
INTEGRATED
NATURAL
RESOURCES
MANAGEMENT
PLAN
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September 2001
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HILL AIR FORCE BASE

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This Integrated Natural Resources Management Plan (INRMP) is intended to set policy and to provide guidance for the Implementation and Enforcement of Land Management, Habitat Enhancement, Wetlands Protection, Fish and Wildlife Management, Wildlife Law Enforcement, Urban Forestry, Agriculture Outleasing, and Wildlife Oriented Outdoor Recreation management on lands under the jurisdiction of Ogden Air Logistics Center (OO-ALC).

In addition to OO-ALC Hill AFB, these other geographic locations are included in this management plan.

- Utah Test and Training Range (UTTR)
    - Military Operation Area
    - High Accuracy Multiple Object Tracking Sites (HAMOT)
    - Radar and telemetry sites
    - Dugway Annex
- Little Mountain Testing Facility
- Carter Creek Campground
- Pinedale Seismic Research Facility
- Potential Park City Facility

Activities that may impact natural resources on HAFB installation lands are regulated primarily by the *Sikes Act*, 16 U.S.C. 670a, and the supplemental *Sikes Act Improvement Amendments (SAIA) of 1997*. Other pertinent regulations include the *National Environmental Protection Act* and various Federal laws and Executive Orders that address specific environmental resources.

The *Sikes Act* provides for conservation programs on government lands, including military installations and requires a cooperative plan for wildlife conservation and rehabilitation. The *SAIA of 1997* provides language clarifying and strengthening the requirements for preparing INRMPs in cooperation with the U.S. Fish and Wildlife Service (USFWS) and appropriate State fish and wildlife agencies.

Several of our key issues include:

- Land Management
- Fish and Wildlife Management (including threatened, endangered, and sensitive species)
- Wetlands Protection
- Invasive Species Control
- Wilderness Protection
- Use of Off-road Vehicles

The INRMP is based on three guiding concepts. These are reflected in our mission statement, resources management and stated goal and objectives.

1. Ensure continued access to land and air necessary to accomplish the Air Force mission.
2. Maintain natural resources in a sustainable and healthy condition.
3. Comply with all environmental policies and regulations.

One concept that has rolled out of our biodiversity management is the idea of high impact areas which are much like a national park's high use areas. Certain areas on Hill AFB installation lands will be disturbed due to the activities required by the military mission. While the rest of the areas will be much like a preserve that can be sustained, enhanced and restored for future generations.

Maintaining biodiversity is crucial to the overall integrity and sustainability of ecosystems. Failure to maintain ecosystem diversity may produce land that cannot support the Hill AFB mission or cause a loss of public confidence in HAFB's ability to act as a good steward of the land. The Hill AFB mission would be negatively impacted if access to the land were denied due to regulatory deficiencies, poor land quality or legal action.

The plan contains our philosophy on biodiversity-ecosystem management, interdisciplinary approach, resource demands, and constraints. We identify sources of stress to the resource, our funding policy, tasking and projects. The NR program supports regulatory requirements, including our information databases, target species, general strategies, implementation procedures and measures of program success.

"By working as a team we can preserve both the natural diversity of military training areas and our opportunity to train the way we plan to fight now and in the future."

Signatures

_____ _____

Marcus W. Blood
OO-ALC/EMP
Environmental Management
Natural Resources Manager

Date

_____ _____

Bruce Evans
OO-ALC/JA
Environmental Law Chief

Date

_____ _____

Allan Dalpias
OO-ALC/EM
Environmental Management
Director

Date

_____ _____

Thomas L. Miner
OO-ALC/CD
Executive Director

Date

Having reviewed the Hill Air Force Base installation lands Integrated Natural Resources Management Plan. I hereby agree with those aspects of the plan that are within the scope of authority of my agency concerning conservation, protection and management of fish and wildlife resources.

_____ _____
Dave Irvine Date
U. S. Fish and Wildlife

_____ _____
Jim Parrish Date
Utah Division of Wildlife Resources

_____ _____
John Kimbal Date
Utah Division of Wildlife Resources
Director

_____ _____
U. S. Fish and Wildlife Date
Regional Director

INTRODUCTION

A.1. PURPOSE OF THE PLAN

This Integrated Natural Resources Management Plan (INRMP) is intended to set policy and to provide guidance for the Implementation and Enforcement of Land Management, Habitat Enhancement, Wetlands Protection, Fish and Wildlife Management, Wildlife Law Enforcement, Urban Forestry, Agriculture Outleasing, and Wildlife Oriented Outdoor Recreation management on lands under the jurisdiction of Ogden Air Logistics Center (OO-ALC).

This plan is not a historical document, but rather an adaptable road map to the desired outcome set by goals and objectives. This plan is to be implemented over the next 5 years. This INRMP has been developed from input from the Utah Division of Wildlife Resources (UDWR) and U.S. Fish and Wildlife Service (USFWS).

In addition to OO-ALC Hill AFB, these other geographic locations are included in this management plan.

- Utah Test and Training Range (UTTR)
    - Military Operation Area
    - High Accuracy Multiple Object Tracking Sites (HAMOT)
    - Radar and telemetry sites
    - Dugway Annex
- Little Mountain Testing Facility
- Carter Creek Campground
- Pinedale Seismic Research Facility
- Potential Park City Facility

The policy and governing document for natural resources management on all HAFB installation lands is the Integrated Natural Resources Management Plan (INRMP). The following is an overview of the legal and mission support requirements on how HAFB is to manage its natural resources.

Activities that may impact natural resources on HAFB installation lands are regulated primarily by the *National Environmental Protection Act* and by various Federal laws and Executive Orders that address specific environmental resources, including wetlands, fish and wildlife, threatened and endangered species, sensitive plant species, and outdoor recreation. Other natural resources less pertinent to HAFB installation lands (e.g., floodplains, coastal zones, and wild and scenic rivers) are not addressed here.

Natural resource management considerations in planning new or increased operations on HAFB installation lands are most relevant when proposed

operations will be located in areas of potential concern. For example, at the UTTR, these include the areas of greatest ecological diversity provided by topographic variation (e.g., the mountainous regions), and the aquatic habitats associated with the spring complexes. Raptors and a diversity of supporting prey species use the areas of topographical variability for nesting and foraging sites. The aquatic areas (e.g., springs, wetlands, mud flats) are important to breeding and migrating avian species.

A.2. Air Force Policy

Several components of Department of Defense and Air Force policy define the requirements for management of natural resources on Hill AFB Installation lands, including the:

- *Department of Defense (DoD) Directives (DoDD) 4700.4, Natural Resources Management Program*. *DoDD 4700.4* prescribes policies and procedures for an integrated program for multiple-use management of natural resources on DoD property.

- *Department of Defense Instruction (DoDI) 4715.3, Environmental Conservation Program*. Similar to *DoDD 4700.4, DoDI 4715.3* implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources under DoD control.

- *Air Force Instruction (AFI) 32-7064 – Integrated Natural Resources Management. AFI 32-7064* outlines the requirements necessary to meet the objectives of the *Air Force Policy Directive (AFPD) 32-70, Environmental Quality. AFI 32-7064* explains how to manage natural resources on Air Force property in compliance with Federal, State, and local standards. Specifically, *AFI 32-7064* calls for the preparation of an Integrated Natural Resources Management Plan (INRMP), as required by the *Sikes Act Improvement Amendments of 1997* (see Federal regulations below). The Plan should be a living document with annual reviews and updates, where appropriate, and full revisions every five years.

The intent of the Plan is to manage ecosystems using an interdisciplinary approach, integrating all aspects of natural resources management with each other and with the installation's mission. This type of planning, often coordinated through the NEPA planning and review process considers natural resource constraints in future developments as the basis for future land use planning.

In addition to establishing integrated planning objectives, *AFI 32-7064* documents procedures to ensure compliance with specific Federal regulations that address natural resource conservation. The applicable Federal requirements are discussed in more detail in the following paragraphs.

A.3. Federal Requirements

Of primary importance in managing natural resources on HAFB installation lands are the *Sikes Act*, 16 U.S.C. 670a, and the supplemental *Sikes Act Improvement Amendments (SAIA) of 1997*. The *Sikes Act* provides for conservation programs on government lands, including military installations and requires a cooperative plan for wildlife conservation and rehabilitation. The *SAIA of 1997* provides language clarifying and strengthening the requirements for preparing INRMPs in cooperation with the U.S. Fish and Wildlife Service (USFWS) and appropriate State fish and wildlife agencies.

The objectives of cooperative efforts are to ensure that the plans reflect "mutual agreement of the parties concerning the conservation, protection, and management of fish and wildlife resources". The *SAIA* requires completion of all Integrated Natural Resource Management Plans by November 18, 2001. As required by the above mentioned DoD and AF policies, the plan should include a list of projects or methodologies essential to implement the plan's objectives for the next fiscal year.

A.4. Other Federal laws and regulations

Other Federal laws and regulations protecting natural resources on and around HAFB installation lands can be grouped into several key issue areas:

- Land Management
- Fish and Wildlife Management (including threatened, endangered, and sensitive species)
- Wetlands Protection
- Invasive Species Control
- Wilderness Protection
- Use of Off-road Vehicles

The specific Federal regulatory requirements associated with each of these areas are discussed in detail in the following subsections.

A.4.1 Wetlands Protection

A significant portion of HAFB installation acreage is covered by potential wetlands and mud flats. Of greatest concern to future planning efforts are those categorized as "jurisdictional wetlands", subject to the permitting requirements of the U.S. Army Corps of Engineers (Corps) established by and Section 404 of the *Clean Water Act (CWA)*. In addition, the Federal government has legislated the protection of wetlands with *Executive Order 11990, Protection of Wetlands*. New

or increased activities at UTTR that require construction within a designated wetlands area must comply with these requirements.

A.4.1.1 Section 404 of the Clean Water Act (CWA)

Section 404 of the *Clean Water Act (CWA)*, 33 U.S.C. 1344, prohibits discharging dredged or fill material into U.S. waters without a permit from the Corps. The regulatory definition of the "waters of the U.S." includes wetlands and mudflats. To grant a permit, the Corps must weigh the need to protect aquatic resources against the benefits of the proposed development. Corps policy requires applicants to avoid impacts to wetlands to the extent practicable, then minimize the remaining impacts, and finally take measures to compensate for unavoidable impacts. Wetlands (including mudflats) are categorized as either "jurisdictional" or "nonjurisdictional". Jurisdictional wetlands are subject to the Section 404 permitting requirements.

Permits issued under Section 404 of the *CWA* vary depending on the project's complexity, location, and environmental effect. An Individual Permit is usually required for potentially significant impacts. However, for discharges that have only minimal adverse effects, the Corps can grant General Permits. The discharges of dredged or fill material as part of a construction of a Federal or State project may be specifically authorized by Congress to be exempt from the permitting requirements. This type of special exemption is only granted if information on the effects of the discharge is addressed in an environmental impact statement pursuant to NEPA.

If new or increased operations on HAFB installation lands might involve the discharge of dredged or fill materials into any jurisdictional wetlands, the local branch office of the Corps, located in Bountiful, Utah, should be contacted to identify permitting requirements. A pre-permit application consultation to identify key issues can be requested. If a permit is necessary, information required can include a permit application form, a vicinity map, a plan and cross-sectional view of the proposed action, the volume of fill material to be discharged, and the area affected.

A.4.1.2 Executive Order 11990, Protection of Wetlands

Executive Order 11990, issued May 24, 1977, requires all Federal agencies to provide leadership in the protection of wetlands. As implemented by the Air Force, efforts are made to avoid starting or assisting new construction located in wetlands unless:

- There are no practicable alternatives to such construction;
- The proposed action includes all practicable measures to minimize harm to wetlands; and

- Potential impacts have been analyzed in the appropriate level environmental impact analysis process document (i.e., NEPA).

Prior to any actions proceeding in a wetland area, the Assistant Secretary of the Air Force for Manpower Reserve Affairs, Installations and Environment (SAF/MI), or other designated official must sign a wetlands finding of no practicable alternative (FONPA) before any action within the wetland may proceed.

A.4.2 Fish and Wildlife

Because of the harshness of the UTTR lands regarding various habitat factors, mainly absence of cover, limited food, and lack of water, numbers of various animals are low. However, the harsh environment is suitable for raptors and a diversity of supporting prey species which use the areas of topographical variability for nesting sites. As described below, management of fish and wildlife on the UTTR is regulated by a number of major Federal regulations. Key in understanding the applicability of these regulations to new or increased operations at the UTTR is the language describing the prohibited "taking" of protected species. In nearly all of the major Federal legislation, the definition of "take" includes "disturb", the most likely type of impact associated with range activities.

A.4.2.1 Endangered Species Act

The primary Federal mandate controlling fish and wildlife is the *Endangered Species Act (ESA),* 16 U.S.C. 1531, which provides protection to threatened and endangered species and their critical habitats. Endangered species are animals or plants listed by regulation as being in danger of extinction. Threatened species are animals or plants that are likely to become endangered within the foreseeable future. Candidate species are animals or plants that have been selected for evaluation for inclusion on the threatened and endangered species list. Candidate species may be considered for immediate listing if significant parts of their habitat are threatened by human impact.

Section 9 of the *ESA,* as amended under 50 CFR 17.3, prohibits any taking of listed species of fish or wildlife without special exemption. "Take" under the ESA means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Harass is further defined by the USFWS to include an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is further defined by the USFWS to include an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

If significant new or increased activities on HAFB installation lands potentially impact any threatened or endangered species as described above, coordination with the appropriate USFWS and Utah Division of Wildlife Resources (UDWR) personnel should be conducted early in the planning process. Specific information needed to ensure a thorough evaluation could include information such as:

- Identification of species and distribution of wildlife occurring within the project areas by evaluation of existing data and/or development of on-site surveys;
- Determination of the location and distribution of important habitats, sheltering areas, feeding areas, and available prey base (where applicable) associated with the proposed activity;
- Definition of the type, extent, timing, and duration of development or human activities proposed to occur;
- Consideration of cumulative effects to wildlife and habitats when added to past, present, and reasonable foreseeable actions;
- Preparation of plans and schedules of short-term and long-term project disturbances and human-related activities to avoid sensitive areas, particularly during crucial periods;
- Definition of post-project and post-mitigation monitoring plans to document stability of affected wildlife populations, and to evaluate success of mitigated efforts.

A.4.2.2 Migratory Bird Treaty Act

Raptors as a group are considered migratory birds. As such, Federal protection is provided for raptors and their habitat through the *Migratory Bird Treaty Act (MBTA)*, 16 U.S.C. 703-712. Under authority of the *MBTA*, it is unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. Take is defined at 50 CFR 10.12 as to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.

When taking of raptors, their parts, nests, or eggs is determined to be the only alternative for a proposed project, application for Federal and state permits must be made through the appropriate authorities. Migratory Bird Permits must be obtained through the USFWS's Migratory Bird Permit Office for take of raptor nests (50 CFR 13,21). The list of migratory birds protected by the *MBTA* includes raptors and is found in 50 CFR 10.13.

Recent case law determined that the *MBTA* did not apply to indirect harm or incidental take of migratory birds such as habitat loss, and further exempted Federal agencies from the need to obtain take permits (USFWS, 1999). However, the letter and intent of the law regarding the take of the birds, nests, or

eggs is still applicable and should be employed on all Federal projects, including those proposed for new or increased UTTR operations.

A.4.2.3 Eagle Protection Act

Specific protection for bald and golden eagles is authorized by the *Eagle Protection Act (EPA)*, 16 U.S.C. 668. It is illegal to take, possess, sell, purchase, barter, or transport any bald or golden eagle, alive or dead, or any part, nest, or egg thereof. "Take" includes to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb (50 CFR 22.3).

The *EPA* was amended in 1978 to authorize the USFWS to issue permits to allow the taking of golden eagle nests in certain situations, specifically natural resource development and recovery operations that meet specific criteria under 50 CFR 22.25. The USFWS will issue a take permit only when there is a reasonable expectation that no significant long-term loss of eagle habitat will result from the proposed action.

Federal agencies are exempt from the need to obtain a take permit under the *EPA*. However, the letter and intent of the law regarding the take of the bald eagles and golden eagles, their nests, or eggs is still applicable and should be employed on all Federal projects, including those proposed for new or increased UTTR operations.

A.4.3 Executive Order 13112, Invasive Species

Executive Order 13112, requires Federal agencies to identify actions that may cause or promote the introduction or spread of invasive species. Federal agencies must not authorize such actions unless it has been determined that the benefits would clearly outweigh the potential harm caused by invasive species and that all feasible measures to minimize risk of harm will be taken in conjunction with the proposed action. Within budgetary constraints, Federal agencies must: conduct research on invasive species and develop technologies to prevent their introduction and provide for their control; detect and control populations of invasive species; and provide for restoration of native species and habitat conditions in ecosystems that have been invaded.

A.4.4 Wilderness Protection

The *Wilderness Act of 1964* established the National Wilderness Preservation System to protect federally owned areas designated as "wilderness areas", administered for the use and enjoyment by the American people in such a manner that will leave them unimpaired for future use as wilderness. The Bureau of Land Management (BLM) is the Federal agency that controls most of the wilderness areas in the State of Utah. Within the MOA there are several wilderness study areas (WSAs), including the Deep Creek and Fish Spring

Mountains, that are currently under the jurisdiction of the BLM. A WSA is an area of public land that is being considered for protective status. They are managed to preserve their wilderness characteristics until it is determined that they are worthy of the designation.

The BLM recently completed a study that found additional possible WSAs around the UTTR, including areas such as the Newfoundland Mountains, Silver Island Mountains, and Pilot Peak. This proposal has raised concerns regarding the coexistence of the WSAs and the type of training activities that occur at the UTTR. Potential legislation banning the WSA designation has been proposed to ensure that the DoD is given an opportunity to determine whether they would create problems for UTTR operations (Section 2814 of the National Defense Authorization Act [H.R. 1401]). This type of legislation is relevant to the management of natural resources at the UTTR only in that the outcome of legislation affecting the designation of WSAs in and around the UTTR, including in the restricted airspace, could impact future plans to increase or add new range operations.

A.4.5 Use of Off-road Vehicles

Executive Order 11644 and 11989 amendment, Use of Off-Road Vehicles (ORVs) on The Public Lands. This EO specifies that ORVs may not be used without special use and location designation.

A.5. Other Potentially Applicable Federal Requirements

Additional Federal legislation and requirements exist that may be applicable to proposed new or increased activities on HAFB installation lands. For the most part, these requirements have been incorporated into the Integrated Natural Resources Management Plan for Hill AFB. However, specific issues may need to be considered during planning efforts. These requirements include the following:

1. Animal Damage Control Act
2. Executive Order 11514, Protection and Enhancement of Environmental Quality
3. Executive Order 11988, Floodplains Management
4. Executive Order 12962, Recreational Fisheries
5. Farmland Protection Act
6. Federal Land Policy and Management Act of 1976
7. Federal Noxious Weed Act of 1974
8. Federal Water Pollution Control Act of 1977
9. Fish and Wildlife Conservation Act
10. Forest and Rangeland Renewable Resources Planning Act of 1974
11. FY 91 Defense Appropriations Act
12. Lacey Act of 1900

13. Multiple Use Sustained Yield Act of 1960
14. National Forest Management Act of 1976
15. National Trails Systems Act
16. Rivers and Harbors Act of 1899
17. Soil and Water Conservation Act
18. Taylor Grazing Act Title
19. Wild and Scenic Rivers Act
20. Wild Horses and Burros Act

A.6 State Requirements

Specific language in the Utah State Code provides for the protection of fish and wildlife, including threatened and endangered species. In addition, actions have been taken by the Air Force in cooperation with the State of Utah through various Memorandums of Understanding (MOUs) to protect wildlife and outdoor recreation opportunities. Both areas of State requirements are discussed in the following subsections.

A.6.1 Wildlife Resources Code of Utah

The Wildlife Resources Code of Utah; Title 23, Utah State Code (R657. Natural Resources, Wildlife Resources), provides for protection of wildlife including: fishing; hunting; trapping; taking; permitting any dog, falcon, or other domesticated animal to take; transporting; possessing; selling; wasting; importing; exporting; rearing; keeping; utilizing as a commercial venture; and releasing to the wild. Under Sections 23-30-3, 23-20-4, and 23-20-4.5 of the State Code, the taking, transporting, selling, purchasing or wanton destruction of protected wildlife are further detailed and declared illegal and as such are punishable offenses subject to restitution, reimbursement for damages, and incarceration among other actions. Protected wildlife as defined in the *ESA* (discussed above).

Taking of protected wildlife, as described under Title 23 (R657), is not allowed without having obtained necessary State of Utah permits and/or certifications of registration. The UDWR determines upon application whether there is a valid justification for the permit and/or certificate of registration. Additional permits may be deemed necessary by the Wildlife Board whenever proposed actions are deemed detrimental to wildlife populations in the State of Utah. If it is determined that new or increased operations on HAFB installation lands, potentially involve the taking of protected wildlife, an application must be filed with the UDWR. The applicant is required to submit detailed information justifying why a take of protected wildlife is considered necessary.

A.7. Memorandums of Understanding

Through a number of MOUs, management of fish and wildlife on the UTTR is coordinated with the UDWR and the USFS. In these MOUs, the Air Force has agreed to work with these agencies as necessary to coordinate actions pertaining to the operation, development, management, and protection of threatened and endangered species and other wildlife and fish resources at the UTTR. Consistent with the objectives laid out in the MOUs, planning new and/or increased activities at the UTTR should be coordinated with the appropriate UDWR point of contact.

CHAPTER 1

1.0 NATURAL RESOURCES ACCESSIBILITY

1.1 Mission Statement

The Natural Resources group on Hill AFB is committed to helping Civilian and Military customers maintain access to land, air and water for realistic operations while sustaining the natural resources in a healthy condition for present and future generations.

1.1.1 Access to land, air and water is provided to our customers:

(1) Through technical support to on or off-base customers requiring technical information; support of formal partnerships, mission related conservation analysis and evaluation, or similar technical requests which require professional conservation expertise, judgment, or skill to provide assistance on questions or situations related to the installation's missions and/or conservation program.

(2) Through the Environmental Impact Analysis Process (EIAP), which includes Environmental Impact analysis (E IA), Environmental Assessments (EA.), abbreviated EAs and Environmental Baseline Surveys (EBS) and Categorical Exclusions (CATX).

(3) By informal and formal consultation with the Utah Division of Natural Resources, the U.S. Fish and Wildlife Service and the Bureau of Land Management.

1.2. MANAGEMENT PHILOSOPHY

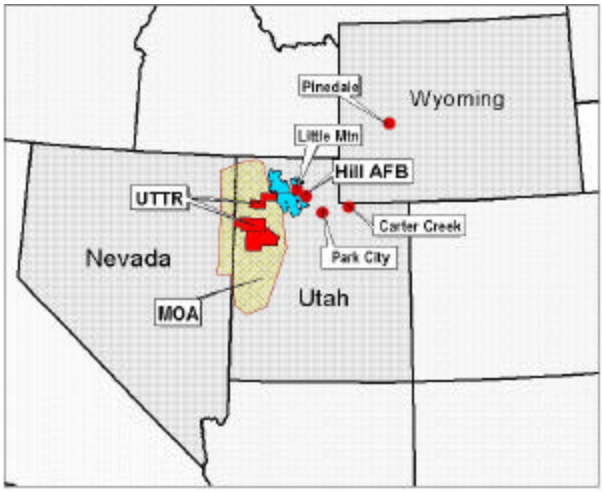
1.2.1 We have attempted to adopt biodiversity - ecosystem concepts. Biodiversity simply refers to the variety of life forms: the different plants, animals and micro-organisms, the genes they contain, and the system they form. Biodiversity demonstrates that all living organisms, including man, are linked and all actions by man or nature have impacts on the natural environment. Some of these impacts are not measurable due to the limitations of science and/or funding.

1.2.2 The ecosystem approach the natural resources group has committed to is a method for sustaining and/or restoring natural systems along with their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired

future conditions that integrates ecological, economic and social factors. It is applied within a geographical framework defined primarily by ecological boundaries (Map 1-1).

1.2.3 The INRMP presents overarching as well as specific goals. We will be monitoring all management strategies and adjust them as needed (adaptive management).

1.2.4 HAFB manages large areas of public lands, which have been withdrawn for military use. "Humans Are Embedded in Nature" and are a fundamental part of it; they influence ecological patterns and processes, and are influenced by them. Both human and mission wants, needs, and desires-must be considered from the outset and throughout the management processes if ecosystems managed by HAFB are to be sustained.



1.2.5 One concept that has rolled out of our biodiversity management is the idea of high impact areas which are much like a national parks' high use areas. Certain areas on Hill AFB installations lands will be disturbed due to the activities required by the mission. While the rest of the areas will be much like a preserve that can be sustainable, enhanced and restored for future generations.

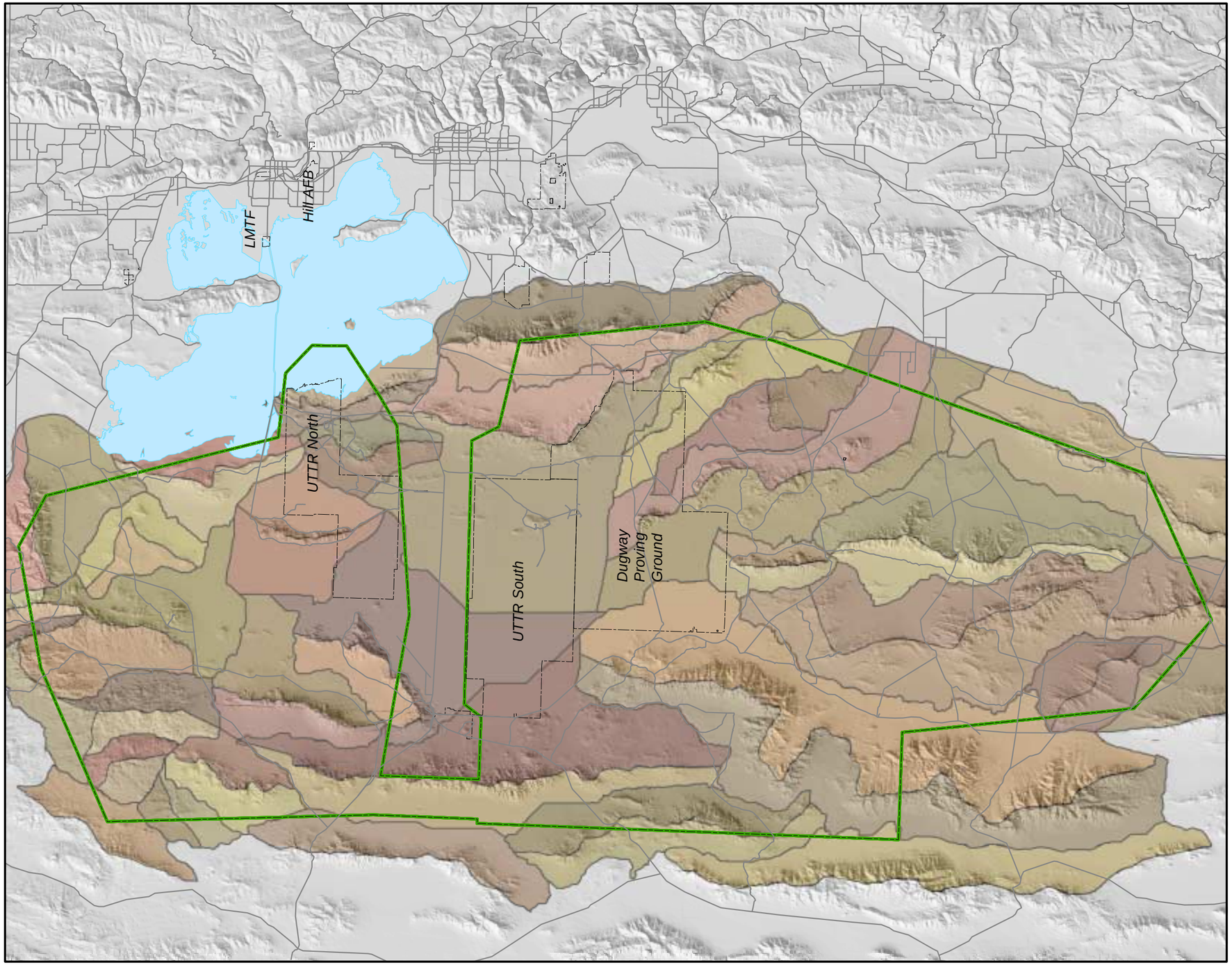
1.2.6 Natural resource management has changed over the years in several ways:
The economic/utilitarian view of natural resources that lead to management of only resources that provided benefit (profit) for people has changed to recognize that all natural diversity has inherent value and plays a functioning role in the ecosystem.

1.2.7 Maintaining biodiversity is crucial to the overall integrity and sustainability of ecosystems. Failure to maintain ecosystem diversity may produce land that could not support the Hill AFB missions or causes a loss of public confidence in the HAFB's ability to act as a good steward of the land. The Hill AFB missions would be negatively impacted if access to the land were denied due to regulatory deficiencies, poor land quality or legal action.

1.2.7.1 Biodiversity Conservation will be considered at 3 Levels:

- **Species Richness -** is the number of different species in a given area
- **Community Types -** relates to the variety of organisms (habitat) within an ecosystem and between different interacting ecosystems

Map 1-1 Ecological Regions - Military Operations Area (MOA), Utah & Nevada



Ecological Region

Military Operations Area (MOA)

Military Boundaries

Roads

1:1,328,942

0 5 10 20 30 40 Miles

0 24,500 49,000 98,000 Meters

Source: Hill Air Force Base

- **Landscape Composition -** relates to the variety of different ecosystems that interact across the larger landscape

1.3. INTERDISCIPLINARY APPROACH

The fact that ecological boundaries extend beyond political and administrative boundaries tells us that cooperation among many federal, state and local agencies, and in some cases private parties is required.

1.3.1 Social, economic or political factors may have greater impacts on conservation than the biological sciences. Solutions to conservation problems will be found only by integrating perspectives from many different stakeholders (see Figure1-1).

1.3.2 We have developed an advisory council with the U.S. Fish and Wildlife Service; Utah Division of Wildlife Resources; Bureau of Land Management; 75th RANS – Civil Engineering, operation, and security; OO-ALC Range Safety; 388th RANS – operations, EOD and security.

Figure 1-1 Ecosystem management

"By working as a team we can preserve both the natural diversity of military training areas and our opportunity to train the way we plan to fight now and in the future."

General Joseph W. Ralston, USAF
Former Vice Chairman, Joint Chiefs of Staff

1.4 AUTHORITY

Sikes Act (16 USC 670), DODI 4715.3 Environmental Conservation Program and AFI 32-7064 Integrated Natural Resources Management. (see appendix for other applicable laws and regulations).

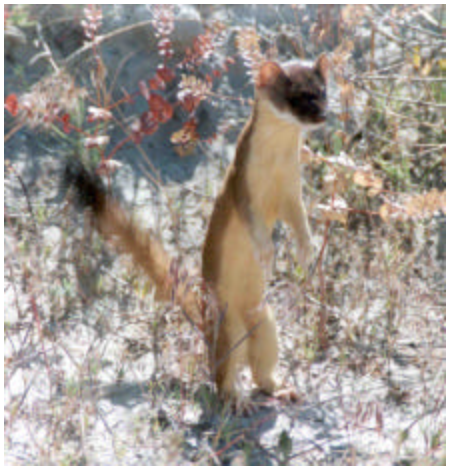
1.4.1 All lands administered by Ogden Air Logistics Center (OO-ALC) meet the requirements for Category 1 designation (natural resources requiring protection and management, such as critical habitat for protected species, aquatic resources, or any habitat that is suitable for conserving and managing wildlife) and is therefore required to develop a INRMP.

1.4.2 Key elements to this plan.

1. Ensure continued access to land and air necessary to accomplish the Air Force mission
2. Maintain natural resources in a sustainable and healthy condition
3. Comply with all environmental policies and regulations

1.5 PUBLIC NOTICE

The Hill AFB Environmental Management is committed to notifying the public on any major federal action they plan to undertake. National Environmental Policy Act of 1969 (NEPA) is the umbrella under which the Air Force has developed the Environmental Impact Analysis Process (EIAP). The following figure 1-2 illustrates the process in meeting EIAP requirements. Further information can be found on the Hill AFB NEPA website at http://em.hill.af.mil/conservation/NEPA/index.htm and the Natural Resources website at http://em.hill.af.mil/conservation/natural/nrstart.htm.



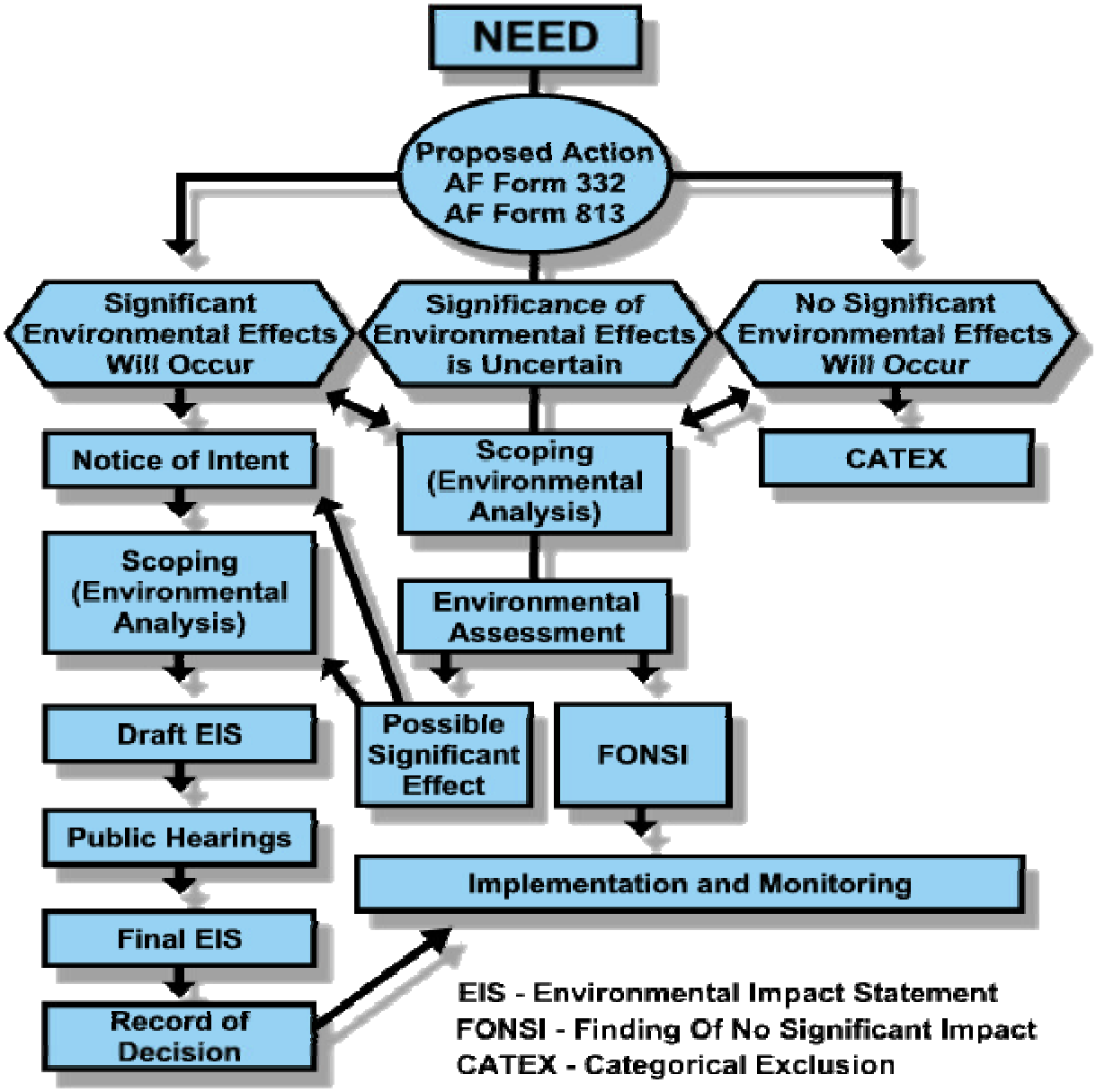


Figure 1-2 National Environmental Policy Act Process

- Work request Air Force form number 332 is
- Environmental Impact Analysis, Air Force form number 813 is
- Environmental Assessment is
- Environmental Impact Statement is

1.6 PERSONNEL

Natural Resources group falls under the Environmental Management Directorate which is assigned to the OO-ALC. There is one full time employee. A DoD professional Natural Resources Manager who is responsible for program direction, developing long term plans, policies, program implementation and wildlife law enforcement for natural resources associated with HAFB installation lands.

1.6.1 When it's not practicable for the NR manager to perform various functions he will independently evaluate proposal, projects, assessments and provide approval to one of three sources (see external assistance) which may be assigned to conduct the action. NR manager has responsibility for scope, consequences and compliance with all applicable federal, state statues, DOD and AF instructions, in the environmental arena dealing with natural resources.

1.6.2 EXTERNAL ASSISTANCE

The NR program will receive assistance from three sources. (e.g. Federal/State agencies, service provider and private contract. The U.S. Fish and wildlife Service along with the Utah Division of Wildlife Resources will provide professional field personnel to accomplish the majority of the workload.
Portions of the Natural Resources Work load will be conducted by a "service provider" as outlined in the A-76 performance work statement. A small part will be contracted to a private environmental firm.

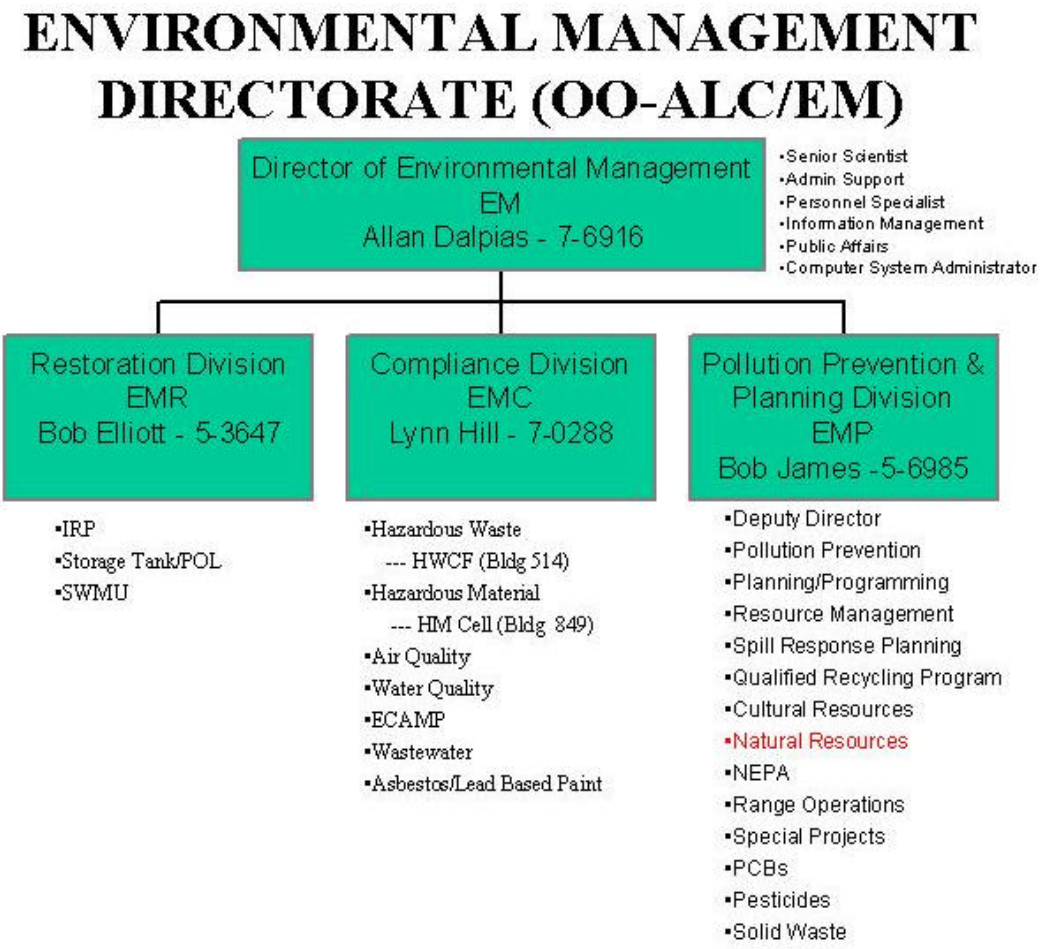


Figure 1-3 Environmental management organization

1.7 MANAGEMENT ISSUES AND CONCERNS

1.7.1 DEMANDS ON INSTALLATION NATURAL RESOURCES FROM THE AF MISSION

1.7.1.1 Cause for demand: Spatial use (Land) for new roads, targets and buildings.

These demands are high, and require land that is unimproved to be converted into improved or semi-improved lands.

1.7.1.2 Effect of demand: Habitat loss
Fragmentation of habitats

Solution: Meet goals and objectives of INRMP. Reconfigure existing targets so no new areas are lost.

Establish (Important Habitat Areas (IHA). In-house training of operation personnel. Compliant with EIAP. Law Enforcement. NR advisory council.

1.7.2 DEMANDS ON INSTALLATION NATURAL RESOURCES FROM THE PUBLIC

1.7.2.1 Cause for demand: Access/encroachment, recreational use, and grazing.

Access – Increased public expectation to access military lands due to restrictive status.
Encroachment – Development adjacent to boarder, development in test and training weapons system flight path. The primary demand for resources from the public is for recreational use (wilderness designation), hunting and fishing (Blue Lake).

Grazing – use of prime land

1.7.2.1 Effect of demand:: Loss or reduction in mission (weapons testing, combat training, detonations (treaty support)

Solution: More public involvement – Web site. Keep it healthy (Perception of poor management, trust)
NR road tour. Meet goals and objectives of INRMP. Compliant with EIAP. UTTR open house (bi-annual). Develop Wetlands Mitigation bank. Law Enforcement NR advisory council.

1.7.3 NATURAL RESOURCE CONSTRAINTS TO INSTALLATION PLANNING AND MISSION

Source:

1.7.3.1 Raptor nesting/roosting sites**.**

1.7.3.2 Invasive species (Noxious Weed) Control E.O. 13112 –
Required to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. There are several weed species that need to be controlled such as Tamerisk and Dyers Woad. This EO applies to all Hill AFB installations.

1.7.3.3 Cumulative Effect (Human intrusion)
A major goal of conservation biology is to be able to measure the total effect that all land uses and disturbances have on the plants, animals and the environment.

1.7.3.4 Habitats for Threatened or Endangered Species and Species of Special Concern.

1.7.3.5 Wetlands
Section 404 of CWA, special aquatic sites.

1.7.3.6 Watershed Protection
HAG, GAT areas potential contribute to pollution of GSL.

1.7.3.7 Storm water management issues - managed by SWPPP

1.7.3.8 Superfund cleanup – managed by IRP

1.7.3.9 Fish and Wildlife Management

1.7.3.10 Problems Caused by Wildlife (Pests)
Bird Aircraft Strike Hazard (BASH) program.
Starlings roosting at Hill AFB.
Pigeons in aircraft hangers at Hill AFB.
Woodpeckers creating holes at Pinedale SRF.
Risk of hitting antelope and cows on roads at UTTR and on access road across BLM lands.
Deer on Airfield

1.7.3.11 Grounds Maintenance
Non-point source pollution problems associated with pesticides and fertilizers and problems handling solid wastes associated with grounds maintenance activities mainly at Hill AFB.
Disease, insect and general maintenance issues associated with turf areas and ornamental planting areas.

1.7.3.12 Urban Forestry Program.
Maintenance and replacement of tree

1.7.3.13 Outdoor Wildlife oriented recreation
Watchable Wildlife Programs
Because public access is limited on HILL AFB properties, areas to establish watchable wildlife programs are limited. Hill AFB does offer an opportunity to view deer on the eastern edge of the base, or for bird watching at Pond 3 and the golf course. Blue Lake and Carter Creek Campground offer opportunities to view birds and wildlife.

1.7.3.14 Agricultural outleasing (grazing)

Solution:

Discuss and develop INRMP composite planning map of major constraints such as: IHA habitat, wetlands, flood plains, sensitive plant communities, highly erodible soils and steep slopes.

1.7.4 AF Constraints on NR Program

1.7.4.1 Funding for:

Survey projects
Enhancement/restoration projects
Updating Status of Wildlife and Plant Inventories
Identify damaged or declining habitats and species
Control of Wildland fires
In house staff

1.8 LAND CLASSIFICATION

The INRMP is applicable for all lands administered by OO-ALC. Lands have been classified as one of the following use categories: improved, semi-improved and unimproved with the urban forest being contained within the 3 different classes (Table 1-1 and Land Use Category Maps 1-2 thru 1-8).

1.8.1 Improved Lands: Lands on which AF personnel annually plan and perform intensive maintenance activities. These are developed areas of an installation that

have lawns and landscape plantings that require intensive maintenance. They usually include the cantonment, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, Roads and housing areas.

1.8.2 Semi-Improved Lands: Lands where periodic maintenance is performed primarily for operational and aesthetic reasons. These usually include grounds adjacent to runways, taxiways, aprons, runway clear zones, lateral safety zones, rifle and pistol ranges, picnic areas, ammunition storage areas, antenna facilities, and similar areas.

1.8.3 Unimproved Lands: All grounds not expressly defined as improved or semi-improved are unimproved. Unimproved grounds include weapons firing and bombing ranges; forestlands; croplands and grazing lands; grasslands or ranges; lakes, ponds, and wetlands; and areas in the airfield beyond the safety zones.

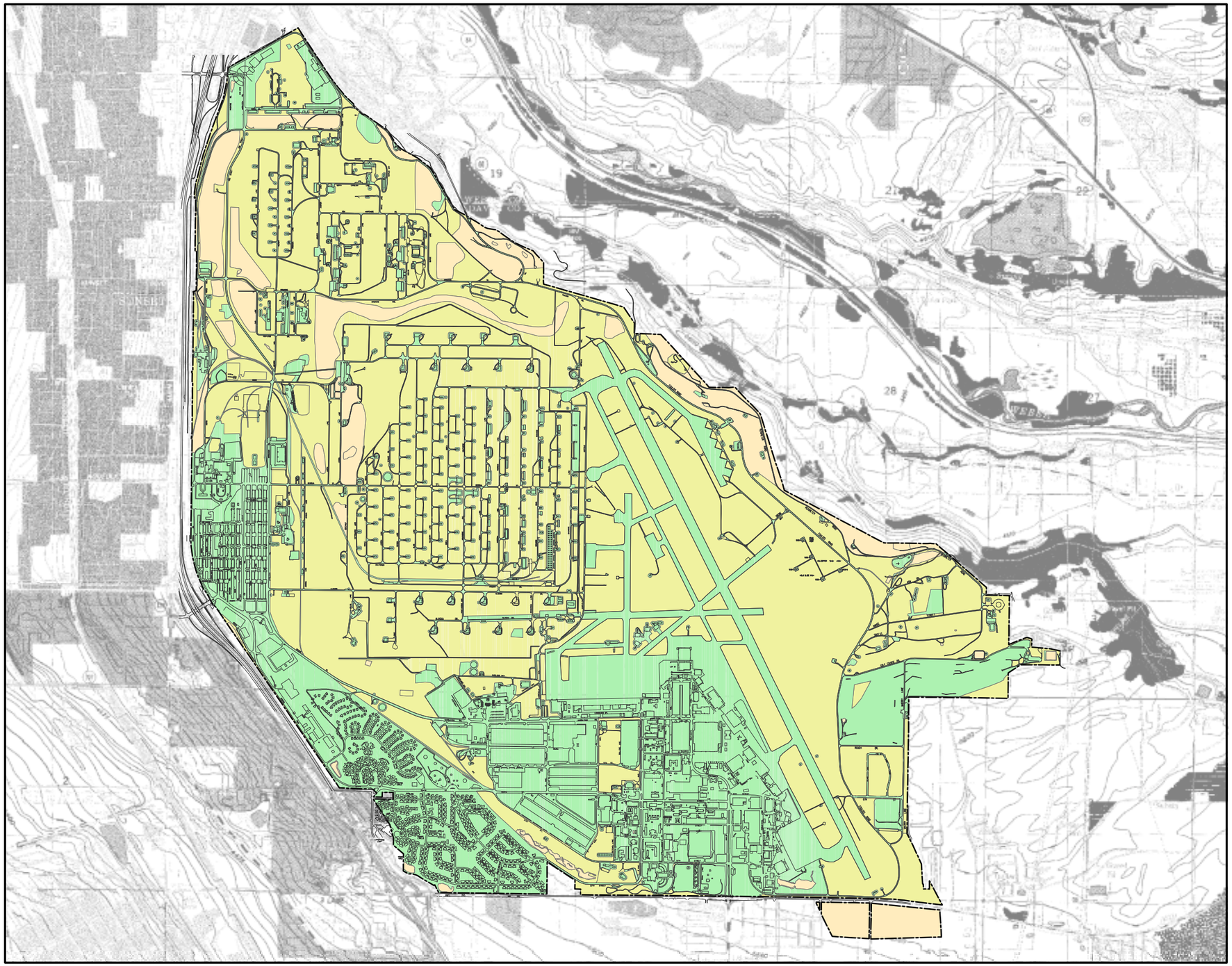
1.8.4 Urban Forestry Lands: Lands covered with planted or remnant native tree species existing within urbanized areas such as parks, tree-lined residential or commercial/ business streets, scattered tracts of undisturbed woodlands, and cantonment areas.

1.8.5 The INRMP has management responsibility over the following three types of lands with their associated components. (see table 1-1)

Unimproved	**Semi-improved**	**Improved**
Wetland	Wetland	----------
Urban forest	Urban forest	Urban forest
Outleasing	Outleasing	----------
Pesticides	Pesticides	Pesticides
Wildlife recreation	Wildlife recreation	Wildlife Controls
Fish/wildlife management	Fish/wildlife management	----------
Land management	Land management	Landscaping
Habitat enhancement	Habitat enhancement	----------
Public Access	----------	----------
Wildlife Law Enforcement	Wildlife Law Enforcement	Wildlife Law Enforcement

Table 1-1 Land types

Map 1-2 Land Use Categories - Hill Air Force Base, Utah



Land Use Category

- Improved
- Semi-improved
- Unimproved

- Hill Air Force Base Boundary
- Buildings, Roads, Airfield

1:32,668

0 0.15 0.3 0.6 0.9 1.2 Miles

0 625 1,250 2,500 Meters

Source: Hill Air Force Base: boundary, bldgs., etc.
U.S.G.S. DRGs: Roy, Ogden, Clearfield, Kaysville

Map 1-3 Land Use Categories - Little Mountain Testing Facility, Utah

Land Use Category

- Improved
- Semi-improved
- Unimproved

Buildings, Roads, Fences
Elevation Contours

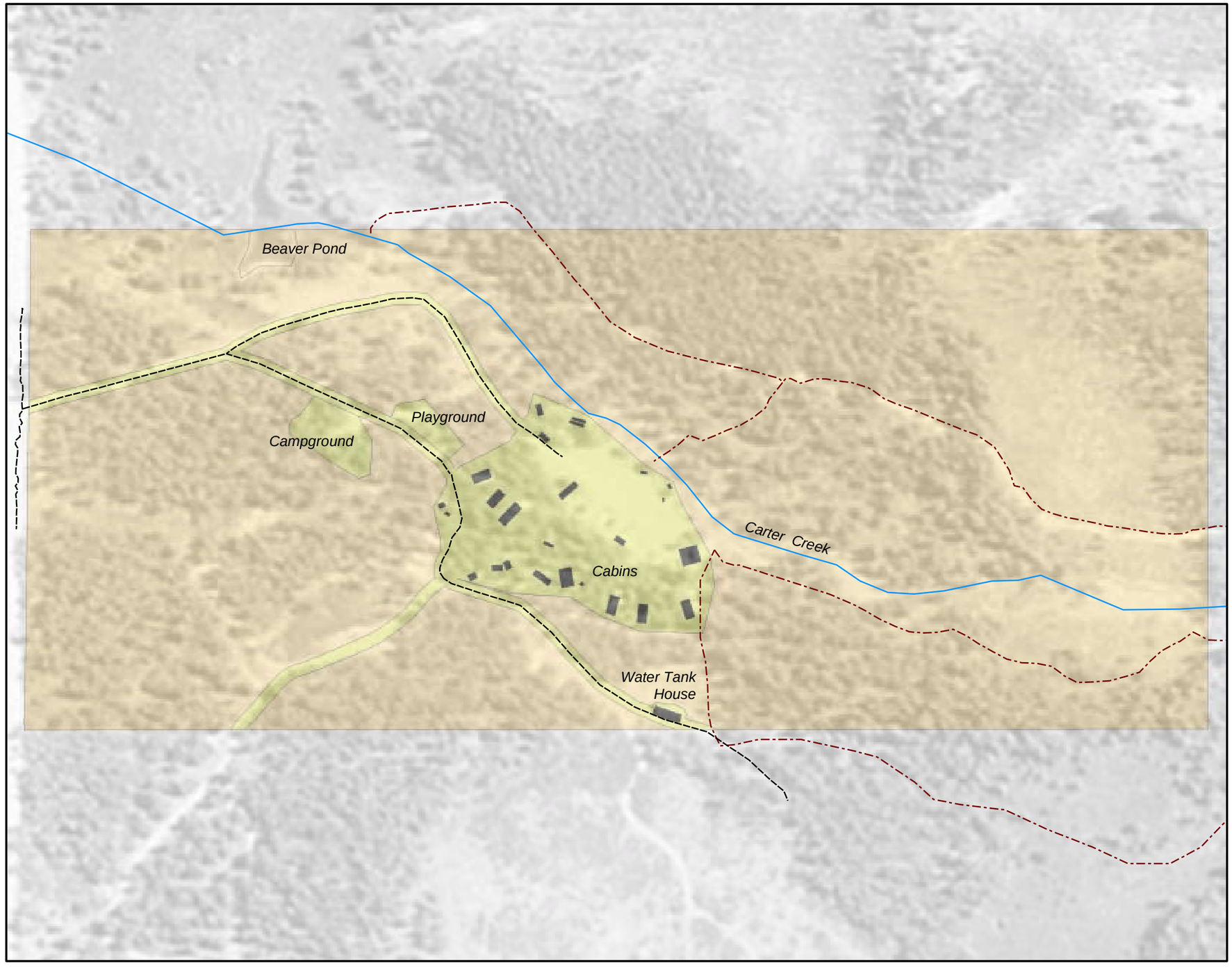
1:11,160

0 0.05 0.1 0.2 0.3 0.4 Miles

0 95,000 190,000 380,000 570,000 Meters

Source: Hill Air Force Base

Map 1-4 Land Use Categories - Carter Creek Campground, Utah



Land Use Category

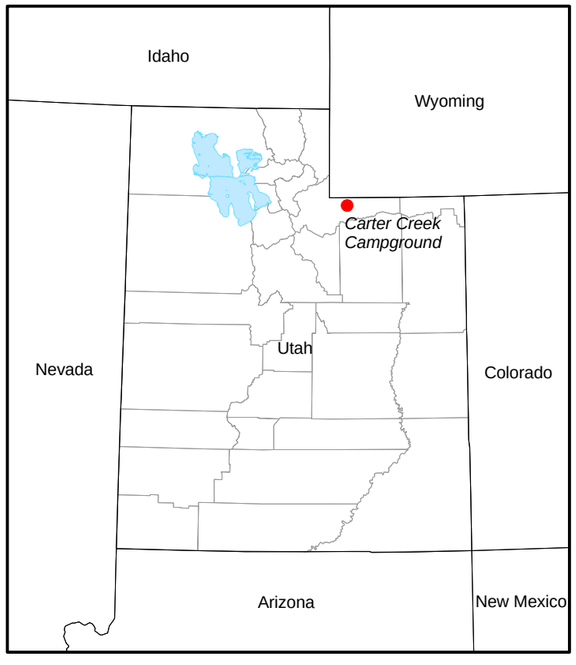
- Improved
- Semi-improved
- Unimproved
- Cabins, Trailers, Sheds
- Gravel Roads
- Foot Trails
- Streams

1:1,656

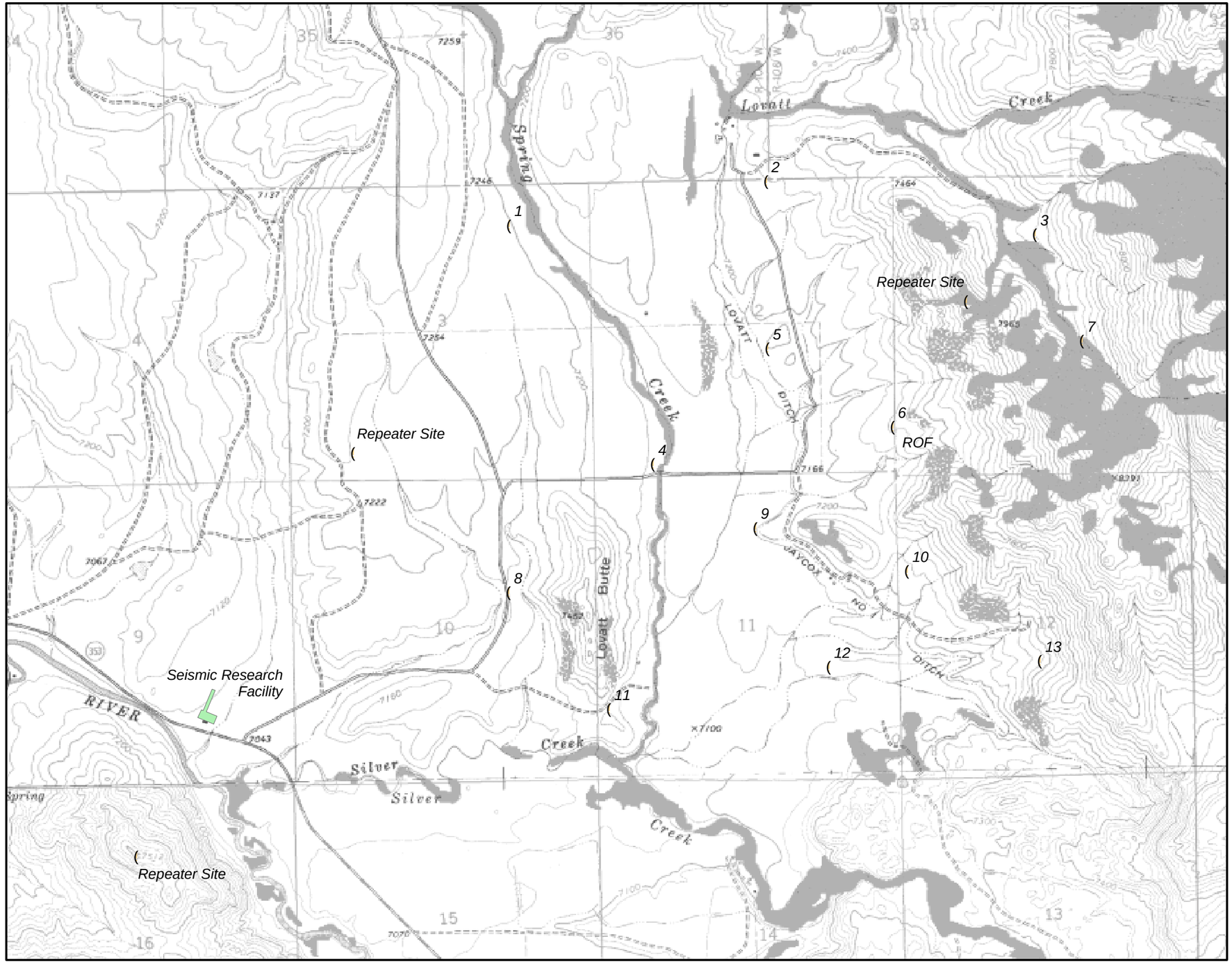
0 0.01 0.02 0.04 0.06 0.08 Miles

0 20 40 80 120 Meters

Source: Hill Air Force Base: bldgs., roads, trails;
U.S.G.S. DOQ: Carter Creek, DLG: stream



Map 1-5 Land Use Categories - Pinedale Seismic Research Facility, Wyoming



Land Use Category

- Improved
- Semi-improved
- Unimproved

(Unimproved Boreholes, Repeater Sites

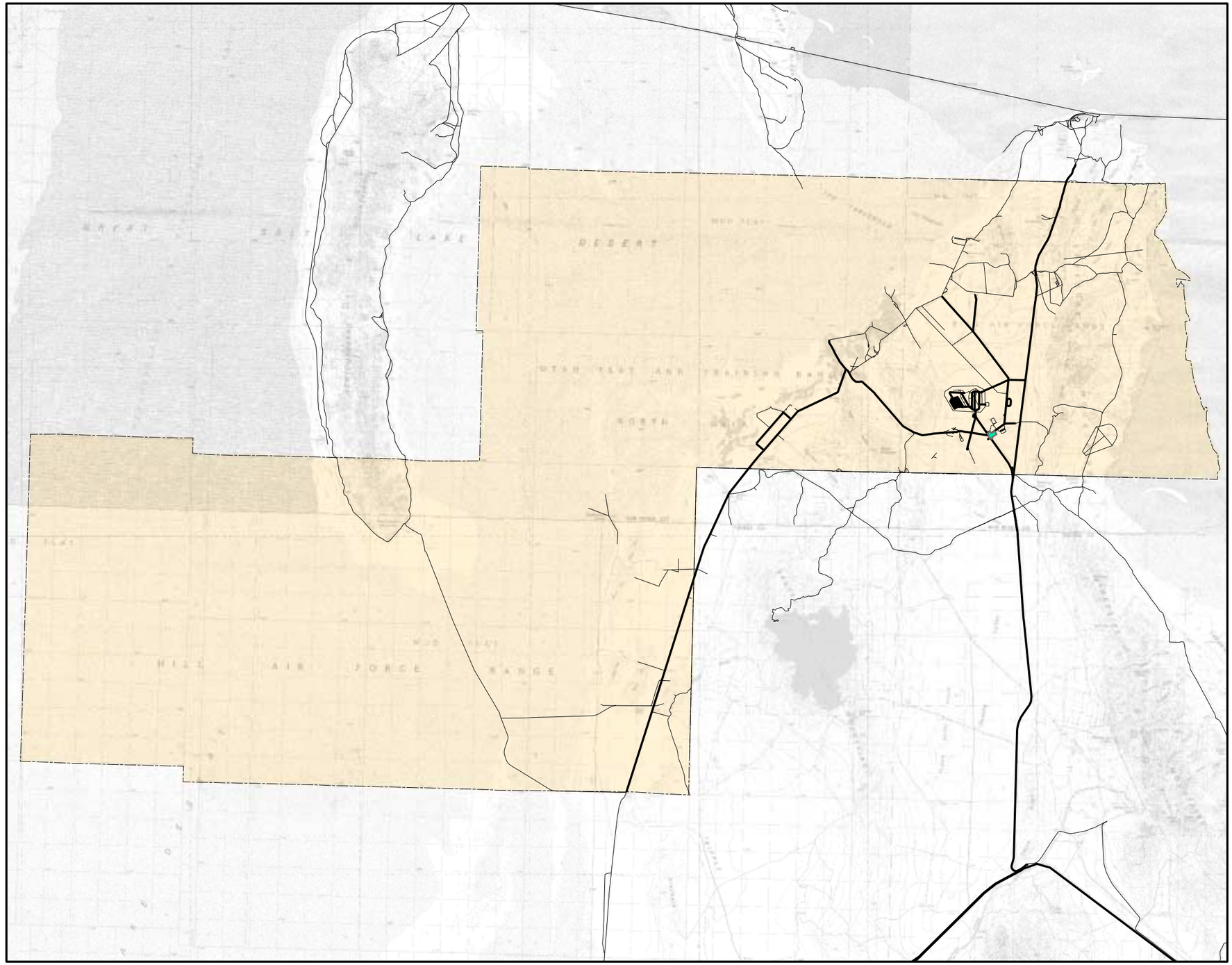
1:22,006

0 0.1 0.2 0.4 0.6 0.8 Miles

0 380 760 1,520 Meters

Source: Hill Air Force Base: boundary, borehole sites.
U.S.G.S. DRG: Scab Creek

Map 1-6 Land Use Categories - Utah Test & Training Range North, Utah



Land Use Category

- Improved
- Semi-improved
- Unimproved

UTTR North Boundary

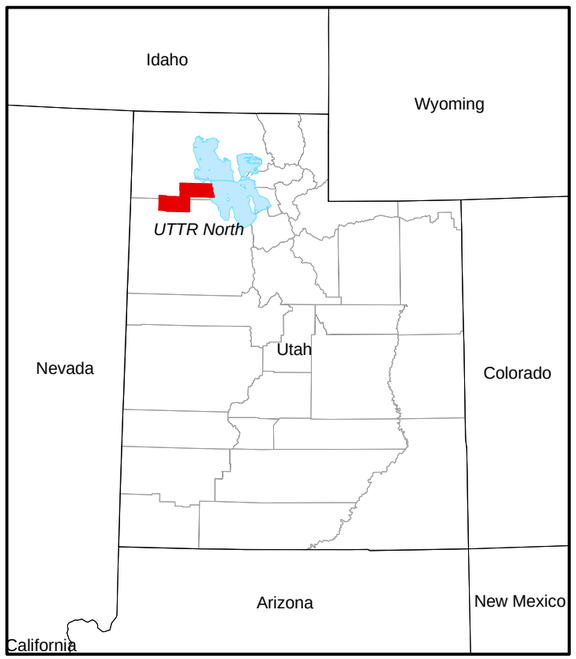
Roads, Target Areas

1:245,669

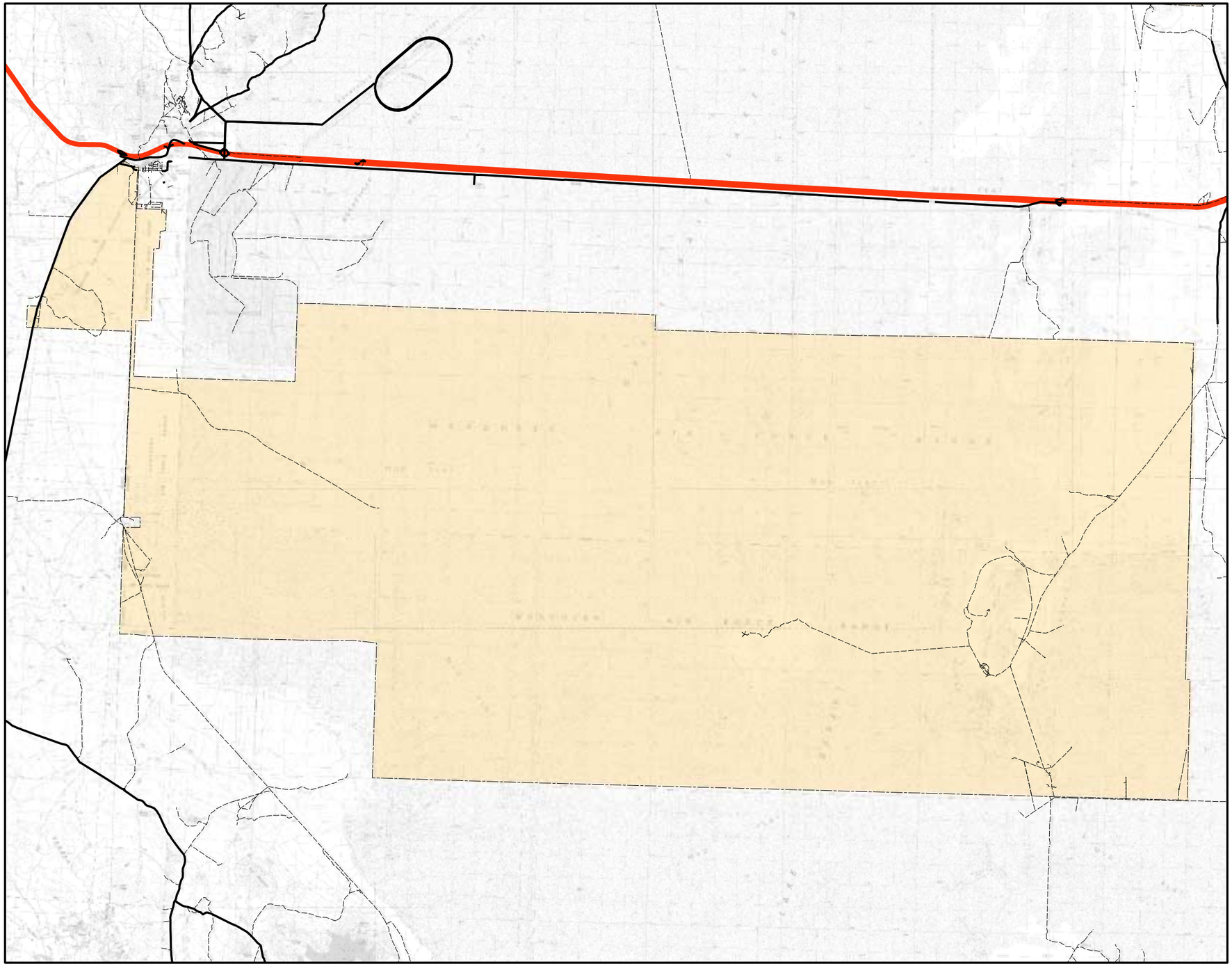
0 1.25 2.5 5 7.5 10 Miles

0 4,000 8,000 16,000 Meters

Source: Hill Air Force Base: roads, target areas.
U.S.G.S. DRG: Tooele, Newfoundland Mountains, Bonneville Salt Flats, Promontory Pt.



Map 1-7 Land Use Categories - Utah Test & Training Range South, Utah



Land Use Category

- Improved
- Semi-improved
- Unimproved

UTTR South Boundary

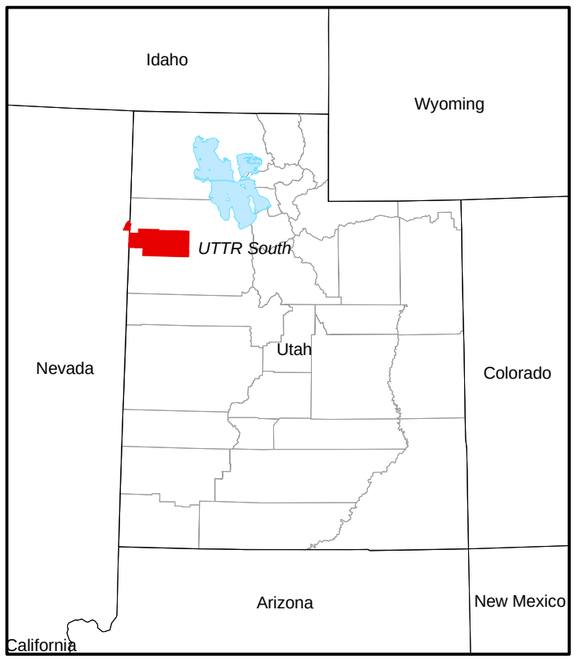
Roads, Target Areas

1:297,679

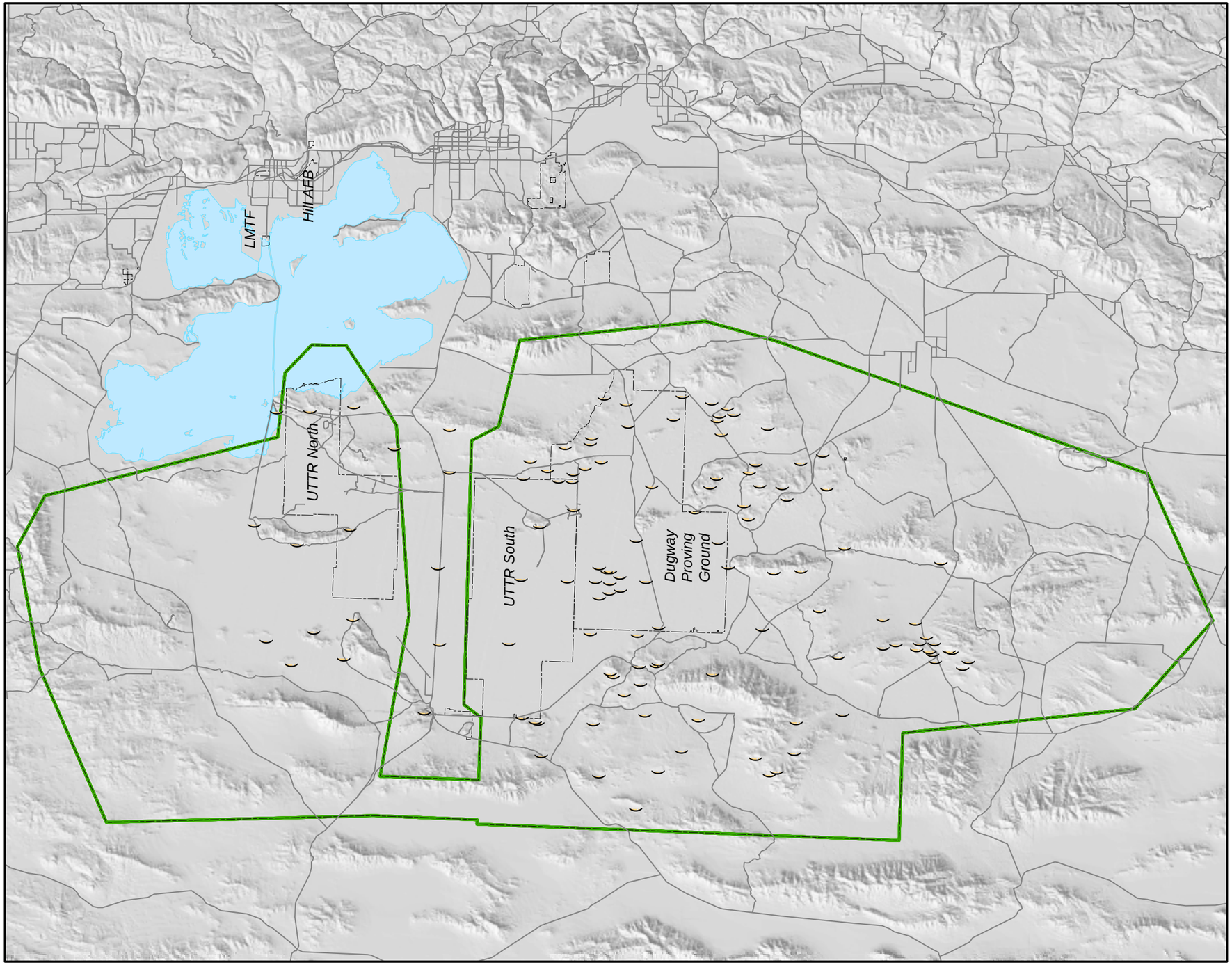
0 1.25 2.5 5 7.5 10 Miles

0 4,950 9,900 19,800 Meters

Source: Hill Air Force Base: roads, target areas.
U.S.G.S. DRGs: Wendover, Bonneville Salt Flat, Wildcat Mtn., Currie.



Map 1-8 Land Use Categories - HAMOTS, Military Operations Area (MOA), Utah & Nevada



Land Use Category

(Unimproved HAMOTS

Military Operations Area (MOA)

Military Boundaries

Roads

1:1,329,239

0 5 10 20 30 40 Miles

0 26,000 52,000 104,000 Meters

Source: Hill Air Force Base

1.8.6 LAND USE SUMMARY (see Table 1-2)

OO-ALC Installation Lands

	ACREAGE
Hill Air Force Base	6,723
Facilities, buildings	1,463
Improved grounds	1,037
Semi-Improved lands	3,154
Unimproved lands	1,069
Military Operational Area (MOA)	11,200,000
HAMOTS	458
Unimproved	
UTTR-North	369,022
Facilities, buildings	174
Eagle tower complex	188
Semi-improved land	1,931
Targets	2,400
Roads	412
Boundary Fire Breaks	238
Unimproved land	363,679
UTTR-South	589,993
Facilities, buildings	3
Semi-improved land	1,337
Targets	478
Roads	324
Boundary Fire Breaks	318
Blue Lake wetlands	15,800
Unimproved land	571,733
Dugway Annex (Air Force Operation/Army Real Estate)	
Facilities, buildings	412
Semi-Improved lands	2,500
Targets	50
Triple 7	119
Baker Strong Point	235
Unimproved Lands	799127
Little Mountain Test Facility	751
Facilities, buildings	47
Parking	3
Improved Lands	26

Semi-Improved Lands	90
Unimproved lands	585
Carter Creek Campground	23
Facilities, buildings	0.75
Parking	0.50
Improved grounds	0
Semi-Improved lands	3
Unimproved lands	18.75
Pinedale Seismic Research Facility	1.55
Facilities, buildings	0.25
Improved lands	1.30
Bore Hole Sites	13 (No.)

1.9 MEASURES OF NR PROGRAM SUCCESS

1.9.1 Access Performance Indicator Description:

1.9.1.1 The indicator measures the accessibility of the installation's land, air and water resources while meeting the requirements of the regulatory and oversight agencies with jurisdiction over conservation programs. The indicator is based upon the desire of installation customers to complete their proposed actions on schedule and to avoid costly program delays.

Percent mission delay avoidance =

$$\frac{\text{Number of Actions Not Delayed by conservation Regulatory Requirements}}{\text{Total Number of Actions reviewed for Conservation regulatory Requirements}} \times 100$$

CHAPTER 2

2.0 NATURAL RESOURCE SUSTAINABILITY

Sustainability means to maintain and/or improve the native biological diversity of terrestrial and aquatic ecosystems while supporting human needs, including the DOD mission.

In this chapter we introduce our goal and objectives. Each objective is repeated again outlining a process to accomplish them. The various components: Land management (with sub-components). Wetland protection, Fish and wildlife, Outdoor wildlife oriented recreation, Public access, and Law enforcement are listed within INRMP requirements and how they relate to the objectives.

2.1 GOALS

In order to provide Access and Sustainability of Hill AFB lands provided for in our mission statement the Natural Resources group goal will be to measure how much natural and anthropogenic impact the biological system can support before the overall cumulative effects threatens biodiversity. By doing this, the following should be considered:

2.1.1 Objectives

1. **Measure the rate and/or intensity of human disturbance**

2. **Maintain or increase populations and distributions of target species on Hill AFB lands**

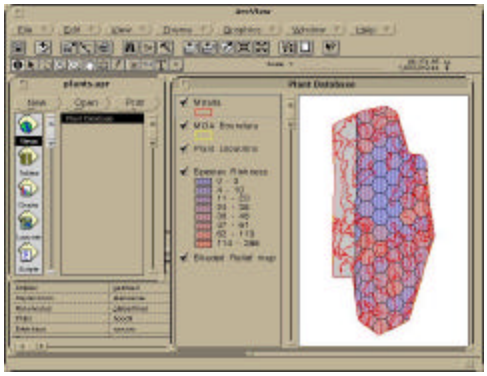
3. **Maintain or increase the species composition of communities on Hill AFB lands.**

4. **Maintain or increase the connectivity of populations of target species on Hill AFB lands to permit species migration.**

5. **Conduct annual plan review of NR program using existing Environmental Compliance Assessment Management Program (ECAMP).**

6. **Conduct an annual physical/biological inventory review of at least 20% of all Hill AFB installations lands (completing 100% within 5 years)**

Each of the **objectives** are listed separately below with process outlining how to accomplish them.



2.1.1.1 Measure the rate and/or intensity of human disturbance

There are three elements: Function, Distance, and Intensity.

Functions are separated into two types, passive (admin review) and active (physical review)

PASSIVE	**ACTIVE**
Disturbance (physical)	Disturbance (operational)
Use Current - GIS layers to measure	Aircraft Detonations
Planned – Documentation (add to GIS) 332/813/EA etc	Equipment Vehicles Personnel Walking ATV

Distance

- distance from activity to NR resource

(a simple measurement in meters, e.g. nest to target 13)

Intensity (will be measured in terms of - how loud, how long does it last, how often does it occur)
Dbh
duration
frequency

- Evaluate the impacts of the mission & personnel on test & training lands
- Match training load with land capability and capacity in order to maintain a stable useful condition
- Disturbance measurement update 20% annually
- Absence/presence of species and habitat

2.1.1.2 Maintain or increase populations and distributions of target species on Hill AFB lands

There are two elements with sub-elements.

Life requites (see appendix B for data on target species)

- Food
- Water
- Shelter
- Reproduction
- Chronology
- Habitat
- Threat
- Stress/source

Scientific Methods

Habitat Evaluation procedures (HEP)
Avian point counts with habitat data
Mammal survey
Raptor Survey
Amphibian/Reptile survey
Vegetative/habitat survey (health index)
Soil survey
Discriminate analysis
GIS analysis

2.1.1.2.1 TARGET SPECIES LIST

The "Target Species List" have been chosen by an inter-agency team from USAF, UDWR biologist, to be monitored for population trends and ecosystem changes. Monitoring is currently planned only for the UTTR, however the same Target Species List will be used at other installation lands if monitoring is required.

Each of these species listed is either a keystone, flagship, vulnerable or indicator species. Federal, state or conservation species are indicated with a small number.

There are no Federal Threatened or Endangered Species on HAFB installation lands.

PLANTS

Vulnerable- Giant Four-Wing Saltbush (*Atriplex sp.*) [1]

FISH

Vulnerable- Bonneville Cutthroat Trout (*Oncorhynchus clarki utah*) [2]
Least Chub (*Iotichthys phlegethontis*) [1]

MAMMALS

Flagship- Pronghorn antelope (*Anthilocapra americana*) [3]
Keystone- Lagomorphs
Townsend ground squirrel
Vulnerable- Bushy tailed Woodrat
Ringtail
Indicator- Kangaroo Rat

BIRDS

Vulnerable- Golden Eagle (*Aquila chrysaetos*) [4]
Ferruginous Hawk (*Buteo regalis*) [5]
Burrowing Owl (*Athene cunicularia*) [6]
Short-eared Owl (*Asio flammeus*) [6]
Long-billed Curlew (*Numenius americanus*) [7]

Indicator- Brewer's Sparrow
Black-throated Sparrow
Loggerhead Shrike
Sage Thrasher
Sage Sparrow
Western Meadow Lark
Horned Lark

REPTILE

Indicator- Desert Side Blotched Lizard

AMPHIBIAN

Vulnerable- Spotted Frog

[1] Species is federally listed as Candidate
[2] State conservation species
[3] Species is a game species, the dominant megafauna in the ecosystem
[4] Special protections under the Eagle Act
[5] Species is state listed as Threatened
[6] State species of special concern due to declining populations
[7] State species of special concern due to declining populations and limited distribution

- Maintain number of target species and distribution within 12 vegetative habitat classes
- IHA concept associated with target species

2.1.1.3 Maintain or increase the species composition of communities on Hill AFB lands

MAINTAINED

Current resources group

Group 1	Soils Vegetation classification
Group 2	Wetlands Fish Amphibians
Group 3	Birds – raptors, song birds, shorebirds, and waterfowl
Group 4	Mammals
Group 5	Reptile

ENHANCEMENTS

Lakeside - shrub to grass classification
Blue lake – mitigation bank

INDICATORS

Keystone – Lagomorphs,
- Ground squirrel
Vulnerable – species of concern
Flagship – antelope

- Survey 1 resource group a year, end of 5 years all groups will be covered.
- Number of species – look for change % up or down

2.1.1.4 Maintain or increase the connectivity of populations of target species on Hill AFB lands to permit species migration.

The MOA has been classified into 60 separate systems (see map 1-1), additionally we will look at the vegetative patchiness and or fragmentation across the 20 meter resolution image.

- Ecosystem (60 separate)
- Patchiness within ecosystems
- Fragmentation within 12 vegetation classes

2.1.1.5 Conduct annual plan review of NR program using existing Environmental Compliance Assessment Management Program (ECAMP).

2.1.1.6 Conduct an annual physical/biological inventory review of at least 20% of all Hill AFB installations lands (completing 100% within 5 years)

2.2 COMPONENTS

There's a short narrative and a measure of success section. The tables contain component requirements per the AFI 32-7064 with their corresponding INRMP objectives

2.2.1 LAND MANAGEMENT

Hill AFB installation lands consist of 960,000 acres in 5 major geographical locations and multiple small geographical separate units(GSU). The GSU's are mostly in the Military operational Area (MOA) in the west desert of Utah.. Each geographical land location has been classified into one or more of the major classes as noted in chapter 1, improved lands, semi-improved lands and un-improved lands. Each land

class may have subclasses associated with them. (See maps 1-2 thru 1-5 for installation lands).

Un-improved lands are managed by the natural resources manager. Improved and semi-improved lands are maintained by 388 RANS, 75th ABW CE and the grounds contractor. There are elements within the improved and semi-improved categories that fall under the Natural resources management. (see table 1-1 in chapter 1). The natural resources manager will determine suitability and operational distance while the various Installation, wing, squadron and group commanders will determine access. The organizational proponent will recommend land use. The various program managers within environmental management will assist in making suitability and use determinations as required.

General Requirements	Objective
Use regional approaches	4
Coordinate 5 year revisions through EPC committee, BASH working group	1-6
Supports objectives identified in BASH plan, Pest Management Plan, Cultural resources management plan, Air Installation Compatible Use Zone (AICUZ).	1-6
Coordinate and approve suitability on each AF332, AF 813, DD form 1391 and EIAP process	1-5
ATV use policy	1-6
Public access policy	1-6

Measures of Success

A. Review/inspect land use conversions - at a rate of one fifth or 20% of all HAFB installations lands annually (approximately 200,000 acres)

1. Converting lands from improved & semi to unimproved.
2. Per cent of total lands – disturbance divided by total land, broken out by major geographical locations.

The following components - Habitat Enhancement, Wildland Fires, Invasive Species Management, Agricultural Outgrants, BASH (bird/wildlife aircraft strike hazard), and Grounds Maintenance are **Sub units** of Land Management. The tables contain component requirements and the INRMP objective. A measure of success has been developed for each component.

2.2.1.1 HABITAT ENHANCEMENT

Habitat enhancement is a new element of the INRMP, and will be tied to invasive species control and wildland fire management was well. We will match our vegetative data with the ecosystem established on UTTR north and south. Look at current condition (set metric), locate reference sites, and look for patterns of fragmentation/patchiness. Establish project areas.

Requirements	Objective
Maintain or restore native ecosystems	2, 3
Identify through survey species listed as G-1 through G-3 and S-1 through S-2	2
Habitat Fragmentation	4
Reference Conditions	4
Current Conditions	4

Measures of Success

Target species distribution, habitat/vegetation restoration (number of ac requiring enhancement divided by number of ac enhanced, times 100 equals per cent (enhance X number of ac per year).

Health Index = NRCS site condition X vegetative survey

2.2.1.2 WILDLAND FIRE MANAGEMENT

Wildland fire management is a new element for the INRMP. We will work with the fire department and establish criteria for fire fighting. Natural fire return rates are beneficial to the ecosystem. The problem is when the return rate intervals are more frequent than the system can support. This results in habitat change (cumulative effect) e.g. shrub to grass (species loss) on the system. Fragmentation/patchiness beyond the natural establishment process.

Requirements	Objective
More than 1,000 ac of unimproved lands will address wildland fire management in INRMP	4
Fire chief approves plan submit for review to HQ	N/A
installation commander approves wildland mgt plan for implementation	N/A
Fire Chief and NR manager reviews and approves prescribed burns on unimproved lands	2, 3, 4
Mutual aid fire agreement with BLM	
EA required	
Maintain ecological processes such as fire and other disturbance regimes	2, 3, 4

Measure of success

Measure burn areas, place larger buffers around targets or shift location of activity with in target, (measure fire escape percent) measure return rate of invertebrates, vegetation, control of invasive.

2.2.1.3 INVASIVE SPECIES MANAGEMENT

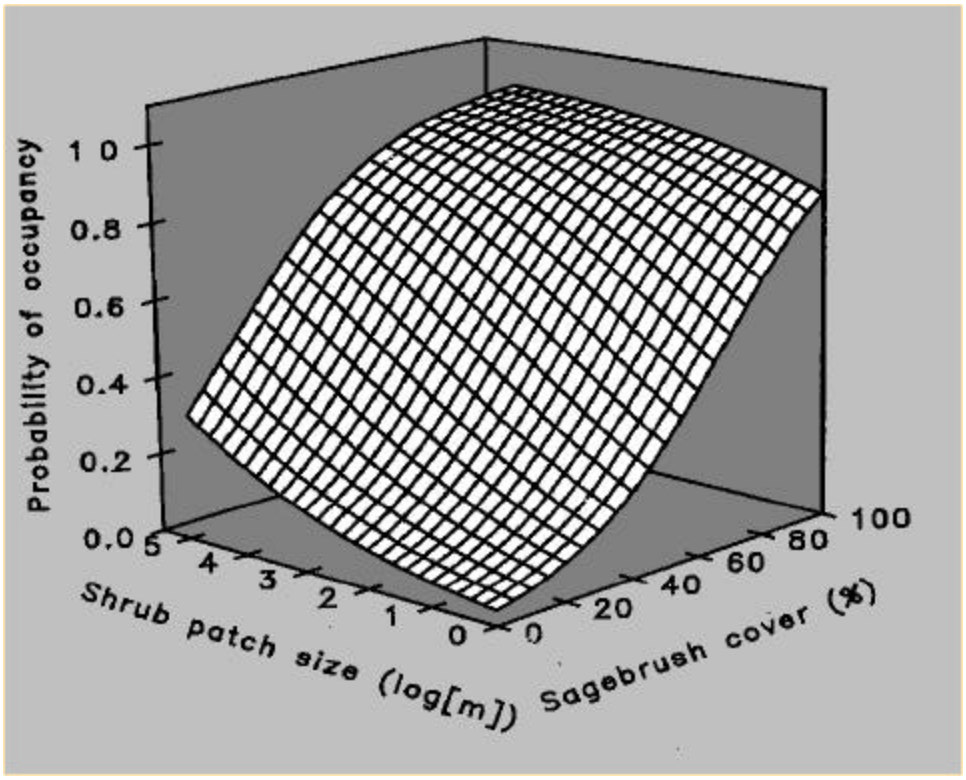
Invasive or exotic species occur when there is a disruption of the normal soil and vegetation components due to mission requirements, or wildland fires natural process. Compound this by low precipitation, 5-7 inches annually with two well known invader species cheat grass (Brome tectitorum) and Halogeten (Halogetin).

Requirements	Objective
-Reduce introduction of invasive species (ground disturbance and fire)	1, 2, 3
-Restoration of native species	2
-Develop environmentally sound control measures of invasive species	3
-Promote awareness and prevention	1
-Inventories of current invasive species, monitor and update yearly	1, 2, 3, 6

Measure of success

(number of ac disturbed divided by number of ac enhanced, times 100 equals per cent (goal X number of ac per year). Per cent cover of invasive around disturbed sites. Maintained or loss or gain. Monitor x ac per year establish permanent points.

Target recycling, larger buffers around targets. Replant or herbicide areas. Use base line data from 2000 (GIS disturbance inventory)



2.2.1.4 AGRICULTURAL OUTGRANTS

We have 2 suitable locations that are currently being grazed parcels A & B (south of us 193) and a 3rd suitable site at little mountain, west of 12th street that is not being grazed. Update land use regulations, develop compliance check list and conduct annual inspection. (see maps 1-2 and 1-3)

Requirements	Objective
-Site suitability determination, & Compatibility with mission determined by installation or wing	5, 6
-Compatibility with INRMP goals	1-4
-Administration CE real estate Office	N/A
-Out grant instrument (permit, license, lease)	N/A
-Land use regulation - protect, soil, water, vegetation. Implement Best Management practices (BMP) must also support INRMP	1-3
-Develop compliance checklist, annual inspection	1-6
-Technical oversight	1-6
-Guidelines for grazing required in INRMP	
-Control noxious and invasive weeds	1-6

Measure of success

Establish exclusion plots, measure invasives in and out of exclusion plots, per cent bare ground and per cent cover and available forage against AUM's spring and fall inspection required.

2.2.1.5 BASH (Bird/wildlife Aircraft Strike Hazard)

The air field consists of 1700 ac with low growing herbaceous material which is mowed as required to a height of 4-7 inches and the infield between taxi way is sprayed as required. We have approximately 12 recorded strikes a year with the occasional deer and gulls flocks on the air field area. There is a storm water retention pond just outside the air field to the north east which remains dry. Inside the fenced air field is pond 1 a storm retention pond and associated wetlands. Parcels A & B have small wetlands and habitat for wintering song birds. 2 Golf courses and county land fill to the east of fenced infield. Federal and state depredation permits for gulls.

Requirements	Objective
Ref BASH plan	1-6
Flight line area Clear of all standing water (wetlands)	1
Outleasing - distance to flight line (compatible with mission)	1-6
Urban forestry close to flight line (compatible with mission)	1
Control of nuisance wildlife	1
Obtain Federal and state permits	1

Measure of success

Number of strikes, number of times required to spray for hoppers, number of required cuttings, risk assessment number

Update bird risk assessment (1998), modify pond 1, plant low growing grasses throughout infield area, update

Bash plan insert control measures, contacts.

2.2.1.6 GROUNDS MAINTENANCE

The grounds maintenance is preformed by contract through the 75 AGW CE squadron. They maintain improved and semi-improved lands. Primary functions are irrigation, mowing and trimming. The urban forest on base consists of 13,000 plus trees with 85 species.

Requirements	Objective
-Landscaping projects (HAFB) use of regionally native plants	3
-Use mulch (recycle program) back into HAFB projects	
-Soil erosion	1
-Vegetation management control, herbicide use and mechanical mowing	1
-Develop Urban forestry - long term goals, desired condition, current species, size, age, replacement, removal plan	1-6
-Tree city USA	1-6
-Pest management	1-6
-Non-point source pollution Ponds runoff, discharge points	1-6
- Service contracts review by NR and HQ	6

Measure of success

Number of project meeting Landscape master plan requirements. Urban forest maintenance plan. Tree city award received.

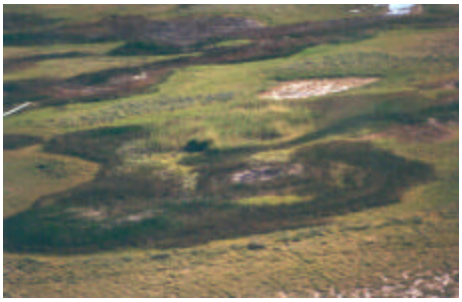
2.2.2 WETLAND PROTECTION

There is 20 ac of jurisdictional wetlands on HAFB and a potential of 44,000 ac of jurisdictional wetlands on the UTTR They primarily are lacustrine and slope type wetlands. We have conducted a NWI inventory and are reviewing a new Supreme Court ruling (swanc). The new ruling has potential of effecting our wetlands status. Current method of determining impacts and functionality is jurisdictional delineation and HGM/HEP.

Requirements	Objective
-Wetlands inventory, maintain current inventories of wetlands areas (NWI)	5,6
-Jurisdictional wetlands delineation required for project level planning.	1-3
-Wetlands per E.O. 11990	1-4
- Jurisdictional wetlands must include long-term monitoring of trends in habitat value as well as plans for restoration and enhancement.	1-4
EA for actions that may affect wetlands	1-6
-FONPA signed before any action as defined in executive order 11990	1-6
-Develop Wetlands Mitigation bank	1-4

Measures of Success

Determine total wetlands after (swanc rule) % protected and maintained divided by total wetlands times 100. Develop mitigation bank. Develop long term HGM/HEP monitoring plans for all jurisdictional wetlands.



2.2.3 FISH AND WILDLIFE

We have developed a list of 19 Target species consisting of keystone, vulnerable, and flagship indicator species. There are 14 guzzlers on the UTTR north range that support wildlife that live on BLM and AF lands. We welcome the development of a conservation agreement for least chub with the USFW service. The Utah Test and Training Range is located in the west desert of Utah where there is many proposed acres to be designated as wilderness. The Air force is concerned with the ability to keep test and training operations functional far into the future, encroachment of human related activities may have an effect on those test and training plans. We have a number of caves we believe contain important scientific information. The habitat component is extremely important to the military mission as well as the NR mission. We do not have any federally listed T/E species on HAFB installation lands, we do know that there is a few T/E species within the MOA.

Requirement	objective
-Address management of game and non-game with USFW and DWR	1-6
-Use Professionally trained F/W personnel	1-6
-Current assessment of F/W habitat, state natural heritage program classification.	1-6
-Hunting and fishing and trapping programs are appropriate when used to implement INRMP goals for F/W	1-6
-Fee collection specific into AF account 57X5095, INRMP address specific rules and procedures for the collection of fishing and hunting.	1-6
-Develop Access and participation categories (Outdoor Wildlife Oriented Recreation)	1-6
-Develop procedures for wildlife damage control – BASH, Pest management, emergency wildlife control.	1-6
-T/E within MOA do we have habitat (Coordinate with FW & BLM, DWR)	1-4
-INRMP coordination with USFW and DWR place on approval page for each agency	1-6
Develop and maintain Target Species , Habitat Requirements – (LIFE HISTORIES), Threats and Management Techniques	1-6

Measures of Success

Habitat disturbance – total number of acres divided by disturbance acres times 100 = ??… Percent in the 12 Vegetative types. T/E habitat requirements. Distribution maps for target species. Bio-diversity lose/gain.

2.2.4 OUTDOOR WILDLIFE ORIENTED RECREATION

Hill AF Base has bass and blue gill fishing for the youth and bird watching for all others at pond 3. Carter Creek recreational camp grounds nestled in the wasatch-cache national forest has plenty of fishing, hunting, bird watching, hiking opportunities. Blue Lake area in the west desert offers scuba diving, fishing, bird watching on state lands, the remaining 15,800 acres on the UTTR has not been opened to the public.

Requirements	Objective
Coordinate with base planner and services	1-6
Address outdoor wildlife oriented programs - fishing, bow hunting, bird watching	1-6
Classify areas suitable for use into one of the 3 categories	1-6
Class I developed areas	
Class II dispersed	
Class III special interest areas	
Public use	1-6
ATV use policy	1-6
-Provide for outdoor recreation that does not inflict long term ecosystem damage or negatively impact mission.	1-6

Measures of Success

Number of permits

2.2.5 PUBLIC ACCESS

We do not have open access to the public for any HAFB installation lands. Blue Lake area has the possibility for hunting and fishing, this area does not have any safety or mission restrictions associated with it.

Requirements	Objective
Notify public through EIAP	1-6
Develop Volunteer programs (citizen scientist)	1-4
Develop education program	1-4
(list what is open for public use)	
Special restriction for disclosing NR information (create a substantial risk of harm, theft, or destruction of such resource, an invasion of privacy, trespass on government property, or interfere with military mission.	1-4

Measures of Success

2.2.6 LAW ENFORCEMENT

There are a few exceptions of wildlife that are not protected by State of Utah wildlife code. All wildlife species are owned by the state of Utah re-guard less of land ownership. This soegrieven right has been granted to the state by congress. Our wildlife law enforcement issues are primarily unlawful taking of protected wildlife by individuals who have access to HAFB installation lands. Currently we have no hunting on HAFB installation lands. The NR group will obtain permits, Certificates of registration, licenses, approval letters etc, prior to any projects, surveys, monitoring or control measures required to support the military mission.

Requirement	Objective
All individuals enforcing fish, wildlife and natural resources laws on Air Forces lands must receive specialized training on the enforcement of fish, wildlife and natural resources in compliance with the Sikes act. This training may be obtained by acquiring certification as a state fish and wildlife conservation law offer or by attending the Federal Law Enforcement Training Center's land management class. Correspondence courses and standard Security Forces training does not meet the requirement of the Sikes Act.	1-6

Measures of Success

Lack of wildlife law enforcement actions.

2.3 MEASURES OF NR PROGRAM SUCCESS

Sustaining Performance Indicators:

Under sustainment there are two indicators. The indicator measures the health of the installations natural resources in meeting the requirements of the regulatory and oversight agencies with jurisdiction over conservation programs.

(1) The number of program deficiencies, which are identified to the installation and the command, is similar to accounting for enforcement Actions in the compliance arena. Program deficiencies are any negative, official action taken by state or federal agency, a conservation group, public citizen's organization, or other related group that impacts current or planned desired operational requirements of the installation or how the installation conducts its conservation program. ECAMP major findings are considered program deficiencies. Regardless of the cause of the deficiency, each one will be identified and reported during the quarter in which it is received.

(2) Conservation Status Index (CSI) This indicator is a direct measure of the health of the installation's natural resources through a consolidated, equally weighted index. The CSI accounts for the status of Threatened and endangered species (T&E) habitat, and wetlands – most visible natural resources on the installation. The CSI is computed as follows:

$$CSI\ (\%) = \frac{(TEpm/TE) + (WLpm/WL)}{2} \times 100$$

TEpm = the number of T&E species habitats (in acres) protected and maintained.
TE = the total number of T&E species habitats (in acres).
WLpm = the number of wetlands acres protected and maintained.
WL = the total number of wetland acres.

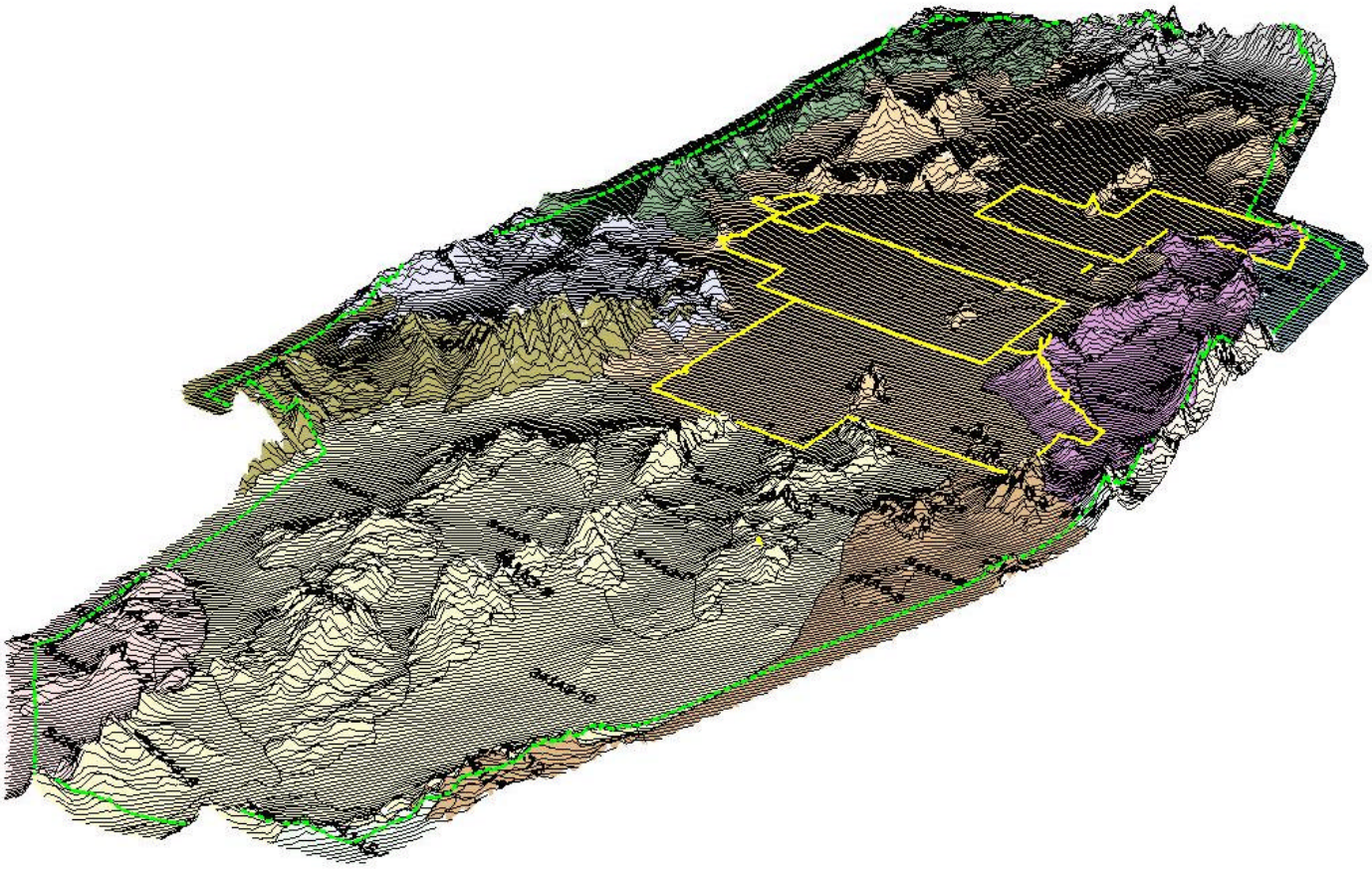
2.8.1. Mitigating, Restoring, and Monitoring Sites; The output is the number of separate, distinct, and specific recurring actions required to protect, enhance, and sustain natural resources as a result of MOUs, MOAs, Programmatic Agreements, RODs, biological Opinions, or other documented requirement of a regulatory agency.

2.8.2 Annually updating INRM Plan. Developing a non-competitive management program with other federal and state agency, private lands owners and public interests. Develop and implement MOU's, MOAs, cooperative agreements, and citizen scientists groups as required.

2.8.3 Updating Inventories. Avoid , restore/enhance, compensate, monitor.

2.8.4 Updating an inventory is defined as physical observation (or other substantial method of analysis or monitoring) of the resource, comparing current condition with recorded status, reviewing pertinent laws that protect the resources, and making any required revisions to the existing inventory database.

2.8.5 Natural Resource acres are defined as those acres managed for Federally and state listed and candidate species, and the acres of wetlands identified by the National Wetlands Inventory.



CHAPTER 3

3.0 NATURAL RESOURCES GEOGRAPHIC INFORMATION SYSTEM

The Natural Resources Program geographic information system (GIS) is used to assist in biological inventory and management by utilizing up-to-date geographic and attribute data for Hill Air Force Base installation lands. This system provides the ability to analyze and model pertinent natural resource information to ensure compatibility between the military mission and ecosystem management. Applications are used to manage biodiversity and assist in the preparation of required military operation requests to ensure regulatory compliance. This capability is critical to the success of an integrated natural resources management program by providing methods in baseline measurement, tracking of progress, identification of problems, and solution strategy implementation.

3.1 GOALS AND STRATEGIES

The GIS natural resources database is designed to provide individual coverage for each resource or type of data. Coverage is updated on a regular schedule to provide current data for any project or plan being completed for Hill AFB installation lands and also for other agencies requiring current inventory data in a useable format. The following are primary goals of the natural resource database:

- Perform a strategic resource management approach by utilizing GIS functions to execute operations too complicated and cost intensive for manual application.

- Maintain current biological inventory and other resource data for each individual natural resource.

- Use natural resource data for modeling and analysis in work request (AF Form 332, 813) planning and execution to maintain military access to Hill AFB installation lands.

- Utilize the database and system analysis capabilities for effective and efficient biodiversity management to maintain long-term sustainability of natural resources on Hill AFB installation lands and to develop and measure accomplishments.

- Use current technology such as up-to-date GIS software and global positioning systems (GPS) to keep natural resources data refined and in a current status.

- Implement Air Force initiative 'Geobase' recommended system architecture supporting ESRI ArcGIS, SDE, IMS, and Oracle database and application design to support a common data format.

- Maintain data using U.S. Army Engineer (ACE) Spatial Data Standards (SDS) for uniform and shareable consistencies.

- Generate and maintain metadata and other data in accordance with Federal Geographic Data Committee (FGDC) standards.

- Generate cartographic products to streamline mission requirements and manage resources.

- Use current technology and implementation for education and training.

3.2 DATA LAYERS

Data themes maintained for tracking natural resources and other baseline information may include:

Auditory
- Aircraft noise contours

Boundaries
- Administrative/ownership
- Agency management districts
- Municipalities
- Counties
- States
- Wilderness areas, study areas, proposals

Buildings
- Footprints
- Floor plans

Cadastre
- Department of Defense installations
- Department of Defense use areas
- Public Land Survey System
- Weber and Davis County, Utah Parcels
- Sublette County, Wyoming Parcels

Communications
- Radio transmitter sites
- Radar/Telemetry sites
- Fiber optics lines

Cultural
- Sites
- Isolates
- Features
- Historic districts
- Pony Express route
- Historic buildings
- Survey areas

Environmental Hazards
- Air sources
- Salvo areas
- Explosive waste residue sites
- Magnetic grid areas
- Installation Restoration Program sites
- Soil contaminated areas
- Landfills
- Underground and aboveground storage tanks
- Operable units / plumes

Fauna
- Pole nest boxes
- Avian survey points
- Satellite tracking coordinates
- Bat survey
- Small mammal survey
- Guzzlers

Flora
- U.S. Forest Service Region 4 (Gap) vegetation classification
- Hill AFB vegetation
- Vegetation survey 1998
- USDA vegetation test plots
- Sensitive plant habitat
- SPOT image vegetation classification

Geodetic
- Quadrangle index 1:24,000
- Quadrangle index 1:100,000

- Quadrangle index 1:250,000
- Quadrangle index 1:500,000
- Quadrangle tic points 1:24,000
- Benchmarks

Geology
- Geology of Utah and Eastern Nevada
- Geology of Northern Davis County
- Landslide potential
- Landslides
- Geologic faults
- Liquefaction potential
- Caves

Hydrology
- Springs
- Water bodies
- Great Salt Lake levels
- Water courses
- National Wetlands Inventory
- LANDSAT wetlands image classification
- Canals

Improvement
- Golf course
- Fences
- Gates
- Miscellaneous
- Disturbed areas general
- Lots
- campground
- recreation trails

Landform
- Elevation contours
- Aspect
- Slope
- 3-dimensional views
- DEMs
- Shaded relief models

Land Status
- Land cover classifications
- Land management classes

- unimproved lands
- semi-improved lands
- improved lands
- Land use areas, Davis and Weber counties
- Gravel pits
- Mine locations, Utah
- Restricted use areas
- Grazing allotment areas
- Ecological regions

Military Operations
- Example cruise missile test flight path
- HAMOTS
- Military air training routes
- Military airspace
- Restricted airspace
- Supersonic airspace
- Aircraft/missile crash sites
- Utah Test and Training Range targets
- UTTR checkpoints
- Camera stations

Soil
- Soil sample sites
- Soil classifications

Transportation
- Airfield, Hill AFB
- Airports
- Roads
- Trails
- Railroads

Utilities
- Utility lines
- Utility poles

Satellite Imagery
- Landsat
- Spot
- Ikonos

Aerial Photography
- DOQs

Project specific fly-overs

Other Georeferenced Images
U.S. Geological Survey Digital Raster Graphics (DRG)

3.3 GEOBASE STRATEGY

3.3.1 Background

In an effort to coordinate federal spatial data activities and develop a national digital spatial information resource, OMB (Office of Management and Budget) Circular No. A-16, "Coordination of Surveying, Mapping, and Related Spatial data Activities" was published 6 May 1967 and revised 19 October 1990. Implementation of this circular resulted in information partnerships, avoidance of duplication effort, and ensured effective and economical management of information resources to meet user needs. Then on 13 April 1994, Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure" [NSDI] was published in the Federal Register, Volume 59, Number 71, pp. 17671-17674 which was intended to strengthen and enhance OMB Circular No. A-16. This E.O. established a National Geospatial Data Clearinghouse, data and metadata standards, and provides a national digital geospatial data framework.

3.3.2 Objective

In 1998 the U.S. Air Force Academy Institute for Information Technology proposed the GeoBase Initiative. The U.S. Air Force GeoBase Foundations were developed the following year, twelve statements of policy guidance for development and management of geospatial data.

1. Recognize importance of geospatial assets
2. User understanding, acceptance, and stewardship more important than specific technology
3. Employ strategic planning to guide long-term development and investments
4. Use phased, modular projects to reduce risk
5. Ensure all IRM assets are inventoried and managed to avoid duplication
6. Validate existing info sources before investing in new ones
7. Employ data and QA standards to maximize interoperability and minimize costs
8. Provide access to data through existing communications networks
9. Assign data owners responsibility for data maintenance and protection
10. Protect info resources at appropriate levels
11. Facilitate data sharing with other agencies and interested parties
12. Establish a skilled cadre of full-time geo-spatial personnel to sustain long-term use of resources and data

3.3.3 Implementation

The natural resources program has adopted the Geobase policies and standards by operating the database in conjunction with other Environmental Management Directorate (EM) databases. All GIS efforts are being merged to a common hardware and software environment comprised of ESRI ArcSDE and Oracle databases. This integration serves to facilitate user support and prevent duplication of effort, improve quality, and reduce costs related to geographic information. Figure 3-1 outlines the current system structure and operation of the GIS to maintain military access the land, air, and water by responding to operator requests and natural resources sustainability through biodiversity conservation.

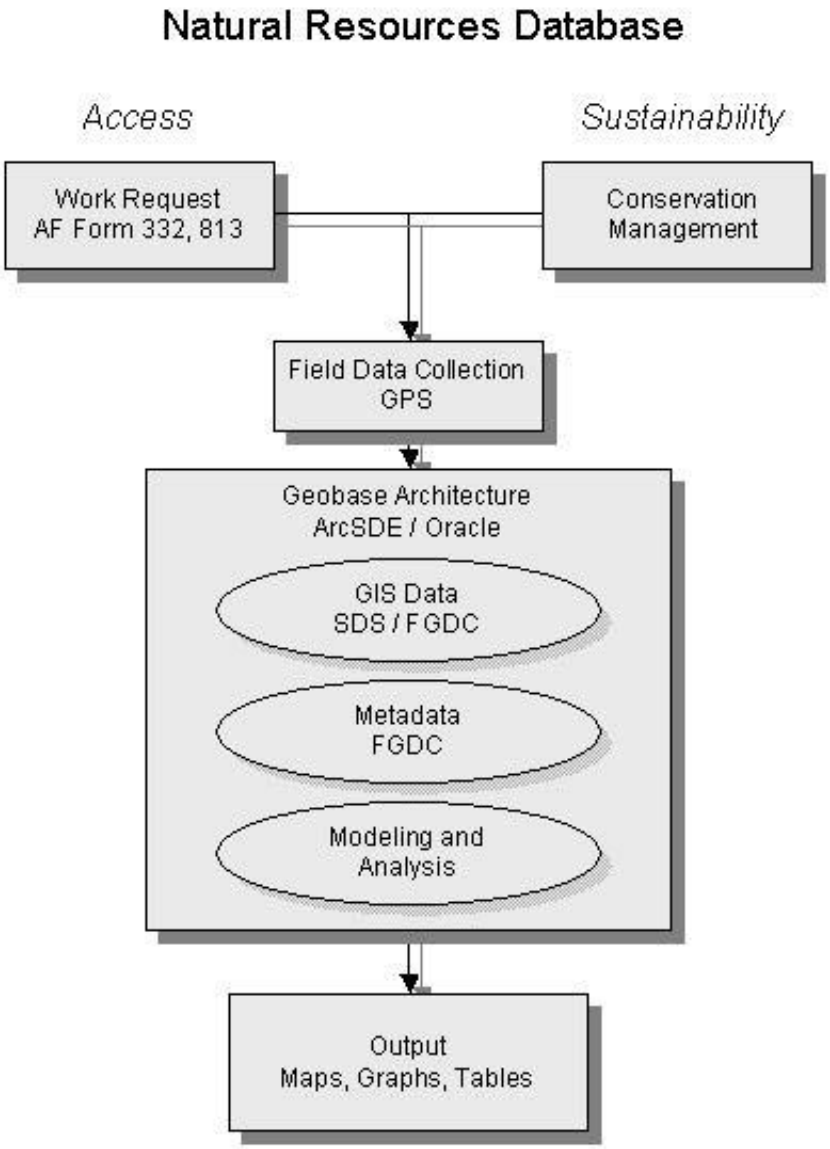


Figure 3-1. The current GIS structure and operation used to maintain military access to the land, air, and water and to maintain sustainability through biodiversity conservation.

3.4 DATA STANDARDS

3.4.1 Overview - The Federal Geographic Data Committee (FGDC) coordinates the development of the National Spatial Data Infrastructure (NSDI) as called for by Executive Order 12906 and includes representatives from the Department of Defense. Some of the FGDC's responsibilities include the coordination and development of standards for implementing NSDI. The *FGDC Standards Reference Model* describes different types of geospatial standards and documents the FGDC standards process. Specific FGDC standards used by the natural resources program include metadata, biological data, and vegetation classification standards. Spatial data standards have been established by the U.S. Army Engineer Research and Development Center for data storage format and nomenclature. Map accuracy standards are based on the input data and output requirements. All geographic data are currently stored in Universal Transverse Mercator (UTM) coordinate system, meters, Zone 12, North American Datum 1927 (NAD27).

3.4.2 Data Accuracy - Data accuracy requirements within the Natural Resources Program depend on the particular project or application. The overall policy is to acquire and maintain data at the highest level of accuracy practicable. Most natural resource data collected in the field can be cost effectively captured within an accuracy of +/- 10 meters. Data acquired from other sources maintain their own accuracy standards that are the responsibility of the Natural Resources Program to assess and determine their suitability. Accurate, high quality analysis, modeling, and map output are the end result of accurate data preparation and input. Examination and documentation of input data include addressing the following topics:

- content
- source(s) of data
- utility of data
- reliability
- dates of inventories
- updates
- source scale

3.4.3 Data Sources - Once the required data for each coverage has been determined, sources of data for that topic should be researched and contacted to determine if the data are available, current, and accurate. If the required data are not available in digital form, alternative manuscript sources are considered. Other government agencies and private companies including the U.S. Geological Survey, U.S. Fish and Wildlife Service, and State of Utah Automated Geographic Reference Center (AGRC) provide digital geographic data.

3.4.4 Digitizing - Based on individual project requirements it is determined what scales and format of data are to be used. In order to digitize manuscript maps in a georeferenced format, the map is registered to a ground-based coordinate system. The resource information (points, lines, and/or polygons) drafted on overlays must have four corner tic-marks which are associated with known horizontal (X,Y) coordinate values in latitude and longitude or UTM. Once the geographic data has been digitized, attributes are assigned to provide information to each piece of data (polygonal, lineal, point) in the coverage.

3.4.5 Field Data Collection – Adherence to field data collection standards minimizes uncertain data quality and time-consuming integration with the existing database. For all geographic information collected in the field, a global positioning system (GPS) is used. Locations are captured in UTM Zone 12 NAD27 meters or latitude and longitude WGS84. Data post processed in the office is exported to an ESRI compatible format and imported into the GIS database. Data sets containing only point locations are occasionally imported from spreadsheet files, text files or a database with documented X, Y (easting, northing) coordinates. All tabular data is strictly formatted with individual columns and rows, not separated into subgroups with blank rows and headings in the middle of the file. Number and date fields are consistent with valid values for their corresponding data type. Units are included in column heading or placed in a separate column. Different groups of data are in different files, tables, or worksheets if it is necessary to give them different attributes or fields. All data is simple point, line, or polygon and the spatial data types are appropriate for the feature: point locations are points and areas are polygons (not lines). All attribute data are linked to the corresponding spatial objects. Basic attributes may include featureID, featureType, subType, comments, description, collector, and date. Critical ID fields are not separated into files that cannot be joined to the original data file.

3.4.6 Data Organization and Nomenclature – The CADD/GIS Technology Center for Facilities, Infrastructure and Environment, coordinates the use of CADD and GIS activities within the Department of Defense and other participating governmental (federal, state, and local) agencies, and the private sector. In October 1999, the Federal Geographic Data Committee endorsed the Center as the FGDC Facilities, Infrastructure, and Environmental Working Group. One of the key roles of the Center has been the development of the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE). The SDSFIE have focused on the development of graphic and nongraphic standards for GIS data organization and nomenclature.

The Spatial Data Standards set specific data organization and nomenclature requirements without addressing application. Specific feature entities are assigned to entity sets that are a function of data maintenance rather than data use. By

implementing this type of standard, redundant and obscure information is minimized. The Spatial Data Standards physical data model was designed to support multiple CADD and GIS software products including ESRI ArcGIS and Oracle (Oracle Corporation).

The SDSFIE data model consists of five basic levels of hierarchy: Entity Sets, Entity Classes, Entity Types (includes Entities), Attribute Tables, and Domain Tables. A SDSFIE Attribute Table is a relational database table containing data, or information, about a specific SDSFIE entity. Since SDSFIE Attribute Tables are linked directly to a graphic entity they are classified as "graphic" attribute tables. Domain tables contain standardized lists of permissible values for specific attributes. They provide a predefined finite set of allowable values, which may be enlarged by each user. Join relationships are mechanisms by which relational databases link multiple records by a common attribute or item and provide access to the records through the use of queries. Join relationships are established in the SDSFIE through the use of "Primary Key" attribute fields in a "parent" attribute table and "Foreign Key" attribute fields in related "child" attribute tables. Specific symbologies for graphic elements are defined in the SDSFIE for presentation standards. These line styles/types, thicknesses/width, colors, and graphic symbols are included to assist with the standardization of map product display.

3.4.7 Data Classification – Certain data acquisition and classification standards may prove beneficial for future development and implementation of the Natural Resources Program GIS. In coordination with appropriate sub-committees and working groups, the FGDC has developed standards for certain classifications such as wetlands, vegetation, and biological nomenclature. These standards provide consistent reference systems and allow precise communication about each subject based on scientifically accepted methodologies.

The classification of wetlands will assist in assessing wetland loss and gain while aiding restoration efforts by providing ecologically similar enhancements or reconstruction. A vegetation classification standard supports the use of a consistent national vegetation classification system (NVCS) to produce uniform reporting and comparisons of vegetation resources from vegetation cover data. Vegetation classification methods can be used to accurately assess the floristic levels of vegetation at a scale representing Associations and Alliances. National standards for these classification levels are currently under proposal. Biological nomenclature and taxonomy data standards focus on providing a consistent reference system and data structure for maintaining and representing dynamic, scientifically based information on scientific and common names for plant, animal, fungal, moneran and protist species.

3.4.8 Metadata – During or upon completion of data acquisition or update, the contents of the data are documented to provide pertinent information to the user.

This metadata allows the user to assess certain aspects of the data such as quality, organization, spatial reference, and entity and attribute information. Content standards for digital geospatial metadata have been established by the FGDC and provide a common set of terminology and definitions for the metadata documentation. Documentation includes the following:

- Title
- Area covered
- Themes
- Currentness
- Restrictions
- Accuracy
- Completeness
- Consistency
- Lineage
- Data type
- Projection and Datum
- Coordinate System
- Features
- Attributes
- Author
- Formats

To increase the utility of the content standard for digital geospatial metadata, a theme-specific profile has been established for documenting biological resources data and information. This biological data profile also serves as the metadata content standard for the National Biological Information Infrastructure (NBII), a collaborative biological information management program amongst federal, state, academic, and other partners. This standard supports increased data effectiveness in the management of biological resources by including categories, such as research reports, field notes or specimen collections.

Other metadata standards are being proposed and undergoing the approval process to describe geospatial data obtained from remote sensing. These metadata extensions define content standards for additional metadata, not defined in the Metadata Content Standard, that are needed to describe data obtained from remote sensing. They include metadata describing the sensor, the platform, the method and process of deriving geospatial information from the raw telemetry, and the information needed to determine the geographical location of the remotely sensed data.

3.5 DATABASE ADMINISTRATION & MAINTENANCE

The Natural Resources GIS Administrator service provider is responsible for maintaining and operating the geographic database as it pertains to the management of biological and other natural resources. Recommendations and requests for system budgeting are coordinated through HQ AFMC (Headquarters Air Force Materiel Command) on an annual basis. The administrator purchases hardware and software maintenance and upgrades as required to maintain the system in a current and effective status. Data are updated, analyses and modeling are performed, and output is generated regularly to maintain an accurate database for planning and restoration projects.

Other system maintenance and product output requirements are provided by sources other than those found within the Natural Resources Program. Network administration to maintain hardware and software communication is performed by a separate organization on Hill AFB. The Oracle database and ArcSDE are administered by the Information Management and Support service provider within the Environmental Management Directorate. This service provider also develops and maintains ArcIMS, performs data updates and analyses, and generates map and other output as required by Environmental Management Directorate projects and programs.

3.6 REFERENCES

Biological Nomenclature and Taxonomy Data Standard, Federal Geographic Data Committee (FGDC), draft stage, revised 22 July 1999.

Classification of Wetlands and Deepwater Habitats of the United States, FGDC-STD-004.

Content Standard for Digital Geospatial Metadata (version 2.0), FGDC-STD-001-1998.

Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata, review stage (closes August 31, 2001).

Content Standard for Digital Geospatial Metadata, Part 1: Biological Data Profile, FGDC-STD-001.1-1999.

FGDC Standards Reference Model, Federal Geographic Data Committee, March 1996.

National Standards for the Floristic Levels of Vegetation Classification in the United States: Associations and Alliances, FGDC, proposal stage.

Spatial Data Standards for facilities, infrastructure, & environment (SDSFIE) and Facility Management Standards for facilities, infrastructure, & environment (FMSFIE) Data Model and Structure, The CADD/GIS Technology Center For facilities, infrastructure, and environment, Information Technology Laboratory, U.S. Army Engineer Research and Development Center Vicksburg, Mississippi.

Vegetation Classification Standard, FGDC-STD-005.

CHAPTER 4

4.0 IMPLEMENTATION PLAN

Natural Resources (NR) Management and implementation of the installation's NR program shall be IAW the *Sikes Act,* PL 105-85; DODI 4715.3, *Environmental Conservation Program;* AFI 32-7064, *Integrated Natural Resources Management*, other federal and state laws, DOD directives, Air Force Instructions (AFIs), MAJCOM guidance and base regulations.

Natural Resources group falls under the Environmental Management Directorate which is assigned to the OO-ALC. There is one full time employee. A DoD professional Natural Resources Manager who is responsible for program direction, decisions, developing long term plans, policies, program implementation and wildlife law enforcement for natural resources associated with HAFB installation lands.

When it's not practicable for the NR manager to perform various functions he will independently evaluate proposal, projects, assessments and provide approval to one of three sources (see external assistance) which may be assigned to conduct the action.

The NR manager has responsibility for scope, consequences and compliance with all applicable federal, state statues, DOD and AF instructions, in the environmental arena dealing with natural resources.

4.1 EXTERNAL ASSISTANCE

4.1.1 The NR program will receive assistance from three sources. (e.g. Federal/State agencies, service provider and private contract.

(note) The U.S. Fish and wildlife Service, Bureau of Land management (BLM) along with the Utah Division of Wildlife Resources will provide professional field personnel to accomplish the majority of the workload. (e.g. Federal/State agencies).

4.1.2 Portions of the Natural Resources Work load will be conducted by a "service provider" as outlined below (A-76 performance work statement). A small part will be contracted to a private environmental firm.

(Note): Hill AFB installation lands include Hill AFB; Little Mountain Testing Facility; Pinedale, Wyoming (WY) site; Carter Creek recreation site; UTTR both North and South; and high altitude multiple object system and transmitter sites.

4.2 PROGRAM FUNDING

4.2.1 Project funding will follow the requirements as outlined by HQ AFMC. Below is a brief description of the process.

4.2.1.1 Operations and Maintenance (O&M) Funds. Air Force Conservation Program Operations and Maintenance requirements will be categorized as recurring and non-recurring and designated for priority funding as Level 0, 1, 2, or 3.

4.2.1.2 Level 0 Requirements. Recurring conservation requirements on an annual or more frequent basis that are "must do" activities, such as projects necessary to execute the compliance obligations of the Air Force Conservation Program or activities which are in direct support of the military mission.

4.2.1.2.1 Level 0 requirements include personnel, travel, training, and supply costs, as well as recurring inventories, surveys, sampling, monitoring, reporting and record keeping, payments, and fees required by a specific Public Law, Executive Order, or compliance agreement.

4.2.1.2.2 Ongoing natural resources management activities identified in an approved INRMP may be Level 0 requirements if they are essential for the successfully implementation of the goals and objectives stated in the plan.

4.2.2 Level 1 Requirements. A non-recurring requirement, occurring only once or less frequently than once a year, that corrects an out-of-compliance condition with a valid driver in the year programmed.

4.2.2.1 Valid drivers include federal laws, legal or regulatory mandates, and state laws applicable to federal lands. The principal legal drivers for Conservation Program funding are the Endangered Species Act, Clean Water Act, Sikes Act, and National Environmental Policy Act.

4.2.2.2 Mitigation measures required as a prerequisite for regulatory approval of proposed projects must be funded as part of the project cost and are not Level 1 conservation requirements.

4.2.2.3 Projects that implement an INRMP approved in accordance with the Sikes Act may be Level 1 requirements if they are essential for the successfully implementation of the goals and objectives stated in the plan.

4.2.3 Level 2 Requirements. A non-recurring funding requirement for activities and projects programmed in a fiscal year which is in advance of the year in which compliance is mandatory and necessary to prevent non-compliance beyond the program year. Legal drivers are the same as for Level 1.

4.2.4 Level 3 Requirements. Non-recurring activities and projects that are not explicitly required by an applicable legal driver, but are needed to enhance the environment beyond statutory compliance or to address INRMP conservation goals.

4.2.5 Reimbursable Conservation Funds. Funds generated from the sale of forest and agricultural products, grazing/cropland outleases, and the collection of hunting, fishing, trapping and other outdoor recreation fees may be reimbursed to commands and installations for support of natural resources programs under certain conditions set forth by law.

4.2.5.1 HQ AFCEE/EC is responsible for management of reimbursable conservation funds. Submit annual budgets for reimbursable conservation program funding to the MAJCOM natural resources manager by 31 March each year. MAJCOMs must insure that projected incomes are reasonable and in line with program expenses. MAJCOMs submit consolidated budgets, as amended, to HQ AFCEE/EC by 30 June prior to the upcoming fiscal year. HQ AFCEE/EC reviews and consolidates budgets and recommends a final budget for AF/ILEV approval by 31 August.

4.2.6 Standard Project Titles.

Table 4-1 contains the standard project titles to be used for natural resources requirements for all Classes (Compliance Levels) of work, as indicated:

I&S Activity	Approved Title	Class
Apportioned	P&F, Wetlands	O&S
Consultation	Consultation, ESA Section 7	O&S
Mitigating Sites	Mgt, Habitat, (List Habitat Type)	O&S
Mitigating Sites	Mgt, Invasive Species Control	O&S
Mitigating Sites	Mgt, Native Ecosystems	O&S
Mitigating Sites	Mgt, Species (List Species)	O&S
Mitigating Sites	Mgt, Wetlands/Floodplain	O&S
Mitigating Sites	Monitor, Species, (List Species)	O&S
Mitigating Sites	Monitor, Wetlands	O&S
Mitigating Sites	Monitor, Habitat (List Habitat Type)	O&S
Mitigating Sites	Public Awareness, Natural	O&S
Consultation	Biological Assessments, ESA	1
Updating inventories	Inventory, Baseline NR	1
Updating inventories	Inventory, T&E Species	1
Updating inventories	Inventory, Wetlands	1
Updating Plans	Plan Revision, INRMP	1
Updating Plans	Plan Revision, INRMP Component	1
Mitigating Sites	Protect/Restore, T&E Species	1
Mitigating Sites	Protect/Restore, Wetlands	1
Mitigating Sites	Protect/Restore, Native Ecosystems	1

Table 4-1 standard titles

The following brief guidance description are given for natural resources standardized project titles

4.2.6.1 Level O Projects (O&S recurring)

4.2.6.1.1 P&F, Wetlands:

This project title provides for preparation of documents to support the issuance of a COE Section 401 permit for impacts to jurisdictional wetlands.

4.2.6.1.2 Consultation, ESA Section 7:

This project title provides for consultations with regulatory agencies are required by Section 7 of the Endangered Species Act (ESA). Federal agencies must consult with the U.S. Fish and Wildlife Service (USFWS) if their action(s) are likely to affect a federally protected threatened or endangered (T&E) species.

4.2.6.1.3 Mgt, Habitat, (List Habitat Type):

This project title provides for the on-going management of habitats that may support rare, sensitive or keystone flora or fauna species. Indicate what species are being inventoried and the agency/organization (State F/W, State Natural Heritage, Nature Conservancy, etc.) that classified the species as of concern requirements.

4.2.6.1.4 Mgt, Invasive Species Control:

This project title provides for the on-going management of native ecosystems that are degraded by the invasion of exotic or non-native plants. Ecosystems should be monitored and control strategies developed.

4.2.6.1.5 Mgt, Native Ecosystems:

This project title provides for on-going projects to management native ecosystems. Ecosystems degraded by the invasion of exotic or non-native plants should be monitored and control strategies developed

4.2.6.1.6 Mgt, Species (List Species):

This project title provides for on-going projects for the protection, enhancement and restoration of T&E species. Project should be support by a biological opinion, recovery plan, cooperative/programmatic agreement or the installation's INRMP as coordinated under the Sikes Act with the USFWS.

4.2.6.1.7 Mgt, Wetlands/Floodplain:

This project title provides for on-going projects that protect or restore destroyed or degraded wetlands and floodplains.

4.2.6.1.8 Monitor, Species, (List Species):

This project title provides for on-going monitoring of federally listed threatened and endangered (T&E) species. Monitoring of T&E species may be required under the terms and conditions of a USFWS issued biological opinion. Monitoring may also be required under USFWS recovery plans or other regulatory requirements. These mandates must be specifically listed in the citation section.

4.2.6.1.9 Monitor, Wetlands:

This project title provides for on- going monitoring of U.S. Army Corp of Engineers (COE) designated jurisdictional wetlands on the installation. Wetland monitoring is normally carried out in areas that are experiencing impacts due to mission or construction activities. Projects should not include the monitoring of wetland areas that have little or no potential for adverse impacts.

4.2.6.1.10 Public Awareness, Natural:

This project title provides for on-going public awareness and education programs that are needed to comply with USFWS biological opinions. Public awareness programs may also be developed for newcomers orientation briefings and for general base populace education of natural resources programs that protect sensitive species or habitats.

4.2.6.2 Level 1 Projects (Non-recurring)

4.2.6.2.1 Biological Assessments, ESA:

This project title provides for the completion of a biological assessment (BA) as required in Section 7, ESA. The BA identifies any T&E species that is likely to be affected by an action.

4.2.6.2.2 Inventory, Baseline NR:

This project title provides for the inventory of habitats that may support rare, sensitive or keystone flora or fauna species. Indicate what species are being inventoried and the agency/organization (State F/W, State Natural Heritage, Nature Conservancy, etc.) that classified the species as of concern.

4.2.6.2.3 Inventory, T&E Species:

This project title provides for inventories of T&E species. Initial inventories of currently listed T&E species should be complete. As USFWS adds species to the list, additional inventories may be needed. Unless there are some extenuating circumstances, re-inventories should not be needed.

4.2.6.2.4 Inventory, Wetlands:

This project title provides for the inventory of installation wetlands. Planning level (National Wetlands Inventories) has been completed at all installations. Inventories to support COE jurisdictional wetland classifications may be needed in areas where actions may impact wetlands. The COE District Regulation Office determines the length of the validity of the wetland delineation. Wetland boundaries should be reevaluated as often as required by the COE District Regulation Office, or whenever a change in definition or delineation methodology alters the demarcation. Changes in technologies and methodologies for classify wetlands may justify additional inventory work if it can be shown that these new classifications can significantly improve land use/management practices.

4.2.6.2.5 Plan Revision, INRMP:

This project title provides for the revision of the installation INRMP. The Sikes Act requires the preparation of an INRMP for each military installation. The Act requires plans be revised on a five year cycle. Requirement should be programmed in the fourth year of the current plan to insure that the revised plan will be completed before the current plan expires.

4.2.6.2.6 Plan Revision, INRMP Component:

This project title provides for the update of a component plan in the installation INRMP. Component plans may include T&E species, wetlands, watershed protection, floodplain/floodway regulations, fish and wildlife management, grounds maintenance, forestry, outdoor recreation, agricultural outleasing and coastal zone management. The requirement for a particular plan depends on the extent of the resources on the installation. Some component plans may need updates outside the normal INRMP revisions due to the complexity of the resource. In these cases, component plan updates may be justified.

4.2.6.2.7 Protect/Restore, T&E Species:

This project title provides for the protection and restoration of T&E species. Project should be support by a biological opinion, recovery plan, cooperative/programmatic agreement or the installation's INRMP as coordinated under the Sikes Act with the USFWS or the National Marine Fisheries Service for marine mammals.

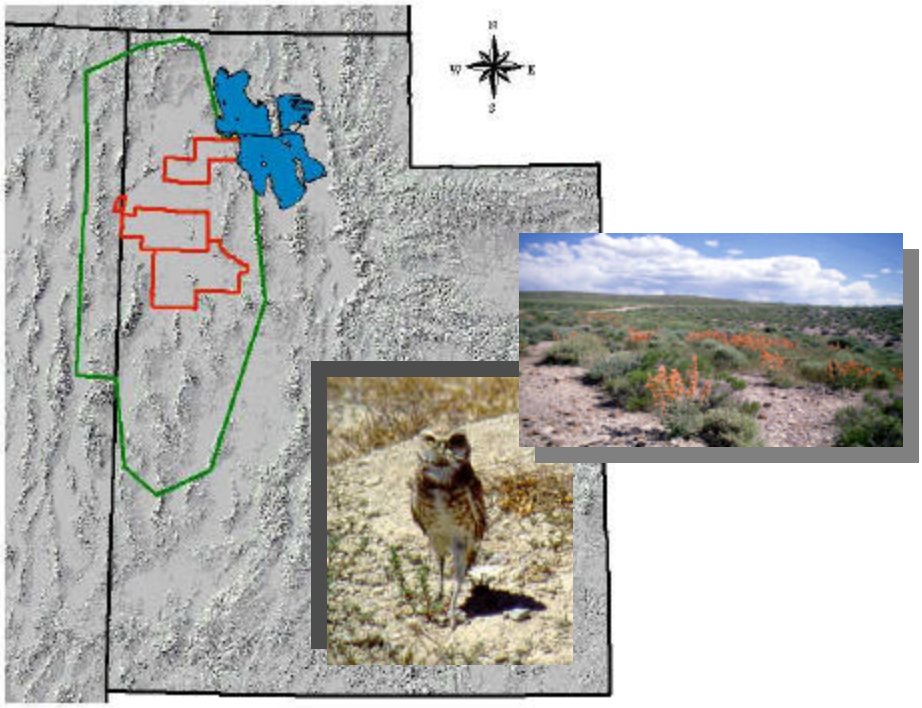
4.2.6.2.8 Protect/Restore, Wetlands:

This project title provides for the protection and restoration of wetlands.

4.2.6.2.9 Protect/Restore, Native Ecosystems:

This project title provides for the restoration of native ecosystems. Ecosystems degraded by the invasion of exotic or non-native plants should be monitored and control strategies developed.

4.3 General strategies



4.3.1 Habitat & Species Management - Inventory and Monitoring
It difficult to discuss habitat with out species and visa versa. Important habitat areas will be established, T/E habitat within the MOA will be identified and compared to UTTR habitats. Target species and habitat will be identified using ARC view. A biological opinion will be requested from the Utah DWR and United States FWS. The advisory council will be asked to address this issue as well. Baseline inventories for Giant four wing saltbush and monitoring (habitat loss) will be required. Habitat and species will be identified and a task or project will be established to accomplish required work per BO.

4.3.1.1 Because of the harshness of the UTTR lands regarding various habitat factors, mainly absence of cover, limited food, and lack of water, numbers of various animals are low. However, the harsh environment is suitable for raptors and a diversity of supporting prey species which use the areas of topographical variability for nesting sites. As described below, management of fish and wildlife on the UTTR is regulated by a number of major Federal regulations. Key in understanding the applicability of these regulations to new or increased operations at the UTTR is the language describing the prohibited "taking" of protected species. In nearly all of the major Federal legislation, the definition of "take" includes "disturb", the most likely type of impact associated with range activities.

4.3.2 Invasive species control and management

Invasive species control will be conducted at Blue Lake, Wildcat dune area, wildcat mudflats and TS-5. The primary species targeted for control is Tamarisk (salt cedar), cheat grass and halogeton. Mechanical and herbicide practices will be used. These areas and their respective systems will be degraded by the invasion of the listed exotics. Monitoring has the entire UTTR and control at identified locations is required. The details of the process will be listed in either the task or project.

4.3.2.1 Executive Order 13112, issued requires Federal agencies to identify actions that may cause or promote the introduction or spread of invasive species. Federal agencies must not authorize such actions unless it has been determined that the benefits would clearly outweigh the potential harm caused by invasive species and that all feasible measures to minimize risk of harm will be taken in conjunction with the proposed action. Within budgetary constraints, Federal agencies must: conduct research on invasive species and develop technologies to prevent their introduction and provide for their control; detect and control populations of invasive species; and provide for restoration of native species and habitat conditions in ecosystems that have been invaded.

4.3.3 Native ecosystems management

We have identified one of our systems (shrub land, grassland complexes) that have demonstrated a loss in biodiversity due to repeated wildland fire, invasion of exotic or non-native plants. We will take our Ecosystem map and over lay our veg/habitat types on it. Locate systems that are adjacent to operational target areas, look for fire escape. Compare the patchiness/fragmentation. A biological opinion will be requested from the Utah DWR and United States FWS. The advisory council will be asked to address this issue as well. Inventory and monitoring of these system will be identified and a task or project will be established to accomplish required work per BO. A test project for restoration is underway and will help in determining the best restoration process and control strategies. The effects of Off-road vehicles will also be address.

4.3.4 Wetland management and inventory

We have completed a National wetlands inventory (NWI) for the UTTR. A significant portion of the UTTR acreage is potentially covered by wetlands and mud flats. Of greatest concern to future planning efforts are those categorized as "jurisdictional wetlands", subject to the permitting requirements of the U.S. Army Corps of Engineers (Corps) established by and Section 404 of the *Clean Water Act (CWA)*. In addition, the Federal government has legislated the protection of wetlands with *Executive Order 11990, Protection of Wetlands*. Section 404 of the *Clean Water Act (CWA)*, 33 U.S.C. 1344, prohibits discharging dredged or fill material into U.S. waters without a permit from the Corps. The regulatory definition of the "waters of the U.S." includes wetlands and mudflats.

4.3.4.1 New or increased activities at UTTR that require construction within a designated wetlands area must comply with these requirements. You can not simply determine which areas are jurisdictional in nature and leave it at that. We have been working on developing a hydro geomorphic method which is an assessment of the functionality of a wetland. This new method deals with the "no net loss" guidance in the clean water act. The potential off set of loss is addressed through avoidance, minimization and then compensation for unavoidable impacts. To cover this aspect a federal mitigation bank is recommended, where restoration of a portion of blue lake complex will provide the functional uplift required. Long term monitoring will be required to accomplish this. An opinion will be requested from the Utah DWR , United States FWS and US Army Corps office in bountiful. The advisory council will be asked to address this issue as well. The details of the process will be listed in either a task or project.

4.4 The following (listed by objective) are projects programmed for funding. Some projects may be moved to the tasking list

Objective 1	Project title	O/M level Class	Programmed
Measure the rate and/or intensity of human disturbance	Protect/restore, Native Ecosystems (Develop OHV/ATV policy)	1	FY 03
	Protect/restore, wetlands (Monitor using HGM mudflats)	1	FY 03
	P&F, wetlands (UTTR S, TS-5 new south route)	O&S	FY 03
	Mgt, Invasive species control	O&S	FY03-08

Objective 2	Project title	O/M level Class	Programmed
Maintain or increase populations and distributions of target species on Hill AFB lands	Protect/restore, T&E species (Id habitat on UTTR)	1	FY 03
	Inventory, baseline NR (species of concern)	1	FY 01
	Inventory, baseline NR (Eagle survey)	1	FY 01
	Mgt, Habitat (list habitat type) Fire restoration	O&S	FY 03-08
	Mgt, species (Develop game & non game species mgt, with advisor council, classify areas suitable for outdoor wildlife oriented recreation)	O&S	FY03-04
	Restoring, Native Ecosystems	O&S	FY01

Objective 3	Project title	O/M level Class	Programmed
Maintain or increase the species composition of communities on Hill AFB lands.	Protect/Restore, native ecosystems (Identify acres requiring habitat enhancement use GIS regional/Eco map) *	1	FY 03
	Inventory, baseline (develop urban forestry plan)	1	FY 03
	Protect/Restore, wetlands (develop mitigation bank)	1	FY 02
	Inventory, wetlands (Monitor HGM)	1	FY 07
	Protect/Restore, wetlands (HGM)	1	FY 01-03
	Protect/Restore Native Ecosystems (Target species)	1	FY 02
	Restoring Native Ecosystems (invasive species)	O&S	FY 01-07

Objective 4	Project title	O/M level Class	Programmed
Maintain or increase the connectivity of populations of target species on Hill AFB lands to permit gene exchange.	Protect/restore, Native Ecosystems (Develop GIS Regional/Ecosystem map) *	1	FY 03
	Protect/restore, Native Ecosystems (Develop wildland fire management Plan)	1	FY 03
	Restoring, Native Ecosystems (guzzlers)	1	FY 02
	Protect/restore, Native Ecosystems (Giant four wing saltbush)	1	FY 03-04

Objective 5	Project title	O/M level Class	Programmed
Conduct annual plan review and NR program using existing Environmental Compliance Assessment Management Program	Monitor, habitat (list habitat type) ATV use	O&S	FY 03-07

Objective 6	Project title	O/M level	Programmed
Conduct an annual physical/biological inventory review of at least 20% of all Hill AFB installations lands (completing 100% within 5 years)	Plan revision, INRMP	1	FY 06
	Inventory, Baseline (update soils & Vegetation classification)	1	FY 03
	Inventory, Baseline (update Wetlands, fish, amphibians species survey)	1	FY 04
	Inventory, Baseline (update avian species survey)	1	FY 05
	Inventory, Baseline (update mammals species survey)	1	FY 06
	Inventory, Baseline (update Reptiles species survey)	1	FY 07
	Mgt, Native ecosystems	O&S	FY 03-07

Objective	Project title	O/M level	Programmed
Program support	Training	O&S	FY 01-07
	Manpower & contractor support	AFMC 13	FY 01-07
	Equipment & supplies	O&S	FY 01-07
	Annual conservation permits/fees	O&S	FY 02-07
	Vehicle lease	O&S	FY 02-07
	Public Outreach/Public relations	O&S	FY 03-08
	Printing	O&S	FY 01-07
	Citizen Scientist program	O&S	FY 03-08
	GIS Support	AFMC 03	FY 01-07
	TDY	O&S	FY 01-07

4.5 Service Provider Support On an annual, or re-occurring bases or as outlined the "service provider" shall perform the following NR functions (i.e., Natural Resources Administration, Land Management, Fish and Wildlife Management, Wildlife and Outdoor Oriented Recreation Programs) as approved and discussed below.

4.5.1 Administration. This function includes support for: general administrative requirements, document reviews, data transfer, program metrics development, planning, literature reviews, permits and Certificates of Registration (COR), public access determination, equipment management and maintenance, GIS/GPS field collection operations, official filing, and management of the NR digital photo library.

- **4.5.1.1** Administrative Support.

- Prepare or review NR Statements of Objectives (SOOs), Statements of Work (SOWs), Memoranda of Agreement or Understanding (MOA/MOU) required to meet NR work requirements under this contract. Apply knowledge of specific division responsibilities and applicable environmental laws, data processing equipment, field procedures, and office polices to meet regulatory time schedules.

- **4.5.1.2** Document review.

- Perform approved field review (site visits) for AF forms 332, 813, military construction documents, EAs, EISs, EBSs, etc. GIS/GPS analysis may be required as a part of this work. Recommend any additional surveys and/or studies to support proponent action. Complete 10% follow-up review of 332/813 EIAP database in support of NR function. Submit field review information to the NR manager on pre- and post-review actions.

- **4.5.1.3** Data transfer:

- Provide professional and technical data transfer to personnel at all levels within Hill AFB installation lands. (Hard copy and electronic formats including ArcView® and GPS data), as approved.

- Special Restrictions for Disclosing Natural Resources Information. The NR manager may determine that the disclosure of information on the location or character of sensitive natural resources may create a substantial risk of harm, theft, or destruction of such resources, an invasion of privacy, trespass on Government property, or interfere with the military mission. In such cases, the installation will ensure that documents and other data provided to the public do not disclose this information.

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- **4.5.1.4** Funding.

- Assist in the development of funding requirements for projects or reports.

- **4.5.1.5** Develop program metrics:

- Use a combination of INRMP's goals and objectives, habitat evaluations procedures (HEPs) and, biodiversity/ecosystem concepts to develop a set of program metrics that can be used to measure the natural and anthropogenic effects of the military operations on installation lands. Coordinate development with the NR manager; provide annual updates and maintain database of field data collected.

- Develop a conservation analysis document used in conjunction with field support for the document review process (332s, 813s etc). Coordinate development with NR, CR, and NEPA managers. After development, provide annual updates and maintain the associated database.

- Develop a GIS map for each of the installation's lands that divide the individual areas into 5 equal parts (20% each). These land parcels support the annual program review and quarterly Mission Practice Indicators (MPIs) requirements from HQ AFMC/CEV. Conduct and update quarterly MPI requirements as approved.

- **4.5.1.6** Natural Resources Planning.

- Participate in the preparation of the long-range, strategic Integrated Natural Resources Management Plan (INRMP). The service provider shall assist in annual 20% program reviews to ensure that the entire INRMP is reviewed and updated every five years. An integrated team comprised of representation from the Division of Wildlife Resources, U.S. Fish and Wildlife, Bureau of Land Management (BLM) and other organizations as needed will take part as required during the five-year review process. The NR manager shall chair and direct this effort. Any NR Management plans prepared by service provider shall incorporate the principles of ecosystem management and adaptive management and ensure the maintenance and enhancement of native biodiversity.

- **4.5.1.7** Literature research:

- Conduct literature searches for biological data as required.

- **4.5.1.8** Permits and CORs:

- Submit air quality permits and/or certificates of registration (CORs) to the appropriate federal or state agency for wildlife or wetlands. Examples of activities that will require a permit include: Sec 404 CWA, open burn, transportation, trapping, special hunts, fishing ponds, collection, banding, handling, depredation, and "take" of wildlife species either plant or animal.

- **4.5.1.9** Public Access:

- Make recommendations concerning public access on installations lands where safety and mission requirements do not prohibit use. Conduct annual 20% surveys and/or document reviews completing a 100% review within five years.

- **4.5.1.10** GIS/GPS:

- Work in this area requires demonstrated knowledge and capability in the operation of ArcView® software. Collect field data as approved. Generate approved routine and non-routine interpretive reports, data reports and summaries. Produce output findings in several ways including text, table graphical and geographical (map) format. Store and maintain comprehensive survey and monitoring records in a database suitable for easy retrieval and analysis. Operate a Global Positioning System (GPS) with all its associated software and base station requirements to verify map information and to develop data for entry into the existing NR GIS database. This work will provide data to the EM GIS support team (managed under a separate contract) in a format which meets their input criteria.

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- **4.5.1.11**NR Files:

- Maintain the NR files and update the file management plan sections associated with NR program.

- **4.5.1.12** NR Photo file:

- Maintain and digitize all NR photos in a photo library. The library database shall be capable of searches and retrieval of desired subjects within the GIS environment.

4.5.2 Land Management. This work area includes quarterly MPI surveys, urban forestry, agricultural outleasing, and fire control.

- Provide support for the INRMP and Quarterly MPI Survey:

- Conduct quarterly surveys per the MPI requirements (48,000 Ac). Recommend survey criteria, maintain reports, use annual review maps and submit results to the NR manager. May required GIS linkages.

- **4.5.2.2** Urban Forestry:

  - Develop and maintain an Urban Forestry GIS database. Recommend software database maintenance tracking program(s). Update 20% of the data base elements each year or as required from CE or NR government representative inputs.

  - Review (quarterly) ground maintenance activities to determine if refuse from the pruning process and grass cutting process is placed in HAFB's compost

recycling program, and not disposed of in any landfill. Report results to the NR and solid waste government representatives.

- Support the Tree City USA program and submit the re-certification and growth award application to the appropriate State Forester no later than 31 Dec each year to qualify for annual recognition.

- **4.5.2.3** Agricultural Outleasing.

  4.5.2.3.1 Grazing Management.

  - Perform biannual evaluation inspections (May and Oct) to determine the impact of grazing on installation lands. Monitor outleased property, leasee contract operations and Base Riding Clubs to insure full compliance with the grazing management portion of the INRMP.

  - Develop and apply a performance metric; submit results to the NR government representative and the CE real estate office within one week after a survey is competed. The current area that is being leased for grazing includes Parcels A and B located south of the HAFB runway and state highway 193. The Little Mountain testing facility is currently being fenced and considered for leasing (700 ac) and will require performance metric application.

  - Upon lease updates (every fives years), assist in preparing land use (grazing) regulations that specify the technical requirements, restrictions and allowable uses that pertain to the outleased, permitted or contracted grazing land. Animal Unit Months (AUM) evaluations will be conducted by the Natural Resources Conservation Service (NRCS). Prepare an approved land-use grazing regulation.

  4.5.2.3.2 Grazing/cropland budget.

  - Develop and submit an agricultural budget to the NR government representative by 30 January of each year.

- **4.5.2.4** Fire Control.

- Obtain Bureau of Land Management (BLM) and AF fire management plans and identify incompatible situations. Provide a report to the NR manager. Assist in the preparation of wildfire and suppression agreements, coordinate with the NR manager and AF fire departments prior to submittal for signature (every 5 years).

- Coordinate with the NR manager and AF fire departments to develop Prescribed Burning Plans for fuel reduction. Conduct and recommend vegetation management evaluation, site preparation, seedbed preparation, and special interest areas (20%

of land area yearly). Develop an approved metric, and evaluate post-burn effectiveness annually.

- Maintain reports and records of wildfire and fire suppression activities (man or natural caused). Reports shall include size, location, time and cost of each incident. Location of incidents shall be mapped and documented by using a GPS unit, which is compatible with current government-approved data systems. GIS linkage required. Field Data collection will support the INRMP.

4.5.3 Fish and Wildlife Management. This work includes Bird Aircraft Strike Hazard (BASH), urban wildlife control and fish and wildlife habitat enhancement.

4.5.3.1 Budget:

- Develop by 15 Oct each year a fish and wildlife budget for the coming FY using AF Form 2639 and submit anticipated requirements to the NR manager.

4.5.3.2 Bird Aircraft Strike Hazard (BASH):

- [Includes all wildlife] Attend quarterly Bird Hazard Working Group meetings and provide input and information on wildlife that affect flight operations. Provide a written report within one week of attendance of meetings to the NR manager. Maintain, and annually apply for, approved federal and or state bird depredation permits. Review compliance with applicable laws, report violations of existing local ordinances, state laws, the Endangered Species Act, and the Migratory Bird treaty Act to the NR manager. Conduct annual or as required, on-site risk assessment reviews for wildlife, habitat, etc. associated with the Hill AFB runway, take off and landing zones and make recommendations for habitat modifications to deter species that may cause damage or accidents to aircraft.

4.5.3.3 Urban Wildlife:

- Recommend habitat improvement projects for non-game species to the NR manager. Make recommendations for INRMP updates to address population control measures for anticipated wildlife control needs (HAFB and UTTR).

4.5.3.4 Fish and wildlife habitat enhancement:

- Survey all installation lands (20% each year) to identify and develop project proposals that will recover damaged lands due to human use. The service provider shall, upon approval, assist in the development and implementation of projects and shall maintain a GIS data base. Updates shall be completed within the five-year INRMP process.

4.5.3.4 Pesticides Management.

- Pesticides Management. Provide program technical consultation to Base CE. Review pesticide operations, which directly affect sensitive ecosystems and recommend to the NR manager compliance procedures. Review NR issues in the CE Integrated Pest Management Practices document and recommend coordination action and resolutions. Participates in annual reviews. Provide approved documents to HQ. Maintain pesticides applicator certification by an authorized agency including both of the following categories: (i) Right-of-way, and (ii) Aerial

4.5.4 Wildlife and Outdoor Oriented Recreation. This area includes fishing, recreational land use and watchable wildlife.

4.5.4.1 Fishing:

- The fishing opportunity on HAFB installation lands are located at pond 3 (HAFB), Blue Lake (UTTR South by Wendover), Oasis (UTTR North) and Carter Creek recreational area. Recommend fishery habitat improvement projects in accordance with the INRMP. Maintain fishing/stocking pond on HAFB, transport fish to pond 3 and Oasis fishing ponds. Maintain fishing pond aerators as required. Obtain approved fish species from appropriate source (permit required), raise species in fish farm tank, maintain equipment, transport and transplant fish into fishing/stocking pond. Conduct approved inventorying and monitoring of HAFB and Oasis ponds annually. Coordinate the development of HAFB fishing regulations with the Base MWR office, and the NR manager. Update regulations annually and publish.

4.5.4.2 Recreational Land Use.

- Recommend the optimum level of recreational use for Carter Creek (hiking, camping, fishing) by follows guidance documents from the USFS Evanston ranger district. Provide recommendations to the Base MWR office and the NR manager. Conduct annual review and report results to the NR manager.

- UTTR North (hiking area, ATV trails, mountain bike trail, stocking of fishing pond). Post boundaries of specific recreation areas/sites and areas closed to recreational use. Develop GIS maps displaying routes and sites. Publish information as required.

- Recommend maintenance standards for designated outdoor recreation sites; conduct annual inspections and maintain results in the GIS database according to these standards. Data will be used to support the INRMP. Conduct annual reviews and reports results to the NR manager.

4.5.4.3 Watchable Wildlife:

- The watchable wildlife opportunities vary from location to location. Develop a brochure in coordination with NR and CR managers. Update brochure and watchable wildlife list every 5 years or as approved. Provide copies for new comers briefing.

4.6 TASKING LIST

This list comprises ANTICIPATED tasking requiring completion within the 5 yr cycle of this INRMP. Some tasks may develop into projects.

4.6.1	TASK	PROGRAMMED PROJECT	OBJECTIVE	STATUS
Land Management (Habitat enhancement, Wild land fires, Invasive species, Agricultural out grants, BASH, Grounds maintenance	Establish NR advisory council			
	Tree board – update maintenance and replacement plan			
	HAFB landscape master plan - update			
	Review potential park city property			
	HABITAT			
	DWR, USFW, USA CROP opinion			
	Establish Important Habitat Areas (IHA) develop (target sp) ARC view maps			
	Develop INRMP Planning Map (Arc view)			
	ID species and location requiring invasive control			
	Develop disturbance maps (installation lands) in Arc view. Compare 12 vegetative types			
	Vegetation map (installation lands) ARC view			
	Soils map (installation lands) ARC view			
	Enhancements – Lakeside Mtns west side grass to shrub. Blue Lake dry area.			
	Develop ATV use policy – advisory council			
	Develop quarterly review/inspection data sheet (5% - 48,000 ac)			
	Develop land health index -			
	Eco system map broken out into veg/habitat types ARC view			
	FIRE			
	Develop Wild lands Fire Plan			
	Develop GIS layer annual areas burned			
	Fire Buffer around targets (shift location of activity with in target) ARC view			
	Measure fire escape ARC view			

	Measure return rate of invertebrates, vegetation, and invasive in burned areas			
	GRAZING			
	Up date Grazing land use plan			
	Develop annual grazing inspection – compliance check list			
	Establish exclusion plots			
	BASH			
	Up date bird risk assessment (airfield)			
	Deer control measures			
	Airfield grass plan			

IP = in-progress C = Completed C/P = Cancelled or Postponed

4.6.2	**TASK**	**PROGRAMMED PROJECT**	**OBJECTIVE**	**STATUS**
Wetlands	Develop wetlands Mitigation bank			
	Develop HGM (slope, & mineral flats)			
	Develop long term wetlands monitoring			
	Develop Pond 3 master plan			
	EA Pond 1 - complete delineation			
	DWR, USFW, USA CROP opinion			

IP = in-progress C = Completed C/P = Cancelled or Postponed

4.6.3	TASK	PROGRAMMED PROJECT	OBJECTIVE	STATUS
Fish and Wildlife	Power pole Action Plan			IP
	Life History/chronologies of target species			
	HAG & GAT areas – pollution GSL			
	Conservation data sheet – (target species in proposed site) disturbance – specific location, planned & current)			
	Noise measurements			
	Distance to activity (e.g. nesting) ARC view			
	Evaluate impacts of mission & personnel on test & training land			
	Develop HEP for target species			
	Establish permanent survey points ARC view			
	Develop species connectivity map (patchiness fragmentation) ARC view			
	Discriminate analysis tool			
	Guzzlers inventory			
	T/E within MOA – compare habitat to UTTR			
	Advisory council game and non game			
	Least chub conservation agreement			

IP = in-progress C = Completed C/P = Cancelled or Postponed

4.6.4	TASK	PROGRAMMED PROJECT	OBJECTIVE	STATUS
Outdoor Wildlife Oriented Recreation	Classify areas suitable for use into one of 3 categories (developed, dispersed, special interest)			
	Watchable wildlife areas ARC view			
	Develop watchable wildlife brochure			
	Develop outdoor use categories (Cat A-E)			

IP = in-progress C = Completed C/P = Cancelled or Postponed

4.6.5	TASK	PROGRAMMED PROJECT	OBJECTIVE	STATUS
Public Access	UTTR Open house (bi-annual) NR demo project			
	Natural Resources website (Update)			
	NR road tour			
	Develop access/participation categories			
	Develop citizen scientist program			
	Outreach program (Earth Day)			

IP = in-progress C = Completed C/P = Cancelled or Postponed

4.6.7	TASK	PROGRAMMED PROJECT	OBJECTIVE	STATUS
Law Enforcement	In house training			
	Hunting & fishing programs regulations			
	Update Mouse and Moans			

IP = in-progress C = Completed C/P = Cancelled or Postponed

APPENDIX A

Applicable Public Laws

Sikes Act Improvement Amendments

(USC Title 16 chapter 5c conservation programs on government lands, subchapter I, section 670a.

Sike's Act 1960
(Public Law 86-797)
Amendments of 1978
(Public Law 95-420)
Amendments of 1986
(Public Law 99-561) (16 USC § 670 *et seq.*) (Section 202?)
The Sike's Act requires Federal agencies to cooperate with the US Fish and Wildlife Service and the appropriate state fish and game agency (UDWR).

The Secretary of Defense is authorized to carry out a program of planning for the development, maintenance and coordination of wildlife, fish, and game conservation and rehabilitation in accordance with a cooperative plan. The cooperative plan is to be agreed upon by the Secretary of Defense, the Secretary of the Interior and the appropriate state agency (UDWR).

Conservation and rehabilitation programs shall include, but not be limited to, specific habitat improvement projects, related activities and adequate protection for species of fish, wildlife, and plants considered threatened and endangered.

The natural resources of each military reservation shall be managed to:

Provide for sustained multipurpose uses of those resources
Provide public access that is necessary or appropriate for these uses to the extent that this access does not interfere with the military mission

National Environmental Policy Act of 1976

(42 USC §§ 4371) (Public Law 91-190)
The National Environmental Policy Act (NEPA) is the basic national charter for protection of the environment. NEPA establishes policy, sets goals, and provides means for carrying out the policy. The NEPA process is intended to help public officials identify and assess reasonable alternatives to proposed actions that avoid or minimize adverse effects on the quality of the human environment by making decisions that are based on understanding environmental consequences and taking actions that protect, restore, and enhance the environment.

NEPA requires all federal agencies to prepare Environmental Impact Statements on all major federal actions in accordance with Council on Environmental Quality (CEQ) [40

Code of Federal Regulations (CFR) 1500]. Agencies will implement the NEPA process in order to assist agency planning and decision making.

Federal Land Policy and Management Act of 1976

(Public Law 92-579) (43 USC §§ 1701 1784)

The Federal Land Policy and Management Act (FLPMA) was enacted to retain federal ownership (if in the National interest) to establish public land policy and administrative guidelines. FLPMA also provides for management, protection, development and enhancement of the public lands:

Public lands and their resources will be periodically and systematically inventoried. Present and future use is projected through a land use planning process and will be coordinated with other Federal and State planning efforts

Public lands that have not been previously designated for any specific use and all existing classifications of public lands will be reviewed in accordance with the provisions of this act

Public lands are to be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values. Where appropriate, certain public lands will be preserved in their natural condition to provide food and habitat for fish, wildlife and domestic animals and to provide for outdoor recreation, and human occupancy and use

Regulations and plans for the protection of public land areas that are considered to be of critical environmental concern

Public land will be managed in a manner that recognizes the Nation's need for domestic sources of minerals, food, timber and fiber from the public lands including implementation of the Mining and Minerals Policy Act of 1970 as it pertains to the public lands

Regulation of grazing through allotment management plans (AMP). All permits and leases for domestic livestock grazing may incorporate an allotment management plan developed by the Secretary concerned. The Act requires planners to consult with the permittees to plan for range improvements, and to prescribe how livestock operations will be conducted.

Clean Water Act (formerly Federal Water Pollution Control Act) and Amendments of 1972

(Public Law 92-500) (33 USC §§ 1251-1387)

The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical and biological integrity of the Nation's water. CWA places general limits on activities that would violate water quality standards.

Wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water.

It is a national policy that the discharge of toxic pollutants in toxic amounts be prohibited.

It is a national policy that area-wide waste treatment management processes be developed and implemented to assure adequate control of sources of pollutants.

The nature and extent of non-point sources of pollutants are to be identified, and processes, procedures and methods to control such pollutants are to be evaluated for the following sources:

Agriculture and silviculture activities, including runoff from fields, crops and forest lands
Mining operations, including runoff and siltation from new, currently operating, and abandoned surface and underground mines
Construction activity, including runoff from the facilities resulting from such construction
Disposal of pollutants in wells or in subsurface excavations
Salt water intrusion resulting from reductions of fresh water flow from any cause, including extraction of ground water, irrigation, obstruction, and diversion
Changes in the movement, flow or circulation of any navigable waters or ground waters, including changes caused by the construction of dams, levees, channels, and causeways or flow diversion facilities.
Dredge and fill and construction activities are subject to the section 404 permitting process.

The following definition of wetland is the regulatory definition used by the EPA and the Army Corp of Engineers for administering the Section 404-permit program:

Those areas that are inundated or saturated by surface or groundwater 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 Section 404 regulations also deal with other “waters of the United States” such as open water areas, mud flats, coral reefs, riffle and pool complexes, vegetated shallows, and other aquatic habitats.

Environmental Pesticide Control Act (EPCA) of 1972
(7 U.S.C. 136 et seq.) (Public Law 92-516)
(Also known as: Federal Insecticide, Rodenticide and Fungicide Act)

The EPCA specifies methods and standards of control in the registration, manufacture, sale, transport, storage, disposal, and monitoring of pesticides. (EPCA identifies lists*) pesticides used to minimize risks associated with toxicity and environmental degradation.

In general, all pesticides must be registered through EPA. The requirements are quite complex and EPA will not register a pesticide unless EPA is satisfied that its use, as specified by the label, will not cause undue harm to people (*animals?) or the environment. Periodically pesticides must be reregistered and EPA will reanalyze the

effects on people and the environment. There are limited exemptions to the registration requirements.

North American Wetlands Conservation Act (NAWCA) of 1989
(16 USC §§ 4401-4414) (Public Law 101-233)
NAWCA was established to conserve North American wetland ecosystems and waterfowl and other migratory birds, fish and wildlife that depend on such habitats. The Act was also established to encourage partnership among public agencies and others to:

Protect, enhance, restore and manage an appropriate distribution and diversity of wetland ecosystems and other habitats for migratory birds and other fish and wildlife in North America

Maintain current or improved distributions of migratory bird populations

Sustain an abundance of waterfowl and other migratory birds consistent with the goals of the North American Waterfowl Management Plan and the international obligations contained in the migratory bird treaties and conventions and other agreements with Canada, Mexico, and other countries

The National Historic Preservation Act (NHPA) of 1966
(19 USC §§ 470a) (Public Law 89-665)
The Secretary of the Interior is authorized to maintain a National Register of districts, sites, buildings, structures and objects significant in American history, architecture, archeology or culture. The Secretary can grant funds to States for the purpose of preparing comprehensive statewide historic surveys and plans, in accordance with criteria established by the Secretary, for the preservation, acquisition and development of such properties.

NHPA requires that “historic properties” (equal to, or greater than 50 years old, including prehistoric and historic archeological resources) on lands owned or controlled by the Federal government be inventoried, evaluated, and where appropriate must be listed on the National Register of Historic Places. This evaluation process must occur prior to approval for any Federally authorized project. The authorizing agency must take into account the proposed project’s effect on any National Register-listed or -eligible property, and give the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on the proposed project effects.

Archeological Resources Protection Act (ARPA) of 1979
(16 U.S.C.470aa et seq.) (Public Law 96-95)
The purpose of ARPA is to secure the protection of archeological resources and sites on public and Indian lands for the benefit of the American people (present and future). ARPA is to foster increased cooperation and exchange of information between governmental authorities, the professional archeological community and private individuals having collections of archeological resources and data which were obtained before the date of the enactment of this Act.

ARPA requires permits for the excavation and/or removal of archeological materials (equal to, or greater than 100 years old) on lands owned or controlled by the Federal government. ARPA requires consultation with appropriated American Indian tribes before issuance of an archeological permit. ARPA outlaws the interstate trafficking of illegally acquired archeological materials and provides for civil and criminal penalties for un-permitted archeological resource damage. ARPA requires archeological public awareness programs be established by Federal land managers.

Therefore, all personnel are forbidden to enter archeological sites on any HILL AFB lands unless they have received written authorization from the Natural Resources Manager.

Taylor Grazing Act
(43 U.S.C. 315 et seq.) (Public Law 73-482) see also (10 USC § 2667(D))
The Taylor Grazing Act (TGA) creates grazing districts and provides authority to issue grazing permits on Federal lands. The purpose of TGA is to prevent overgrazing and soil deterioration, and to provide for the orderly use, improvement and development of public rangelands for the stability of the livestock industry.

Migratory Bird Treaty Act of 1918
(16 U.S.C. §§ 703-713)
Raptors as a group are considered migratory birds. As such, Federal protection is provided for raptors and their habitat through the *Migratory Bird Treaty Act (MBTA)*, 16 U.S.C. 703-712. Under authority of the *MBTA*, it is unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. Take is defined at 50 CFR 10.12 as to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.

When taking of raptors, their parts, nests, or eggs is determined to be the only alternative for a proposed project, application for Federal and state permits must be made through the appropriate authorities. Migratory Bird Permits must be obtained through the USFWS's Migratory Bird Permit Office for take of raptor nests (50 CFR 13,21). The list of migratory birds protected by the *MBTA* includes raptors and is found in 50 CFR 10.13.

Recent case law determined that the *MBTA* did not apply to indirect harm or incidental take of migratory birds such as habitat loss, and further exempted Federal agencies from the need to obtain take permits (USFWS, 1999). However, the letter and intent of the law regarding the take of the birds, nests, or eggs is still applicable and should be employed on all Federal projects, including those proposed for new or increased UTTR operations.

Migratory Bird Conservation Act of 1913
(16 U.S.C. §§ 701-715) (Public Law 89-669)
All migratory game and insectivorous birds which migrate through, or do not remain permanently the entire year with in the borders of any state, shall hereafter be deemed to

be within the custody and protection of the U.S. Government, and shall not be destroyed or taken contrary to regulations.

Therefore, all personnel are forbidden to visit the nest of any species of bird on any HILL AFB lands unless they have received written authorization from the Natural Resources Manager.

Federal Noxious Weed Act (FNWA) of 1974
(7 USC § 2801) (Public Law 93-629)
FNWA provides for the control and eradication of noxious weeds, and the regulation of the movement in interstate or foreign commerce of noxious weeds and potential carriers thereof and for project purposes.

Noxious Plant Control
(14 USC § 1241) (PL 90-583) pA8 CBML
The heads of Federal departments or agencies are authorized and directed to permit the commissioner of agriculture or other proper agency head of any State in which there is in effect a program for the control of noxious plants to enter upon any lands under their control or jurisdiction and destroy noxious plants growing on such land if:

Such entry is in accordance with a program submitted to and approved by such department or agency: Provided, That no entry shall occur when the head of such Federal department or agency, or his designee, shall have certified that entry is inconsistent with national security.

The means by which noxious plants are destroyed are acceptable to the head of such agency.

The same procedures required by the State program with respect to privately owned land have been followed.

Endangered Species Act (ESA) of 1973
(Public Law 93-205)
Congress finds and declares that various species of fish, wildlife and plants in the United States have been rendered extinct as a consequence of economic growth and development un-tempered by adequate concern and conservation. Other species of fish, wildlife and plants have been so depleted in numbers that they are in danger of or threatened with extinction. These species are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people.

The purpose of ESA is to provide a means to conserve the ecosystems upon which threatened and endangered species depend. ESA provides a program for the conservation of threatened and endangered species and appropriate steps to achieve the purposes of the treaties and conventions set forth by Congress.

It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve threatened and endangered species and shall use their authorities in furtherance of the purposes of this Act.

Endangered Species Act Amendments of 1978
(Public law 95-632) (16 USCA §§ 1531-1543)
To amend the Endangered Species Act of 1973 to establish an Endangered Species Interagency Committee to review certain actions to determine whether exemptions from certain requirements of that Act should be granted for such actions.

Federal Cave Resources Protection Act (FCRPA), as Amended 1990
(16 USC §§ 4301-4310)
This Act is intended to protect significant caves on federal lands by identifying their location, regulating their use, requiring permits for removal of their resources and prohibiting destructive acts. FCRPA requires that caves be considered in the preparation and implementation of land management plans, and allows for cave locations to be kept confidential.

Caves are to be preserved for the perpetual use, enjoyment and benefit of all people; foster increased cooperation and exchange of information between government authorities and people who use caves on federal lands for scientific, education or recreational purposes.

The specific location of a significant cave cannot be made available to the public unless the Secretary (Agriculture or Interior) determines that disclosure of this information would further the Act's purposes and not create a substantial risk of harm, theft, or destruction of the cave.

Information of significant caves may be made available on written request by federal or state governmental agencies or educational and research institutions. Request must: describe the specific site; explain the purpose for which information is sought; include assurances that the information will be kept confidential and the cave protected from vandalism an unauthorized use.

FCRPA prohibits destroying, disturbing, defacing, removing, or harming any significant cave; altering the free movement of any animal or plant life into or out of the cave; possessing, selling, or exchanging any known cave resource.

Therefore, all personnel are forbidden to enter caves on any HILL AFB lands unless they have received written authorization from the Natural Resources Manager.

Bald and Golden Eagle Protection Act Of 1940
(16 USC §§ 668-668d)
It is unlawful to: take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner any bald eagle commonly known

as the American eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof of the foregoing eagles.

Therefore, all personnel are forbidden to visit eagle nests on any HILL AFB lands unless they have received written authorization from the Natural Resources Manager.

Administrative Procedures Act
(5 USC, CHAPTER 5)

Lacey Act
(16 USC §§701, 3371-3378 and 18 USC § 42) (PL97-79)
Unlawful to import, export, transport, sell, receive, acquire, or purchase any fish or wildlife or plant taken, possessed, transported, or sold in violation of any law, treaty, or regulation.

Fish and Wildlife Coordination Act Of 1958
(16 USC §§ 661-667e)
To make surveys and investigations of the wildlife of the public domain, including lands and waters or interests therein acquired or controlled by any agency of the United States;

Wild And Free-Roaming Horses And Burros Act Of 1971
(16 USC §§ 1331-1340) (PL 92-195)
Congress finds and declares that wild, free-roaming horses and burros are living symbols of the historic and pioneer spirit of the West; and that they contribute to the diversity of life forms within the Nation and enrich the lives of the American people; and that these horses and burros are fast disappearing from the American scene. It is the policy of Congress that wild free-roaming horses and burros shall be protected from capture, branding, harassment, or death; and to accomplish this they are to be considered in the area where presently found, as an integral part of the natural system of the public lands.

Soil Conservation
(PL 74-461)

Native American Graves Protection and Repatriation Act Of 1990
(25 USC §§ 3001-3002)
Section 1 of PL 101-601provided that: "This Act (enacting this chapter and section 1170 of Title 18, Crimes and Criminal Procedure) may be cited as the 'Native American Graves Protection and Repatriation Act'. "

Laws, Codes and Regulations Effecting Natural Resources

Title 16 United States Code Section 153 I (Abbreviated 16 USC 1531). Subject is: "Congressional findings and declaration of purposes and policy. " Paragraph (c) (l) states, "It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in further of the purpose of the chapter." (Equivalent to Endangered Species Act (ESA), Section 2(c) (l), implemented by 50 CFR 402)

16 USC 1536. Paragraph (a) (2). States, "Each Federal agency shall, in consultation with and with the assistance of the Secretary (of Interior), insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species..." (Equivalent to Endangered Species Act (ESA), Section 7(a) (2), implemented by 50 CFR 402)

16 USC 1536. Paragraph (a) (3). States, "...a Federal agency shall consult with the Secretary (of the Interior) on any proposed agency action … if the applicant has reason to believe that an endangered species or a threatened species may be present in the area affected by his project and that implementation of such action will likely affect such species." (Equivalent to Endangered Species Act (ESA), Section 7(a) (3), implemented by 50 CFR 402)

16 USC 1536. Paragraph (c) (l). States that when advised by the Secretary of Interior (acting through the FWS) the agency shall conduct a biological assessment for the purpose of identify any endangered species or threatened species which is likely to be affected by such action. (Equivalent to Endangered Species Act (ESA), Section 7(c) (l), implemented by 50 CFR 402)

16 USC 670.Sikes Act. Section 670a(B): Integrated natural resources management plan. -To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary determines that the absence of significant natural resources on a particular installation makes the preparation of such a plan inappropriate.

40 CFR 230 & 232, 404 Program. Requires a permit from the U.S. Army Corps Engineers (USCOIE) before discharging fill material into U.S. waters. (Equivalent to Clean Water Act (CWA), P. L. 95-217,
Section 404 and 33 USC 1344)

7 UCS 2814. Management of undesirable plants on Federal lands. Federal agencies shall establish integrated management systems to control or contain undesirable plant species under cooperative agreements. Cooperative agreements with State agencies coordinate management of undesirable plant species on Federal lands. Undesirable plants include species that are classified as noxious, harmful exotic, injurious, or poisonous pursuant to State or Federal law. Normally management of undesirable plants is not a natural resources responsibility unless the species is impacting critical habitats or

displacing native vegetation in sensitive areas. (Equivalent to Federal Noxious Weed Act (7 USC 2809 et seq.)

16 USC 1361. 1371 et seq., Marine Mammal Protection. Protects all marine mammals in State and Federal waters. Although it prohibits “taking” of marine mammals, MMPA provides mechanism for allowing incidental 'taking" through permitting regulations. (Equivalent to Marine Mammal Protection Act (MMFA) (PL 92-533).

Executive Order (E.O.) 11990.Protection of Wetlands. Section 1(a) states that agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.
I
E.O. 11988. Floodplains Management. Requires all Federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impacts of floods on human safety, health and welfare; and restore and preserve the natural and beneficial values of floodplains when acquiring, managing or disposing of federal lands.

E.O. 12962. Recreational Fisheries. Federal agencies shall to the extent permitted by law and where practicable, and in cooperation with States and Tribes, improve the quality function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities. The E.O. identifies nine separate activities to support increase recreational fishing opportunities.

Department of Defense Instruction (DODI) 4715.3, Environmental Conservation Program, Paragraph D2b. INRMPs shall he prepared, maintained and implemented for all lands and water under DoD control that have suitable habitat for conserving and managing natural ecosystems.

DODI 4715.3, Paragraph D2c. Biologically or geographically significant or sensitive natural resources or species shall be inventoried and managed to protect these resources and to promote biodiversity.

DODI 4715.3, Paragraph D2j. DoD lands shall be managed for the goal of no net loss of wetlands. DoD operations and activities shall avoid the net loss of size, function, or value of wetlands.

DODI 4715.3, Paragraph D2j. Consistent with ecosystem-based management, altered or degraded landscapes and associated habitats shall be restored and rehabilitated whenever practical.

DODI 4715.3, Paragraph F1h(i). A planning level biological inventory should include, at a minimum, soils, vegetative communities, critical species (e.g. threatened and endangered, locally rare, keystone) and delineation of wetlands and water resources.

DODI 4715.3, Paragraph F2b. Biodiversity conservation on DoD lands and waters shall be promoted when consistent with the mission and practicable to achieve the following goals:
(1) Maintain or restore remaining native ecosystem types across their natural range of variation
(2) Maintain or reestablish viable populations of all native species in an installation's areas of natural habitat, when practical.

DODI 4715.3, Enclosure 4 Paragraph BI. DoDI identifies environmental analysis for natural resource conservation projects and monitoring and studies required to assess and mitigate potential impacts of the military mission on conservation resources as Class I activities.

DODI 4715.3, Enclosure 4 Paragraph B9. DoDI identifies efforts to achieve compliance with requirements that have deadlines that have already passed, as cited in DoD agreements, such as support for the Chesapeake Bay Agreement and the DoD Mojave Desert Ecosystem Management Initiative as Class I activities.

Air Force Instruction (AFI) 32-7064, Integrated Natural Resources Management. 1 Aug 97, Paragraph 72. All installations shall prepare and maintain a current inventory of threatened and endangered (T/E) species and their habitats.

AFI 32-7064, Paragraph 14.4.1. Natural resources managers at category I installations (see AFI 32-7064, 6.1.1) must take the course DoD Management of Cultural and Natural Resources.

AFI 32-7064, Paragraph 14.4.2. Permit and fund professional natural resources manager to attend appropriate national, regional, and state conferences and training courses.

E.O. 13112 - To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

E.O. 13101 September 14 1998
Section 101. Consistent with the demands of efficiency and cost effectiveness, the head of each executive agency shall incorporate waste prevention and recycling in the agency's daily operations and work to increase and expand markets for recovered materials through greater Federal Government preference and demand for such products. It is the national policy to prefer pollution prevention, whenever feasible.

Pollution that cannot be prevented should be recycled; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner. Disposal should be employed only as a last resort.

Executive Order (E.O.) 11990. Protection of Wetlands. Section 1(a) states that agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

E.O.s

Prescribing regulations for Coordinating Planning and the Acquisition of Land Under the Outdoor Recreation Program of the Department of the Interior and the Open Space Program of the Housing and Home Finance Agency (Executive Order 11237)
Floodplain Management (Executive Order 11988) and Wetland Protection (Executive Order 11990)
Protection and Enhancement of Environmental Quality (Executive Order 11514)
Prevention, Control, and Abatement of Environmental Pollution at Federal Facilities (Executive Orders 11724 and 11752)
Outdoor Recreation Resources-Recreation Advisory Council (Executive Order 11017)
Protection and Enhancement of the Cultural Environment (Executive Order 11593)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644)
Off-Road Vehicles on Public Lands (Amends Executive Order 11644) (Executive Order 11989)

DOD Directives

Natural Resources Management Program (DOD Directive 4700.4)
Natural Resources-Fish and Wildlife Management (DOD Instruction 4170.6)
Natural Resources-Forest Management (DOD Instruction 4170.7)
Natural Resources-Soil and Water Management (DOD Instruction 4170.8)

Air Force Regulations

Conservation and Management of Natural Resources (AFI 126-1)
Pollution Abatement and Environmental Quality (AFI 19-1)
Environmental Impact Analysis Process (EIAP) (AFI 19-2)
Use and Control of Off-Road Vehicles (AFI 19-4)
Environmental Protection Committees and Environmental Reporting (AFI 19-8)
Interagency Intergovernmental Coordination of Land, Facility and Environmental Plans, Programs, and Projects (AFI 19-9)
Manpower Policies and Procedures, Volumes I and II (AFI 26-1)
Operation and Maintenance of Real Property (AFI 85-10)

Base Comprehensive Planning (AFI 86-4)
Planning Criteria and Waivers for Airfield Support Facilities (AFI 86-5)
Granting Temporary Use of Real Property (AFI 87-3)
Pest Management Program (AFI 91-21)
Historic Preservation (AFI 126-7)
The Bird Strike Hazard Reduction Program (AFI 127-15)
Responsibility Center/Cost Center Codes (AFI 170-5)
Nonappropriated Funds: Basic Responsibilities, Policies, and Practices (AFI 176-1)
Administrative Control of Appropriations (AFI 177-16)
Air Force Morale, Welfare, and Recreation (MWR) Programs and Activities (AFI 215-1)
Air Force Outdoor Recreation Program (AFI 215-20)
Base Level Service Contracts, Volumes I, II, VII (AFI 400-28)
Air Force Data Dictionary, Volume I (AFI 700-20)

APPENDIX B

PRONGHORN ANTELOPE
Antilocapra americana

General

As recent as 10,000 years ago, there were 13 members of the Antilocapridae family (Zeveloff 1988). However, today the pronghorn is the only surviving species (Zeveloff 1988). The pronghorn has several unique characteristics that set it apart from other North American mammals. It is the only North American big game mammal with branched horns, from which the pronghorn gets its name (Hoover and Ogilvie 1959). The pronghorn is the only mammal in the world that annually sheds its horn sheaths. It is also the fastest mammal in the western hemisphere (Zeveloff 1988). The pronghorn can reach bursts of speed up to 70 miles an hour and it can maintain speeds of 30 miles an hour for several miles. This ability of speed is present even very early in life, as a week old fawn can run up to 25 miles an hour (Hoover and Ogilvie 1959).

The pronghorn is a unique looking animal and can scarcely be confused with any other North American mammal. It is tan in color with white markings on its rump, flanks, that continue to the belly, and 2 bands that run laterally across the throat region (Hoover and Ogilvie 1959). Mature adult males have black cheek patches that are displayed during courtship rituals (Zeveloff 1988). Adults of both sexes have a dark mane located on the dorsal side of the neck. The hair of the mane is the longest of the animal's body hair (O'Gara 1978). The white rump patch is composed of hairs that are capable of being raised to visually increase its size (Hoover and Ogilvie 1959). The raising of the rump hair indicates fear or suspicion and serves as a warning to other members of the antelope herd.

Although both sexes may have horns, the males are easily distinguished by their considerably larger set. The black horns curve back and then inward at the tips (Zeveloff 1988). Mature males have horns that are from 12-20 inches in length. The horns of the males have a forward projection or "prong". The horns of mature females rarely exceed the length of their ears which is about 4 inches long (Zeveloff 1988). The sheaths are made of specialized skin, protein keratin, and fused hairs which cover a bony, blade like core. These sheaths are usually shed in early winter and are replaced by July (Zeveloff 1988).

Adult pronghorn average 4 feet in length and stand 3 feet at the shoulder (Hoover and Ogilvie). Males average 125 pounds in weight, while the females average 90 pounds (Smith and Beale 1979). Although their senses of smell and hearing are very sharp, the

antelope's most acute sense is its sight. Some have compared its sight to a human with 8X binoculars (Hoover and Ogilvie 1959).

Range

Historically, the pronghorn was found throughout the western United States east to about the Mississippi River (Hoover and Ogilvie 1959). There was an estimated 40 million antelope in the United States in 1800, before the westward exploration of the country. Early explorers reported that antelope numbers were comparable to the numbers of bison (Hoover and Ogilvie 1959). Market hunters brought the pronghorn to near extinction. The population reached its lowest point by World War I at 13,000 animals (Hoover and Ogilvie 1959). However, with the enforcement of strict hunting regulations and with transplants, the current population in the United States is estimated at 750,000 (Zeveloff 1988). Today the pronghorn can be found throughout the inter mountain west from southern Canada to northern Mexico and from eastern California to western Nebraska (Zeveloff 1988).

Habitat Interspersion

The habitat of the pronghorn includes open grasslands and sagebrush (*Artemisia sp.*) communities. Although some pronghorn inhabit timbered areas, most often they are found in open areas with gently rolling hills (Hoover and Ogilvie 1959). Yoakum (1972) estimated antelope numbers by using a map that showed major vegetation communities in North America. He found the following distribution: 62% grasslands, 37% grassland-brushlands, and 1% desert. Antelope can be found in areas with elevations that vary from 3500-10,000 feet above sea level (Hoover and Ogilvie 1959).

Antelope often migrate from summer feeding grounds to protected wintering areas. Bruns (1977) described the pronghorn as "opportunistic migrants", not always moving to definite wintering areas each year, but migrating only when forced to do so by extreme weather or habitat conditions. Snow or snow storms may not always initiate migration, but rather a decreased moisture content of vegetation in higher elevations will (Hoskinson and Tester 1980).

Water

Antelope can receive most of their needed water supply from vegetation, but will drink freely when water is available (Hoover and Ogilvie 1959). Ranges that produce the highest antelope densities have water sources available every 1 to 5 miles (Yoakum 1974). It has been found that antelope are reluctant to drink from stock tanks but do drink from overflow water (Hoover 1959). Winter water requirements can be filled from snow where present.

Food

Although antelope are opportunistic feeders, browse and forbs make up the majority of their diet. Beale and Smith (1970) found during summers of above-average rainfall,

90% of the pronghorn diet in Utah consisted of forbs and only 10% browse. Conversely, in summers of below-average rainfall, their diet was 80% browse and 20% forbs. During the fall and winter months, 90% of their diet consisted of browse, mainly black sagebrush (*Artemisia nova*). Pronghorn are capable and willing to eat various species of cacti such as the prickly pear, spines and all (Hoover and Ogilvie 1959). Grass plays a very minor part in their diet. Usually, grass is eaten in the spring. Hoover and Ogilvie (1959) found the following annual consumption rates of food in antelope stomachs: 42.3% forbs, 42.5% browse, 11% cacti, and 4% grass. The lack of grass in a pronghorn's diet leads to limited competition with cattle grazing (Hoover and Ogilvie 1959). In fact, the pronghorn can help improve range lands for cattle grazing by eating of plants that are poisonous, injurious, and undesirable (Hoover and Ogilvie 1959). Such plants include locoweeds, cockleburs, soapweed, rabbit brush, and thistle (Hoover and Ogilvie 1959). Pronghorn are diurnal feeders, with most of its activity taking place in the mornings and early evenings (Burt and Grossheider 197). The mid day is usually reserved for resting.

Reproduction

Antelope rut in early fall. Dominant bucks become territorial and keep a small harem of up to 20 does (Zeveloff 1988). Buck vigorously defend their harems from other males and will prevent any member of his harem from leaving his territory (Hoover and Ogilvie 1959). The buck marks its territory with scent glands located behinds its jaws (Zeveloff 1988). Gestation lasts from 230 -250 days with 1 month of delay for the implantation of the fertilized egg in the uterus (Zeveloff 1988). The fawns are usually born in mid June. Does usually give birth to twins but younger does may have only a single fawn. The fawns weigh 7 pounds on average (O'Gara 1978). The doe gives birth from a standing position that results in the fawn dropping a few feet to the ground (Zeveloff 1988). Some have speculated that the shock of hitting the ground may stimulate breathing. A doe keeps its fawns clean of urine and feces to prevent any odors being detected by predators (Zeveloff 1988). Newborn fawns are precocial, with the fawns able to outrun a coyote after a couple weeks from being born (Zeveloff 1988). Does usually breed for the first time at 16 months of age but some may breed in their first fall (Zeveloff 1988). Young bucks are usually prevented from mating by more mature dominant bucks (Gilbert 1973).

Special Considerations

Natural predators of the antelope include coyotes, bobcats, cougars, and golden eagles (Hoover and Ogilvie 1959). Most predation occurs when the antelope are very young. Golden eagles mostly prey on antelope fawns when their usual food sources such as rabbits are scarce (Hoover and Ogilvie 1959). Unless wounded, diseased, or very old, there is little predation on mature animals. The primary predators of mature antelope today are humans. Antelope have become an important game animal in the western states, however more human kills are the results of poaching than legal hunting (Hoover and Ogilvie 1959). Some populations of pronghorn are adversely affected by the

construction of livestock fences that close traditional migration routes (Hoover and Ogilvie 1959). To allow antelope migration but still contain livestock, fences can be

modified to allow antelope to pass under the fence. Antelope generally are reluctant to jump a fence as deer do. Antelope fawns will die if abandoned by the parent doe with in the first 2 months of life. Normally antelope reach the average age of 9 years (Hoover and Ogilvie 1959).

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BURROWING OWL
Speotyto cunicularia

Distribution

Burrowing Owls breed from southern interior British Columbia to southern Manitoba south through eastern Washington, central Oregon, and California to Baja California, east to western Minnesota, western Missouri, Oklahoma, eastern Louisiana, and Florida, and south to Mexico and Central America (DeGraaf and Rappole 1995). Also resident in the West Indies (Bahamas, Hispaniola), on Clarion Island, and locally distributed in South America south to northern Tierra del Fuego (Johnsgard 1988). Populations in the Caribbean and South America are resident. Winters throughout breeding range except in northern portions of the Great Basin and Great Plains regions where it is variably migratory (DeGraaf and Rappole 1995; Johnsgard 1988). Observed throughout Utah where habitat is suitable (Eyre and Paul 1973). Formerly was abundant in Salt Lake and Utah Lake valleys, especially in prairie dog colonies (Hayward et al. 1976).

Habitat

Burrowing owls inhabit grasslands, prairies, farmland (Kaufman 1996); deserts, open shrubsteppe (DeGraaf and Rappole), preferring open, level ground with short vegetation or bare soil (Kaufman 1996, Johnsgard 1988). They also are found in open areas near human habitation such as airports, golf courses, vacant lots, and industrial parks (Kaufman 1996).

Food and Foraging Behavior

Diet: Varies with season and location, however several biomass studies have shown small mammals to be the most important component of its diet, especially in the spring (Johnsgard 1988). Prey identified by Rodriguez-Estrella (1997) consisted of invertebrates (such as scorpions, coleoptera, orthoptera) and small mammals (i.e. Dipodomys, Perognathus, Peromyscus); the mammals representing more than 50% of the injested biomass in both years of the study. Other mammal prey include ground squirrels, gophers, chipmunks, shrews, young prairie dogs, cottontails, and bats (Bent 1938). They may also eat frogs, toads, lizards, snakes (Kaufman 1996) and various birds, especially horned larks (Eremophila alpestris) (Johnsgard 1988).

Behavior: Hunting is mostly crepuscular and nocturnal, but also will hunt often by day during the breeding season (Kaufman 1996). Hunting methods include capturing insects on the wing, hovering over prey (Johnsgard 1988; Kaufman 1996); swooping down from a perch, and running along the ground and then clutching the prey in its talons (Kaufman 1996).

Breeding Biology

Nest: Burrowing owls will construct their nest in abandoned burrows left by colonial rodents such as prairie dogs and ground squirrels (DeGraaf and Rappole 1995). They will also nest in burrows of woodchucks, foxes, badgers, coyotes, and armadillos. They rarely dig their own burrows, except in Florida (Kaufman 1996) and in the savanna region of the Llanos Orientales, Colombia, South America (Keller and Vanegas 1998); also using gopher tortoise burrows in Florida (DeGraaf and Rappole 1995). The owls will often enlarge or renovate existing burrows by digging and kicking dirt backward (Ryser Jr. 1985); creating a tunnel of up to 6-10 feet long and then lining the nest with cow manure (Kaufman 1996).

Eggs and Incubation: Clutch size ranges from 3-12 eggs; typically 7-10 in west, 4-6 in Florida (Kaufman 1996). Eggs are white, becoming nest-stained. Incubation is 28-30 days, performed only by the female. The male will provide food to the female while she incubates all day and most of the night (Johnsgard 1988).

Young: Approximately 4 days after hatching, owlets begin to open their eyes. Contour feathers emerge from their sheaths in about 14 days which is also about the time when the owls begin to appear at the burrow opening. The average weight in 30 days is near its adult limit, with fledging occurring in 40-45 days (Johnsgard 1988). During the first week after hatching, the female will stay with the young while the male brings food. One to two weeks later, the female will then begin foraging for herself and the young (Kaufman 1996). One brood per year is raised.

Conservation Status

The burrowing owl in Utah is considered a species of special concern due to declining populations. The decline of this species is primarily due to poisoning, nest site loss, and food supply reduction resulting from human efforts to control ground squirrels and prairie dogs (Johnsgard 1988). Desmond and Savidge (1998) reported that burrowing owl populations on 17 prairie dog colonies declined from 91 to 38 nesting pairs (58%) between 1990 and 1996 due to significant declines in prairie dog burrow densities. Habitat loss through conversion of grassland to cropland is also a significant factor for the reduced numbers (DeGraaf and Rappole 1995). Additionally, accidental mortality by collision with vehicles (Kaufman 1996); and natural predation (Holyroyd 1998) are factors as well.

Management.

Management recommendations from Haug and Oliphant (1990) emphasize maintenance of a pesticide-free zone of a 600-m radius around nest burrows, maintain areas of dense vegetation to supply habitat for prey, and install artificial burrows in areas where burrows are lacking. Sheffield (1998) suggests the following measures:

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- Form an interagency task force to review the conservation status and existing plans of prairie dogs and burrowing owls in grassland ecosystems

- End funding of prairie dog eradication programs and, instead, integrate prairie dogs and their complexes into the management of grasslands
- Initiate major research on limiting factors of prairie dog towns
- Promote conservation easements on private land

Currently in Utah, artificial nest boxes are being installed to provide more nesting sites and will be used to monitor nest success and to capture owls for genetic research and banding. Also, through the Watchable Wildlife Program of the Utah Division of Wildlife Resources and as part of the Partnership for Wildlife Act Project with the US Fish and Wildlife Service, the Cougar Park Nature Preserve was created in West Jordan, Utah to protect an established population of burrowing owls.

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BUSHY-TAILED WOODRAT
(*Neotoma cinerea*)

Distribution

Bushy-tailed woodrats are widespread, occurring from the southeastern Yukon and extreme southwestern Northwest Territories south into northwestern U.S. to northern California and northwestern New Mexico, and east to southwestern North Dakota and western Nebraska (Whitaker 1997, Zeveloff 1988). In Utah, six subspecies occur and are found throughout the state except in Tooele, Juab, Millard, and Beaver counties where they only occur in the extreme eastern areas. Bushy-tailed woodrats occur only in northern Boxelder County (Durrant 1952), except for a recent specimen found in a Golden eagle nest at UTTR-N.

Habitat

Inhabits rocky ledges, caves, coniferous forests, cliff crevices, rock slides, among tree roots – almost anywhere from sea level to mountain slopes 14,000 feet (4,267 m) high (Allen 1995, Burt and Grossenheider 1976, Wassink 1993, Whitaker 1997). In the Intermountain West, they commonly occur in rocky areas, usually the mountains (Zeveloff 1988). Prime habitats include rimrock, rock slides, and conifer forests. In much of the West they live in rocky crevices behind a shield of sticks or in a stick house (Zeveloff 1988).

Food and Foraging Behavior

Diet: Green vegetation from shrubs and forbs is its preferred food, but also eats twigs, nuts, roots, shoots, seeds, stems, berries, fungi; also animal matter such as invertebrates and carrion (Burt and Grossenheider 1976, Nowak 1991, Wassink 1993, Whitaker 1997, Zeveloff 1988). They do not drink much water, but during dry seasons they make heavy inroads on the fleshy stems of cacti and other plants that are well filled with water if available (Nowak 1991).

Behavior: Woodrats are active throughout the year and are mainly nocturnal, but will venture out during long summer days (Allen 1995, Ulrich 1986, and Zeveloff 1988). Since they do not hibernate they must store large amounts of food in their den. In the fall they gather caches of pine nuts, dry hay, fir twigs, aspen leaves, and other vegetation which will sustain the rodent through the winter (Allen 1995, Burt and Grossenheider 1976, Wassink 1993). Predators include spotted owls, bobcats, coyotes, snakes, and long-tailed weasels (Allen 1995, Zeveloff 1988, Whitaker 1997).

Breeding Biology

Between May and September, following the early spring breeding season, they usually have three or four altricial young, with litter sizes ranging from one to six with up to two litters produced per year (Allen 1995, Burt and Grossenheider 1976,Wassink 1993,

Whitaker 1997 Zeveloff 1988). The gestation period is approximately 35 days (Nowak 1991, Zeveloff 1988). The young nurse for the first 2 or 3 weeks of life aided by specially developed teeth that help them grasp their mother's nipples (Wassink 1993). Usually, a single family will live in one rockslide area (Burt and Grossenheider 1976, Zeveloff 1988). Families are often harems, composed of a dominant, larger male and several females (Zeveloff 1988). When it is time for the young males to disperse, they may have to be driven out of the area by their father.

Nest/Den: There appears to be much variation in shelters, depending on habitat conditions and availability of materials (Nowak 1991)**.** Some build elaborate dens or nests composed of twigs, stems, foliage, bones, rocks, dung, stones or whatever material is available and is easily carried (Burt and Grossenheider 1976, Nowak 1991, Ulrich 1986, Wassink 1993). A newly constructed nest may measure 5 feet across and 2 feet high. These houses often rest on the ground or are placed against rocks or at the base of a tree. Buried deep in the nest structure is the sleeping chamber that is a neat ball of soft material consisting of feathers, bits of animal hair, and grasses (Allen 1995, Wassink 1993). The nest also contains an area for food storage and another for waste. In coniferous forests, this woodrat may build its house as high as 50 feet (15m) up a tree. In some areas, the house is used only for caching large quantities of dried vegetation, and the nest itself is concealed in a rocky crevice behind a barricade of sticks (Nowak 1991, Whitaker 1997).

Unique habits

Woodrats pick up material for their nests while foraging and then carry it to the homesite (Nowak 1991). Bushy-tails have a tendency to collect shiny objects, such as coins, silverware, etc. (Nowak 1991, Ulrich 1986, Whitaker 1997, Wassink 1997, Zeveloff 1988). If, while carrying something in its mouth, the animal spots another, more interesting item, it will drop whatever its is carrying and pick up the more intriguing object These habits have resulted in the nickname "trade rat" or "pack rat."

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LEAST CHUB
Lotichthys phlegethontis

General

The least chub, a member of the Cyprinidae family, is one of the aberrant minnows found only in the Bonneville Basin (Sigler and Miller 1963). Originally, it was a resident of Lake Bonneville that covered parts of Utah, Nevada, Wyoming, and Idaho. When the lake began to recede about 10,000 years ago, the least chub was stranded in the water bodies in the ancient lakebed.

The least chub gets its name from its diminutive size, rarely exceeding two inches in length (Lee et al. 1980). The least chub swims in large, well ordered schools, but is very shy and will quickly retreat to vegetation for cover at the least disturbance (Sigler and Workman 1975).

The most distinguishable characteristics of the least chub are its large oblique or upturned mouth, large scales, and the lack of a visible lateral line (Sigler and Miller 1963). It has a short round snout and large eyes. Males are olive green on its back with steel blue sides. The lower parts of their sides and belly are golden and its fins are a lemon amber color. Female and young least chub are pale olive on its back with silver sides. Their fins are watery white and their eyes are silver. Males have golden colored eyes. Both sexes have black specks on their backs and sides. Pharyngeal teeth are in 2 rows: 2,5-4,2. The dorsal fin origin lies behind the insertion of the pelvic fins. It has 8 rays in the dorsal fin, 8 rays in the anal fin, and 34-38 large scales along the side (Sigler and Workman 1963).

The least chub is an effective predator of mosquito larva, more effective than the introduced Gambusia species, because the chub is more adaptable to adverse conditions (Sigler and Miller 1963). The least chub was an important forage base for larger fish such as the cutthroat trout when it was present in sufficient numbers (Sigler and Workman 1975). However, due to extremely low numbers, this is no longer the case.

Range

Historically, the least chub was widely distributed and abundant in the Bonneville Basin (Crist 1990). It occupied water bodies from Big Cottonwood Creek, Provo River, and Utah Lake to the north and east, south to Parowan Creek, and west to Snake Valley. Today its range is considerably smaller with most of the know populations in Snake Valley at Leland Harris Springs in Juab County, Utah and at Gandy Salt Marsh in Millard County, Utah (Crist 1990).

In recent years, in order to extend its current reduced range, the state of Utah has tried five introductions (Perkins et al. 1997). Four of those introductions have failed, but one

was successful. That successful introduction occurred at Fish Springs National Wildlife Refuge in Juab County. The state is currently considering other locations for possible introductions (Perkins et al 1997).

Habitat Interspersion

The least chub can live in nearly all aquatic habitats, both lotic and lentic, found in the Bonneville Basin with the exception of the Great Salt Lake (Perkins et al 1997). Rivers, springs, streams, ponds, and marshes are all suitable for the least chub. The chub is tolerant of alkaline water, temperature fluctuations, high pH levels, and high conductivity. The chub prefers water with slight to no current and with dense vegetation for cover and spawning (Perkins et al 1997). Preferred vegetation includes algae, chara, duckweed, and watercress in the water and cattails, bull rushes and sedges on the edges. The bottoms of least chub water varies from hard to soft clay, mud, soft muck and peat (Sigler and Miller 1963).

Food

The least chub is an omnivorous opportunistic feeder. Algae, diatomaceous material, midge adults, pupae, and larva are the most common in their diets (Sigler and Sigler 1987). Stomach contents of 185 fish from 27 different sites revealed the presence of food items by frequency: green algal filaments & diatomaceous material 23%, midge larva 15%, copepods 11%, single filament green algae 10%, midge pupae 9%, and the remainder crustacean and insects 33% (Workman et al. 1979). By volume, the following food items were found in the same fish: 24 invertebrate taxa, 7 plant taxa, and detritus (Workman et al. 1979). Where mosquito larva are present, they make an important part of the chub's diet. Other important food includes copepods, ostracods, and other available invertebrates (Perkins et al. 1997). The least chub's diet varies considerably dependent on its location.

Reproduction

The least chub spawns from April to August (Perkins et al. 1997). Spawning begins in the spring when the water temperature reaches 60° F (Sigler and Sigler 1987). Least chubs are polyandrous; the females use the sperm from more than one male (Perkins et al 1997). Least chubs are partial and intermittent spawners, laying a few eggs at a time over an extended period (Crawford 1979). They may have limited spawning migration, depending on the location. When migrating, chubs leave springs and travel to marshes to spawn returning to the springs after the spawn is over (Perkins et al. 1997). This may help prevent cannibalism of young chubs by the adults.

Spawning takes place in heavily vegetated areas. Filamentous algae seems to be preferred (Lamarra 1981). Eggs and sperm are deposited over vegetation. The fertilized eggs sink and, being adhesive, will attach to aquatic vegetation. There is no parental guarding of the eggs or the fry. This results in heavy predation of the eggs and

young chubs primarily by introduced fish such as Gambusia and killifish (Perkins et al. 1997).

The act of tunneling through vegetation during the spawn results in a primitive nest. The vegetation where the eggs are deposited provides the eggs and the young with a microenvironment rich in food and oxygen (Lamarra 1981). Females can deposit from 300 to 2700 eggs in a breeding season (Sigler and Sigler 1987). Incubation time for the eggs is similar to other warm water fish species, about two days at 72 degrees F (Sigler and Sigler 1987). Newly hatched young live off their yolk sacs for 3 to 4 days at which time they begin feeding (Sigler and Sigler 1987).

Special Considerations

Least chubs normally live to 3 years of age (Sigler and Sigler 1987). Natural predators include frogs, ducks, gulls, herons, egrets, mink, and raccoons. Far more damaging to the least chubs are introduced species of fish such as carp, sunfish, and bass (Sigler and Sigler 1987). Gambusia, plains killifish, and the rainwater killifish compete with the least chub for food as well as prey on the eggs and fry of the chub (Perkins et al. 1997). The least chub typically is not found in conjunction with non-native fish species (Crist 1990).

Hybridization with the speckled dace and the mosquito abatement program are also possible threats to the least chub currently under study (Perkins et al. 1997).

The factor that is probably most responsible for the decline of the least chub is the loss and degradation of habitat through water diversion (White et al. 1974). For example, the Beaver River, which once held a large population of least chub, is now dry for part of the year. Most suitable streams in the Wasatch Mountains are either diverted or polluted before reaching the valleys (White et al. 1974). Livestock also pose a serious threat to least chub because of the destruction of aquatic vegetation and the increase of organic pollution of the water (Crist 1990). As new roads for mining and oil exploration are built, the previous protection of inaccessibility is now compromised (Perkins et al. 1997).

To eliminate or reduce threats to least chub, the following statewide actions in Utah have been proposed by Perkins et al. (1997):

- Perform additional surveys of chub population, life history, and habitat requirements
- Determine and maintain genetic integrity
- Enhance, maintain, and protect habitat; selectively control nonnative species
- Expand least chub populations through introduction or reintroduction
- Monitor populations and habitat
- Develop a mitigation protocol for proposed water development and future habitat alteration.

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LONG-BILLED CURLEW

Numenius americanus

Range

The Long-billed Curlew breeds from south-central British Columbia to southern Manitoba, south to northeastern California, central Utah, central New Mexico, northern Texas and east to southwestern Kansas (DeGraaf and Rappole 1995). Winters from central California, southern Texas, southern Louisiana, and coastal South Carolina south to Mexico. Localized summer populations in Utah are most common in the north, but nesting has been confirmed near Fillmore in Millard County, Milford in Beaver County, Parowan and Lund in Iron County, and suspected near Enterprise in Washington County (Behle et al. 1985).

Habitat Interspersion

The Long-billed Curlew is usually found in grasslands and meadows near a water source containing abundant invertebrate prey (Ryser Jr. 1985). During migration and in wintering areas, they may be found along beaches and mudflats, although some are also found in prairie environments and areas that have been moderately grazed by livestock during the migration (Kaufman 1996). In aquatic habitats, curlew often associate with godwits, willets, and yellowlegs (DeGraaf and Rappole 1995).

Food

The Long-billed Curlew is an opportunistic feeder. During the breeding season and somewhat during wintering areas, the Long-billed Curlew is an upland feeder (Bent 1962). It can be found foraging in open prairies, damp grassy hollows, and on the edges of prairie ponds. During migration and somewhat in their wintering areas, the curlew feeds on the shorelines of lakes or oceans and in mudflats (Bent 1962). The curlew uses its long bill to probe the mud and sand for invertebrates such as mollusks, crustaceans, and insects (Ehrlich et al. 1988, Kaufman 1996, and Ryser Jr. 1985). Small fish, frogs, snakes, and the eggs and nestlings of other birds are also eaten where available (Ehrlich et al. 1988, Kaufman 1996). Occasionally, they will also eat berries (Bent 1962, Ehrlich et al. 1988, Kaufman 1996, and Ryser Jr. 1985). Curlew feed during the day light hours, returning to shallow water to sleep at night (Bent 1962).

Reproduction

The Long-billed Curlews arrive at their breeding grounds from early March to early April (Redmond and Jenni 1986). Males will perform aerial flight displays, ground calling, and nest-scraping displays that are important in establishing a pairing bond (Ryser Jr. 1985). Mated pairs form loose colonies to help share in guarding of nest from predators. In Weber County, Utah females often share nests and a curlew has even been observed sharing a nest with a western willet, and both species were guarding the eggs (Bent 1962).

Nests can be made anywhere, such as in arid, upland areas far from water (DeGraaf and Rappole 1995, Reyser Jr. 1985), but they show some preference for damp, grassy hollows and long slopes near water (Bent 1962). Nests are of a simple construction, usually just a slight hollow in the ground, loosely lined with grass and weeds and often located next to a conspicuous landmark such as a pile of cow manure (Erhlich et al. 1988, Kaufman 1996). In especially wet areas, the curlew will sometimes build a grass platform for the nest (Bent 1962).

The clutch size is usually 4 eggs, rarely 3-5, as is in most scolopacid shorebirds in north temperate and arctic latitudes (Redmond and Jenni 1986, Kaufman 1996). The eggs are olive-colored with dark spots (Ehrlich et al. 1988). Egg laying takes place usually over four days and incubation time is 27-30 days with both parents sharing in egg-sitting duties (Redmond and Jenni 1986).

Adults will drive predators away by repeated aerial assaults and wing-injury feigning to pull them away from the nest (Bent 1962, Kaufman 1996). After hatching, both sexes will tend young, however the young will feed themselves (Kaufman 1996). When they are only a few days old, the young become very adept at hiding in the grass if danger threatens (Bent 1962). They will be capable of flight in 32-45 days (Ehrlich et al. 1988). Female curlews will become sexually mature at 2-3 years and the males at 3-4 years (Bent 1962). They raise only one brood per year (Redmond and Jenni 1986).

Special Consideration

The primary reason for the drastic decline in Long-billed Curlew numbers was because of over harvesting by market hunters (Kaufman 1996). By the early 1900's, many Long-billed Curlew populations were decimated (Bent 1962). The birds were easy to hunt, responding readily to decoys and calls. Flock members would often circle back and return within gun range to help their fallen comrades (Bent 1962).

Natural predators include mink, foxes, and raccoons, which prey mainly on the eggs and young. Curlews experience a very high mortality rate to these predators. This combined with the fact that a mated pair will only raise one brood a year, has proved that the Long-billed Curlew populations take a long time to recover from low numbers (Redmond and Jenni 1986).

Although hunting is now prohibited, humans continue to pose a stumbling block for curlew recovery. Increased cultivation, grazing, and development has destroyed much of the curlew's breeding grounds (DeGraaf and Rappole 1995, Kaufman 1996). Therefore, habitat preservation is probably the most crucial aspect of Long-billed Curlew recovery.

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FERRUGINOUS HAWK
(*Buteo regalis*)

Distribution

Breeds from eastern Washington, southern Alberta, and southern Saskatchewan south to eastern Oregon, Nevada, northern and southeastern Arizona, northern New Mexico, north central Texas, western Oklahoma, and Kansas. Winters primarily from the central and southern parts of breeding range south to northern Mexico. Much of the total population may winter in the southwestern United States. Winters occasionally to the arid highlands of Central Mexico (DeGraaf and Rappole1995, Johnsgaard 1990). A widely distributed species in Utah but found mainly in lowland open desert terrain (Behle 1985, Hayward et al. 1976). It is primarily a summer resident with only a few records for winter months.

Habitat

Inhabits the semiarid western plains and arid intermountain regions including shrubsteppes, badlands, saltbush-greasewood flats, sagebrush plains, and desert; prefers relatively unbroken ungrazed prairie grasslands, with scattered trees, rock outcrops, or tall trees along rivers or streams for nesting sites (DeGraaf and Rappole 1995, Johnsgaard 1990, Kaufman 1996, Palmer 1988). Cultivated landscapes cannot sustain populations (Gilmer and Stewart 1983). Avoids high elevations, forest interiors, narrow canyons, and cliff areas (Palmer 1988). Although locally resident year-round in more southern parts of the range, some birds there move into high mountain shortgrass valley during postbreeding and migration periods (Evans 1982).

Food and Foraging Behavior

Diet: Ferruginous Hawk food resources are comprised of rabbits (*Lepus* sp. and *Sylvilagus* sp.) (Howard and Wolfe 1976), ground squirrels (*Spermophilus* sp. and *Ammospermophilus leucurus*), prairie dogs (*Cynomys* sp.) (Olendorff 1993), and pocket gophers (*Thomomys talpoides*) (Thurow, White, Howard and Sullivan 1980). In Smith's and Murphy's (1973) Utah study, black-tailed jackrabbit (*L. californicus*) comprised over 90% of the foods in each of two years, while cottontails and ground squirrels made up most of the remainder. Also eats kangaroo rats, mice, birds, snakes, amphibians, and large insects (DeGraaf et al. 1991, Kaufman 1996, Palmer 1988).

Behavior: Hunting usually takes place in the early morning and late afternoon hours (Smith and Murphy 1973). Cooperative hunting of pairs has been reported (Clark 1987).

Four major hunting methods are used (Kaufman 1996, Johnsgaard 1990, Palmer 1988, Ryser 1985):

1. Still-hunting from a perch followed by flights to prey of 100 meters or more.
2. Short-distance (usually under one meter) strikes on prey from the ground.

3. Aerial hunting from altitudes of less than about 30 meters.
4. Aerial hunts from altitudes of over 100 meters

Breeding Biology

Nest: The breeding season begins mid-April, approximately ending by mid-July (Baicich and Harrison 1997). Ferruginous Hawks use a wide variety of nesting substrates (see Table 1.) (Bechard and Schmutz 1995). Bechard, Knight, Smith and Fitzer (1990) found 62.1% (18/29) nests in cliffs; and Nugent (1995) found 58.3% (21/34) of his nests in cliffs. Bechard et.al. (1990) observed 34.45% (10/29) nests in trees and 1 (3.5%) in human structures; whereas Nugent (1995) located 5/34 (13.9%) in trees and 27.8% (10/34) in electrical transmission towers. The minimum size (dbh) of tree nests reported by Bechard et al. (1990) was 23 cm. A summary of shrub/steppe nesting (WA, OR, NV, ID, and UT nests) data in Olendorff (1993) suggests Ferruginous Hawks have a strong preference for cliff nesting (483/863 (56%)), but this preference may be a function of biased nest searching techniques. In the absence of cliffs, the same Olendorff (1993) data indicate that trees and shrubs comprise the next preferred substrate (192/863 (22.2%), and that ground nesting comprises 9.8% (85/863) of the nests. Ferruginous Hawks will also use artificial nest platform (Baicich and Harrison 1997). Nests are built by both males and females with sticks, old bones, and similar debris, lined with grass, shredded bark, and horse or cow dung (Baicich and Harrison 1997, Ehrlich et al. 1988). The structure becomes massive with constant re-use, with outside diameter from 24-42 in., and a height of 12-24 in.

Table 1. Ferruginous Hawk nest sites reported by Bechard, Knight, Smith and Fitzer (1990), Nugent (1995) and Olendorff (1993).

NESTSITE	Bechard, Knight, Smith and Fitzer (1990)	Nugent (1995)	Olendorff (1993)
CLIFF	62.1	58.3	56.0
TREE	34.4	13.9	22.2
STRUCTURE	3.5	27.8	
GROUND			9.8

Eggs and Incubation: Clutch size is usually 3-4, but may range from 1-8, due in large measure to fluctuating food supplies (Johnsgaard 1990, Palmer 1988). Eggs are laid at approximate two-day intervals, with incubation beginning with the first egg (Powers 1981). Incubation is shared by the sexes, lasting 32-36 days, with the females spending more time on the eggs (approx. equal numbers of shifts taken by males and females)(Baicich and Harrison 1997, Johnsgaard 1990, Palmer 1988).

Young: Development is semi-altricial with both parents tending the young. After hatching, the female remains with the young while the male brings food (Kaufman

1996). At first, the female presents small morsels to the beaks of her nestlings, and for 2-3 weeks mammals are dismembered and birds at least plucked before they are offered. After about 3 weeks, both parents hunt (Kaufman 1996). Fledging occurs at times varying from 38-50 days, with the smaller males leaving the nests as much as ten days before the slower-developing, heavier females (Johnsgaard 1990, Palmer 1988). Generally the young remain dependent on their parents for several weeks after fledging (Blair and Schitoskey 1982).

Conservation Status

The Ferruginous Hawk in Utah is listed by UDWR as threatened, because it has declined seriously over most of its range. Schmutz (1984) estimated a North American population of perhaps 3,000-4,000 breeding pairs, of which 500-1,000 were in Canada. This hawk was on the Audubon Society's Blue List of declining species from 1971-1981, and was listed as a species of Special Concern from 1982-1986 (Ehrlich et al. 1988, Johnsgaard 1990).

In the past, the Ferruginous Hawk was severely persecuted by humans and many were shot while perched along roads, although it preys almost entirely on pest mammals such as rodents and rabbits (Ehrlich et al. 1988, Ryser 1985). Shooting continues to be a problem, especially in the south during the legal gamebird season (Palmer 1988). The virtual elimination of the prairie dog by settlers was probably the first serious blow delivered to this hawk. Other causes of decline include loss of habitat through cultivation and other forms of human disturbance which adversely affect nesting density (DeGraaf and Rappole 1995, Ryser 1985).

Artificial nesting platforms and nests have been erected as part of management programs in an attempt to increase the size of breeding populations and their level of reproductive success (Ryser 1985). While this may have some local impact, less disturbance by humans and their agricultural practices is needed to bring this species back to a healthy population level.

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COLUMBIA SPOTTED FROG
Rana luteiventris

Distribution

The distribution of the spotted frog has been documented from southeastern Alaska to Oregon and western Wyoming with disjunct populations in Utah (Turner and Dumas 1972). In 1997, Green et al. split *Rana pretiosa* into two species and assigned all populations in Utah to the species *Rana luteiventris*, the Columbia spotted frog. Its range in Utah includes the eco-regions of the Wasatch and Uinta Mountains, Utah High Plateaus, and the Great Basin, occupying Juab, Millard, Sanpete, Summit, Tooele, Utah, and Wasatch counties. In these areas the status of the Columbia spotted frog is native and natural (Oliver 1991).

Habitat

This very water dependent species is found in cool, clear spring-fed water with an organic substrate (Morris and Tanner 1969). It is unlikely to stray far from water, living nearly all of its life in its aqueous habitat. In their study along the Wasatch front, Ross et al. (1993) found that the frogs occupied wetlands with small, clear, cold-water habitats where shallow water was present with an abundance of herbaceous emergent vegetation. A subsequent study by Ross et al. (1994) of this species in the West Desert (Millard, Juab, and Tooele counties) found variation in the spring habitats utilized. The Tule Valley springs are warm, high in salinity and have high pH levels while those in Snake and Deep Creek Valleys have cooler water temperatures, low salinity, and low pH levels.

Diet/Feeding Habits

Common bacteria found in the water, is used as food in the larval stage of the spotted frog (Burke 1933). As an adult, the spotted frog feeds on aquatic prey predominately in the water, floating on the water surface or clinging to aquatic vegetation (Licht 1986). On wet days it will feed only on land along the river margin or in or along rainpools. Moore and Strickland (1955) found this species to subsist mainly on beetles and flies. In Oregon and Washington, Schonberger (1945) found the diet consisting of 97.5 % arthropods; 86.3% insects, 9.4% arachnids, 1.2% crustaceans, .6% millipedes, .6% tadpoles, and 1.9% mollusks. In his study of digestive tracts, Turner (1959) found that prey consumed is largely governed by availability and his data indicated that the spotted frog feeds both above and under water. Whitaker et al. (1983) found the spotted frog ate a great variety of insect foods, including distasteful types, indicating that the species is an opportunistic feeder.

Breeding Biology/Reproduction

General: Spotted frogs arrived at breeding sites in southwestern British Columbia and began breeding activities within 2 weeks after emergence from hibernation in February and March (Licht 1969). In southern Montana, the majority of males began breeding at four years of age, while most females began breeding a year later (Hollenbeck 1975). Male frogs gather into small groups with individuals vocalizing within inches of each other (Licht 1969). The mating call is given in the air as the frogs float on the surface of water only a few inches deep at the margins of the ponds and rivers. Female frogs spawn mainly during daylight and the eggs are placed on top of, or immediately adjacent to, the first mass present. In Licht's (1969) study, as many as 26 separate masses were laid on top of one another in the same place, unattached to vegetation in only a few inches of water. For *R*. pretiosa, the lethal thermal limits of young embryos are approximately 6-28 degrees C (Licht 1971). The tolerance limits broaden as embryos become older, and embryos can survive short-term exposure to normally lethal chronic cold temperatures. High mortality of spotted frog embryos often results from freezing temperatures at night and desiccation of egg masses.

In the West Desert, Ross et al. (1994) found that egg masses were highest (frequency) in areas where the amount of open water was less than 33%, less than 1 meter from shore, with water temperature between 11-15° C, between 1445-1469 m elevation and with water depth between 5-10cm.

In the Wasatch Front, Ross et al. (1993) found the number of egg masses were highest where the wetland size was 0.0-0.09 ha, less than 25% open water, water temperature between 11-15° C, 1700m in elevation, between 0.0-1.0m from the shoreline, and the depth of the water between 0-19cm.

Development

Great variation in growth rates among individuals is the rule, even within the same population. Larval growth rates in *R. pretiosa* in Montan ranged from 0.3-2.0mm/day with highest rates occurring about the middle of July (Hollenbeck 1978). Maximum larval length is reached near the middle of August, followed by a decrease in length until metamorphosis late in August or early in September. Larval mortality rates during the middle of the growing season varied from 50-80%. Sexual dimorphism in size was clear-cut in fourth-year frogs, although differential growth probably occurred during the third year (Hollenbeck 1975). Licht (1974) found the embryonic survival for spotted frogs was 70%. In dry periods during breeding, embryos face the danger of desiccation and extensive or complete mortality. Survival of tadpoles in a pond-breeding site was less than 1%. After the end of the first full year of life, there was a minimal survival of 3.5% from the eggs laid the year before. For adults, there was a 64% survival between 1968 and 1969; males suffered higher mortality than females. The pre-reproductive life

span is almost 4 years in males, 5-6 years in females (Turner 1960). The annual growth increment decreases each year. Licht (1974) concluded that predation and chance climatic events for embryos are the strongest factors limiting frog population numbers.

Threats/Reasons for Decline

Wasatch Front: Ross et al. (1993) found that along the Wasatch Front, the distribution and abundance of the spotted frog is declining. The spotted frog is vulnerable to a variety of impacts since the majority of the populations are small, averaging 8.9 egg masses per site. These impacts include:

- Alterations to aquatic systems such as Deer Creek Reservoir, water diversion systems along the Provo River, golf course ponds, railroads, roads, bridges, drainage for agricultural uses and livestock grazing.
- Introduced fishes such as mosquito fish which were observed feeding on newly-emergent spotted frog tadpoles at six breeding sites in 1992.
- Landuse changes and impacts from chemical treatments of wetlands for mosquito control and agricultural pests are also contributing factors.

Spotted frogs are vulnerable to decreasing water levels as eggs laid in shallow water are on plants that hold egg masses in place as water levels drop. Therefore, the eggs are more likely to be exposed to desiccation, predation, and freezing. Migration, or distribution of spotted frogs, is affected by any alteration of riparian habitat that reduces herbaceous cover or otherwise eliminates wetland or shoreline habitat. Fragmentation causes reduced genetic diversity, and, if allowed to continue, will result in extirpation.

West Desert: Ross et al. (1994) found that the West Desert populations are more stable than those populations along the Wasatch Front. This is due partly to the fact that habitat loss in the West Desert has been minimal and therefore the distribution has not changed much from historic times. However, the introduction of non-native amphibians and fish may be negatively impacting spotted frogs in these areas. Ross et al. (1994) concluded that the following factors, listed in declining order of importance, are affecting habitat and populations of spotted frogs in the West Desert: population fragmentation, viability; livestock grazing, water development, nonnative fish, and nonnative frogs.

Management

The following are management recommendations by Ross et al. (1994):

(1) Monitor select population clusters and associated habitats
(2) Evaluate the feasibility of constructing level ditches and other habitat management practices for wetland habitat improvement, determine the effects of grazing, wetland and riparian fencing, and controlled burning on spotted frog habitat

(3) Determine if non-native ranid frogs are displacing spotted frogs and evaluate appropriate management actions, if feasible, to reduce expansion of their distribution
(4) Take actions to enhance the habitat and to reduce threats to the population, with priority given to clusters with indices of less than 500.
(5) If translocation is required, future efforts should focus on translocation of egg masses rather than adults due to imprinting behavior upon their natal site (Shirley 1993)

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GOLDEN EAGLE
Aquila chrysaetos

Distribution

The Golden Eagle breeds in North America from northern and western Alaska east to Labrador, south to southern Alaska, Baja California, the highlands of northern Mexico, west-central Texas, western Oklahoma, Nebraska, the Dakotas and western Kansas, in eastern North America to New York and New England. Golden Eagles are also widespread in Eurasia and local in North Africa (DeGraaf et al. 1991, Johnsgaard 1990). The Golden Eagle winters from south central Alaska and the southern portions of the Canadian provinces south throughout the western breeding range, rarely eastward to coastal South Carolina. Formerly, nests and eggs were recorded from almost every county in Utah (Hayward et al. 1976).

Habitat

The Golden Eagle inhabits open country, from barren areas to open coniferous forests, primarily in hilly and mountainous regions, rugged deserts, prairies, rangelands, tundra where human population density is low and territories are at least partly inaccessible to disturbance (Cramp and Simmons 1980, DeGraaf et al. 1991, Kaufman 1996). In Utah, the golden eagle is a common permanent resident ranging from lowland deserts up into the mountains (Behle et al. 1985).

Special habitat requirement would include an area that has a suitable nest site (usually in a large tree or cliff), a dependable food supply (mainly of medium to large mammals and birds), and broad expanses of open county for foraging (Johnsgaard 1990). Winter habitat selection in Utah includes areas with available perches and native shrub-steppe vegetation types (*Artemisia* and similar shrubs), with good populations of black-tailed jackrabbits (*Lepus californicus*) (Fisher et al. 1984).

Food and Foraging Behavior

Diet: The Golden Eagle is an opportunist and will eat a variety of prey, but primarily feeds on small mammals (mainly lagomorphs) but also ground squirrels, prairie dogs, marmots, rodents, snakes and game birds. On occasion Golden Eagles also prey upon foxes, coyotes, bobcats, young pronghorns or deer, owls, hawks, vultures, cranes, swans and geese (DeGraaf et al. 1991, Kaufman 1996, Johnsgaard 1990, Palmer 1988, Ryser 1985).

In his review of more than 7,000 identified food items, Olendorff (1976) found that lagomorphs comprised 54% of the total, marmots, ground squirrels, and prairie dogs 22%, game birds 8%, wild ungulates 6%, passerine birds 3%, domestic livestock 1%, and mammalian predators 1%.

Behavior: Golden Eagles search for prey by soaring high, requiring either thermals or updrafts, or by flying low over slopes, quartering areas below methodically, striking the prey on the ground rarely in mid-air, with talons in a brief rush or swift pounce (Cramp and Simmons 1980, Kaufman 1996, Johnsgaard 1990). Eagles also watch for prey from high perches (Cramp and Simmons 1980, Kaufman 1996). Members of a pair sometimes hunt cooperatively, with the second bird capturing prey that evades the first (Cramp and Simmons 1980, Johnsgaard 1990, Palmer 1988, Ryser 1985).

Breeding Biology

Nest: Site is usually on rock ledges of outcrops or cliffs, preferably overlooking grasslands (Baicich and Harrison 1997, DeGraaf et al.1991, Kaufman 1996). Ideally nest site is located where an eagle carrying prey can land easily, on a favorable wind or updraft, and where there is shelter from excessive heat or cold (Palmer 1988). Sometimes nests on the ground, at forest edges in top of trees (10-100 ft. up) and may even nest on man-made structures such as power poles (Baicich and Harrison 1997, Clark 1987, Kaufman 1996).

In Utah, Caminzind (1969) found that 87% of 31 nests he observed were on cliffs, while the rest were on the ground or some artificial structure. The nest (built by both sexes) is a bulky platform of sticks lined with weeds, grass, leaves, and mosses (Baicich and Harrison 1997, Kaufman 1996). During the nesting period and in successive years more material may be added, creating a massive nest, some doubling in size during a season (Palmer 1988). A tree nest may be built up to have an outside diameter of 2.5m (8ft).

Eggs and Incubation: Clutch size is usually 2, sometimes 1-3 (rarely 4). The eggs are whitish to buff and marked with brown, often with one of the clutch being unmarked (Baicich and Harrison 1997, Kaufman 1996 Johnsgaard 1990). Eggs are laid at about 90-120 hour intervals. Incubation is primarily performed by the female and lasts 41- 45 days.

Young: Hatch semi-altricial and downy, the young are closely brooded by the female until they are 20-30 days old. The young grow body and flight feathers between 30-50 days (Baicich and Harrison 1997). Because of the fairly long egg-laying interval, the young are substantially different in size and age (Johnsgaard 1990). This usually leads to the older nestling killing the younger (Johnsgaard 1990, Palmer 1988, Ryser 1985). The female feeds young on food brought by the male, until the chicks are able to feed themselves (about 40 days) (Baicich and Harrison 1997). After young are half-grown, both parents bring food (Kaufman1996 and Baicich and Harrison 1997). The age at first flight ranges anywhere between 59-84 days (Baicich and Harrison 1997, Kaufman 1996, Johnsgaard 1990, Palmer 1988). Even after fledging the young may remain largely dependent upon their parents for as much as 11 weeks afterward (Johnsgaard 1990).

Conservation Status

The Golden Eagle has been federally protected since 1962 by the Eagle Act after more than 20,000 were destroyed in 10 years, mostly by sheep ranchers through shooting, trapping, and poisoning in spite of little evidence of livestock depredation (Ehrlich et al. 1988). Today, governors of states can still request permission to take Golden Eagles for any period deemed necessary to protect livestock, but not by aircraft or poison (Palmer 1988). Other threats include electrocution, poisoned baits intended for coyotes, habitat modification or human disturbance, and continued shootings (Clark 1987, Ehrlich et al. 1988, Palmer 1988).

Electrocution can be prevented by adding perches above the wires and separating the wires (5-ft min.) so they cannot be bridged (shorted out) by eagles (Olendorff et al. 1981).

Despite these threats, current population levels are thought to be fairly stable, although undoubtedly have declined from historical records (Clark 1987).

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RINGTAIL
Bassariscus astutus

Distribution

The ringtail is found in the U.S. from southwestern Oregon, California, southern Nevada, Utah, western Colorado, and southern Kansas through Arizona, New Mexico, Oklahoma, Texas, Louisiana, and Arkansas (Allen 1995, Poglayen-Neuwal and Toweill 1988, Nowak 1991, Whitaker 1997).

The ringtail is found in Washington, Kane, San Juan, Sevier, Emery, Juab, Uintah, Duchesne, and Tooele Counties (Oliver 1997). Two subspecies occur in Utah, *B. a. arizonensis* is found generally east of the Green and Colorado rivers and *B. a. nevadensis* is generally west of the Colorado and Green rivers (Durrant 1952).

Habitat

Ringtails live in dry habitats from sea level to about 9,200 ft, but seldom more than one-quarter mile from a water source (Nowak 1991, Wassink 1993, Zeveloff 1988). They inhabit broken, semi-arid country characterized by oak (*Quercus*), pinyon pine (*Pinus edulis*), or juniper (*Juniperus*) woodland. They may also inhabit montane conifer forests, chaparral, desert, and dry tropical habitats, provided there are rocky outcroppings, canyons, or talus slopes present (Poglayen-Neuwall and Toweill 1988, Oliver 1997, Whitaker 1997, Zeveloff 1988).

Food and Foraging Behavior

Diet: Principal food items are arthropods (grasshoppers, crickets, spiders, centipedes, scorpions) mammals, and fruits (persimmons, juniper berries, hackberries, mistletoe, prickly pear) (Allen 1995, Burt and Grossheider 1976, Poglayen-Neuwall and Toweill 1988, Wassink 1993, Whitaker 1997). Mammals are eaten mostly during the winter and typically include rodents, rabbits, squirrels, as well as carrion. They will also eat birds, eggs, reptiles (chiefly lizards and snakes), acorns, nectar, and occasionally frogs and fish.

Behavior: Ringtails are chiefly nocturnal and rarely active in the daytime (Burt and Grossenheider 1976, Poglayen-Neuwall and Toweill 1988, Wassink 1993). Of 390 observations at a feeding station, 93.6% were after dusk and 6.4% occurred during dusk (Trapp 1978). The tail of the ringtail is flared and is carried over the back making the animal appear larger. They are extremely agile (its hind foot can rotate at least 180 degrees), they run and climb easily, but usually ambush their prey, pouncing and forcing the animal down with their forepaws, then delivering a fatal bite to the neck (Nowak 1991, Wassink 1993, Whitaker 1997, Zeveloff 1988).

Breeding Biology

Ringtails den most often in rock crevices, boulder piles, or talus, but also uses hollows in trees and under roots, burrows dug by other animals, brush piles, the ruins of old Indian dwellings, and rural buildings (Nowak 1991, Poglayen-Neuwall and Toweill 1988, Wassink 1993, Whitaker 1997). They change dens frequently (sometimes daily).

The breeding season extends from February into May, but most breeding occurs in March and April (Nowak 1991, Poglayen-Neuwall and Toweill 1988, Wassink 1993). Ringtails are polygamous with no evidence of persistent pair bonds (Wassink 1993). Heat lasts only 24 hours, and the gestation period ranges from 51-54 days with parturition occurring from April to July but usually in May or June. Litter size ranges from one to four with five being rare. They have only one litter per year (Burt and Grossenheider 1976).

Newborns are altricial with sealed eyelids, closed ear canals, and with fuzzy hair on their back. Their ears open after 19-31 days and the eyes open at 21-34 days. They begin to eat solid food at 30 to 40 days, when the male joins the female in bringing food to the den. The young will begin to forage with the adults between 60 and 100 days. At 6 weeks they are fully furred and are able to walk. At 8 weeks, young can climb and at 4 months are completely weaned, dispersing in late fall/early winter when they begin to den separately and hunt independently. Young ringtails are at full size in about 30 weeks and sexual maturity is attained in both sexes at approximately 10 months (Burt and Grossheider 1976, Nowak 1991, Poglayen-Neuwall and Toweill 1988, Wassink 1993, Whitaker 1997, Zeveloff 1988).

Conservation Status

The ringtail is listed in Utah by UDWR as a species of Special Concern based on limited distribution. Due to the fact that the ringtail is very elusive and secretive, it has been difficult to study and special efforts must be made in order to successfully trap this species (Oliver 1997). Threats in Utah, are not fully understood, but probably include predator control activities, trapping, shooting, and habitat loss through urbanization. Natural predators include the Great Horned Owl (primary predator), coyotes, raccoons, and bobcats (Poglayen-Neuwall and Toweill 1988, Whitaker 1997, Zeveloff 1988).

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GIANT FOUR-WING SALTBUSH

Atriplex canescens* var. *gigantea

Description

Giant four-wing saltbush (ATCAGI) is a wind-pollinated evergreen shrub of the Chenopodiaceae family, mainly 8-20 dm tall, not especially armed; leaves persistent, alternate, sessile or nearly so, 10-40 mm long, 2-8 mm wide, linear to oblanceolate, oblong, or obovate, entire, retuse to obtuse apically; staminate flowers yellow, in clusters 2-3 mm wide in panicles; pistillate flowers borne in panicles 5-40 cm long; fruiting bracts 9-25 mm long and as wide, on pedicels 1-8 mm long, with 4 prominent wings extending the bract length, united throughout, the surface of wings and body smooth or reticulate; wings dentate to entire, the apex toothed; seeds 1.5-2.5 mm wide; 2n = 18; presence of adventitious roots at buried, elongated internodes (Welsh et al. 1993).

Distribution and Habitat

ATCAGI grows in the inter-dune valleys of the Lynndyl sand dunes in Juab County, Utah, and at UTTR-S. ATCAGI survives being buried by the shifting dunes by producing adventitious roots along the stem and by continued growth above the sand (Welsch et al. 1993). Most areas that have resident populations of ATCAGI receive less than 15 inches of annual rainfall and occur in elevations between 670-2380 meters above sea level (Welsh et al. 1993). ATCAGI is a halophyte, being highly tolerant of high salt concentrations in the soil, enabling it to survive severe drought conditions (Glen et al. 1996 and 1998, Wilkins and Klopatek 1984). It is also tolerant of high alkalinity conditions (Ostyina et al. 1984).

Importance

Wildlife: four-wing salt bush (normal variety) has long been recognized as one of the most important browse plants for western range lands (McKell et al. 1972). In Utah, it produces abundant and nutritious forage as well as seeds (Ostyina et al. 1984). Wildlife such as deer, antelope, rabbits and other rodents utilize this high-protein shrub as a primary food source. It also provides a vital cover type for upland game birds such as ring-necked pheasant, California quail, and gray partridge (Shaw et al. 1984). As a year-round forage plant, its value to grazing animals is greatest in cold desert ecosystems during the fall and winter (Ostyina et al. 1984).

Reclamation: Besides an important food source, the four-wing salt bush (normal variety) is also a valuable tool for the reclamation of disturbed, damaged, and over-grazed areas (Carlson 1984, Wilkins and Klopatek 1984). The saltbush is an excellent soil stabilizer and is often planted in alluvial fans to help hold sediments (McKell et al. 1972). Range managers often use the saltbush in mixed plantings with grasses like the crested wheat grass to restore depleted rangelands (Ostyina et al. 1984). It has been found to significantly increase the production of grass growing in association with

shrubs (Shaw et al. 1984). Four-wing saltbush is also used to reclaim areas disturbed by the mining industry (Welsh et al. 1993).

Seed: Its value as a food source and a tool of reclamation has led to a great demand for four-wing saltbush seed by both private and government interests. The most desirable and expensive seed is obtained by harvesting wild stands of saltbush, but this cannot keep up with demand (Carlson 1984). Now there are people growing the four-wing saltbush in organized orchards that produce greater yields of seed. The saltbush grows easily and quickly from seed, but can also be propagated from cuttings.

Special Considerations

Although it is used to re-seed depleted rangelands four-wing saltbush is vulnerable to over-grazing practices. Jackrabbits can also over-graze stands when other food sources are depleted (Young et al. 1984). Grasshopper infestations can severely damage stands as well. The most serious threat to *A. canescens* is hybridization with *Atriplex confertifolia* (shadscale) and some species of sagebrush (*Artemesia* spp.) (Welsh et al. 1993).

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SHORT-EARED OWL
Asio flammeus

Distribution

The Short-eared Owl breeds from northern Alaska and northern Yukon to northern Quebec and Labrador, south to central California, northern Nevada, Utah, Kansas, Missouri, northern Ohio, northern Virginia, and New Jersey (DeGraaf and Rappole 1995). The Short-eared Owl winters generally in the breeding range from southern Canada south to Mexico. Individuals in Puerto Rico, Hispaniola, and South America are resident. The Short-eared Owl is especially found throughout the northern and central valleys of Utah where marshes and wet pastures are present (Hayward et al. 1976).

Habitat

The Short-eared Owl primarily inhabits marshlands and open grasslands, but also tundra, open fields, forest clearings, sagelands, deserts, sparse shrub steppe, pastures, prairies, lower mountain slopes, canyons, arroyos, dunes, meadows, and other open habitats (DeGraaf and Rappole 1995). In winter, it prefers open areas such as in grain stubblefields, small hay meadows, pastures, coastal dunes, inland or coastal marshes and shrubby areas (Kaufman 1996, Johnsgaard1988). Winter roosts typically are characterized by providing shelter from the weather, close proximity to hunting areas and relative freedom from human disturbance (Clark 1975).

Special habitat requirements include a combination of extensive open marshlands or grasslands that support high numbers of small rodents (DeGraaf and Rappole 1995, Kaufman 1996) and substantial areas of suitable resting and nesting cover (Cramp 1985).

Food and Foraging Behavior

Diet: Short-eared Owls prey primarily on rodents (especially voles), but also eats shrews, rabbits, gophers, bats, muskrats, large insects (DeGraaf et al. 1991) and birds (Kaufman 1996). In his study of analyzing over 10,000 pellets from short-eared owls in N.A., Clark (1975) found that 94.8% was identified as mammalian prey (61% were *Microtus* voles), 5.1% were birds. The bird species included various sandpipers, Killdeer, Western Meadowlark, Horned Lark, Red-winged Blackbird, Virginia Rail, Vesper Sparrow, juncos, American Robin, terns, Savannah Sparrow, American Pipit, Fox and White-throated Sparrows, woodpecker, flicker, kinglets, Hermit Thrush, Sora, Yellow-bellied Sapsuckers (Clark 1975, Bent 1961).

Behavior: Short-eared Owls hunt by flying into the wind (when present), low over the ground, usually less than 2 meters above the vegetation, often hovering before quickly descending vertically on the prey (Bent 1961, Johnsgaard 1988, Kaufman 1996). They also will hover for periods as long as 30 seconds, examining the ground below for prey

(Ryser 1985, Johnsgaard 1988). They also still-hunt, from a perch or the ground, watching over areas for prey and then flying out to pounce upon it (Bent 1961, Ryser 1985, Johnsgaard 1988). Short-eared owls find prey mostly by sound but also by sight (Kaufman 1996). They hunt mostly during late afternoon and early evening, but will also hunt during the day or late at night if unable to catch enough food at dusk (Bent 1961, Johnsgaard 1988, Kaufman 1996).

Migration

The short-eared owl is especially migratory in the northern part of its range where the deep snow makes it extremely difficult for the owls to obtain voles (Ryser 1985). There is also evidence of the birds being nomadic, often congregating in areas where population densities of voles are high (Kaufman 1996, Johnsgaard 1988). They are also known to irrupt periodically due to the four-year cycle of boreal small mammals such as tundra and grassland rodents (Ehrlich et al. 1988). The number of short-ears breeding in a locality can therefore vary greatly from year to year, depending upon the food supply.

Breeding Biology

Breeding season: Begins as early as March to as late as August (Johnsgaard 1988), but usually begins in April and ends by early June (Baicich and Harrison 1997). Usually single-brooded, but double-brooded when food is plentiful. Replacement of lost clutches are also fairly common (Mikkola 1983, Cramp 1985). Courtship displays by the male include spiraling up into the air, hovering while making short, rapid hoots, then diving while clapping his wings together loudly under his body (Kaufman 1996).

Nest: Sites are selected in various open-country, but usually well-vegetated habitats, on dry ground, often on a raised hummock or ridge (especially in marshy country), sheltered by tall grass, reeds, or bushes (Bent 1961, Baicich and Harrison 1997, Kaufman 1996). Of 63 sites tabulated by Clark (1975), over half were in grasslands, about a quarter in grain stubble, and the rest were located in hay fields or low perennial vegetation. Tall and rank vegetation, such as cord grasses (Spartina) and alfalfa (Medicago) appear to be preferred cover plants. The female builds the nest as a shallow depression on the ground, lined with grass, weed stalks, and feathers (Baicich and Harrison 1997, Kaufman 1996) or sometimes as cups of dried weeds and/or flattened grasses, or with a canopy of tall grasses above it (Peck and James 1983). The nest may be entirely exposed to light in an open field or marsh or partly hidden by a clump of grasses or weeds (Bent 1961).

Eggs and Incubation: Clutch size ranges usually from 4-8 eggs (up to 14 when food is abundant)(Baicich and Harrison 1997). Murray (1976) reported that the average clutch size of 186 North American nests was 5.61 eggs. Eggs are laid at 1-2 day intervals, occasionally longer (Johnsgaard 1988, Baicich and Harrison 1997). They are white and smooth before becoming nest-stained (Baicich and Harrison 1997, Kaufman 1996).

Incubation requires 24-37 days and is done mostly if not solely by the female (Kaufman 1996), however there have been some reports of both sexes incubating (Johnsgaard 1988).

Young: At hatching are altricial and downy (Baicich and Harrison 1997) and after 3-4 days can support themselves upright and begin to beg for food by wing flapping and uttering calls (Johnsgaard 1988). They have a rapid development rate with their eyes fully open at 8-9 days and by 10 days weighing more than 10 times their original hatching weight. The female broods and feeds the young while the male provides most of the food (Baicich and Harrison 1997, Kaufman 1996) Young may leave the nest at 12-18 days on foot and can fly at 24-36 days (Baicich and Harrison 1997, Kaufman 1996, Johnsgaard 1988). During the time before fledging, they may venture as far as 200 meters from the nest (Johnsgaard 1988), and owe their protection from some predators to their cryptic coloration (Bent 1961). If the nest is threatened, adults may fly at intruder, making a loud wing-clap or may ruffle up their feathers with wings spread out and tilted forward to make them look as large as possible to intimidate a possible predator (Kaufman 1996).

Conservation Status

The short-eared owl is considered a species of special concern in Utah by UDWR due to declining populations. The decline of this species, especially in the southern portions of its range, is primarily due to habitat loss. In western North America, loss of marshes and overgrazing or conversion of native prairie to croplands has resulted in dramatic declines since the 1930s (DeGraaf and Rappole 1995).

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
HILL AIR FORCE BASE INSTALLATION LANDS

BONNEVILLE CUTTHROAT TROUT

Oncorhynchus clarki utah

General

The Bonneville cutthroat is one of fifteen subspecies of cutthroat trout. It is one of the three native trout species native to Utah along with the Yellowstone and the Colorado cutthroat subspecies (Lentsch et al. 1997). It has been designated as the state fish of Utah. The Bonneville species is the most rare of all the cutthroat subspecies. In fact, it was believed to be extinct as late as the 1960's (May et al. 1978). This species gets its name from Lake Bonneville that once covered parts of Utah, Nevada, Wyoming, Idaho, and Wyoming. The Bonneville species probably gained access to the lake when the Bear River changed its course from the Snake River to the Bonneville Basin 30,000 years ago (Sigler and Sigler 1987). As the lake retreated, the cutthroat was left isolated from other trout species in lakes, streams and rivers of the Great Basin.

The Bonneville cutthroat trout (BCT) is similar in appearance to the other cutthroat species especially the Yellowstone species. This is especially true if there has been any hybridization with other cutthroats. As with other subspecies, it has a red to orange "cut" mark on each branch of its lower jaw (Sigler and Sigler 1987). It is steel gray in color but has larger, more evenly distributed spots than other cutthroats. The tail is slightly forked. There are 8-11 rays on the dorsal fin and 10-11 rays on the anal fin. Young Bonneville cutthroats have 9-10 oval parr marks on the lateral line (Sigler and Sigler 1987). The most distinguishable characteristics of the BCT are: 61-62 vertebrae, 30-40 pyloric caeca, 18-20 gill rakers, 155-179 scales along the lateral lines, and the presence of basibranchial teeth in the throat between the jaws (White et al. 1974).

The Bonneville cutthroat taken from Utah Lake in the 19th century gained a length of 30 inches and weighed 16 pounds (May et al. 1978). Now restricted to smaller streams BCT rarely exceeds 12 inches in length or one pound in weight (Sigler and Sigler 1987).

Range

Historically, the Bonneville cutthroat was found in most streams and rivers in the Bonneville Basin that contained suitable habitat. After the disappearance of Lake Bonneville, lacustrine populations could be found in Panguitch, Bear, and Utah Lakes. Currently only Bear Lake contains lacustrine populations. Other populations are found in isolated headwaters of streams in Utah, Nevada, Idaho, and Wyoming. Currently there are 40 known and 15 suspected populations of the Bonneville cutthroat (Lentsch et al. 1997). Genetic testing is needed to confirm if populations are pure strains. The status of the BCT is native and natural, presence confident in Rich, Beaver, and Salt Lake Counties and probable in Cache County (Oliver 1997). In Washington and Juab counties the origin is unknown but presence is confident. The southern most range of the Bonneville cutthroat is the head water of the Santa Clara River drainage at Pine Valley Mountain in southern Utah (White et al. 1974).

Habitat Interspersion

As with other trout species, cutthroat require relatively cool, well oxygenated, clean water with minimal sediments (Lentsch et al. 1997). Cutthroat trout do well in high-altitude, cold clear lakes, as well as streams and rivers with suitable water quality. They may be found in elevations as high as 10,000 feet above sea level (Sigler and Sigler 1987). Pure populations are usually found in the headwaters of streams isolated by natural barriers that prevent genetic contamination by rainbow trout or other subspecies of cutthroat trout (Hickman 1978).

Food

The Bonneville cutthroat, like other trout species are opportunistic feeders (May et al. 1978). Diet varies dependent on what prey species are present. Insects and smaller fish are probably the most important food source because of their abundance in trout habitats. Hatchling fry subsist on zooplankton and micro-insects (Sigler and Miller 1963). Small trout will feed on small invertebrates like crustaceans and insects, both aquatic and terrestrial (Behnke 1979). May et al. (1978) examined the stomach contents of 39 BCT from Birch Creek, Utah. During the summer and fall, the stomachs contained a majority of terrestrial insects. About 50% of those were ants. In the winter and early spring, aquatic insects made up the majority of their diet. Sigler and Sigler (1987) found that large BCTs (20 to 30 in.) have diets of 90% fish. Large trout rely primarily on smaller fish but will also eat crawfish, snakes, and frogs where present (Sigler and Sigler 1987).

Reproduction

The Bonneville cutthroat spawn in the spring or early summer when water temperatures reach close to 50 degrees F (Sigler and Miller 1963). Exact spawn timing is dependent on elevation and water temperature (Lentsch et al. 1997). Cutthroat trout need cool, well oxygenated water with well sorted gravel containing minimal sediments in order to spawn successfully. The larger the body size of spawning trout, the larger the size of substrate used for spawning (Lentsch et al. 1997).

The female creates a nest (called a redd) in shallow riffles of small streams (Sigler and Sigler 1987). A typical redd is 24 inches long by 18 inches wide and is found in 7-10 inches of water. After being fertilized by the male, the eggs are covered with a shallow layer of substrate. Generally, females produce 1,000 eggs for every 1 pound of body weight (Sigler and Miller 1963).

Exact incubation time is not known for the BCT, but it is assumed to be similar to other cutthroat subspecies (about 30 days) (Lentsch et al. 1997). Hatch time may be increased or decreased by a few days by the variance of water temperature. As much as 90% of the eggs may hatch, but mortality of the fry is very high (Sigler and Miller

1963). Fry rely on yolk sacs for nutrition during their first two to three weeks. At 14 to 23 days of age, the fry will begin feeding (Sigler and Sigler 1987). Male cutthroat trout are sexually mature at 2 years and females mature at 3 years (May et al. 1978).

Special Considerations

The Bonneville cutthroat has several natural enemies including mink, raccoons, raptors, herons, cranes and larger fish. Mortality is high during the early stages of life, with only a few of the hundreds of fry from a nest reaching sexual maturity. Mortality decreases with growth but it is never eliminated, especially with fishing pressure from humans.

Historically, human predation was the most serious threat to the Bonneville cutthroat. Populations in Utah Lake were an important food source for resident Ute Indians. These people would gather at the mouths of streams and rivers like the Provo River during the spring when the cutthroat spawned. As the fish moved from the lake to the river, they were relatively easy to catch. When the pioneers settled Utah ca. 1850, they also found the cutthroat of Utah Lake to be an important food source. In 1864, an average net haul could yield 3,500 lbs. of fish, but by 1889 that same net haul averaged only 100 lbs. The last known BCT was taken from Utah Lake in 1933 (Behnke 1979).

Lentsch et al. (1997) determined that the threats to Bonneville cutthroat in Utah are:

- Habitat degradation through water development/diversion and livestock grazing
- Detrimental interactions including whirling disease and hybridization
- Over harvesting and inadequate regulation
- Other factors such as natural climatic events and socio-political pressure associated with managing a species recognized as sensitive by state and federal agencies.

Actions that have been initiated to eliminate or reduce these threats:

- Reintroduction, additional surveys and genetic analysis
- Habitat enhancement and habitat monitoring
- Control of nonnative fish

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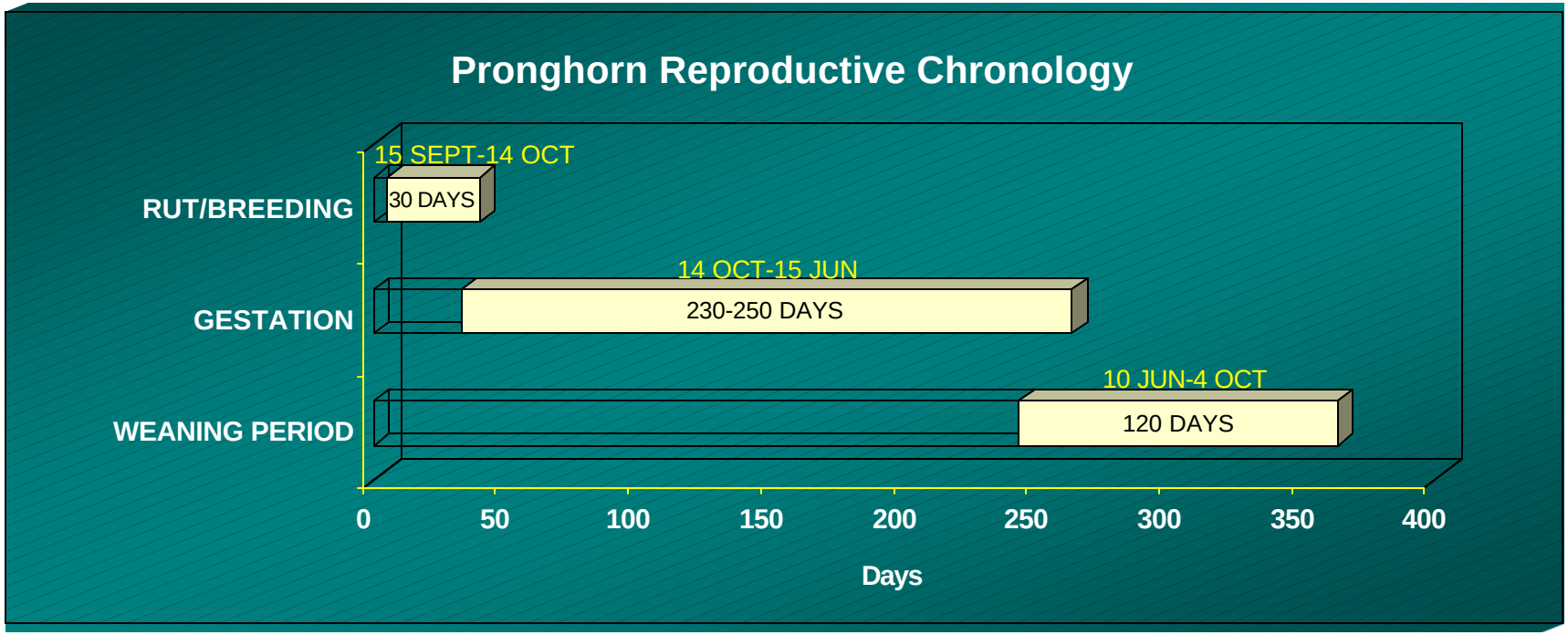
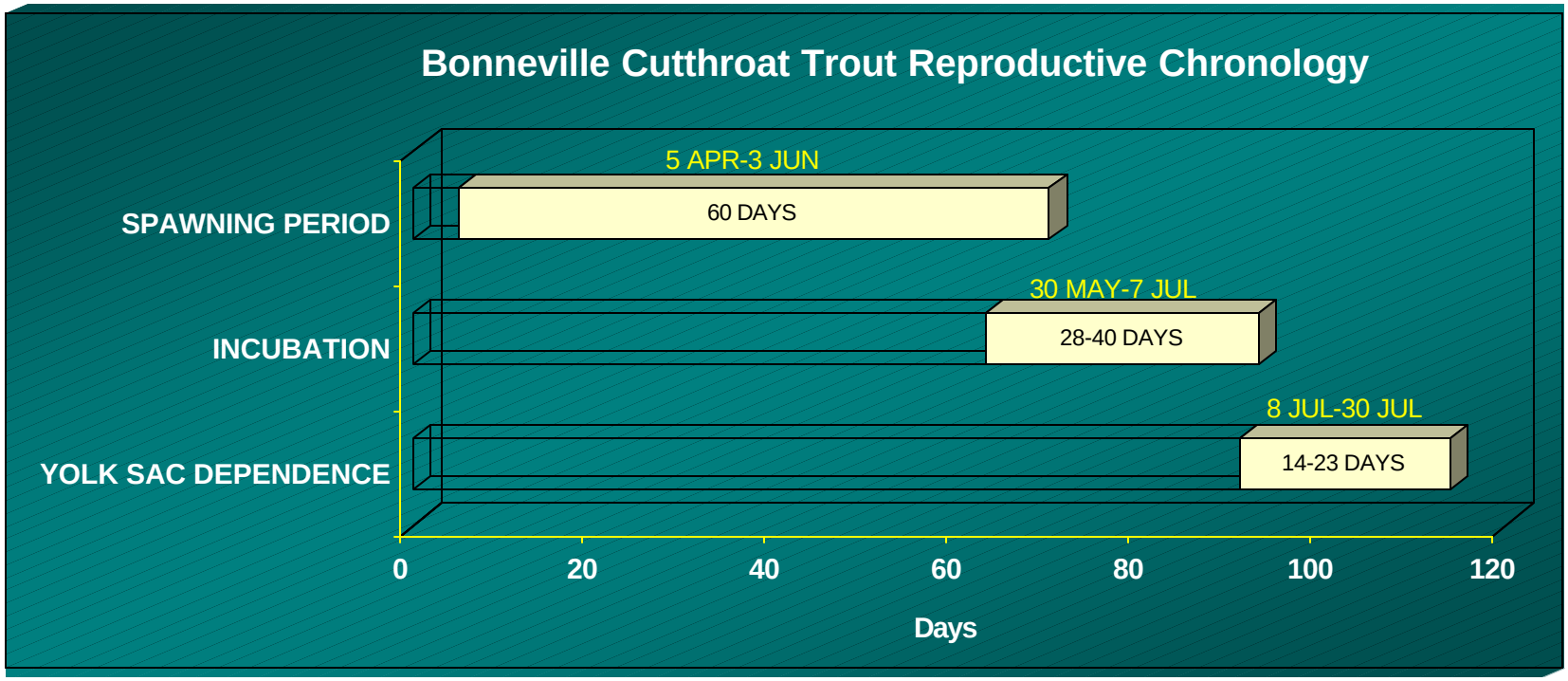
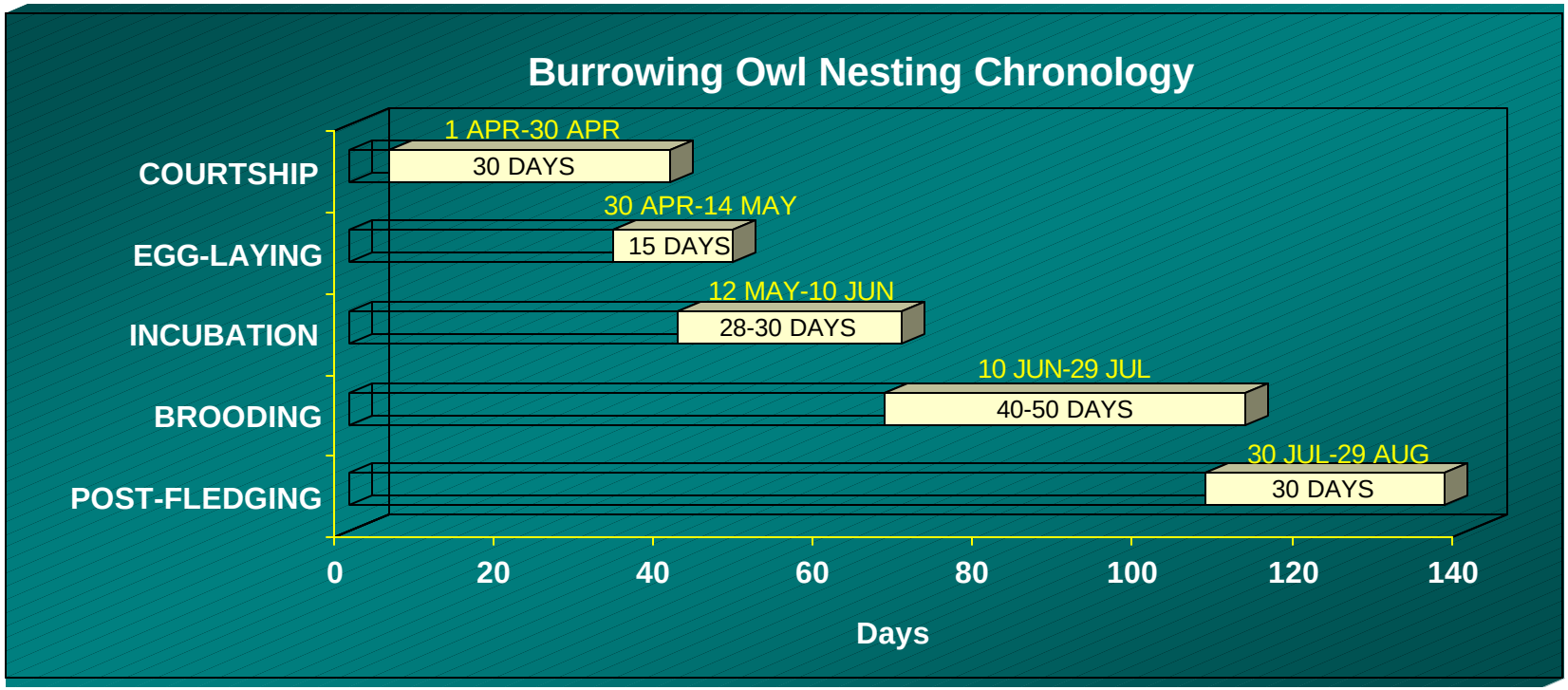
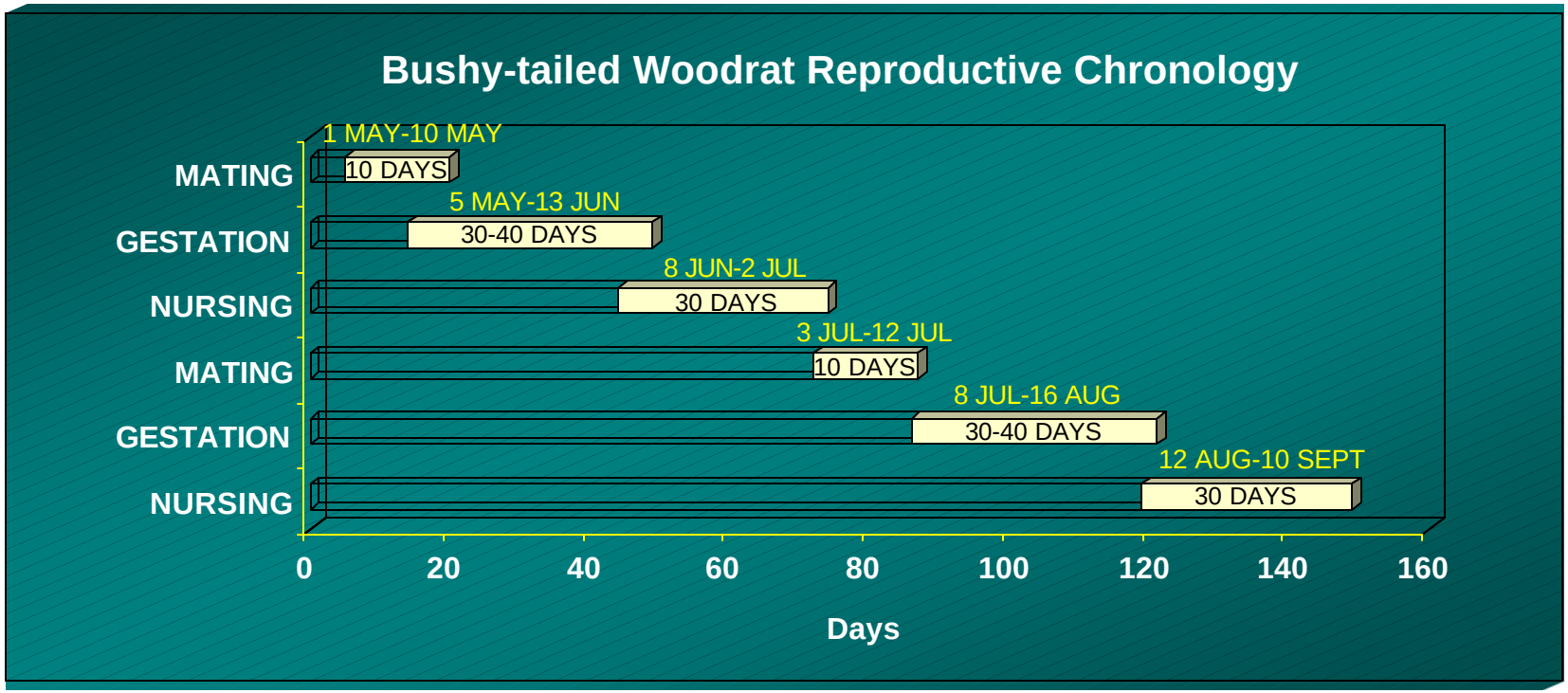
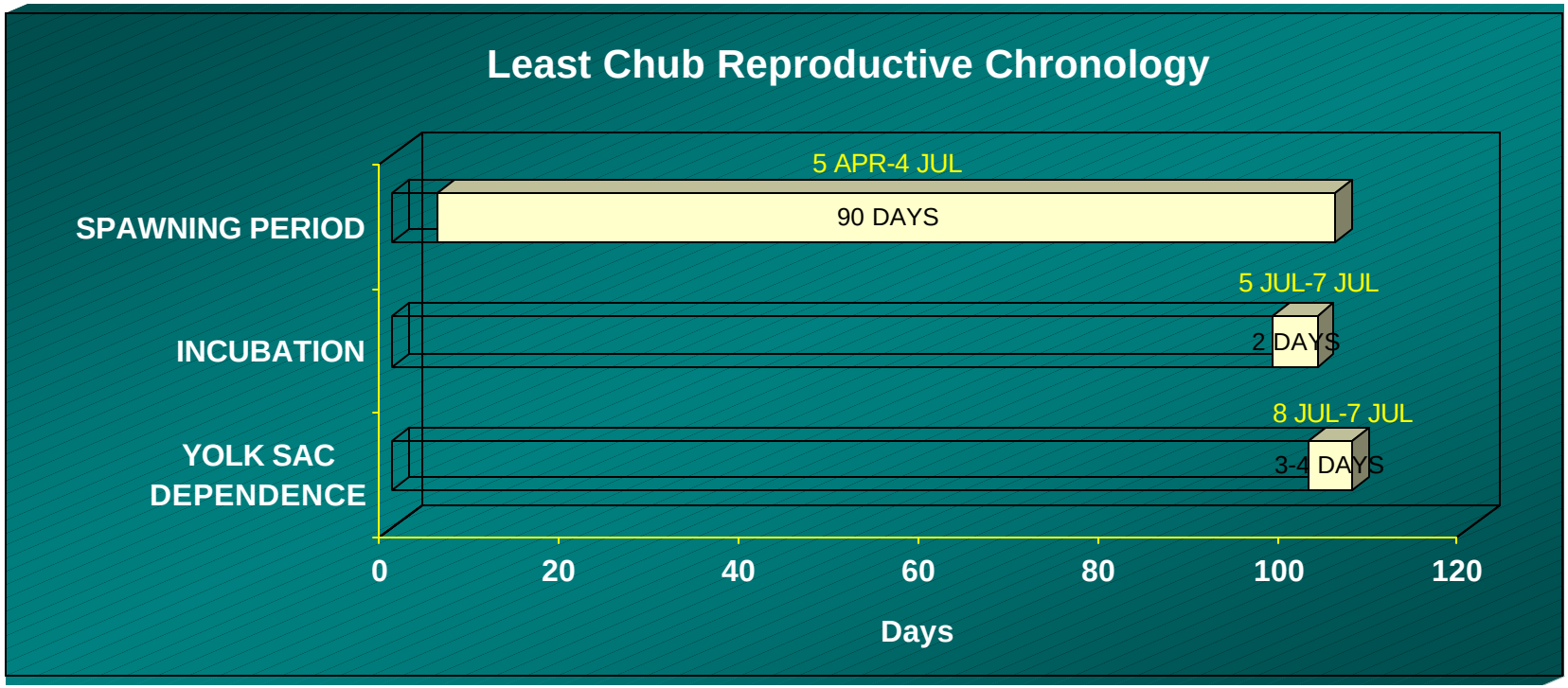
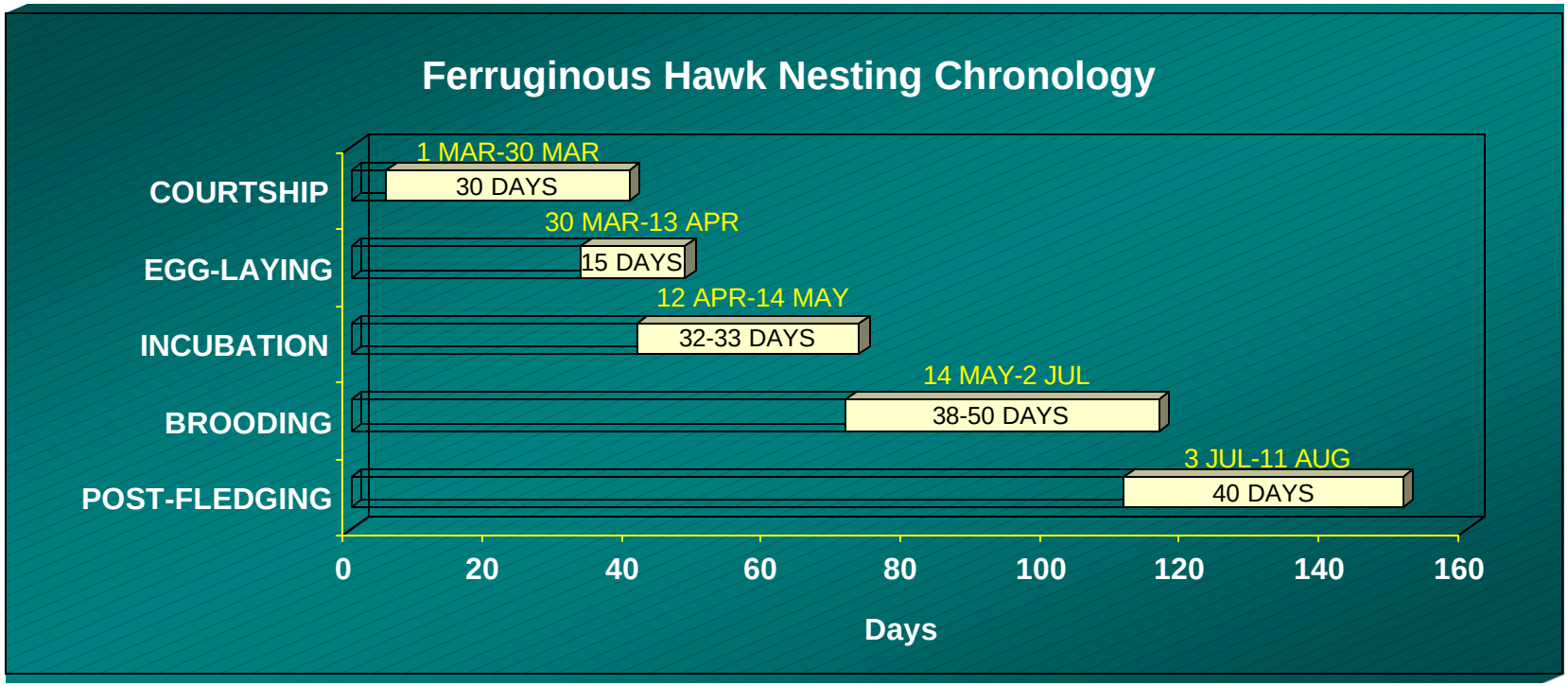

Pronghorn Reproductive Chronology
RUT/BREEDING
GESTATION
WEANING PERIOD
15 SEPT-14 OCT
30 DAYS
14 OCT-15 JUN
230-250 DAYS
10 JUN-4 OCT
120 DAYS
0
50
100
150
200
250
300
350
400
Days

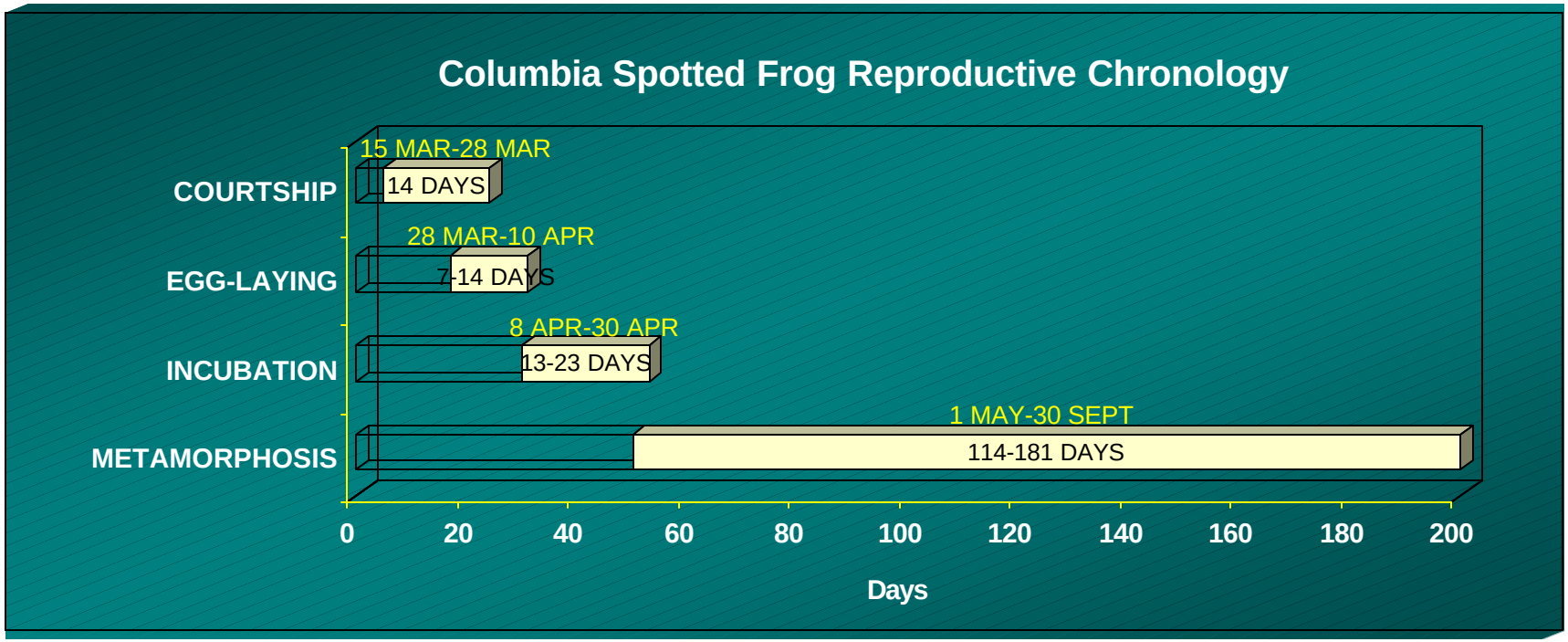

Bonneville Cutthroat Trout Reproductive Chronology
SPAWNING PERIOD
INCUBATION
YOLK SAC DEPENDENCE
5 APR-3 JUN
60 DAYS
30 MAY-7 JUL
28-40 DAYS
8 JUL-30 JUL
14-23 DAYS
0
20
40
60
80
100
120
Days

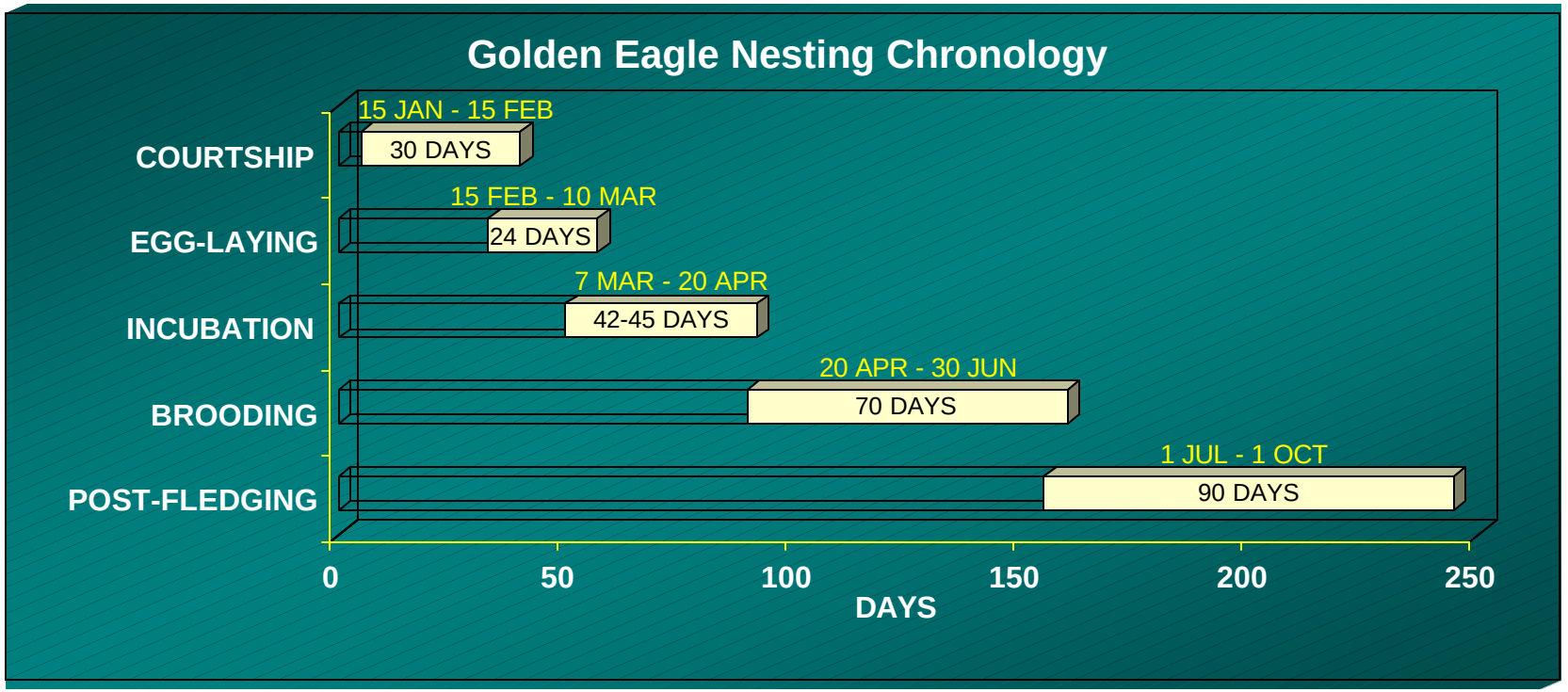

Burrowing Owl Nesting Chronology
COURTSHIP
EGG-LAYING
INCUBATION
BROODING
POST-FLEDGING
1 APR-30 APR
30 DAYS
30 APR-14 MAY
15 DAYS
12 MAY-10 JUN
28-30 DAYS
10 JUN-29 JUL
40-50 DAYS
30 JUL-29 AUG
30 DAYS
0
20
40
60
80
100
120
140
Days

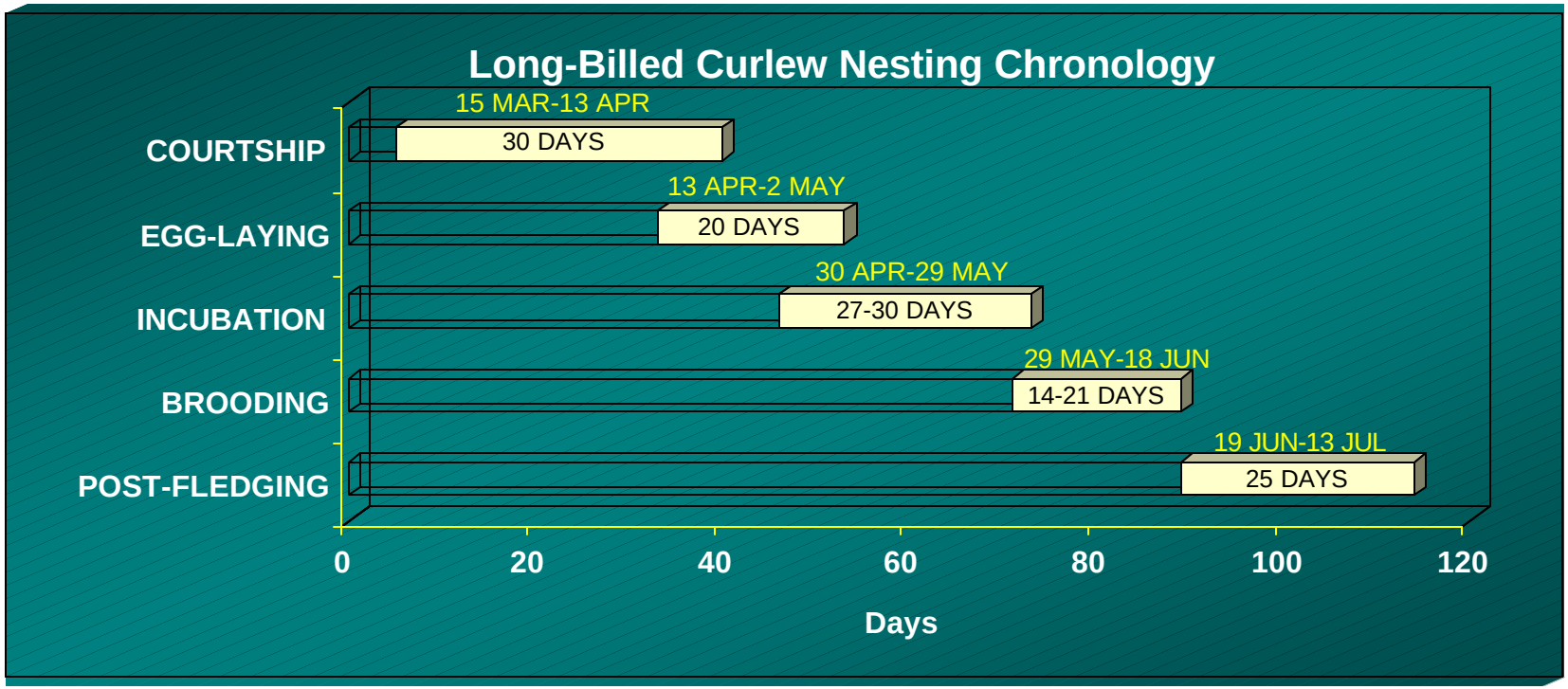

Bushy-tailed Woodrat Reproductive Chronology
MATING
GESTATION
NURSING
MATING
GESTATION
NURSING
1 MAY-10 MAY
10 DAYS
5 MAY-13 JUN
30-40 DAYS
8 JUN-2 JUL
30 DAYS
3 JUL-12 JUL
10 DAYS
8 JUL-16 AUG
30-40 DAYS
12 AUG-10 SEPT
30 DAYS
0
20
40
60
80
100
120
140
160
Days

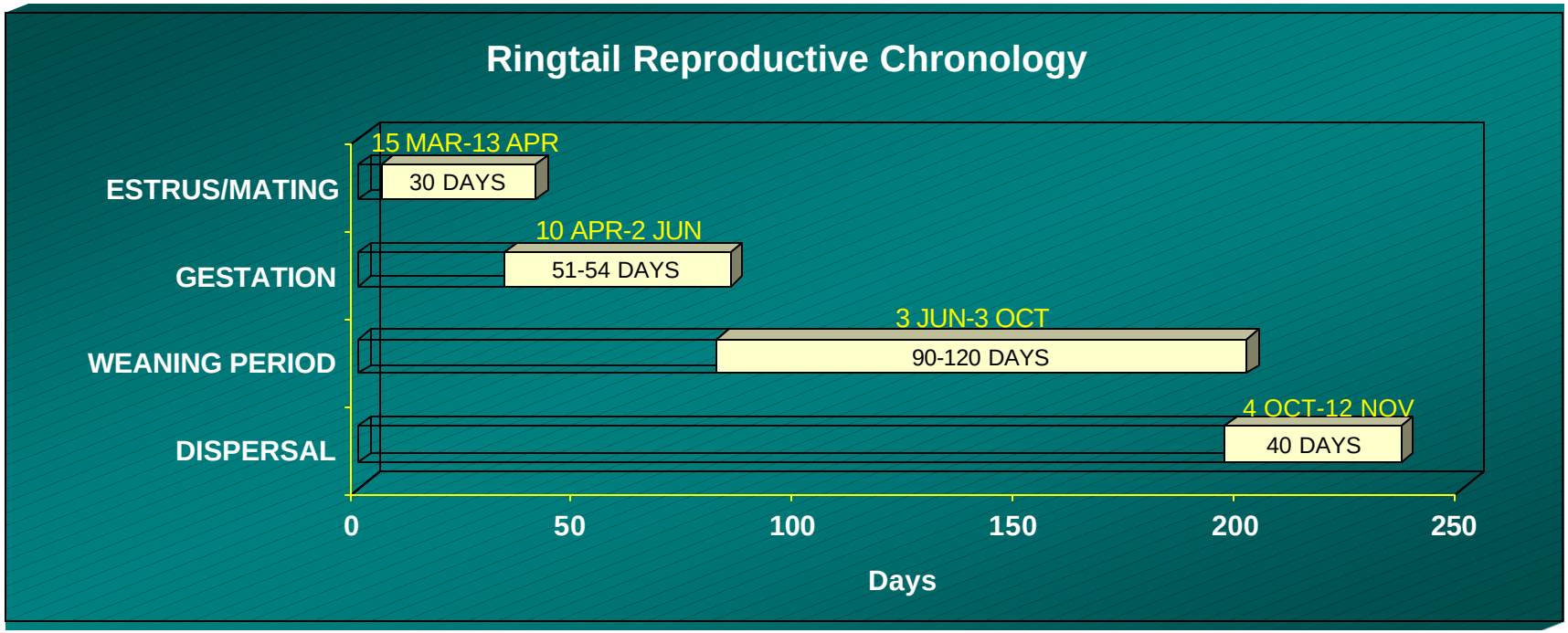

Least Chub Reproductive Chronology
SPAWNING PERIOD
INCUBATION
YOLK SAC DEPENDENCE
5 APR-4 JUL
90 DAYS
5 JUL-7 JUL
2 DAYS
8 JUL-7 JUL
3-4 DAYS
0
20
40
60
80
100
120
Days

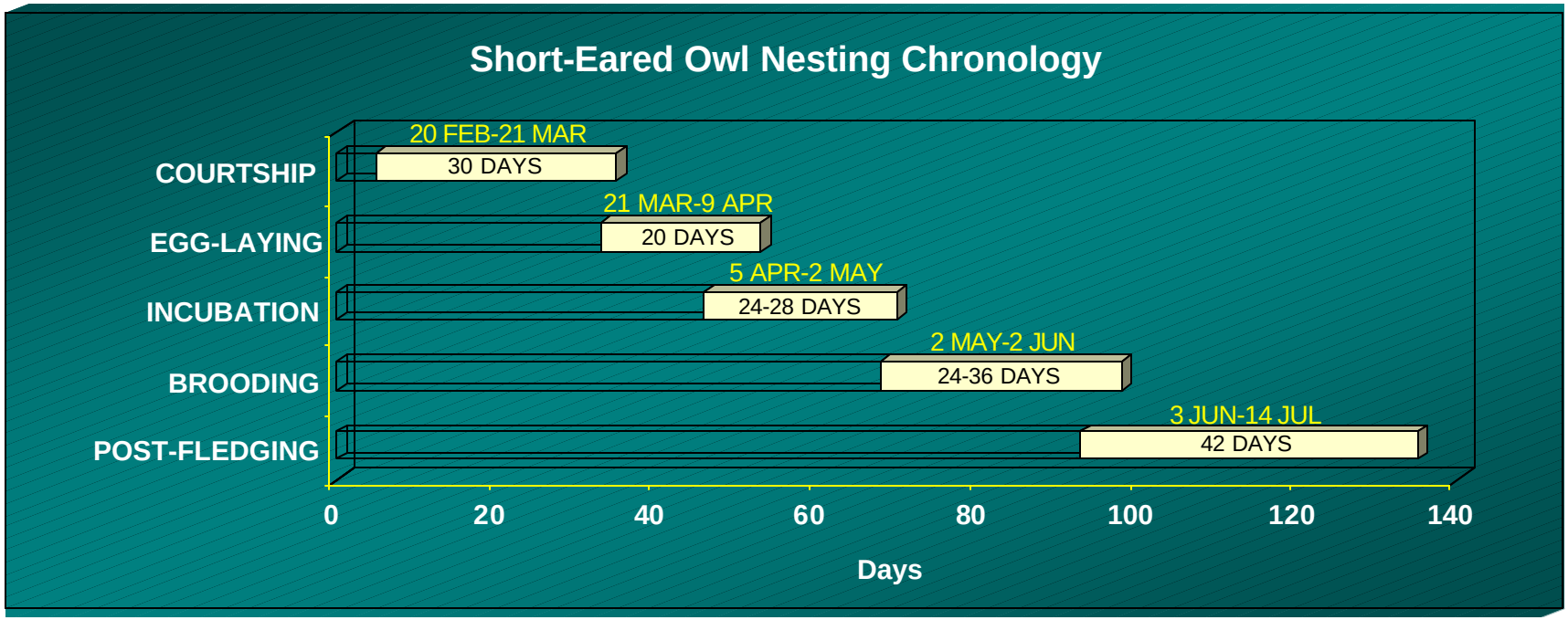

Ferruginous Hawk Nesting Chronology
COURTSHIP
EGG-LAYING
INCUBATION
BROODING
POST-FLEDGING
1 MAR-30 MAR
30 DAYS
30 MAR-13 APR
15 DAYS
12 APR-14 MAY
32-33 DAYS
14 MAY-2 JUL
38-50 DAYS
3 JUL-11 AUG
40 DAYS
0
20
40
60
80
100
120
140
160
Days


Columbia Spotted Frog Reproductive Chronology
COURTSHIP
EGG-LAYING
INCUBATION
METAMORPHOSIS
15 MAR-28 MAR
14 DAYS
28 MAR-10 APR
7-14 DAYS
8 APR-30 APR
13-23 DAYS
1 MAY-30 SEPT
114-181 DAYS
0
20
40
60
80
100
120
140
160
180
200
Days


Golden Eagle Nesting Chronology
COURTSHIP
EGG-LAYING
INCUBATION
BROODING
POST-FLEDGING
15 JAN - 15 FEB
30 DAYS
15 FEB - 10 MAR
24 DAYS
7 MAR - 20 APR
42-45 DAYS
20 APR - 30 JUN
70 DAYS
1 JUL - 1 OCT
90 DAYS
0
50
100
150
200
250
DAYS


Long-Billed Curlew Nesting Chronology
COURTSHIP
EGG-LAYING
INCUBATION
BROODING
POST-FLEDGING
15 MAR-13 APR
30 DAYS
13 APR-2 MAY
20 DAYS
30 APR-29 MAY
27-30 DAYS
29 MAY-18 JUN
14-21 DAYS
19 JUN-13 JUL
25 DAYS
0
20
40
60
80
100
120
Days


Ringtail Reproductive Chronology
ESTRUS/MATING
GESTATION
WEANING PERIOD
DISPERSAL
15 MAR-13 APR
30 DAYS
10 APR-2 JUN
51-54 DAYS
3 JUN-3 OCT
90-120 DAYS
4 OCT-12 NOV
40 DAYS
0
50
100
150
200
250
Days


Short-Eared Owl Nesting Chronology
COURTSHIP
EGG-LAYING
INCUBATION
BROODING
POST-FLEDGING
20 FEB-21 MAR
30 DAYS
21 MAR-9 APR
20 DAYS
5 APR-2 MAY
24-28 DAYS
2 MAY-2 JUN
24-36 DAYS
3 JUN-14 JUL
42 DAYS
0
20
40
60
80
100
120
140
Days

APPENDIX C

GLOSSARY OF TERMS

Agricultural Outleasing - The use of DoD lands under a lease to an agency, organization or person for growing crops or grazing animals.

Biological Diversity - The variety of life forms, the ecological roles they perform, and the genetic variability they contain within any defined time and space.

Cooperative Agreement - A written agreement between an AF installation and one or more outside agencies (Federal, state, or local) that coordinates planning strategies. It is a vehicle for obtaining assistance in developing natural resources programs.

Critical Habitat - Any air, land, or water area (excluding existing synthetic structures or settlements that are not necessary to the survival and recovery of a listed species) and constituents thereof that the USFWS has designated as essential to the survival and recovery of an endangered or threatened species or a distinct segment of its population.

Conservation Agreement -

Cropland - Land primarily suitable for producing farm crops, including grain, hay, and truck crops.

Ecosystem Management - An approach to natural resources management that focuses on the interrelationships of ecological processes linking soils, plants, animals, minerals, climate, water, and topography. Managers view such processes as a living system that affects and responds to human activity beyond traditional commodity and amenity uses. They also acknowledge the importance of ecosystem services such as water conservation, oxygen recharge and nutrient recycling.

Endangered Species - Any plant or animal listed as endangered by the Federal Government.

Exotic Species - Any plant or animal not native to a region, state, or country. (This definition excludes certain game species that have become established, such as pheasants.)

Fish - Fresh and salt water fin-fish, other aquatic vertebrate organisms, and crustaceans and mollusks.

Forest Land - Land on which forest trees of various sizes constitute at least 10 percent of the area. This category includes open land that is capable of supporting trees and is planned for forest regeneration and management.

Forest Management - Developing, conserving, and protecting forest resources to ensure that they provide sustained yield and multiple use.

Forest Products - Plant materials in wooded areas that have commercial value, such as sawlogs, veneer (peeler) logs, poles, pilings, pine needles, cordwood (for pulp, paper, or firewood), fence posts, mine timber, Christmas trees (from unsheared trees cut during intermediate harvests), and similar wood or chemical products.

Game - Any species of fish or wildlife for which state or federal laws and regulations prescribe hunting seasons and bag or creel limits.

Genetic diversity –variation of heritable traits within a particular species. Genetic diversity exists at three levels. (1) genetic variation within a single individual, (2) variation among individuals within a population, and (3) variation among different populations.

Grazing Land - Land with vegetative cover that consists of grasses, herbs and shrubs valuable as forage.

Grazing Systems - Specialized methods of grazing management (the manipulation of livestock grazing to accomplish a desired result) that define systematically recurring periods of grazing and deferment for pastures or management units.

Habitat - An area that provides the environmental elements of air, water, food, cover, and space necessary for a given species to survive and reproduce.

Highly Erodible Soils - Soils that, because of their physical properties or slope, the US Department of Agriculture, Natural Resources Conservation Service, identifies as being highly susceptible to wind or water erosion.

(1)Improved Grounds - Grounds on which personnel annually plan and perform intensive maintenance activities. These are developed areas of an installation that have lawns and landscape plantings that require intensive maintenance. They usually include the cantonment, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, and housing areas.

(2)Improved Grounds- Improved grounds are associated with developed areas on HAFB that have lawns and ornamental landscape plantings that require intensive maintenance programs.

Integrated Natural Resources Management Plan (INRMP) - A natural resources management plan based on ecosystem management that shows the interrelationships of the individual component plans as well as mission and land use activities affecting the basic land management plans.

Integrated Pest Management (IPM) - A planned program incorporating continuous monitoring, education, record-keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. IPM includes methods such as habitat modification, biological control, genetic control, cultural methods, mechanical control, physical control, regulatory control and the judicious use of least-hazardous pesticides.

Conservation Units?

Land Management Unit - The smallest land management division that planners use in developing specific strategies to accomplish natural resources management goals. Land management units may correspond to grazing units on agricultural outleased lands, stands or compartments on commercial forest lands, various types of improved grounds (for example, athletic fields, parks, yards in family housing, or landscaped areas around administrative buildings), or identifiable semi-improved grounds (for example, airfield areas, utility rights-of-way, or roadside areas).

Land-Use Regulation - A document that prescribes the specific technical actions or land use and restrictions with which lessees, permittees or contractors must comply. It derives from the grazing or cropland management plan and forms a part of all outleases, land use permits, and other contracts.

Livestock - Domestic animals kept or raised for food, by-products, work, transportation or recreation.

Memorandum of Understanding – A framework for cooperative activities between an AF installation and one or more outside agencies (Federal, state, or local).

Natural Resources Management Professional - A person with a degree in the natural sciences who manages natural resources on a regular basis and receives periodic training to maintain proficiency in that job.

"No Funds" Service Contract - An agreement by which a party performs a land management service for a consideration other than funds. Such a contract exists, for example, when a party hired to establish, control, or remove vegetative cover or growth agrees to take payment for the service in the form of the growth that results.

Non commercial Forest Land - Land not capable of yielding forest products of at least 20 cubic feet per acre a year because of adverse site conditions. The classification also includes productive forest land on which mission requirements, accessibility, or non-compatible uses preclude forest management activities.

Outdoor Interpretation - Observing and explaining the history, development, and significance of our natural heritage and natural resources.

Outdoor Recreation - Recreation that relates directly to and occurs in natural, outdoor environments.

Outdoor Recreation Resources - Land and water areas and associated natural resources that provide, or have the potential to provide, opportunities for outdoor recreation for present and future generations.

Prime Farmland - Land that has the best combination of chemical and physical characteristics for producing food, feed, forage, fiber, and oil-seed crops and is also available or potentially available for these uses. It has the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops under modern farming methods. Existing pasture land, rangeland, forest land, and other land not in an urban buildup condition is considered eligible for designation as prime farmland, providing it meets the other criteria.

Rangeland - Land on which the native vegetation is predominantly grasses, grass-like plants, herbs, or shrubs suitable for grazing or browsing use. It includes lands revegetated naturally or artificially to provide a forage cover that is managed like native vegetation. It also includes natural grasslands, savannas, shrubland, most deserts, tundra, alpine communities, coastal marshes and wet meadows.

Recreation Carrying Capacity - The level of recreational use that an area can sustain without damage to the environment.

(1)Semi-Improved Grounds - Grounds where personnel perform periodic maintenance primarily for operational and aesthetic reasons (such as erosion and dust control, bird control, and visual clear zones). These usually include grounds adjacent to runways, taxiways and aprons; runway clear zones; lateral safety zones; rifle and pistol ranges; picnic areas; ammunition storage areas; antenna facilities; and golf course roughs.

(2)Semi-Improved Grounds - Semi-improved grounds are areas where periodic maintenance is performed primarily for operational and aesthetic reasons. These usually include grounds adjacent to runways, taxiways, aprons, runway clear zones, lateral safety zones, rifle and pistol ranges, picnic areas, ammunition storage areas, antenna facilities, and similar areas.

Species Richness – The Number of different kinds of species within a given area.

Stewardship - The management of a resources base with the goal of maintaining or increasing the resources' ' value indefinitely into the future.

Threatened Species - Those federally listed species of flora and fauna that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range and that have been designated for special protection and management pursuant to the Endangered Species Act.

(1)Unimproved Grounds - Grounds normally managed by the natural resources staff on an installation or in firing ranges or annexes in support of the AF mission and to achieve integrated resources goals defined in the INRMP. All grounds not expressly defined as improved or semi-improved are unimproved. Unimproved grounds include weapons firing and bombing ranges; forest lands; croplands and grazing lands; grasslands or ranges; lakes, ponds, and wetlands; and areas in the airfield beyond the safety zones.

(2)Unimproved Grounds - Unimproved grounds are lands maintained once a year and not included in improved or semi-improved ground categories. These areas include: weapon ranges, forest lands, agricultural and grazing lands, lakes, ponds, wetlands, and areas beyond safety zones.

Unique Farmland - Land, other than prime farmland, used for producing specific high-value food and fiber crops at the time of designation. It has the special combination of soil quality, location, growing season and moisture supply needed to produce sustained high-quality or high yields of a specific crop under modern farming methods. Examples are citrus, tree nuts, olives and cranberries.

Urban Forests - Planted or remnant native tree species existing within urbanized areas such as parks, tree-lined residential streets, scattered tracts of undisturbed woodlands, and cantonment areas.

Watchable Wildlife Areas - Areas identified under the Watchable Wildlife Program as suitable for passive recreational uses such as bird watching, nature study, and other non-consumptive uses of wildlife resources.

Wetlands - Areas inundated or saturated by surface or ground water at a frequency and a duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

APPENDIX D

ABBREVIATIONS

ACMI - Air Combat Maneuvering Instrumentation
AES - Agricultural Extension Service
AFB - Air Force Base
AFLC - Air Force Logistic Command
AFMC - Air Force Materials Command
AFR - Air Force Regulations
AGL - Above Ground Level
AICUZ - Air Installation Compatible Use Zone
ALC - Air Logistics Command
ANG - Air National Guard
AUM - Animal Unit Months
BASH - Bird Aircraft Strike Hazard
BCP - Base Comprehensive Plan
BLM - Bureau of Land Management
CATEX - Categorical Exclusion
CEER - Real Property Office
CEMGB - Pest Control Shop
CEMGG - Grounds Maintenance Shop
COE - U.S. Army Corps of Engineers
CR - Directorate of Competition Advocacy
CWA - Clean Water Act
DLA - Defense Logistics Agency
DoD - Department of Defense
DS - Directorate of Distribution
EIS - Environmental Impact Statement
EM - Environmental Management
EMX - Resource Management Office
FM - Directorate of Financial Management

GSL - Great Salt Lake

HAFB - Hill Air Force Base

HAFR - Hill Air Force Range

HQ - Headquarters

ICBM - Intercontinental Ballistic Missile

IRP - Installation Restoration Program

IM - Inventory Management

MAJCOM - Major Commands

MOA - Military Operation Area

MOU - Memorandum of Understanding

MSL - Mean Sea Level

MWR - Morale, Welfare, and Recreation

NAF - Non-Appropriated Funds

NEPA - National Environmental Policy Act

NPDES - National Pollution Discharge Elimination System

NPS - National Park Service

OOALC - Ogden Air Logistics Center

PMX - Program Depot Maintenance

RACUZ - Range Compatible Use Zone

SAC - Strategic Air Command

SC - Directorate of Communications - Computer Systems

SCS - Soil Conservation Service

SHPO - State Historic Preservation Officer

SM - Systems Management

SVTC - Survivability and Vulnerability Test Center

SWCD - Soil and Water Conservation Districts

SWPP - Storm Water Pollution Prevention Plan

TAC - Tactical Air Command

TWF - Tactical Fighter Wing

UDWR - Utah Division of Wildlife Resources

US - United States

USA - United States of America

USAF - United States Air Force

USDA - United States Department of Agriculture

USFS - U.S. Forest Service

USFWS - U.S. Fish and Wildlife Service

USU - Utah State University

UTTR - Utah Test and Training Range

UTTR-N - Utah Test and Training Range -North

UTTR-S - Utah Test and Training Range -South

XP - Directorate of Plans and Programs