes refinement of fire suppression and pre-suppression plans and the analysis of the effects of various management actions. The Fire Atlas will embody the primary procedures for pre-fire activity (prevention), suppression, protection and avoidance of sensitive biological and cultural resources and will serve as a field aid in time-critical decision making under conditions of wildfire. Information and procedures derived from the Plan and Atlas will be used by DPG Managers to consult with the U.S. Fish and Wildlife Service under the Endangered Species Act, Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The FMP specifically includes a Cheatgrass control component based upon Cheatgrass spatial analysis and modeling performed by Utah State University (USU). The FMP update also includes the refinement of fire suppression and pre-suppression plans. Delineation of the Fire Management Units were determined based on the history of wildfire behavior, critical infrastructure, topography, watersheds, human activities, vegetation types, urban interface, existing fuel breaks and the presence of sensitive natural, archeological, cultural and historical resources. We now have a draft final DPG Fire Management Plan.

The FMP contains the following sections:

- Introduction
- Fire management framework
- Discussion of fire attributes and fuels of the west desert and DPG (including fire regime, fire history, fuel characteristics, modeling and fire behavior analysis)
- DPG values and risk analysis for cultural and archaeological resources (historic structures, Native American sites, etc.)
- DPG values and risk analysis for natural resources (including birds, mammals, reptiles, amphibians, and invertebrates)
- Vulnerability assessment for cultural and natural resources
- DPG fire operations plan (addressing preparedness and prevention, access, safe refuge, evacuation planning, reduction of combustible fuels, managing for sustainable Military training, promoting healthy ecological communities, wildlife fire suppression, post fire resilience planning, monitoring and evaluation, and research)
- Implementation (priorities and schedules, implementing table, assignment of responsibility for elements of fire planning, adaptive management)
- Fire management plan modifications and amendments.

27. DPG Natural Resource Outreach
Wildlife Biologist/Entomologist shared display of animal specimens (live and dead) with Dugway Elementary and High School Students.

28. Greater Sage-Grouse Inventory
Under current Federal status, the greater-sage grouse was petitioned for listing and a 12 month finding published in 2010 deemed the species merited listing but was precluded at that time because of higher priority species. Known greater-sage grouse populations occur in proximity to DPG, however, to date, we have not found any evidence that the greater-sage grouse occurs on DPG. Should the greater-sage grouse be listed as an endangered species, the potential impacts to the mission at Dugway could be considerable. In 2012 the BLM initiated the NEPA process to update their management plans and asked the DPG NRO to be a cooperating agency. In light of both the Federal listing status of the greater-sage grouse and the BLM action, the NRO has secured funding to perform population surveys to determine sage grouse presence and usage of habitat on DPG. A map of potential greater-sage grouse habitat was generated in partnership with BYU and UDWR. Ground and bird-dog survey work establishing the presence/absence of greater-sage grouse at DPG was performed in the summer/fall of 2012, the winter and summer of 2013, and continued into 2014-2015. Evidence of greater-sage grouse occupancy on DPG has not been found at this time.

29. NRO Annual Report
Draft final completed for 2012-2013.

30. Rough Haul Greenstrip Reseeding 1/3 done, in process

31. Stark Electric Restoration Reseeding Done

32. Wetland Water Quality Monitoring
In process.

33. Arbor Day/Earth Day Event
The DPG NRO gives presentations to the DPG school children and community for Arbor Day/Earth Day and plants many trees each year.

34. Tree City U.S.A. Designation/Urban Forestry
In process.

35. Dugway Herbarium Done

36. Plant Taxonomy Update Done

37. Fuel Moisture Monitoring
In process.

38. Fire Event Monitoring
In process.

39. Tamarisk Removal
In Process.

40. Jack Rabbit II
The Jack Rabbit test program is a study to improve the understanding of rapid large-scale releases of pressurized, liquefied TIH gases from a railcar or other TIC/TIM transports. The program supports a DHS Transportation Security Administration (TSA) initiative aimed at deterring terrorist attacks on TIH railcars or attacks against U.S. rail yards. Along with the counter-terrorism aspect, knowledge gained from the program has proven to be a valuable asset to the TIC/TIM and scientific communities and more importantly, to first responders of large chemical incidents. The first Jack Rabbit test program was funded by DHS/TSA and was conducted at DPG during April/May 2010. A total of nine tons of ammonia and nine tons of chlorine were released during this field campaign. Since the first Jack Rabbit test, the Chemical Security Analysis Center (CSAC) has distributed the information gained throughout the TIC/TIM industry and to first responders.
Currently, the DHS S&T Directorate is proposing a follow-on test to Jack Rabbit (Jack Rabbit II), to be conducted at DPG. This second phase of Jack Rabbit will be a multi-year program with field testing to be executed in June, July, and September of 2015 and 2016. The only chemical to be released during this test program is chlorine, but the quantity far exceeds the 10 ton HAP restriction that is regulated under the current Title V permit for DPG. During the field trials, it is anticipated that a total of 400 tons of chlorine could be disseminated (i.e. NEPA / EA Proposed Federal Action). In the first year of testing (2015), multiple releases of two-, four- and eight-tons were conducted (i.e. 5 releases at each volume). In the second year of testing (2016), releases of 16, 20, and 90-ton volumes are planned (i.e. NEPA / EA Proposed Federal Action).
Jack Rabbit II will address many issues not examined in the original Jack Rabbit test, such as the long-range dispersion of the chemical. Another component of this new program will be an urban element to see how much of the chemical infiltrates buildings and cars. Lastly, reactivity with soil and vegetation will be studied.

41. NTA Program Support

Project Definition Worksheets (PDWs)

PDWs are provided below for the projects they have been completed for. They more clearly define goals and objectives for each project, completed and planned activity, implementation tables, and deliverables. Each project has project lead and is run independently with input from the Natural Resources Program Manger and other NRO staff. Current members of the NRO staff are:

6. Robbie Knight, Wildlife Biologist and Natural Resource Program Manager (June 2006 to present)
7. Keeli S Marvel, Wildlife Biologist (December 20, 2010 to present)
8. Jessica Delph, Botanist, General Dynamics, Inc. (August 2010 to present)
9. Robert Delph, Field Biologist, Select Engineering Services, Inc. (August 2010 to present)
10. Heather McCarthy, Natural Resource Specialist, Maden Technologies (May 2009 to present)
11. Kalon Throop, Botanist, Maden Technologies (March 2016 to Present)
12. Devin Reed, Field Tech, Maden Technologies (January 2016 to Present)

Appendix 10: Questionnaires, Agency Feedback, and DPG Natural Resource Office Responses.

DPGs 2012 Annual INRMP Review:
INRMP Implementation Questionnaire

Your Agency and Name:

Indicate on a scale of 1 (No, Least Important, Not Very Much) to 5 (Yes, Most Important, A Great Deal) your responses for the first four questions and then provide additional feedback within the bottom two text boxes.

Do projects overall meet goals, objectives, and intent of DPGs INRMP? 1 2 3 4 5

Do biologists at DPG coordinate with your agency or office as frequently as you would like? 1 2 3 4 5

Would you like to be more involved with new project design or implementation? 1 2 3 4 5

Do you believe DPG is implementing its INRMP adequately and within the letter and intent of the SIKES Act? 1 2 3 4 5

What can we do better?

What future directions would you like us to take with our program that we are not?

Other Comments and Recommendations?

DPGs 2012 Annual INRMP Update:
Individual Project Feedback Questionnaire

Project Title:	
Your Agency and Name:	

Indicate on a scale of 1 (No, Least Important, Not Very Much) to 5 (Yes, Most Important, A Great Deal) your responses for the first four questions and then provide additional feedback within the bottom two text boxes.

Does project meet goals, objectives, and intent of DPGs INRMP? **1 2 3 4 5**

How important do you feel this project is/was to DPG? **1 2 3 4 5**

How much does this project benefit your agency? **1 2 3 4 5**

How well does this project align with your agencies' priorities in land and species management? **1 2 3 4 5**

Project Comments:

Please provide feedback on any future direction you would like to see this project take:

Dugway Proving Ground INRMP Project Survey Reponse
By Project

Shareholder Feedback Response

Question #	Questions:
1	How much does this project benefit your agency?
2	How well does this project align with your agencies' priorities in land and species management?
3	Project comments.
4	Feedback on any future direction you would like to see the project take.
5	What can we do better?
6	What future directions would you like us to take with our program that we are not?
7	Other comments and recommendations.

BSU Raptor Management			
		Agency Comment	**DPG Response**

Burrowing Owl			
		Agency Comment	**DPG Response**

Coyote and Kit Fox			
		Agency Comment	**DPG Response**

Desert Soils			
		Agency Comment	**DPG Response**

Fire Management			
		Agency Comment	**DPG Response**

Guzzler Camera Montoring			
		Agency Comment	**DPG Response**
ITAM			
		Agency Comment	**DPG Response**

Legacy Raptor			
		Agency Comment	**DPG Response**

Rare Plant Surveys			
		Agency Comment	**DPG Response**

Winter Raptor Surveys			
		Agency Comment	**DPG Response**

General Comments			
		Agency Comment	**DPG Response**

