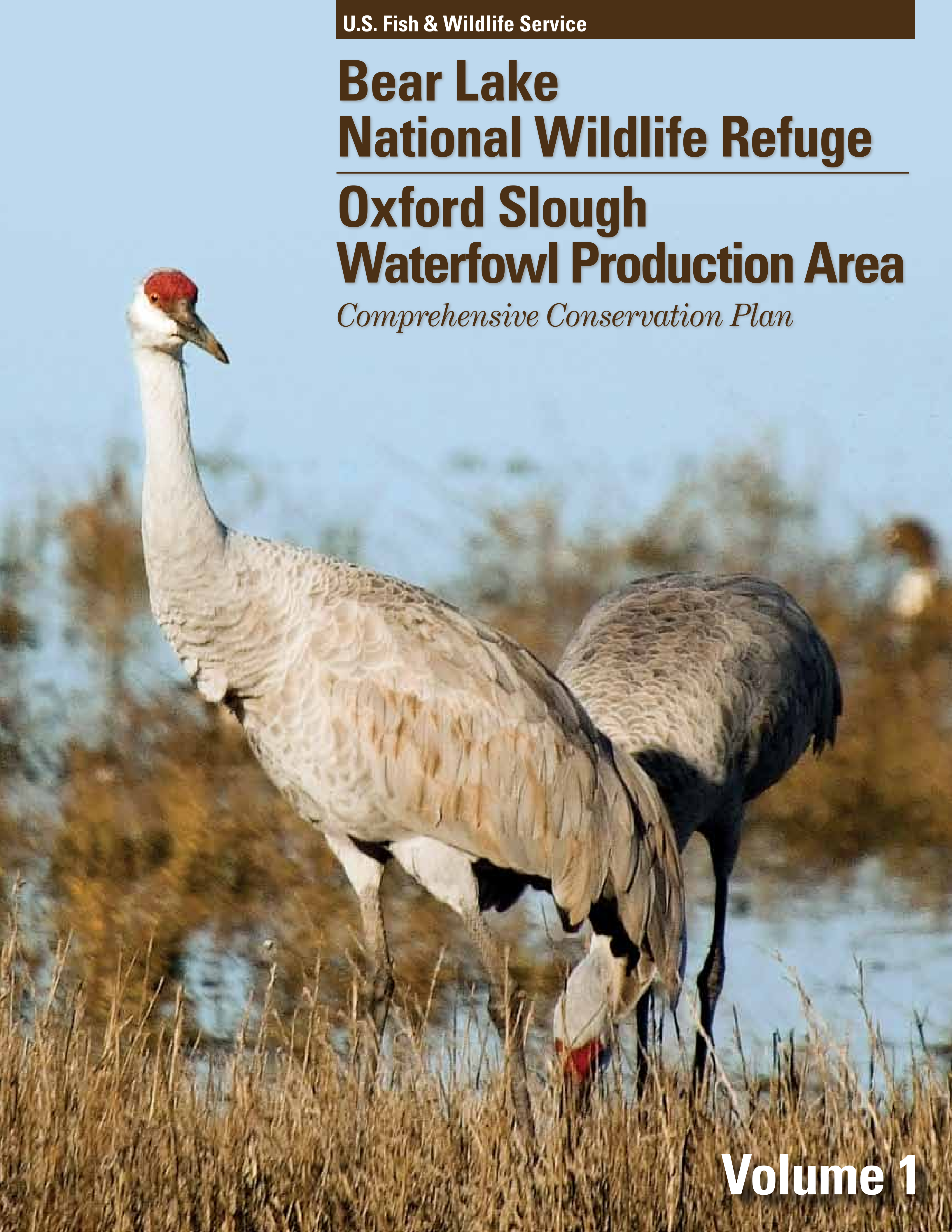
U.S. Fish & Wildlife Service

Bear Lake National Wildlife Refuge

Oxford Slough Waterfowl Production Area

Comprehensive Conservation Plan



Volume 1

Our Vision for the Future

Bear Lake National Wildlife Refuge
Bear Lake National Wildlife Refuge, nestled in the Bear Lake Valley of southeastern Idaho, continues to be a paradise for wildlife. Native peoples, explorers, farmers, and ranchers were drawn to the valley's plentiful natural resources: wildlife, land, and water. Today and tomorrow, visitors and residents alike enjoy a beautiful landscape that supports the modern-day dichotomies of small towns and rugged wilderness, farm fields and natural meadows, diversion canals and marshes, livestock and wildlife.

An integral part of this landscape, the future of the Refuge depends on the carefully managed waters of the Bear River and Bear Lake flowing through a system of man-made structures and providing sustenance for humans and wildlife. Visitors to the Refuge will always hear the laughter of coots and the trilling of marsh wrens, the soft wind through the grass before the ducks arrive and the crack of expanding ice that follows the exodus of geese.

People will see trumpeter swans escorting their broods through the emerald-green marsh and feel gratified that mule deer, moose, badger, beaver, trout, garter snakes, and leopard frogs will have homes for a long time to come here at Bear Lake NWR.

Thomas Fork Unit
The Thomas Fork Unit of Bear Lake NWR is located in the bucolic Thomas Fork Valley at the border of Wyoming and Idaho. This lovely valley, bordered by the Preuss and Sublette Ranges, harkens back to the days of rugged pioneers traveling the Oregon Trail, attempting to ford the Thomas Fork Creek, and trading goods and services with the Native Americans. Hay and willows, cranes and herons, chub and trout, cattle and pronghorn will ever be a part of this diverse panorama.

People who love the scenic beauty of the Thomas Fork Valley will continue to work together to improve the quality of the creek and its surrounding lands. Healthy waters and lands will always be the backbone of sustainable agriculture and ranching as well as key for providing food and home for wildlife. As part of the larger Bear River Watershed, the vigor of the Thomas Fork Unit will remain integral to the overall quality of the landscape.

Oxford Slough Waterfowl Production Area
Oxford Slough Waterfowl Production Area is situated in a lush valley surrounded by the Caribou National Forest with Oxford Peak and the Bannock Range in the background. Oxford Creek is one of the many streams that flow into the valley to create the Oxford Slough, which acts as a natural catchment for runoff from the adjacent mountain ranges.

Oxford Slough will persist as a small but important part of the Bear River Watershed, providing water and well-being to wildlife and humans. Franklin's gulls, sage-grouse, coyotes, and cattle continue to co-exist in this peaceful valley drenched in morning mist. Ducks and white-faced ibis decorate the skies on their feeding flights between the marsh and wet meadows. Land managers and landowners will collaborate for years to come to provide optimal water quality and quantity, understanding that what's good for the critters is usually good for people too.

Comprehensive Conservation Plans provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Bear Lake National Wildlife Refuge and Oxford Slough Waterfowl Production Area

Comprehensive Conservation Plan

Prepared by:
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and

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Pacific Northwest Planning Team
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January 2013

Approved: Robyn Thorson
Regional Director, Region 1
Portland, Oregon

February 11, 2013
Date

U.S. Fish and Wildlife Service
Bear Lake National Wildlife Refuge
and Oxford Slough Waterfowl Production Area
Comprehensive Conservation Plan
Approval Submission

In accordance with the National Wildlife Refuge System Administration Act, as amended, the U.S. Fish and Wildlife Service (Service) has completed a Comprehensive Conservation Plan (CCP) for the Bear Lake National Wildlife Refuge (Refuge) and Oxford Slough Waterfowl Production Area (WPA). The purpose of this CCP is to specify a management for the Refuge and WPA for the next 15 years. The goals, objectives, and strategies for improving conditions on the Refuge and WPA – including the types of habitat we will provide, partnership opportunities, and management actions needed to achieve desired future conditions are described in the CCP. The Service's preferred alternative for managing the Refuge and WPA is described in this CCP and the effects on the human environment were described in the Draft CCP and Environmental Assessment.

This CCP is submitted for the Regional Director's approval by:

Tracy Casselman 2/5/13
Tracy Casselman, Project Leader — Date
Southeast Idaho National Wildlife Refuge Complex

Concur: 2/11/13
Bob Flores — Date
Refuge Supervisor

Concur: 2/11/13
Robin West — Date
Acting Regional Chief, National Wildlife Refuge System

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Finding of No Significant Impact
for the
Bear Lake National Wildlife Refuge and Oxford Slough Waterfowl Production Area Comprehensive Conservation Plan

Bear Lake, Franklin, and Bannock Counties, Idaho

The U.S. Fish and Wildlife Service (Service) has completed a Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) for the Bear Lake National Wildlife Refuge (Refuge) and Oxford Slough Waterfowl Production Area (WPA). The CCP will guide management of the Refuge and WPA for 15 years. The CCP/EA describes our proposals for managing the Refuge and WPA, their effects on the human environment under three alternatives, including the no action alternative.

Decision

Based on our comprehensive review and analysis in the CCP/EA, we selected Alternative 3, the agency's Preferred Alternative, for implementation, because it will guide management of the Refuge and WPA in a manner that:

- Achieves the mission of the National Wildlife Refuge System, and the purposes, vision, and goals of the Refuge and WPA.
- Maintains and restores the ecological integrity of the habitats and populations of the Refuge and WPA.
- Addresses the important issues identified during the CCP scoping process.
- Addresses the legal mandates of the Service, the Refuge, and the WPA.
- Is consistent with the scientific principles of sound wildlife management and endangered species recovery.
- Facilitates priority public uses appropriate and compatible with the purposes of the Refuge and WPA, and the Refuge System mission.

Summary of the Actions to be Implemented

Management of the Refuge and WPA under the selected alternative (Alternative 3) will protect, maintain, and enhance habitat for priority species and resources of concern, and protect cultural and paleontological resources. The availability and quality of wildlife dependent recreation on the Refuge and WPA will increase over time under the selected alternative. Implementation of the CCP is subject to the availability of funding and any additional compliance requirements.

Under Alternative 3, the Service and partners will:

- Manage Bear Lake NWR to continue to provide habitat for waterfowl breeding and fall migration, but use water level manipulations and other strategies to provide a variety of wetland habitats that benefit a wide range of priority species. Water in the individual wetland units of Bear Lake NWR would be managed to simulate natural hydrologic variability (normal, drought, and flood conditions), while providing a consistent annual acreage of wetland habitat types across the Refuge.

- Work with PacifiCorp (which owns and manages the water control systems that divert the Bear River through the Refuge into Bear Lake and then release water through the Outlet Canal) to manage water levels on the Refuge for wildlife and habitat while abiding by the stipulations of the Bear River Compact and the 1968 Agreement between PacifiCorp and the Service.
- Protect, restore, and enhance deep marsh, shallow marsh, riparian, instream, and upland habitats of Bear Lake NWR and Oxford Slough WPA.
- Over the 15-year lifespan of the CCP, gradually reduce haying of wet meadow and grassland habitat at Bear Lake NWR and Oxford Slough WPA by 44%, from 3,554 acres (current) to 1,492 acres, to provide late successional wet meadow habitat for nesting waterfowl and waterbirds.
- Pursue increased reliability of late season water at Oxford Slough WPA.
- Work in partnership with PacifiCorp and other stakeholders to study and consult on the effects, desirability, and feasibility of reducing sediment loading in the Mud Lake Complex of Bear Lake NWR.
- Analyze feasibility of, and make recommendations on techniques to exclude carp and non-native game fish within the Mud Lake Complex of Bear Lake NWR.
- Work in partnership with PacifiCorp and the Idaho Department of Fish and Game to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge.
- Manage water at the Thomas Fork Unit to simulate natural hydrologic variability (normal, drought, and flood conditions).
- Restore stream habitat on the Thomas Fork Unit for spawning Bonneville cutthroat trout.
- Manage invasive species and State- and county-listed noxious weeds.
- Survey and protect paleontological and cultural resources.
- Increase inventory and monitoring efforts.
- Provide for additional public use opportunities, including wildlife observation, photography, environmental education, interpretation and fishing. Current hunting programs on the Refuge and WPA would continue, with enhancements to improve access.
- Develop a plan for a Refuge office and visitor contact point on or near Bear Lake NWR.
- Increase outreach to local residents, school children, and tourists.

Public Involvement and Changes Made to the Selected Alternative Based on Comments

We provided a variety of opportunities for the public to be involved in the development and review of the CCP. This included an open house meeting at the start of the planning process, meetings with adjacent landowners, three planning updates, and a 30-day public comment period for the Draft CCP/EA, which was extended to provide additional opportunities for comment. The details of our public involvement program are described in the CCP, Appendix L. The Service received a total of 14 comments (13 letters and 1 verbal comment) during the public comment period. Based on the public comments we received, the CCP has been slightly modified. These changes are:

- In the summary of alternatives (page 2-28) and on page 2-58, the strategy under Alternatives 2 and 3 “In partnership with PacifiCorp, Idaho Department of Fish and Game, and other partners, construct four fish passage ladder projects on the Rainbow bridge; Paris Creek, Paris Dike, and Bloomington Creek to increase fish spawning passage and reconnect the two most genetically viable populations of Bonneville cutthroat trout in the Bear River by 2027" was changed to: "Throughout the lifetime of the CCP, work in partnership with PacifiCorp and the Idaho Department of Fish and Game to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge."

- The strategy under Current Management, page 2-39, "Maintain a stable average water elevation of 5920.5' UP&L datum across the entire Bear Lake NWR marsh complex . . ." has been amended by adding "+/- 0.5" after "5920.5," and the explanatory text "Note: During seasons with very high runoff, it can be difficult to maintain a stable water level," and added to the Rationale under Objective 1.1a in the Final CCP to describe current management.
- On page 2-41, the strategy under Alternatives 2 and 3, "Implement feasibility and engineering studies on techniques to further reduce sediment loading within the Mud Lake Complex. By 2020, provide recommendations to reduce the sedimentation rate of Bear River water diversions and better facilitate carp and non-native game fish exclusion" was changed to: "Work in partnership with PacifiCorp and other stakeholders to study and consult on the effects, desirability, and feasibility of reducing sediment loading in the Mud Lake Unit," and the strategy "By 2020, provide recommendations to better facilitate carp and non-native game fish exclusion" was added.

A number of changes to the Affected Environment portion of the CCP were corrective or editorial in nature; these are listed in Appendix P, Response to Comments. None will have a significant impact on the environment.

Conclusions

Based on review and evaluation of the information contained in the supporting references, I have determined that implementing Alternative 3 as the CCP for the Bear Lake National Wildlife Refuge and Oxford Slough Waterfowl Production Area is not a major Federal action that would significantly affect the quality of the human environment within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969. Accordingly, we are not required to prepare an environmental impact statement.

This Finding of No Significant Impact and supporting references are on file at Southeast Idaho National Wildlife Refuge Complex, 4425 Burley Drive, Suite A, Chubbuck, Idaho 83202 and U.S. Fish and Wildlife Service, Division of Planning and Visitor Services, 911 NE 11th Avenue, Portland, Oregon, 97232. These documents can also be found on the Internet at http://pacific.fws.gov/planning/. These documents are available for public inspection. Interested and affected parties are being notified of our decision.

Robyn Thorson
Regional Director

February 11, 2013
Date

Supporting References

U.S. Fish and Wildlife Service. September 2012. Bear Lake National Wildlife Refuge and Oxford Slough Waterfowl Production Area, Draft Comprehensive Conservation Plan and Environmental Assessment.

U.S. Fish and Wildlife Service. 2013. Bear Lake National Wildlife Refuge and Oxford Slough Waterfowl Production Area Comprehensive Conservation Plan.

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Forster's tern/© Bill Bouton

Chapter 1 Introduction and Background

Chapter 1. Introduction and Background

1.1 Introduction

The Southeast Idaho National Wildlife Refuge Complex consists of four national wildlife refuges: Grays Lake, Bear Lake, Camas, and Minidoka, and the Oxford Slough Waterfowl Production Area. This CCP applies only to Bear Lake National Wildlife Refuge (NWR, Refuge) and Oxford Slough Waterfowl Production Area (WPA). The Grays Lake, Camas, and Minidoka CCPs will occur under separate planning efforts.

1.1.1 Bear Lake NWR

Bear Lake NWR, which was established in 1968, is located within Bear Lake County, near the community of Montpelier, Idaho. The 18,169-acre Refuge lies in Bear Lake Valley at an elevation of 5,925 feet and occupies a portion of the historic Dingle Swamp along the Bear River and north of Bear Lake (Map 1). The Refuge is surrounded by mountains, most notably the 6,800-foot rocky slope of Merkley Mountain to the east. Bear Lake NWR is managed by the U.S. Fish and Wildlife Service (Service) for the protection of Dingle Swamp and to provide resting and feeding habitat for migrating waterfowl. The Refuge is composed of a 16,000-acre emergent marsh, 500 acres of wet meadows, 1,250 acres of uplands, and 5 miles of riparian corridor. Approximately 100 species of migratory birds nest at Bear Lake NWR, including large concentrations of colonial waterbirds. Other species of non-migratory wildlife use the Refuge throughout the year. Bear Lake NWR has been designated as a Globally Important Bird Area by the National Audubon Society based on its contributions to colonial nesting waterbird habitat.

Historically the Shoshone, Ute, and Bannock tribes used the Bear Lake Valley as an important hunting ground and often camped in the area. The first Euro-American settlers to inhabit the Bear Lake Valley were members of the Church of Jesus Christ of Latter Day Saints, who arrived in 1864. They established farming and ranching operations nourished by the waters of the Bear River. Today agriculture, along with tourism, still fuels the local economy; there are a number of small cattle ranches and farms that produce barley, alfalfa, and wild hay.

Water diversion from the Bear River to produce meadow hay likely occurred on a small scale during the late 1800s; however, it was in the early 1900s that substantial modification to the river system began. In 1911 the Telluride Power Company completed its diversion of water from the Bear River into Bear Lake, where a significant portion of flow could be stored for future irrigation needs. This single event greatly altered the hydrology and natural processes of the historic Dingle Swamp and Mud Lake system.

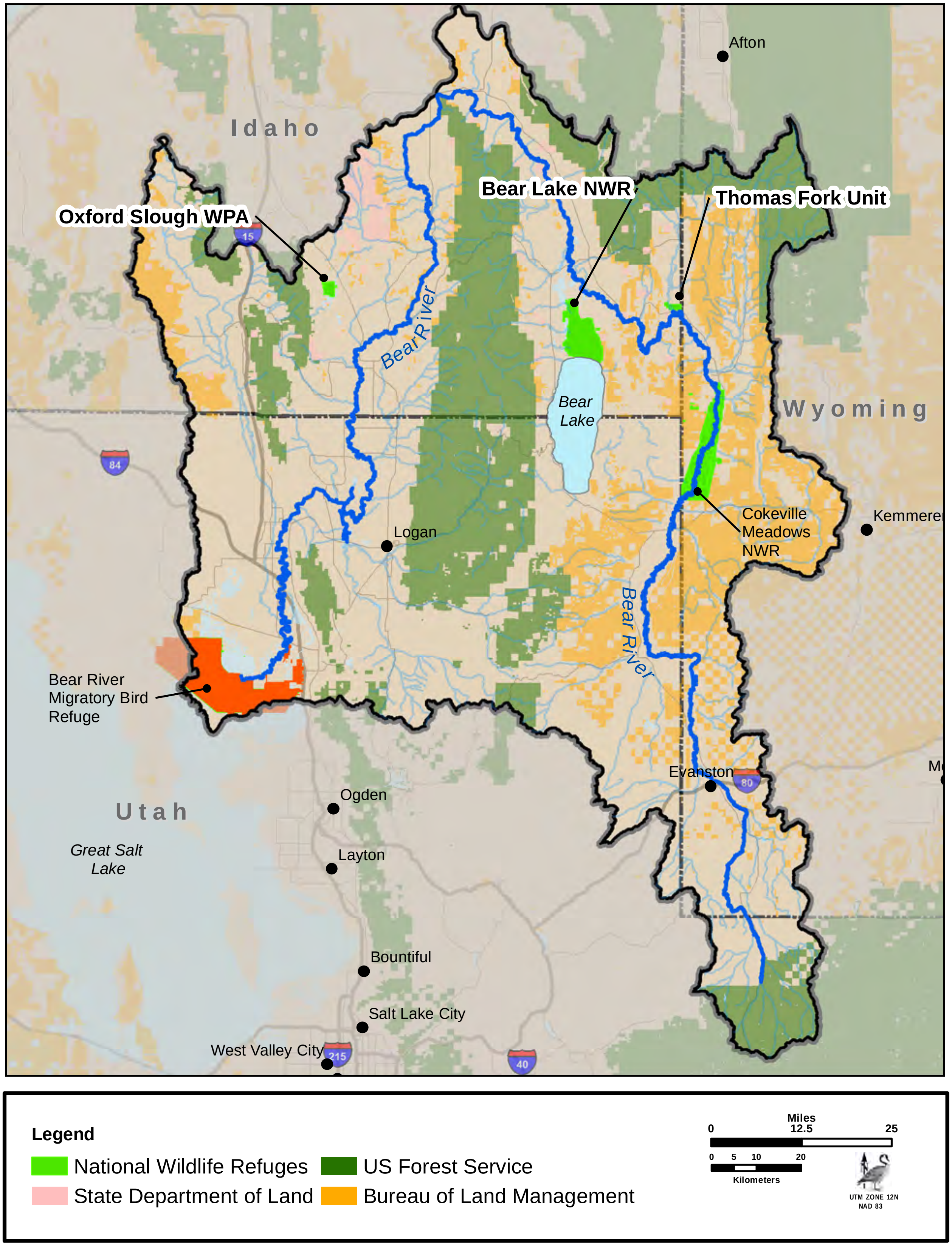
The Thomas Fork Unit is located along U.S Hwy 30, 20 miles east of Montpelier, at an elevation of 6,060 feet. It is a 1,015-acre, rectangular tract of land bordered on its east boundary by the Wyoming state line and was transferred from the Farm Services Agency (FSA), Department of Agriculture, to the U.S. Fish and Wildlife Service in 1995. It provides breeding habitat for greater sandhill cranes, and high quality stream habitat for Bonneville cutthroat trout. Settlers traveling along the Oregon Trail often used the area in and around the Thomas Fork Unit as they attempted to ford the Thomas Fork Creek.

1.1.2 Oxford Slough Waterfowl Production Area

Oxford Slough is situated in the Cache Valley and is the drainage for Oxford and Deep Creeks as well as other smaller streams that cascade down from the surrounding mountains. The Oxford Slough WPA was established in 1985 to preserve an important wetland for waterfowl production. WPA lands are purchased with funds generated by the sale of Federal Duck Stamps, and managed by the Service to establish and protect waterfowl breeding and nesting habitats. Oxford Slough WPA is one of nearly 7,000 WPAs nationwide, and the only WPA in Region 1. The 1,878-acre WPA is located 10 miles north of Preston, Idaho, abutting the small town of Oxford, where it provides valuable foraging habitat for species such as cranes, geese, Franklin's gulls, and white-faced ibis, and nesting habitat not only for waterfowl, but white-faced ibis, Franklin's gulls, and other waterbirds. Oxford Slough WPA has been designated as a Globally Important Bird Area by the National Audubon Society based on its contributions to colonial nesting waterbird habitat.

Native Americans, including the Shoshone, Ute, and Bannock, made use of the Cache Valley for its rich natural resources. The town of Oxford was settled in 1864 by members of the Church of Jesus Christ of Latter Day Saints and it served as the first seat of Franklin County, Idaho. Not far from Oxford, the Battle of Bear River occurred on January 29, 1863, when the United States Army attacked Shoshone Indians assembled at the junction of the Bear River and Beaver Creek (now Battle Creek). The site of the attack was designated a massacre site in 1990.

Map 1. ***Bear River Watershed: Land Ownership and Status***



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1.2 Proposed Action

We, the U.S. Fish and Wildlife Service, manage the Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA as part of the National Wildlife Refuge System. We propose to adopt and implement this Comprehensive Conservation Plan (CCP) for these refuge units. This document is the Refuge's CCP for these refuge units. A CCP sets forth management guidance for a refuge for a period of 15 years, as required by the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd et seq.) (Refuge Administration Act), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Refuge Administration Act requires CCPs to identify and describe:

- The purposes of the refuge unit;
- The fish, wildlife, and plant populations, their habitats, and the archaeological and cultural values found on the refuge unit;
- Significant problems that may adversely affect wildlife populations and habitats and ways to correct or mitigate those problems;
- Areas suitable for administrative sites or visitor facilities; and
- Opportunities for fish and wildlife-dependent recreation.

National Wildlife Refuge System (Refuge System) planning policy (Service Manual Part 602, 602 FW 3, June 21, 2000) states that the purpose of CCPs is to "describe the desired future conditions of a refuge and provide long-range guidance and management direction to achieve refuge purposes; help fulfill the National Wildlife Refuge System mission; maintain and, where appropriate, restore the ecological integrity of each refuge and the Refuge System;… and meet other mandates."

The Service developed and examined alternatives for future management of Bear Lake NWR and Oxford Slough WPA through the CCP process. These were presented in the Draft Comprehensive Conservation Plan and Environmental Assessment (USFWS 2012). The various alternatives address the major issues and relevant mandates identified during the process and are consistent with the principles of sound fish and wildlife management. We evaluated three alternatives for the CCP for the Refuge and WPA, and selected Alternative 3 as the preferred alternative.

The draft preferred alternative represents the most balanced approach for achieving the purposes, vision, and goals for Bear Lake NWR and Oxford Slough WPA; contributing to the Refuge System's mission; addressing relevant issues and mandates; and managing the Refuge and WPA consistent with the sound principles of fish and wildlife management. The preferred alternative was slightly modified between the draft and final documents based upon comments received from the public, other agencies, and organizations. The Service's Regional Director for the Pacific Region made the final decision about the alternative to be implemented. For details on the specific components of management direction for the Refuge and WPA over the next 15 years, see Chapter 2.

1.3 Purpose and Need for the CCP

The purpose of the CCP is to provide the Service, the Refuge System, partners, and the public with a 15-year management plan for improving habitat conditions and infrastructure for fish, wildlife, and public use on the Refuge and WPA. An approved CCP will ensure that the Service manages the Refuge and WPA to achieve their purposes, vision, goals, and objectives; and help fulfill the mission of the Refuge System.

The CCP will provide reasonable, scientifically grounded guidance for the long-term conservation of native plants and animals, with emphasis on migratory birds and improving wetland, riparian, and upland habitats on the Refuge and WPA. The CCP will identify appropriate actions for protecting and sustaining the cultural and biological features of the Refuge and WPA; the migratory waterfowl, waterbird, and landbird populations that use the Refuge and WPA; and threatened, endangered, or rare species. A final purpose of the CCP is to provide guidance and evaluate the priority public use programs on the Refuge and WPA, including hunting, fishing, wildlife observation, photography, environmental education, and interpretation.

The CCP is needed for a variety of reasons. Primary among these is the need to provide breeding and migration habitat for waterfowl and waterbirds in southeast Idaho, including the Bear River and Bear Lake Valley and the northern Cache Valley. There is a need to improve habitat conditions on the Refuge and WPA, since many habitats are degraded by invasive plants and animals. There is a need to address the contributions of the Refuge and WPA to the future persistence of sensitive, rare, and declining species of concern native to southeastern Idaho. Finally, there is a need to protect and restore habitat values of the Bear River and Bear Lake Valley, the northern Cache Valley, and the Thomas Fork of the Bear River.

There is a need to analyze public use programs on the Refuge and WPA for the Refuge System's wildlife-dependent priority public uses and to determine what improvements or alterations should be made in the pursuit of compatible, higher quality programs, and to accommodate increasing numbers of visitors while providing for the needs of wildlife. The Refuge and WPA also include archaeological and historical sites, and there is a need to address both protection of cultural resources and cultural resources education.

1.4 Content and Scope of the CCP

This CCP provides guidance for management of Refuge habitats and wildlife and administration of public uses on lands and waters of the Refuge and WPA. This CCP is intended to comply with both the Refuge System Administration Act and the National Environmental Policy Act (NEPA), as amended (42 U.S.C. 4321-4347). The CCP includes the following information:

- An overall vision for the Refuge and WPA, and their roles in the local ecosystem (Chapter 1).
- Goals and objectives for specific habitats, research, inventory, monitoring, and public use programs, as well as strategies for achieving the objectives (Chapter 2).
- A description of the physical environment of the Refuge and WPA (Chapter 3).
- A description of the wildlife species and species groups identified as priority resources of concern on the Refuge and WPA and their habitats; their condition and trends on the Refuge and WPA and within the local ecosystem; the desired ecological conditions for sustaining them, and a short analysis of threats to resources of concern and their habitats (Chapter 4 and Appendix E).
- A description of the human environment of the Refuge and WPA (Chapter 5).
- Evaluations of existing and proposed public uses for appropriateness and compatibility with the purposes of the Refuge and WPA (Appendices A and B).
- A comprehensive list of plants and vertebrate species known or suspected to occur on the Refuge and WPA (Appendix E).
- An outline of the projects, staff, and facilities needed to meet goals and objectives outlined in this CCP (Appendix C).

1.5 Refuge Planning and Management Guidance

Bear Lake NWR and the Oxford Slough WPA are managed as part of the Refuge System within a framework provided by legal and policy guidelines. This CCP is primarily guided by the provisions of the mission and goals of the Refuge System, the purposes of the Refuge and WPA as described in their acquisition authorities, Service policy, and Federal laws. The following summaries are provided as background for the CCP.

1.5.1 The U.S. Fish and Wildlife Service

The Refuge and WPA are managed by the Service, an agency within the Department of the Interior. The Service is the principal Federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations and their habitats.

The mission of the Service is "working with others, to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people." Although we share this responsibility with other Federal, state, tribal, local, and private entities, the Service has specific trust responsibilities for migratory birds, endangered and threatened species, and certain anadromous fish and marine mammals. The Service has similar trust responsibilities for the lands and waters we administer to support the conservation and enhancement of fish, wildlife, plants, and their habitats. The Service also enforces Federal wildlife laws and international treaties for importing and exporting wildlife, assists with state fish and wildlife programs, and helps other countries develop wildlife conservation programs.

1.5.2 National Wildlife Refuge System

The Service manages the 150-million-acre Refuge System. The Refuge System is the world's largest network of public lands and waters set aside specifically for conserving wildlife and protecting ecosystems. From its inception in 1903, the Refuge System has grown to encompass more than 550 national wildlife refuges, thousands of small wetlands and other special management areas, and millions of acres of islands and their surrounding marine environments in remote areas of the Pacific Ocean. The needs of wildlife and their habitats come first on refuges, in contrast to other public lands that are managed for multiple uses.

National Wildlife Refuge System Mission and Goals. The mission of the Refuge System is:

> *"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans"* (National Wildlife Refuge System Administration Act of 1966, as amended)(16 U.S.C. 668dd et seq.)

Wildlife conservation is the fundamental mission of the Refuge System. The goals of the Refuge System, as articulated in the Mission and Goals and Purposes Policy (601 FW 1) are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and inter-jurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Law and Policy Pertaining to the Refuge System. Refuges are guided by various Federal laws (Acts) and Executive Orders, Service policies, and international treaties. Fundamental to the management of every refuge are the mission and goals of the Refuge System and the designated purposes of the refuge unit as described in establishing legislation, executive orders, or other documents establishing, authorizing, or expanding a refuge. WPAs are considered units of the National Wildlife Refuge System.

Key concepts and guidance of the Refuge System derive from the National Wildlife Refuge System Administration Act of 1966 (Refuge Administration Act) as amended (16 U.S.C. 668dd-668ee); the Refuge Recreation Act of 1962 as amended (16 U.S.C. 460k-460k-4); Title 50 of the Code of Federal Regulations; and the Service Manual. The Refuge Administration Act is implemented through regulations covering the Refuge System, published in Title 50, subchapter C of the Code of Federal Regulations and policies contained in the Service Manual. These regulations and policies govern general administration of units of the Refuge System.

Many other laws apply to the Service and management of Refuge System lands. Examples include the Endangered Species Act of 1973, as amended, and the National Historic Preservation Act of 1966, as amended (see sections 1.5.3 and 1.5.4 below). Brief descriptions of laws pertinent to Bear Lake NWR and the Oxford Slough WPA are included in this chapter. A complete list of laws pertaining to the Service and the Refuge System can be found at http://laws.fws.gov.

Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4). The Refuge Recreation Act authorized the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area’s primary purposes. It provided for public use fees and permits, and penalties for violating regulations. It also authorized the acceptance of donated funds and real and personal property to assist in carrying out its purposes. Enforcement provisions were amended in 1978 and 1984 to make violations misdemeanors in accordance with the uniform sentencing provisions of 18 U.S.C. 3551-3586.

National Wildlife Refuge System Administration Act (16 U.S.C. 668dd et seq.) as amended by the National Wildlife Refuge System Improvement Act (Public Law 105-57). Of all the laws governing activities on national wildlife refuges, the Refuge Administration Act exerts the greatest influence. The National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act) amended the Refuge Administration Act by defining a unifying mission for all refuges, including a new process for determining compatible uses on refuges, and requiring that each refuge be managed under a comprehensive conservation plan. Key provisions of the Refuge Administration Act follow:

- *Comprehensive conservation planning.* A CCP must be completed for each refuge by the year 2012, as is required by the Refuge Administration Act. Each CCP will be revised every 15 years or earlier if monitoring and evaluation determine that changes are needed to achieve the refuge’s purposes, vision, goals, or objectives. The Refuge Administration Act also requires that CCPs be developed with the participation of the public. Public comments, issues, and concerns are considered during the development of a CCP, and together with the formal guidance, can play a role in selecting the management direction. The CCP provides guidance in the form of goals, objectives, and strategies for refuge programs, but may lack some of the specifics needed for implementation. Therefore, step-down management plans will be developed for individual program areas as needed, following completion of the CCP. The step-down plans are founded on management goals, objectives and strategies outlined in a CCP, and require appropriate NEPA compliance.

- *Wildlife conservation, biological diversity, integrity, and environmental health.* The Refuge Administration Act expressly states that the conservation of fish, wildlife and plants, and their habitats is the priority of Refuge System lands, and that the Secretary of the Interior shall ensure that the biological integrity, diversity, and environmental health of refuge lands are maintained. House Report 105–106 accompanying the Improvement Act states ‘‘… the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first.’’
- *Refuge purposes.* Each refuge must be managed to fulfill the Refuge System mission and the specific purpose(s) for which the refuge was established. The purposes of a refuge are specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. When a conflict exists between the Refuge System mission and the purpose of an individual refuge, the refuge purpose may supersede the mission.
- *Priority public uses on refuges.* The Refuge Administration Act superseded some key provisions of the Refuge Recreation Act regarding compatibility, and also provided significant additional guidance regarding recreational and other public uses on units of the Refuge System. The Refuge Administration Act identifies six priority wildlife-dependent recreational uses. These uses include the following (not in priority order): hunting, fishing, wildlife observation and photography, and environmental education and interpretation. The Service is to grant these six wildlife-dependent public uses special consideration during planning for, management of, and establishment and expansion of units of the Refuge System. When determined compatible on a refuge-specific basis, these six uses assume priority status among all uses of the refuge in question. The Service is to make extra efforts to facilitate priority wildlife-dependent public use opportunities.

Compatibility and Appropriate Refuge Uses Policies (603 FW 2 and 1). With few exceptions, lands and waters within the Refuge System are different from multiple-use public lands, in that they are closed to all public access and use unless specifically and legally opened. No refuge use may be allowed or continued unless it is determined to be appropriate and compatible. Generally, an appropriate use is one that contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan. A compatible use is a use that in the sound professional judgment of the refuge manager will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the Refuge.
The six wildlife-dependent recreational uses described in the Refuge Administration Act (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are defined as appropriate. When determined to be compatible, they receive priority consideration over other public uses in planning and management. Other nonwildlife-dependent uses on a refuge are reviewed by the refuge manager to determine if the uses are appropriate. If a use is determined appropriate, then a compatibility determination is completed.

When preparing a CCP, refuge managers must re-evaluate all general public, recreational, and economic uses (even those furthering refuge habitat management goals) occurring or proposed on a refuge for appropriateness and compatibility. Updated appropriate use and compatibility determinations for existing and proposed uses for the Bear Lake NWR and the Oxford Slough WPA are in Appendices A (Appropriateness) and B (Compatibility) of this CCP.

Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3). The Refuge Administration Act directs the Service to “ensure that the biological integrity, diversity, and environmental health of the National Wildlife Refuge System are maintained for the benefit of present and future generations of Americans …” The policy is an additional directive for refuge managers to follow while achieving refuge purpose(s) and the Refuge System mission. It provides for the consideration and protection of a broad spectrum of native fish, wildlife, and habitat resources found on refuges and associated ecosystems. When evaluating the appropriate management direction for refuges (e.g., in compatibility determinations), refuge managers will use sound professional judgment to determine their refuge’s contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of refuge resources, an understanding of the refuge’s role within an ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service. The policy states that “the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions.”

Wildlife-dependent Recreation Policies (605 FW 1-7). The Refuge Administration Act states that “compatible wildlife-dependent recreation is a legitimate and appropriate general public use of the System.” A series of recreation policies provide additional guidance and requirements to consider after a recreational use has been determined to be compatible. These policies also establish a quality standard for visitor services on national wildlife refuges. Through these policies, we are to simultaneously enhance wildlife-dependent recreational opportunities, provide access to quality visitor experiences, and manage refuge resources to conserve fish, wildlife, plants, and their habitats. New and ongoing recreational uses should help visitors focus on wildlife and other natural resources, and provide an opportunity to display resource issues, management plans, and how the refuge contributes to the Refuge System and the Service’s mission. The policies also require development of a visitor services plan.

Oxford Slough Waterfowl Production Area Management and Authorities. The Migratory Bird Conservation Act of February 18, 1929 (45 Stat. 1222), as amended (16 U.S.C. 715d, 715e, 715f, to 715k and 715l to 715r), provides for the acquisition of lands determined to be suitable as an inviolate sanctuary for migratory birds.

The Migratory Bird Hunting Stamp Act of March 16, 1934, was amended in 1958 and authorized the “… acquisition by gift, devise, lease, purchase, or exchange of, small wetland and pothole areas, interest therein, and right-of-way to provide access thereto. Such small areas to be designated as ‘Waterfowl Productions Areas’, may be acquired without regard to the limitations and requirements of the Migratory Bird Conservation Act …” Under the Act, Waterfowl Production Areas are subject to “… all of the provisions of such Act … except the inviolate sanctuary provisions ….” (16 U.S.C. 718(c), Migratory Bird Hunting and Conservation Stamp Act).

Thomas Fork Unit. The mandate for management of Farmers Home Administration easements and fee title transfers to the Service is contained in the Consolidated Farm and Rural Development Act (7 U.S.C. Stat. 2002) "… for conservation purposes …"

1.5.3 Biological Resource Protection Acts

The plant and animal species of the Refuge and WPA are protected under several Federal laws, including the following:

Endangered Species Act of 1973 (16 U.S.C. 1531-1544). Through Federal action and by encouraging the establishment of state programs, the 1973 Endangered Species Act (ESA) provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The ESA:

- Authorizes the determination and listing of species as endangered and threatened;
- Prohibits unauthorized taking, possession, sale, and transport of endangered species;
- Provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- Authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for endangered and threatened wildlife and plants;
- Authorizes the assessment of civil and criminal penalties for violating the act or regulations; and
- Authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the act or any regulation issued there under.

Section 7 of the ESA requires Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of listed species, or modify critical habitat. For candidate species and species of concern, refuge management activities are focused on protecting habitat and reducing threats so that these species do not need the protection of the ESA.

Both the Service and the National Marine Fisheries Service (NMFS) implement and enforce the ESA. The Service has primary responsibility for terrestrial and freshwater organisms, while NMFS has jurisdiction over most marine and anadromous fish listed under the ESA. No ESA listed species occur on the Refuge or the WPA, however several State of Idaho species of the greatest conservation need are found on the refuge and are described in Chapter 4, Section 4.4.

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712). The framers of the Migratory Bird Treaty Act were determined to put an end to the commercial trade in birds and their feathers that by the early years of the 20th century had wreaked havoc on the populations of many native bird species. The Migratory Bird Treaty Act decreed that all migratory birds and their parts (including eggs, nests, and feathers) were fully protected. It is the domestic law that affirms or implements the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions between two nations protect selected species of birds that are common to both countries (i.e., they occur in both countries at some point during their annual life cycle). All of the native bird species found on the Refuge and WPA are protected under this act, with the exception of nonnative species (European starling, house sparrow, and rock dove).

1.5.4 Historic Preservation Acts

The cultural and historic resources of the Refuge and WPA are protected under several Federal laws and Executive Orders:

Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. 470aa-470ll). The Archaeological Resources Protection Act largely supplanted the resource protection provisions of the Antiquities Act of 1906 for archaeological items. This act established detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from Federal or Indian lands. It also established civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from Federal or Indian land in violation of any provision of Federal law; and for interstate and foreign commerce in such resources acquired, transported, or received in violation of any State or local law.
Public Law 100-588, approved November 3, 1988 (102 Stat. 2983), lowered the threshold value of artifacts triggering the felony provisions of the act, from $5,000 to $500, made attempting to commit an action prohibited by the act a violation, and required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the Nation.

Archeological and Historic Preservation Act of 1960, as amended (16 U.S.C. 469-469c). To carry out the policy established by the Historic Sites Act, the Archeological and Historic Preservation Act directed Federal agencies to notify the Secretary of the Interior whenever they find that a Federal or federally assisted, licensed, or permitted project may cause loss or destruction of significant scientific, prehistoric, or archaeological data. The act authorized use of appropriated, donated, and/or transferred funds for the recovery, protection, and preservation of such data.

Historic Sites, Buildings and Antiquities Act of 1935 (16 U.S.C. 461-462, 464-467). This act declared it a national policy to preserve historic sites and objects of national significance, including those located on refuges. It provided procedures for designation, acquisition, administration, and protection of such sites. National Historic and Natural Landmarks are designated under authority of this act.

National Historic Preservation Act of 1966 (16 U.S.C. 470-470b, 470c-470n). This act provided for preservation of significant historical features (buildings, objects, and sites) through a grant-in-aid program to the states. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468-468d). This act established an Advisory Council on Historic Preservation, which was made a permanent independent agency by Public Law 94-422, approved September 28, 1976 (90 Stat. 1319). That act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register. As of September 2004, 157 historic sites on national wildlife refuges had been placed on the National Register.

Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001-13) This Act establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal land. In any case where human remains or funerary objects can be associated with specific Tribes or groups of Tribes, the agency is required to provide notice of the item in question to the Tribe or Tribes. Upon request, each agency is required to return any such item to any lineal descendant or specific Tribe with whom such item is associated.

Executive Order 11593 Protection and Enhancement of the Cultural Environment. Signed May 6, 1971, Executive Order 11593 requires that the Federal government provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the Nation. Agencies of the executive branch of the government must:

1. Administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations;
2. Initiate measures necessary to direct their policies, plans, and programs in such a way that federally owned sites, structures, and objects of historical, architectural, or archaeological significance are preserved, restored, and maintained for the inspiration and benefit of the people; and
3. In consultation with the Advisory Council on Historic Preservation, institute procedures to assure that Federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historical, architectural, or archaeological significance.

1.6 Establishment and Purposes of the Refuge and WPA

The Refuge Administration Act directs the Service to manage refuges to achieve their purposes. The purposes for which a refuge is established form the foundation for planning and management decisions. Refuge purposes are the driving force in the development of the refuge vision statements, goals, objectives, and strategies in a CCP and are critical to determining the compatibility of existing and proposed refuge uses. As units of the National Wildlife Refuge System, Waterfowl Production Areas (WPAs) are also covered under this Act.

The purposes of a refuge are specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. Unless these documents indicate otherwise, purposes dealing with the conservation, management, and restoration of fish, wildlife, and plants, and the habitats on which they depend take precedence over other purposes in the management and administration of any unit.

Where a refuge has multiple purposes related to fish, wildlife, and plant conservation, the more specific purpose will take precedence in instances of conflict. When an additional unit is acquired under an authority different from the authority used to establish the original unit, the addition takes on the purpose(s) of the original unit, but the original unit does not take on the purpose(s) of the newer addition. When a conflict exists between the Refuge System mission and the purpose of an individual refuge, the refuge purpose may supersede the mission. The purposes for Bear Lake NWR and Oxford Slough WPA are described below.

1.6.1 Summary of Purposes and Management Direction for the Refuge and WPA

Bear Lake National Wildlife Refuge
On May 9, 1968, 17,573 acres of land in Bear Lake County, Idaho, was set aside as Bear Lake National Wildlife Refuge by Public Land Order 4415 (33 FR 7151). This was followed by Public Land Order 4545 (33 FR 19948), which withdrew an additional 48.81 acres on December 23, 1968.

While no formal purposes were included within these Land Orders, withdrawn lands assumed the following purposes:

> "… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act).

> "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species … " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

> "… the Secretary … may accept and use … real … property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

> "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species … or (B) plants …" 16 U.S.C. § 1534 (Endangered Species Act of 1973).

> "… for the development, advancement, management, conservation, and protection of fish and wildlife resources …" 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956).

> "… for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude …" 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956).

Additional lands were added to Bear Lake NWR under authority of the Migratory Bird Conservation Act of 1929 (MBCA; 16 U.S.C. 715d).

Thomas Fork Unit
The Thomas Fork Unit was transferred in fee title to the Service from the Farm Home Administration (U.S. Department of Agriculture) on September 28, 1995. This 1,015-acre tract was acquired for:

> "… conservation purposes" under the Consolidated Farm and Rural Development Act (7 U.S.C. § 2002).

Oxford Slough Waterfowl Production Area

The 1,878-acre Oxford Slough WPA was purchased in fee title from the Federal Land Bank on April 25, 1985. Lands were purchased using Federal Duck Stamp Funds, allocated by the Migratory Bird Hunting and Conservation Stamp Act, which provided that the area be managed under the following purposes:

> "… as Waterfowl Production Areas subject to … all of the provisions of such Act [Migratory Bird Conservation Act] … except the inviolate sanctuary provisions …" 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

> "… for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

1.6.2 Acquisition History and Authorities

Acreage within the Bear Lake NWR and the Thomas Fork Unit is included in the Real Property Management Information System. Total acreage of USFWS land or interests in and at Bear Lake NWR is 18,169, while total acreage of USFWS land at the Thomas Fork Unit is 1,015.

Acreage within Oxford Slough WPA is also included in the Real Property Management Information System. To date 1,878 acres have been acquired in fee title. Maps 2 and 3 show current land status and tracts of Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA.

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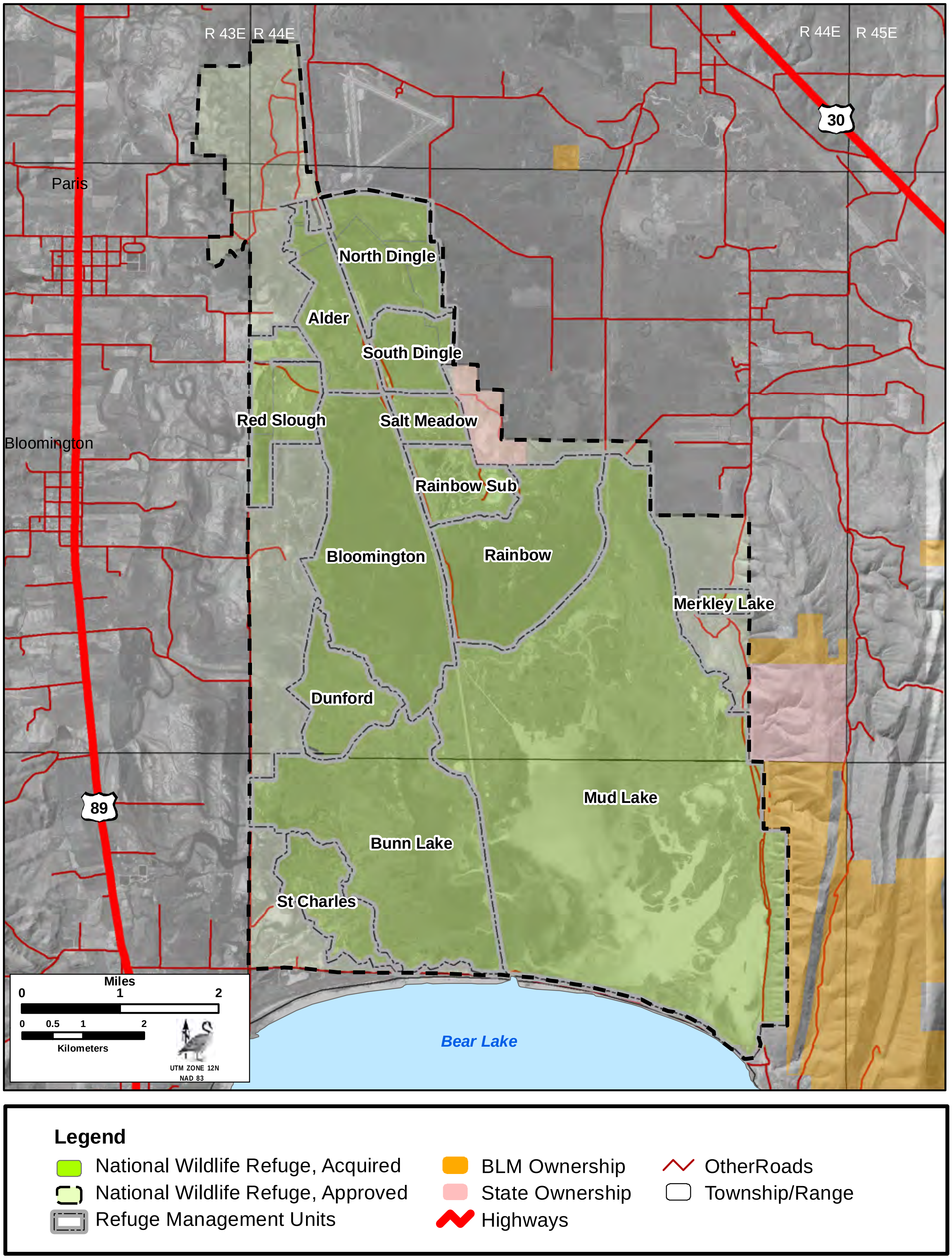
Map 2. **Land Status**



Map Date: 04/26/2012 File:12-080-1.mxd

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Table 1.1. Bear Lake NWR Established through Public Land Orders

Tract Number	Acquired Date	Withdrawal of Public Land	Interest of Acquisition	Acres
1	FR Notice 05/09/1968	PLO 4415	Withdrawal	16,959.12
1	FR Notice 12/23/1968	PLO 4545	Withdrawal	Included above

Table 1.2. Bear Lake NWR Managed Lands through Easements/Agreements

Tract Number	Acquired Date	Tract Owner	Interest of Acquisition	Acres
16M	05/13/2010	PacificCorp	Use Agreements (East Side Roadway, West Side Roadway and Land Use)	~13.64

Table 1.3. Bear Lake NWR Acquired Lands through Fee Title Purchase

Tract Number	Acquired Date	Tract Owner	Interest of Acquisition	Acres
17a, b	03/21/1979	Alder, Gerald and Sandra Alder, Alan and Jean	FEE	344.15
15	04/03/1979	Haslam, Ladell and Amarylis	FEE	273.66
17I, 17II, 17aI	10/29/1979	Alder, Gerald and Sandra Alder, Alan and Jean	FEE	7.62
42	08/15/1986	Nate, Harold E.	FEE	147.78
43	10/29/1986	Tri-State Bank and Trust	FEE	116.25
41	11/13/1986	Skinner; Kent, Emma Lou, and Golda	FEE	78.18
22	07/06/1989	Payne, Russell	FEE	119.54
20	6/10/2011	Elizabeth Hart Barnes Family LLC	FEE	119.41

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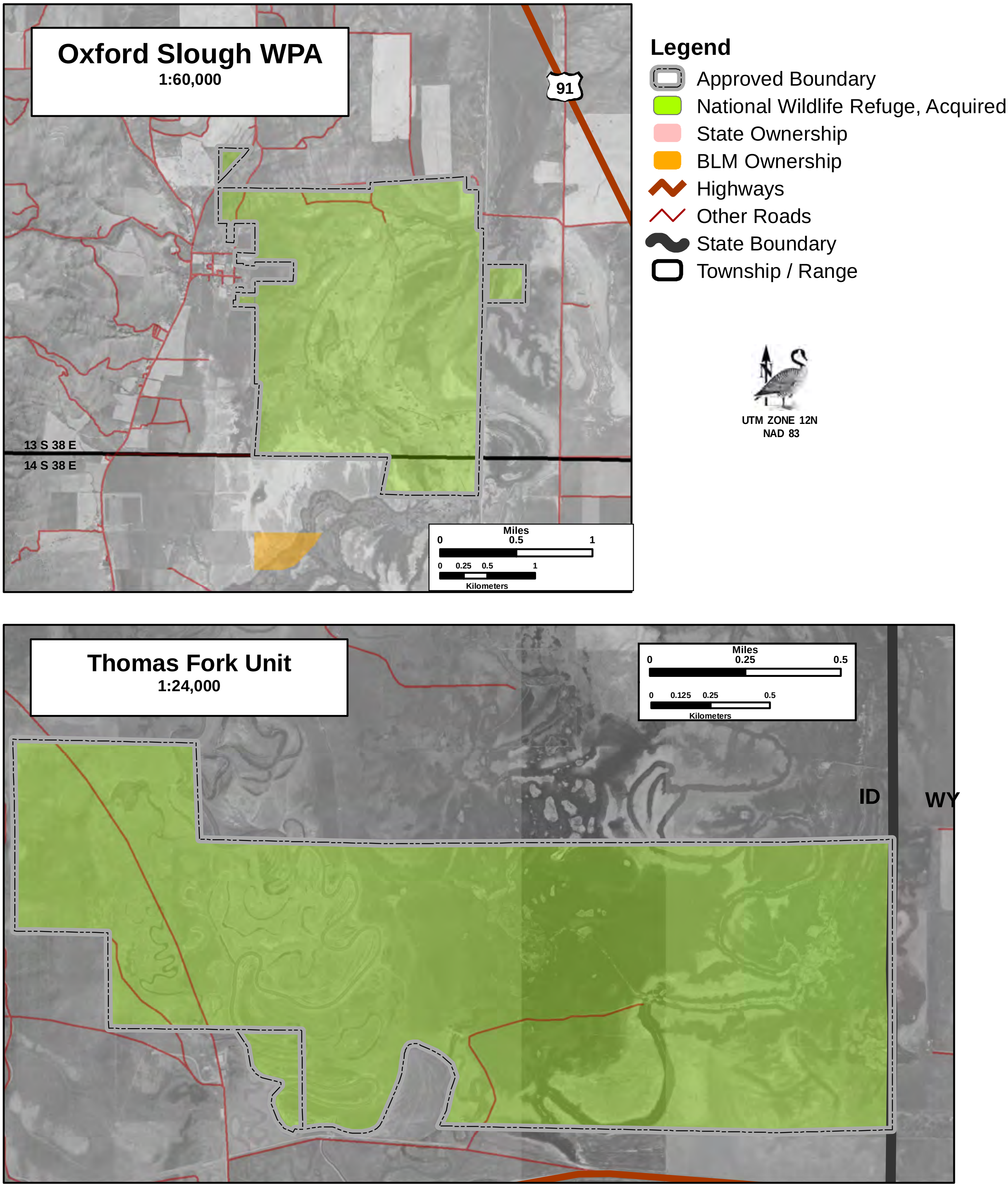
Map 3. ***Land Status, Oxford Slough WPA and Thomas Fork Unit***



Map Date: 04/26/2012 File:12-080-2.mxd

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Table 1.4. Thomas Fork Unit

Tract Number	Acquired Date	Tract Owner	Interest of Acquisition	Acres
10	9/28/1995	U. S. Dept. of Agriculture	Land transfer	1015.2
11	11/12/1997	Esche, Rolf and Elizabeth	Land Exchange	Equal value exchange for Tract 10 Parcel A and Tract 10 Parcel A-C ~17.4 acres

Table 1.5. Oxford Slough Waterfowl Production Area

Tract Number	Acquired Date	Tract Owner	Interest of Acquisition	Acres
10	04/25/1985	Federal Land Bank of Spokane	FEE	1,878 Total acreage including lots excessed below
10b, 10c, 10d	1989	Disposed of as Excess Property		

1.7 Relationship to Ecosystem Management Goals

1.7.1 Regional Setting

Bear Lake NWR and Oxford Slough WPA are located in the Intermountain West, a region that includes portions of eight states (eastern Washington and Oregon, northeast California, northern Nevada and Utah, western Wyoming and Montana, and Idaho). Due to its arid to semi-arid climate, wetlands are scarce in the region (Ratti and Kadlec 1992). Wetlands in the Intermountain West region account for about one percent of total surface area (1.6 million acres) compared to 6 percent (22.5 million acres) in the Midwest region (Dahl 1990).

Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA all lie within the Bear Lake Watershed of the Bear River Basin, which includes all lands draining to the Bear River between Stewart Dam, below the Idaho-Utah border, and Alexander Dam, near the town of Soda Springs, Idaho. The highest point in the watershed is Meade Peak (9,957 feet). The lowest elevation is below Alexander Reservoir (5,712 feet). Bear Lake is the centerpiece of this watershed. The Thomas Fork, a tributary to the Bear River, drains the 150,100-acre Thomas Fork watershed. The Thomas Fork Watershed is a part of the Central Bear River Watershed, the smallest watershed in the Bear River Basin, draining 523,800 acres. Oxford Slough is considered part of the Middle Bear Watershed, which includes all land that drains to the Bear River from below Alexander Dam in Idaho to Cutler Dam in Utah. Oxford Reservoir, just north of Oxford Slough, is a major waterbody of the Middle Bear watershed (BRWIS 2010).

During the hundreds of thousands of years of Bear Lake's existence, the Bear River has, on multiple occasions, connected to the lake during high water periods. However, in the last 11,000 years, the river has not been naturally connected to Bear Lake. About 35,000 years ago, a volcanic debris slide cut off its original, northerly route and deflected the river to the south. The result of these events is the river's current, near-circular, route to the Great Salt Lake. Before this volcanic event, the Bear River was a tributary of the Snake River.

In 1911, the Dingle inlet canal was constructed, which diverted almost all the water in the Bear River southward to Mud Lake. (Later, Stewart Dam and the Rainbow inlet canal were constructed to divert the Bear River water. The Dingle inlet canal is now used as an irrigation canal.) From there, when spring runoff water is being stored, the water flows through Mud Lake to enter Bear Lake. The rest of the year it flows through Mud Lake and out the Outlet Canal to rejoin the original Bear River channel. The upper 6.5 meters (21.3 feet) of Bear Lake function as a reservoir. The Lifton Pumping Station releases water from Bear Lake to the Bear River during the summer for irrigation.

The Bear Lake watershed encompasses parts of Bear Lake and Caribou counties in Idaho, and Rich County in Utah. It includes the towns of Montpelier and Soda Springs in Idaho and Garden City in Utah. The population in this watershed is about 10,500. The largest employment sectors include agriculture, government, retail, and tourism. Future economic growth in this watershed is expected to occur in agriculture, energy, tourism, and manufacturing. Population in the entire Bear River Basin, in and around existing municipalities, is expected to increase significantly by 2050. Development within and near Garden City, Utah, is moving outward from the lakeshore and up the sides of the foothills. Second homes and summer cabins account for most of the growth.

Almost half the watershed is privately owned. The U.S. Forest Service manages about one-third of the public land. Approximately half of the land is used as rangeland. Managed forests and agricultural lands account for most of the remaining land uses. The Georgetown Summit and Montpelier Wildlife Management Areas, managed by the Idaho Department of Fish and Game, provide a migratory pathway for many shorebirds, wading birds, and waterfowl heading south to Bear Lake and Great Salt Lake. The Nature Conservancy manages Formation Springs and Cave as a nature preserve a few miles outside of Soda Springs, Idaho. The preserve was established to protect the crystal-clear pools and a unique wetland complex at the base of the scenic Aspen Mountains. The cold springs that feed the terraced pools and creek system deposit high concentrations of travertine (calcium carbonate), which gives the site its unique geology.

Other regional areas of special biological significance include the Bear River Migratory Bird Refuge located in the northeast arm of the Great Salt Lake known as the Bear River Bay. The Bay encompasses 112,000 acres of the Bear River delta (Kadlec and Adair 1993). The delta is a mosaic of freshwater marshes, river channels, and alkali salt flats. The Migratory Bird Refuge encompasses about 71,000 acres of the Bear River delta. The Bear River delta interrupts the shrub lands of the arid Great Basin acting as a freshwater oasis that hosts high populations of nesting waterbirds and attracts large flights of migrant grebes, waterfowl, and shorebirds.

1.7.2 Regional Conservation Plans

A brief summary of the major regional conservation plans we considered in the development of the CCP follows:

Idaho Comprehensive Wildlife Conservation Strategy: In 2001, the U. S. Congress began to appropriate Federal funds through the State Wildlife Grants program (SWG) to help meet the need for conservation of all fish and wildlife. Along with this new funding came the responsibility of each state to develop a Comprehensive Wildlife Conservation Strategy (CWCS). Idaho has embraced this program by developing a comprehensive strategy that will serve to coordinate the efforts of all partners working toward conservation of wildlife and wildlife habitats across the State. The Idaho Department of Fish and Game (IDFG) coordinated this effort in compliance with its legal mandate to protect and manage all of the State's fish and wildlife resources.

The aim of Idaho's CWCS is to provide a common framework that will enable conservation partners to jointly implement a long-term approach for the benefit of Species of Greatest Conservation Need (SGCN). To this end, this strategy promotes proactive conservation to ensure cost-effective solutions instead of reactive measures enacted in the face of imminent losses.

Specifically, the Idaho CWCS:

(1) Identifies 229 SGCN (103 invertebrates, 126 vertebrates) and associated habitats;
(2) Provides an ecological, habitat-based framework to aid in the conservation and management of SGCN;
(3) Recommends actions to improve the population status and habitat conditions of SGCN;
(4) Describes an approach for long-term monitoring to assess the success of conservation efforts and to integrate new information as it becomes available;
(5) Complements other conservation strategies, funding sources, planning initiatives, and legally mandated activities;
(6) Incorporates public participation throughout development and implementation to provide an opportunity for all conservation partners and Idaho residents to influence the future of resource management;
(7) Provides guidance for use of SWG funds and fulfills Federal requirements associated with these funds; and
(8) Provides a clear process for reviewing and revising the Strategy to address changing conditions.

An objective rule-based process was used to evaluate all animals thought by experts to be a candidate for SGCN. This process was designed specifically to reduce subjectivity and to obtain an objective state rank for species considered for inclusion as SGCN. Factors included, but were not limited to, information about population size, trend, viability, environmental specificity, threats, and protection status. A total of 229 animals (103 invertebrates, 126 vertebrates) were identified as SGCN. Of these, 64 species (44 invertebrates, 20 vertebrates) lacked essential information pertaining to their status (i.e., SRank) in Idaho. Therefore, their primary conservation need is more basic population information. For the remaining 165 species (60 invertebrates, 105 vertebrates) there is enough information to determine their status in the State, identify conservation issues, and recommend conservation actions.

Bear Lake NWR and Oxford Slough WPA are within the Bear River Ecoregion of the Idaho CWCS. Thirty-three SGCNs were identified in the Bear Lake Section of the Idaho CWCS. An additional 20 CWCS species with State rankings of S1 (Critically Imperiled), S2 (Imperiled), or S3 (Vulnerable) are known to inhabit Bear Lake NWR, but were not identified as SGCN for the Bear Lake Ecoregion.

Conservation Plan for the Greater Sage-Grouse in Idaho: The 2006 Plan was designed to provide guidance, tools, and resources to Local Working Groups (LWG) to facilitate the development of their plans, while also encouraging a level of statewide consistency among the LWG plans. The primary goal of the Plan is to maintain, improve, and where possible, increase sage-grouse populations and habitats in Idaho, while considering the predictability and long-term sustainability of a variety of other land uses.

Under the framework outlined in this Plan, the LWG plans will identify and prioritize local threats, and identify appropriate conservation measures at the mid- and fine scale, while this State Plan identifies and prioritizes threats at the broad-scale. This Plan also provides a toolbox of fine-scale conservation measures for use and/or adaptation by LWGs (as appropriate to local population and habitat conditions), and for use in cases where a LWG plan has not been completed, or where no LWG currently exists.

Bear Lake NWR is within the Eastern Idaho LWG. The Eastern Idaho LMG plan is currently in process, with no specified target date for completion. Where appropriate, the Bear Lake NWR CCP will incorporate the guidance provided within the Idaho Conservation Plan for Greater Sage-grouse toolbox of fine-scale conservation measures.

Idaho Mule Deer Management Plan 2008-2017: The Mule Deer Management Plan (IDFG 2008a) tiers off the IDFG strategic plan, functioning as the action plan or mule deer management in the State. Major issues affecting mule deer management are identified, setting overall direction for mule deer management during the next 10 years and providing performance targets and management strategies for management actions.

Bear Lake NWR and the Thomas Fork Unit are within the Caribou Population Management Unit (PMU) (Game Management Units 66, 66A, 69, 72, 76). Oxford Slough WPA is in the Bannock PMU (Game Management Units 56, 57, 70, 71, 73, 73A, 74, 75, 77, 78). Each PMU has multiple habitat and population-based management direction, performance targets, and strategies. Relevant management direction identified in the plan for incorporation into Bear Lake NWR and Oxford Slough WPA CCP includes habitat improvements to key winter, summer, and transitional mule deer habitats and the minimization of population impacts from road and highway mortality.

U.S. Shorebird Conservation Plan (USSCP): Few direct specific habitat guidelines are provided by the USSCP, which instead, seeks to identify key shorebird regions throughout the continent, and allow regional committees to determine the best locations for shorebird restoration initiatives. Bear Lake NWR and Oxford Slough WPA contain small, but significant populations of key shorebird species including American avocet, Wilson's phalarope, willet, and black-necked stilt. Both areas also serve as a secondary migration corridor for migrants traveling between National Priority Areas 27 and 28.

Intermountain West Regional Shorebird Plan (IWRSP): The IWRSP maintains a series of habitat restoration objectives centered around delineating regionally important sites, and incorporating restoration activities into a landscape scale design. Independent water management capabilities at Bear Lake NWR provide a critical breeding and stop-over habitat for shorebirds in the larger landscape. This allows the wetlands to be managed as a complex of habitats, which basically means that mud flat, perennial emergent, and breeding habitat can be simultaneously provided within the same area to help meet the needs of waterbirds with very different life history requirements.

North American Waterbird Conservation Plan: The ultimate goal of the plan is "To protect, restore, and manage sufficient high quality habitat and key sites for waterbirds throughout the year to meet species and population goals." Focusing primarily on colonial nesting waterbirds, the plan seeks to develop cross-cultural partnerships to encompass waterbird habitat across the Americas. Bear Lake NWR and Oxford Slough WPA serve as primary nesting sites for several colonial nesting waterbird species, highlighted by the largest white-faced ibis colony in Idaho at Bear Lake NWR; typically 3,000-5,000 nests but more than 12,000 nests in 2008 (IDFG 2008b).

Intermountain West Waterbird Conservation Plan: The IWWCP is the regional step-down plan, which provides more specific guidance for the Bear River Valley. As general habitat conservation objectives, target restoration areas should consider:

1. Areas rich in priority birds and habitats
2. Opportunities for conservation and partnerships
3. Threats to priority species and habitats
4. Areas large enough in scale to achieve meaningful conservation and small enough to capture local working groups.

The Bear Lake Valley contains colonial waterbird breeding habitat for one of two high concern species (snowy egret), and eight of ten moderate concern species, and includes large nesting colonies of California gull, Forster's tern, Franklin's gull, black-crowned night heron, black tern, and eared grebe.

North American Waterfowl Management Plan (NAWMP): The NAWMP states that the goal is "to return waterfowl populations to their 1970s levels by conserving wetland and upland habitat." This will be accomplished through a combination of a solid "Biological Foundation, Landscape Approach, and Partnerships." Bear Lake NWR and Oxford Slough WPA lie between two National priority sites and maintain a nexus with each through provision of quality breeding and migration habitat for waterfowl (Priority Area 27 – Great Salt Lake and Bear River Marsh**)** and provision of quality breeding habitat for trumpeter swans and overwater nesting waterfowl species such as redhead and canvasback (Priority Area 28 – Yellowstone-Intermountain Wetlands**)**. National breeding population objectives for key waterfowl species include the northern pintail (5.6 million; decreasing), mallard (8.2 million; no trend), and greater and lesser scaup (6.3 million; decreasing) among which only the mallard population has satisfied this objective (8.64 million). Current Bear Lake Valley populations for these species are relatively small compared to these National Objectives; however, they are regionally significant considering proximity to NAWMP high profile sites. The plan also lists breeding population objectives for redhead (640,000) and canvasback (540,000), both of which are currently above the population objective on a National basis, but, with insufficient data to estimate trend information. The remaining three plan-listed priority species–wood duck (200,000 western population), American wigeon (3.1 million total population), and ring-necked duck (2 million)–are all considered to be either increasing or to have stable populations.

Intermountain West Joint Venture Habitat Conservation Objectives (IWJV): The IWJV lists the following habitat objectives in their 1995 implementation plan:

1. To protect 1.5 million public and private acres through facilitation of conservation easements, management agreements, incentive programs, and stewardship programs.
2. To restore and enhance 1 million acres of wetland habitat through direct habitat improvement programs.
3. To enhance all bird habitat through direct habitat improvement programs, public education, and cooperation with our partners.

More recently, the IWJV has developed a coordinated implementation plan to consolidate region-specific information from each of the four National Plans. The 2005 update to the IWJV Coordinated Bird Conservation Implementation Plan describes goals and objectives for two priority habitat types, which occur at Bear Lake NWR and Oxford Slough WPA. The following sections include a synopsis of this plan, and subsequent plans used in the development of the IWJV Coordinated Implementation Plan for Bird Habitat in Idaho.

Intermountain West Joint Venture Coordinated Implementation Plan for Bird Habitat in Idaho (IWJVCIP): Prepared for the Intermountain West Joint Venture, the coordinated implementation plan seeks to address and consolidate National Plan habitat objectives into one document. The plan lists the Bear Lake Bird Habitat Conservation Area (BHCA) as one of 23 priority sites in Idaho, primarily for its importance in meeting wetland and riparian habitat restoration objectives. Bear Lake NWR includes three of the five most critical habitat types (wetlands, riparian, and agricultural) and has been designated a priority A1 BHCA for its contributions to diving ducks, colonial nesting waterbirds, sandhill cranes, and trumpeter swans. The IWJVCIP further lists overall restoration or enhancement of 1.6 million acres of wetland habitat as a priority objective.

More specifically, the Southeast Idaho Wetland Focus Area, Wetland Conservation Plan, lists the mallard and northern pintail as priority species. According to the plan, mallards are the most abundant duck species in Southeast Idaho, while northern pintail breeding populations continue to decline. Other important waterbird groups include colonial nesting waterbirds, of which five species are recognized as National species of low or moderate concern (American white pelican, California gull, white-faced ibis, western grebe, and Clark's grebe). Plan authors used a habitat based, as opposed to population objective approach, and described the desired future condition; *"wetlands should be protected/maintained/enhanced/restored in such condition that the hydrology of a site remains intact."*

Concept Plan for Preservation of Redhead Breeding Habitat in Idaho: In response to declining population numbers, the Service conducted an evaluation to document the extent of redhead breeding habitat in the Great Basin and formulate a strategy to maximize habitat restoration efforts. Private wetlands in Bear Lake County ranked number 1 in Idaho for their importance to redhead production based on a complex set of ranking factors. Primary among these factors were the contributions of perennial emergent marsh for redheads, the importance of these habitats for other waterfowl species, and the increasing threat of agricultural water distribution during the breeding season.

Conservation Strategy for Southeast Idaho Wetlands: Through funding provided by the Environmental Protection Agency (EPA), the Idaho Department of Fish and Game conducted a study to characterize and rank wetland importance in southeast Idaho. This initiative resulted in the Class I ranking of Bear Lake NWR (only one of four wetland areas), primarily for its "high quality, large expanses of emergent marsh." Oxford Slough WPA was given a Class II rating, one of 10 such sites in SE Idaho. The study further identified one State sensitive plant community (category S1; *Salicornia rubra*) and 10 sensitive waterbird species (categories S1 or S2).

Audubon Society Globally Important Bird Area: Both Bear Lake NWR and Oxford Slough WPA have been designated as Globally Important Bird Areas by the National Audubon Society. As two of 503 such sites in Idaho, selection was based on the areas' contributions to colonial nesting waterbird habitat. At present, 13 species of concern have developed colonies on BLNWR and Oxford Slough WPA. Bear Lake NWR is recognized for its exceptional diversity and concentrations of waterbirds. In 2008 more than 12,000 white-faced ibis nests and 29,000 Franklin's gull nests were observed on the Refuge. Oxford Slough WPA contains large colonies of white-faced ibis (more than 4,700 nests in 2010) and Franklin's gulls (more than 6,600 nests in 2010) (NAS 2012).

Other regional plans include **The Southeast Idaho Wetland Focus Area, Wetland Conservation Plan** which recognizes Bear Lake NWR as an area that supports the largest emergent wetland area and largest waterbird breeding population in the Great Basin Habitat complex**.** The Trumpeter Swan Implementation Plan identified a habitat objective specifically for the proposed project's contribution to Rocky Mountain trumpeter swan nesting (*"Task 3, Subtask A, 2. Develop a restoration proposal for the Bunn Lake wetland enhancement project at Bear Lake NWR."*). And finally, the Service, Idaho Partners for Fish and Wildlife Program recognizes the Bear River/Bear Lake region as one of seven priority sites for use of Partners funds, primarily focusing on benefits to Bonneville cutthroat trout and migratory birds.

1.7.3 Pacific Flyway Management Plans

The Pacific Flyway Council is an administrative body that forges cooperation among public wildlife agencies for the purpose of protecting and conserving migratory game birds in western North America. The Council has prepared numerous management plans to date for most populations of ducks swans, geese, and sandhill cranes in the Pacific Flyway (www.pacificflyway.gov). These plans typically focus on populations, which are the primary unit of management, but may be specific to a species or subspecies. Management plans serve to:

- Identify common goals;
- Coordinate collection and analysis of biological data;
- Establish the priority of management actions and responsibility for them; and
- Emphasize research needed to improve management.

The Council creates flyway management plans to help state and Federal agencies cooperatively manage migratory game birds under common goals. Management strategies are recommendations, but do not commit agencies to specific actions or schedules. Fiscal, legislative, and priority constraints influence the level and timing of implementation. Pacific Flyway plans generally guide management and research for a five-year planning horizon. Several of these plans pertain to species found on the Refuge. A brief summary of the flyway management plans we considered in the development of this CCP follows.

Management Plan of the Pacific and Central Flyways for the Rocky Mountain Population of Greater Sandhill Cranes (2007).

This plan is a revision of the July 1997 Rocky Mountain Population (RMP) sandhill crane plan. Its purpose is to establish guidelines for managing RMP sandhill cranes. The plan addresses habitats (breeding range, fall staging areas, migration routes, fall and spring stop-over areas, and winter areas), status, uses, current management, problems associated with the population, and crane hunting guidelines.

The primary objective of the plan is to manage the RMP for numbers and distribution that will provide maximum direct benefit to the public and for the intrinsic values of the birds themselves. Objectives include: A) Manage for a stable population index of 17,000-21,000 cranes determined by an average of the three most recent reliable September (fall pre-migration) surveys; B) Maintain and protect suitable habitats in sufficient quantity and quality to support population objectives and spatial distribution, while encouraging populations expansion where desirable; C) Provide for recreational uses of RMP cranes; and D) Minimize crop depredations by RMP cranes.

The plan recommends several management procedures. The degree and timing of their implementation by the various lead agencies will be influenced by manpower and fiscal and legislative constraints. The following procedures within the plan are the most pertinent to CCP development for Bear Lake NWR and Oxford Slough WPA:

1. The IDFG, in cooperation with other state and Federal agencies, nongovernmental organizations, and private parties, will work to annually provide 600-1,000 acres of supplemental feed crops in strategic locations to help alleviate crop damage. Funding for this program will come primarily from the interest earned by a Lure Crop Endowment established from private contributions.
2. Encourage to identify, classify, rank, and catalog habitats used by the RMP throughout its range to facilitate the protection of important habitat through acquisition, easement, cooperative agreements, special-use permits, and mitigation exchanges and developments.
3. Promoting increased awareness and understanding of cranes was deemed essential to the well being of the RMP cranes. Individual state wildlife agencies and the FWS will cooperatively develop and distribute information on the life history of RMP cranes and important management issues.
4. The plan calls on the Subcommittees to consider problem situations and recommend options to the appropriate state agencies for reducing or eliminating crop damage. Various individuals, nongovernmental organizations, and other agencies will be encouraged to suggest solutions.
5. Population surveys are to be done each September when peak numbers of cranes are present on pre-migration staging areas in summer range states.
6. As appropriate, the Subcommittees will develop research proposals, recommend needed research, and review research proposals. In these actions, the Subcommittees will give priority to research conducted on the RMP or regional flocks/subpopulations, rather than local projects.

Pacific Flyway Management Plan for the Rocky Mountain Population of Western Canada Geese (1983; revised 1992, 2000).

The purpose of this plan is to improve coordinated management of western Canada geese by providing goals and objectives to guide wildlife agencies responsible for management programs for a five-year period (Subcommittee on Rocky Mountain Canada Geese 2000).

The western Canada goose (*Branta canadensis moffitti*) occurring within the Pacific Flyway is currently recognized for management purposes as consisting of two populations: the Pacific Population (PP) and the Rocky Mountain Population (RMP) (Krohn and Bizeau 1980). The RMP population is primarily migratory with geese undertaking spring and fall migrations between breeding and wintering areas. Due to interstate and international distribution of certain flocks and shared management concerns, management of this resource requires interstate and international coordination.

Sixteen reference areas are used in this plan to facilitate management and tabulation of population and harvest data. These areas were delineated on the basis of band recovery distribution and are defined in detail by Krohn and Bizeau (1980). The four NWRs of the Southeast Idaho NWR Complex fall within Southeast Idaho Reference Area 3.

The goal of this management plan is to maintain numbers and distribution of RMP Canada geese to optimize recreational opportunity while controlling depredation and nuisance problems.

Objectives of this plan are to:

A. Maintain a breeding population index of 117,000 birds, while considering desired levels of regional breeding and wintering flocks within individual reference areas. For Reference Area 3 (Southeastern Idaho) there is a Breeding Population Index of 5,040 and an Objective Breeding Population Index of 5,550;

B. Maintain seasonal breeding, wintering, and molting distributions;

C. Maintain suitable breeding and wintering habitats to support distribution objectives;

D. Maintain optimum hunting opportunities and provide for viewing, educational, and scientific pursuits;

E. Evaluate current population and reference area boundaries to determine if they reflect true demographic differences among neighboring Canada goose populations (PP, Hi-Line Population (HLP), and RMP);

F. Evaluate depredation and nuisance issues and implement management practices where appropriate.

The plan recommends several management procedures. The degree and timing of their implementation by the various lead agencies will be influenced by manpower and fiscal and legislative constraints. The following procedures within the plan are the most pertinent to CCP development for Bear Lake NWR and Oxford Slough WPA:

1. Annual Breeding Population Index: Breeding population surveys will be conducted within each reference area throughout the breeding range of RMP Canada geese. These surveys may be either breeding pair or breeding population surveys.
2. Banding Needs Assessment: Banding for monitoring recovery distribution, derivation of harvest, harvest, and survival rates for individual flocks, will be considered as part of a needs assessment.
3. Annual Production Trend Survey: Nesting and/or brood surveys are encouraged in all reference areas throughout the breeding range of RMP Canada geese.
4. Annual Midwinter Waterfowl Survey: RMP Canada geese will be counted in all reference areas that support concentrations of wintering geese during the MWS, which is normally conducted during the first week in January.
5. Research: The Subcommittee will, as needed, recommend research and review proposals for research. The Subcommittee will establish priorities for research based on the needs of the RMP. Areas of identifiable needed research include Harvest Information and Range Delineation.
6. Depredation and Nuisance Problems: Increasing problems with depredation and nuisance Canada geese facilitated the development of a Flyway Depredation Policy. The plan asks all

agencies to implement programs to assist in the deployment of management actions to assist landowners.

Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans (2008).

The goal of this management plan is to restore the RMP of Trumpeter Swans as a secure and primarily migratory population, sustained by naturally occurring and agricultural food resources in diverse breeding and wintering sites. Management objectives are:

A. Continue to encourage swans to use wintering areas outside of the core Tri-state Area while reducing the number of wintering swans in the core Tri-state Area to a maximum of 1,500;

B. Rebuild U.S. nesting flocks by year 2013 to at least 165 nesting pairs (birds that display evidence of nesting) and 718 adults and subadults (white birds) that use natural, diverse habitats. For Idaho, the plan identifies a target of 30 nesting pairs and 175 adults and sub-adults, by 2013. Furthermore, the plan calls for specific nesting and adult/sub-adult objectives for: Bear Lake NWR (5 and 25 respectively); Grays Lake NWR (10 and 30 respectively); and Camas County (1 and 5 respectively).

C. Expand the breeding range in order to enhance the connectivity of breeding flocks;

D. Increase the abundance of desirable submerged macrophytes in the Henrys Fork of the Snake River in and near Harriman State Park (HSP);

E. Promote the restoration and development of high quality wetland habitats for breeding and wintering swans; and

F. Monitor the population.

Important management strategies to achieve the objectives include:

1. Reduce the attractiveness of Harriman State Park (HSP); by manipulating water levels;
2. Provide habitat to attain population objectives;
3. Identify potential breeding and winter expansion areas; (4) evaluate the effectiveness of raising cygnets from eggs collected in Canada to increase the availability of swans for release and to increase genetic heterozygosity;
4. Identify, fund, and implement new wetland projects;
5. Translocate flightless U.S. and Canadian cygnets as appropriate;
6. Continue to monitor submerged macrophytes in the Henrys Fork of the Snake River;
7. Develop and implement an effective public information program; and
8. Maintain trumpeter-swan-compatible, tundra swan sport hunting opportunities in the Pacific Flyway.

Pacific Flyway Management Plan for the Western Population of Tundra Swans (2001).

The goal of the tundra swan plan is to ensure the maintenance of the western population (WP) of tundra swans, at a size and distribution that will provide for all their benefits to society (Pacific Flyway Council 2001).

Objectives of this plan are to:

A. Maintain a population of at least 60,000 swans to provide suitable public benefits.

B. Maintain current patterns of distribution throughout the WP tundra swan range;

C. Provide breeding, migration, and wintering habitats of sufficient quantity and quality to maintain the desired numbers and distribution of swans; and

D. Provide for aesthetic, educational, and scientific uses of swans.

E. Provide for sustainable sport and subsistence harvests of WP swans.

Surveillance for Early Detection of Highly Pathogenic Avian Influenza (HPAI) H5N1 in Wild Migratory Birds (2006).

The overall goal for this strategy is to provide guidance to Pacific Flyway wildlife agencies in planning and implementing surveillance to detect Asian H5N1 in wild migratory birds. The plan was intended as a step-down approach from the draft U.S. Interagency Strategic Plan (Interagency HPAI H5N1 Early Detection Working Group 2006) to articulate flyway-level objectives, recommend surveillance strategies, and support further planning in each state to assess available and needed agency resources.

The goal of the national strategy and this Pacific Flyway strategy is early detection of Asian H5N1 in wild migratory birds—not to assess its prevalence over time, monitor its rate of movement, or investigate the ecology of the disease.

This strategy did not intend to provide detailed implementation plans for each Pacific Flyway state. The strategy also does not dictate rigid sampling objectives—the intent is to provide a sense of priorities, but not to constrain sampling of species or areas deemed important by the states or other cooperators. Surveillance efforts for Asian H5N1 will involve, by necessity, extensive cooperation at state and local levels among wildlife agencies, agriculture agencies, public health systems, and other entities—efforts best left to adaptive approaches by our member agencies. Thus, the scope of this strategy is focused on a flyway-level framework for surveillance of wild migratory waterbird populations that are shared and cooperatively managed throughout the Pacific Flyway.

Objectives of the plan include:

A. Prioritize waterbird species to be sampled for Asian H5N1 in the Pacific Flyway.

B. Recommend a suite of sampling approaches to effectively establish an Asian H5N1 detection system in wild migratory birds.

C. Provide guidance to states and cooperators to develop state-specific implementation plans.

D. Recommend procedures to integrate detection efforts within the Pacific Flyway and with national programs.

E. Describe additional planning efforts and coordination necessary to establish and maintain an effective Asian H5N1 detection system in the flyway.

1.7.4 Partners in Flight Landbird Conservation Plans

The Partners in Flight (PIF) long-term strategy document commonly referred to as “The Flight Plan,” lists the following set of goals:

1. Conservation should be done before species become endangered
2. Conservation that stresses both healthy ecosystems and wise management of natural resources
3. Conservation in breeding, migration, and wintering habitat
4. Groundbreaking partnerships that foster voluntary cooperation among public and private landowners.

Their proactive stance is to “keep common birds common.”

The Bear Lake Valley is located at the confluence of three physiographic regions (PR) including the Utah Mountains (69), Wyoming Basin (86), and Basin and Range (80). Key wetland-dependent species found on Bear Lake NWR and Oxford Slough WPA include long-billed curlew (PR 69); Wilson’s phalarope (PR 86); and American white pelican, Franklin’s gull, and American avocet (PR 80). Primary habitats and species specific to the project area are further detailed in the State Specific, Idaho Partners in Flight Conservation Plan.

Idaho Partners in Flight, Idaho Bird Conservation Plan (IBCP): The Idaho Bird Conservation Plan (Ritter 2000) stresses the importance of four primary habitats, two of which are located on the Refuge riparian and non-riverine wetlands. The plan only recognizes the Basin and Range physiographic region, but further delineates critical species and habitat objectives specific to the State. Objectives for these key habitats include:

- **Riparian –** By 2025, restore at least 10 percent of the historical extent of each riparian system.
- **Non-riverine wetland –** Obtain a net increase in the number of acres (hectares) of wetlands in Idaho, focusing on the same types and amounts that historically occurred.

The **IBCP** lists protection of non-riverine wetlands as a high priority task and the project area contains two of the three, priority wetland sites; lacustrine and depressional. While mallard, northern pintail, and lesser scaup are all considered important species using non-riverine wetland sites, only lesser scaup maintains a moderate priority status ranking. The plan focuses on actions that benefit wetlands as a whole, rather than on individual species, thus population objectives are not provided. The plan further lists hydrologic modification and subsequent water level fluctuations during the breeding season as primary threats.

1.7.5 Recovery Plans

The Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988) states in SEC. 8A.(a) that "The Secretary of the Interior … is designated as the Management Authority and the Scientific Authority for purposes of the Convention and the respective functions of each such Authority shall be carried out through the United States Fish and Wildlife Service." The Act also requires that "all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall use their authorities in furtherance of the purposes of this Act."

No federally listed endangered or threatened species occur within or immediately adjacent to Bear Lake NWR. There are no goals, objectives, strategies, actions, or tasks identified in any regional ESA recovery plans applicable to Bear Lake NWR or Oxford Slough WPA.

1.8 Issues, Concerns, and Opportunities

1.8.1 Major Issues to be Addressed in the CCP

The core planning team evaluated and presented issues and concerns for Bear Lake NWR and Oxford Slough WPA during public scoping. Issues are defined as matters of controversy, dispute, or general concern over resource management activities, the environment, land uses, or public use activities. Issues are important to the planning process because they identify topics to be addressed in the CCP, pinpoint the types of information to gather, and help define alternatives for the Draft CCP/EA. Additional issues, concerns, and opportunities were raised during the public scoping process; we addressed them all in some manner in the CCP. It is the Service's responsibility to focus planning and the EA analysis on the major issues. Major issues typically suggest different actions or alternative solutions, are within the Refuge's jurisdiction, and have a positive or negative effect upon the resource. The following issues, concerns, and opportunities were considered during the development of this CCP.

Habitat Management (All Units)

Water level management is the overriding factor affecting most refuge habitat management strategies, specifically to provide waterbirds nesting, loafing, and feeding areas and to manage muskrat winter habitat. Management efforts focus on maintaining a given ratio of emergent marsh to open water habitat using water level manipulations, prescribed fire, and mechanical disturbance.

Riparian habitats comprise a small, but important, component of refuge ecosystems. However, these creeks do not originate on Refuge lands and significant portions of the watersheds lie outside the Refuge therefore, upstream activities have major impacts on Refuge water quality and quantity. Native fishes of concern were historically present within the refuge waters and included Bonneville cutthroat trout. Widespread population and habitat declines have been projected for numerous sagebrush associated species. A growing sense of urgency over the outlook for sagebrush-dependent wildlife has spawned sagebrush planning and restoration efforts within Idaho.

Agricultural small grains and short-cover areas at the Refuge provide valuable foraging habitat for key bird species such as cranes, geese, and curlews.

Sedimentation (Bear Lake NWR)

Bear Lake NWR's Mud Lake serves as the turning basin for the entire Bear River system, which has led to high quantities of sediment entering the lake over time. Because the Refuge serves as a storage basin for irrigation use in the lower Bear River, water quantity is not a problem. Allen (2011) found that the majority of total suspended solids (TSS) and total phosphorus (TP) loading entered the Refuge from the Bear River. As flows moved across the Refuge marsh (Dingle Swamp), the loading of TSS and TP was greatly reduced. Allen (2011) cites studies on the impacts of TSS on the aquatic food web, on fish gills, and on the channelization of wetlands. The study also notes that TSS can also be a pathway for other pollutants and that excess nutrients (like phosphorus) can cause over-fertilization (eutrophication) of water bodies. Allen's 2011 thesis can be consulted for references on several past efforts to study the potential impacts of Bear River water on Bear Lake proper and on the Refuge.

The Refuge maintains an agreement with PacifiCorp (the primary water rights holder), through which target elevations are maintained within one-half foot of the 5,920.5-foot elevation, subject to the Bear River Compact, irrigation needs, and flood control. Unfortunately, this is not a solution toward solving the habitat quality issues. Redirection of the Bear River has resulted in excessive sediment deposition throughout the Mud Lake system. This sediment load primarily consists of silt and fine clay particles which ultimately deposit in the marsh bottom. Unlike clay, silt particles do not bind to each other and do not create the stable marsh bottom required by some plants. Instead, the silt particles tend to accumulate in loose horizons that have attained depths of greater than four feet in some locations. At these locations, the existing plant community is either relatively homogenous, or in most cases, non-existent (Bundy 2007).

Carp (Bear Lake NWR)

Carp (*Cyprinus carpio*) were introduced to the Bear River system in 1882 and are now widespread in the region. The foraging action of carp contributes to turbidity issues at Bear Lake NWR. Turbid water tends to limit photosynthesis, and therefore both seed germination and plant growth. Those plants that do survive are uprooted by carp. The combination of turbid water and carp creates a relatively sterile wetland ecosystem. Currently, only impounded units that have recently received carp control have high water quality that allows submerged aquatic plants to thrive. In other units, including Mud Lake, water clarity, and therefore aquatic plant growth, is low.

Questions to Consider

- *What are the best means to attain productive marsh habitats for wildlife on the Refuge and WPA?*
- *How can the Service protect and improve the quantity and quality of water for fish and wildlife resources on the Refuge and WPA?*
- *What can the Service do to prevent the introduction and dispersal of invasive plants and animals and facilitate their removal from the Refuge and WPA?*
- *What should be the Refuge's role in supporting native fish and riparian habitat restoration?*
- *What are the most appropriate management techniques for the wet meadow and upland habitats on the Refuge and WPA to maximize habitat values for key wildlife species (e.g., sandhill cranes, Canada geese), while assuring other native wildlife cover and forage requirements are still satisfied?*
- *What is the appropriate role of prescribed fire in habitat management and fuels reduction?*

- *Should the Refuge attempt cooperative and joint watershed management strategies within Bear Lake and Bear River watershed?*
- *How can we engage or adaptively manage the Refuge and WPA in response to predicted and unpredicted challenges faced by climate change?*
- *Given limited budgets and manpower, how can we most appropriately assess the efficacy of management actions at the appropriate scale?*

Public Use of the Refuge

The National Wildlife Refuge System Improvement Act of 1997 identified six priority refuge uses: hunting; fishing; wildlife observation and photography; and environmental education and interpretation. These uses receive enhanced consideration in planning and management over all other general public uses on refuges. When compatible, these wildlife-dependent recreational uses are to be strongly encouraged. These uses, as well as other current or proposed uses, receive an extensive compatibility review in the CCP before being allowed. Under FWS compatibility policy (603 FW 2), Refuges with limited staffing and funding are required to make efforts to obtain additional resources or outside assistance to provide wildlife-dependent recreational uses, and to document those efforts before determining that any of these uses are not compatible.

Bear Lake NWR must manage an ever-increasing request for visitation and demand for visitor services programs with a very small staff of three permanent employees. From 1999 to 2004, annual recreation visits to Bear Lake NWR averaged 4,280 annually (not including visitors viewing the Refuge from roads running through or adjacent to the Refuge). In 2010, total visitation was estimated to be 12,360, but visitation figures also included those viewing the Refuge from roads. When the visitation figure is adjusted by removing this category, the Refuge still had 7,360 visitors in 2010, a substantial increase. Currently, the visitor services and public hunting programs at the Refuge are mostly “self serve”, with informational kiosks and interpretive displays. To date the visitor services emphasis is placed on maintaining visitor and hunter facilities, welcoming and orienting visitors, answering information requests, and law enforcement during the hunting season. The Thomas Fork Unit is closed to public use, and the Oxford Slough WPA receives minimal visitation, mostly for hunting.

Questions to Consider

- *Should existing public uses on the Refuge and WPA be continued, reduced, or eliminated?*
- *Should the Refuge improve its visitor services program?*
- *What actions should be taken to minimize wildlife disturbance issues from public visitation and recreation?*

1.8.2 Issues Outside the Scope of the CCP

While CCPs are very comprehensive plans, no single plan can cover all issues. The planning team compiled a list of issues that are currently considered to be outside the scope of this CCP.

Livestock Grazing. Reassessing the use of cattle grazing on Bear Lake NWR to improve habitat was suggested during public scoping. Livestock grazing is an economic use that must support achievement of refuge purposes and System Mission in accordance with 50 CFR 29.1. Livestock grazing was not included in the management direction, because under current management domestic livestock grazing as a management tool is not required to meet Refuge objectives and was deemed incompatible with Bear Lake NWR purposes in 1995. Therefore, grazing appropriateness and compatibility will not be re-evaluated in the development of the CCP as a future management strategy on the Refuge.

Expanding Off-Refuge Recreational Opportunities. Suggestions were made for the Refuge to work with Bear Lake County to increase off-Refuge wildlife observation opportunities along the south and east boundaries of the Refuge for pedestrians, bicyclists, and others. The Service has no jurisdiction over adjacent land at Bear Lake NWR or Oxford Slough WPA. While the CCP does assess alternatives to increase access and opportunities for wildlife-dependent recreation on the Refuge, persons interested in off-refuge outdoor activities and visitation will need to work with the State of Idaho, Bear Lake County, or private landowners. The Refuge will continue to work with adjacent private landowners and the County to provide improved hunting access to the Refuge.

Impounding the Thomas Fork Unit. The Thomas Fork Unit will be managed primarily as an independent riparian unit. It is currently partially impounded to provide wetland habitat and hayed to provide short grass habitat. No increase in impoundment will be pursued in the CCP.

Restoration of the Dingle Marsh to Pre-Settlement Conditions. Although it is uncertain how the Bear Lake NWR marsh (locally referred to as Dingle Swamp) functioned prior to development of the Bear River irrigation system on lands surrounding the Refuge, it is likely that local topography restricted the Bear River to an isolated flood plain with no major inflow connection to Bear Lake. Current hydrological alterations to the historic system have been substantial and include the diversion of the Bear River by the Telluride Canal Company in the early 1900s. This project led to three major structural changes to the Bear River/Bear Lake system including:

1. Construction of Stewart Dam across the Bear River, which ultimately redirected flow to the south.
2. Construction of the Rainbow inlet canal to carry, which redirected flows into Dingle Swamp.
3. Development of Lifton Road and Pump Station, which separated the natural connectivity of the Dingle Marsh to Bear Lake, in an effort to enhance the storage and delivery capabilities of Bear River water.

Because the Refuge is the only remnant marsh in Bear River valley, migratory birds and other wetland-dependent wildlife species will remain a primary focus of Refuge management. However, restoring the natural hydrology of the Bear River and Bear Lake ecosystems is not feasible or practical at this time. A project of this magnitude on and off-refuge lands would require major alterations that would affect many outside interests. That said, the refuge staff will assess management options to mimic the natural hydrologic processes and variable extents of wetland habitats representative of the historic Dingle Marsh.

1.9 Refuge Vision

The refuge vision statements are broad general statements that describe the fundamental attributes and required contributions for the management of Bear Lake NWR and Oxford Slough WPA. The vision statement will serve as a challenging and worthwhile long-range target toward which people can direct their energies.

1.9.1 Bear Lake National Wildlife Refuge

Bear Lake National Wildlife Refuge, nestled in the Bear Lake Valley of southeastern Idaho, continues to be a paradise for wildlife. Native peoples, explorers, farmers, and ranchers were drawn to the valley's plentiful natural resources: wildlife, land, and water. Today and tomorrow, visitors and residents alike enjoy a beautiful landscape that supports the modern-day dichotomies of small towns and rugged wilderness, farm fields and natural meadows, diversion canals and marshes, livestock and wildlife.

An integral part of this landscape, the future of the Refuge depends on the carefully managed waters of the Bear River and Bear Lake flowing through a system of man-made structures and providing sustenance for humans and wildlife. Visitors to the Refuge will always hear the laughter of coots and the trilling of marsh wrens, the soft wind through the grass before the ducks arrive and the crack of expanding ice that follows the exodus of geese.

People will see trumpeter swans escorting their broods through the emerald-green marsh and feel gratified that mule deer, moose, badger, beaver, trout, garter snakes, and leopard frogs will have homes for a long time to come here at Bear Lake NWR.

1.9.2 Thomas Fork Unit

The Thomas Fork Unit is located in the bucolic Thomas Fork Valley at the border of Wyoming and Idaho. This lovely valley, bordered by the Preuss and Sublette Ranges, harkens back to the days of rugged pioneers traveling the Oregon Trail, attempting to ford the Thomas Fork Creek, and trading goods and services with the Native Americans. Hay and willows, cranes and herons, chub and trout, cattle and pronghorn will ever be a part of this diverse panorama.

People who love the scenic beauty of the Thomas Fork Valley will continue to work together to improve the quality of the creek and its surrounding lands. Healthy waters and lands will always be the backbone of sustainable agriculture and ranching as well as key for providing food and home for wildlife. As part of the larger Bear River Watershed, the vigor of the Thomas Fork Unit will remain integral to the overall quality of the landscape.

1.9.3 Oxford Slough Waterfowl Production Area

Oxford Slough Waterfowl Production Area is situated in a lush valley surrounded by the Caribou National Forest with Oxford Peak and the Bannock Range in the background. Oxford Creek is one of the many streams that flow into the valley to create the Oxford Slough, which acts as a natural catchment for runoff from the adjacent mountain ranges.

Oxford Slough will persist as a small but important part of the Bear River Watershed, providing water and well-being to wildlife and humans. Franklin's gulls, sage-grouse, coyotes, and cattle continue to co-exist in this peaceful valley drenched in morning mist. Ducks and white-faced ibis decorate the skies on their feeding flights between the marsh and wet meadows. Land managers and landowners will collaborate for years to come to *provide optimal water quality and quantity, understanding that what's good for the critters is usually good for people too.*

1.10 Refuge and WPA Goals

1.10.1 Wildlife and Habitat Goals

Goal 1: Wetland Management
Provide high quality wetland habitat at Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA that provides for the life history requirements of focal wildlife species. On Bear Lake NWR, simulate the ecological processes and functional values of the historic Dingle Marsh.

Goal 2: Riparian Management
Provide high quality riparian habitat within the watershed for focal wildlife species life history requirements, while simulating natural environmental processes.

Goal 3: Native Upland Management
Maintain and protect the existing integrity of functional early successional upland habitat and restore the natural range of variability and resiliency to late successional upland habitat.

Goal 4: Non-Native Agriculture Management
Provide a supplemental on-Refuge forage base for carbohydrate and protein requirements of migratory waterfowl and landbirds within the Pacific and Bear River migratory corridor.

1.10.2 Public Use Goals

Goal 5: Wildlife-dependent Recreation and Public Use
Increase public understanding and appreciation of wildlife, and build support for Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA by providing opportunities for visitors to participate in safe, quality wildlife-dependent recreation and education programs, while minimizing wildlife disturbance.

1.11 Planning Process

A core planning team, consisting of a Project Leader, Deputy Project Leader, Refuge Manager, Refuge Biologist, Complex Planner, and a Regional Planner, began developing the CCP in January 2010. An extended team assisted in CCP development, particularly in reviewing preliminary goals, objectives and strategies, and in developing alternatives. The extended team consisted of various professionals from other agencies and divisions within the Service. A list of core and extended team members is located in Appendix K.

Early in the planning process, the core team identified 63 Priority Refuge Resources of Concern for the Refuge and WPA, their associated habitats, and other species that would benefit from managing the focal species. These Priority Refuge Resources of Concern are listed in Chapter 4 and Appendix E. Wildlife and habitat goals and objectives were designed directly around the habitat requirements of species designated as priority resources of concern. The analytical framework for analyzing the resources of concern and for devising appropriate conservation objectives and strategies was based on the Service's Draft *Identifying Refuge Resources of Concern and Management Priorities: A Handbook* (USFWS 2009).

Public use planning centered on developing goals, objectives, and strategies around the "Big Six" wildlife-dependent public uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation—and the transportation and infrastructure needs associated with those uses.

Public scoping began in the summer of 2010. In July a scoping meeting was held in Montpelier, Idaho. Public commentary was also solicited through distribution of a planning update to the refuge mailing list. A summary of public involvement to date is in Appendix L. An internal draft was distributed to Service Region 1 reviewers in March 2012. All changes requested by reviewers and extended team members and actual changes made were documented.

The Bear Lake NWR Draft CCP/EA was issued for public review and comment on September 28, 2012. The plan was provided on CD to a mailing list of approximately 200 recipients, and was made available on the FWS Region 1 planning website. Printed copies of the Draft CCP/EA were available at local public libraries, and upon request. All changes made as a result of public and agency comments were documented. A summary of public involvement is included in Appendix L; public comments on the Draft CCP/EA and the Service's responses to comments are included in Appendix P.

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Chapter 2 Management Direction

Canada goose/© Greenheron47

Chapter 2. Management Direction

2.1 Overview

During development of the management direction for this CCP, the Service reviewed and considered a variety of resource, social, economic, and organizational aspects important for managing the Refuge. These background conditions are described more fully in Chapters 3, 4, and 5. As is appropriate for a National Wildlife Refuge, resource considerations were fundamental in designing the management direction. House Report 105-106 accompanying the Improvement Act states "…the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first."

The Refuge planning team reviewed available scientific reports and studies to better understand ecosystem trends and the latest scientific recommendations for species and habitats. The team met with staff from local, State, Native American Tribes, Federal agencies, and elected officials to ascertain priorities and problems as perceived by others. Refuge staff met with Refuge users, nonprofit groups, and community organizations to ensure that their comments and ideas were considered during CCP development.

2.2 Management Directions Considered but Not Developed

The details of public participation can be found in Appendix L. During development of the CCP, the planning team considered the actions detailed below. All of these actions were ultimately eliminated for the reasons provided.

Livestock Grazing. Reassessing the use of cattle grazing on the Refuge to improve habitat was suggested during public scoping. Livestock grazing is an economic use that must support achievement of refuge purposes and the System Mission in accordance with 50 CFR 29.1. Livestock grazing was not included in the management alternatives in the Draft CCP/EA, because under current management, domestic livestock grazing as a management tool is not required to meet refuge objectives and was deemed incompatible with Bear Lake NWR purposes in 1995. Therefore, grazing appropriateness and compatibility were not re-evaluated during the development of the CCP as a future management strategy on the Refuge.

Expanding Off-Refuge Recreational Opportunities. Suggestions were made for the Refuge to work with Bear Lake County to increase off-refuge wildlife observation opportunities along the south and east boundaries of the Refuge for pedestrians, bicyclists, and others. The Fish and Wildlife Service has no jurisdiction over adjacent land at Bear Lake NWR or Oxford Slough WPA. While the CCP does assess alternatives to increase access and opportunities for wildlife-dependent recreation on the Refuge, persons interested in off-refuge outdoor activities and visitation would need to work with the State of Idaho, Bear Lake County, or private landowners. The Refuge will continue to work with adjacent private landowners and the County to provide improved hunting access to the Refuge.

Impounding the Thomas Fork Unit. The Thomas Fork Unit will be managed primarily as an independent riparian unit. It is currently partially impounded to provide wetland habitat and hayed to provide short grass habitat. No increase in impoundment will be pursued in the CCP.

Restoration of the Bear Lake Marsh to Pre-Settlement Conditions. Although it is uncertain how the Bear Lake NWR marsh (locally referred to as Dingle Swamp) functioned prior to development of the Bear River irrigation system on lands surrounding the Refuge, it is likely that local topography restricted the Bear River to an isolated flood plain with no major inflow connection to Bear Lake. Current hydrological alterations to the historic system have been substantial and include the diversion of the Bear River by the Telluride Canal Company in the early 1900s. This project led to three major structural changes to the Bear River/Bear Lake system including:

1. Construction of Stewart Dam across the Bear River, which ultimately redirected flow to the south.
2. Construction of the Rainbow inlet canal to redirect flows into Dingle Swamp.
3. Development of North Beach Road and Lifton Pump Station, which separated the natural connectivity of the Dingle Marsh to Bear Lake, to enhance the storage and delivery capabilities of Bear River water.

Because the Refuge is the largest remnant marsh in Bear Lake valley, migratory birds and other wetland-dependent wildlife species will remain a primary focus of refuge management. However, restoring the natural hydrology of the Bear River and Bear Lake ecosystems is not feasible or practical at this time. A project of this magnitude on and off-refuge lands would require major alterations that would affect many outside interests. That said, the refuge staff will assess management options to mimic the natural hydrologic processes and variable extents of wetland habitats representative of the historic Dingle Marsh.

2.3 Description of Management Direction

2.3.1 Summary of Management Direction

Actions described in this CCP will be implemented over the life of the plan as funding becomes available. Project priorities and projected staffing/funding needs are included in Appendix C.

The CCP sets priorities for implementation. Actions will be implemented over a period of 15 years as funding becomes available.

A brief description of the management direction follows.
Maps displaying management direction for Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA follow this description. Maps 4 and 5 display the current habitat areas on these units and the change in distribution of habitats under this CCP. Map 6 displays the retirement of hay units on Bear Lake NWR proposed under this CCP. Maps 7 and 8 display changes to public use facilities proposed under this CCP.

Management actions described under this CCP will increase the ecological integrity of the Bear Lake NWR, Thomas Fork Unit, and Oxford Slough WPA and increase opportunities for wildlife-dependent public uses at Bear Lake NWR. Management actions will restore refuge habitat integrity and watershed sustainability; provide hunting opportunities; and increase opportunities for wildlife observation, photography, environmental education, interpretation, and fishing.

Wildlife and habitat. Refuge objectives focus on partially restoring long-term habitat function, providing an acceptable range of natural variability, increasing habitat resilience in the face of external stress, and increasing long-term wildlife population vigor. Management will simulate seasonal natural processes by mimicking variation within “drought,” “normal,” or “flood” scenarios, while providing an approximately equal annual acreage of wetland habitat types across the Refuge. This management will provide waterfowl breeding and fall migration habitat, but the predominant emphasis is on having a representative natural range of habitat variation for not only waterfowl, but also for other migratory waterbirds. In comparison to current management, a moderate increase in spring and fall seasonal and moist soil wetland habitats will occur under this CCP. Management actions and water-level manipulations will provide a variety of permanent, semi-permanent, seasonal, and temporary habitats with irregular spatial occurrence among units, but approximately equal annual extents of wetland habitats across the Refuge. In other words, the total refuge acreage of each habitat will remain approximately the same in any year but will vary by unit. The Refuge will study the feasibility of further reducing sediment loading within the Mud Lake Complex and make recommendations by 2020 to reduce the sedimentation rate of Bear River water diversions and better facilitate carp and non-native game fish exclusion. The Thomas Fork Unit will be managed for variable wetlands by simulating natural “drought” and “normal” hydrologic regimes, but spring runoff will be retained, and “flood” scenarios will be simulated in years of excess snowpack. The Service will pursue strategies to increase the reliability of late-season water on the Oxford Slough WPA to benefit breeding waterfowl and waterbirds. In addition we will set back succession in deep emergent marshes through controlled burns and/or mechanical means, and increase topographic variability in areas previously leveled for farm fields.

Under this CCP, approximately 154 acres (72 percent of current 214 farmed acres) of small grain and legume crops will continue to be cultivated for waterfowl and other key wildlife species on Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA. Haying within meadow and grassland habitats on the Refuge and WPA will be reduced to 1,492 acres (44 percent of current 3,554 hayed acres) by 2027. Haying rotations and incremental reductions will occur every five years, over three five-year cycles: 2013-2017; 2018-2022; 2023-2027 (see Map 6). An approximate 60:40 ratio of hayed-to-unhayed meadow will exist by 2027. Short-stature habitat will be managed for highly productive goose brooding and foraging areas, while medium- and tall-stature habitat will be managed for meadow or upland nesting species (e.g., Wilson’s phalarope, northern pintail, black tern). A total of 2,041 acres of previously hayed habitats will be restored or rehabilitated on the Refuge and Oxford Slough WPA by 2027.

Upland and riparian management activity will increase considerably from current management. We will maintain and protect the existing function of early successional uplands, while restoring resiliency to late successional uplands. We will protect the existing function of early successional uplands by increasing structural height and density of native grasses, forbs, and shrubs. Improvements will be made to the continuity of on and off-refuge in-stream corridor habitats to benefit Bonneville cutthroat trout and other wildlife. This will be accomplished through the promotion of off-refuge collaborative partnerships that attempt to optimize both the productivity of wildlife habitat and the sustainability of land uses. Causal factors for riparian habitat degradation will be minimized, removed, or mitigated.

Hunting and fishing. Under this CCP the Service will continue current waterfowl and upland game hunting programs at Bear Lake NWR and the Oxford Slough WPA. The Thomas Fork Unit will remain closed to all public use.

<u>Bear Lake NWR</u>: 7,450 acres (40 percent) of Bear Lake NWR are open for waterfowl hunting during Idaho Department of Fish and Game (IDFG)-established seasons. The hunt area includes the Salt Meadow, Rainbow Sub-Impoundment, Rainbow, and Merkley Lake Units, and the Mud Lake Unit as far south as the buoys (see Map 7). Two Architectural Barriers Act (ABA)-accessible hunting blinds

are available at Bear Lake NWR from October to January. To facilitate waterfowl hunting, motorized and nonmotorized boats are allowed in the hunt area September 20 to January 15. Upland game hunting of gray partridge, sharp-tailed and ruffed grouse, sage-grouse, ring-necked pheasant, and cottontail is also allowed in the hunt area in accordance with State seasons and regulations; however, only 300 acres of the hunt area support upland game species.

On Bear Lake NWR, the Outlet Canal north of the former Paris Dike is open to bank fishing (pole-and-line for carp, perch, and trout, and bow fishing for carp). Fishing opportunities at Bear Lake NWR will be expanded by opening the banks along Merkley Lake Road to fishing, and through construction of improved signage and small piers or fishing platforms to provide a safer and more comfortable fishing experience along the Outlet Canal north of the Paris Dike. The area north of the Lifton Pumping Station will be closed to fishing.

Oxford Slough WPA: The Oxford Slough WPA will remain open to hunting of waterfowl, upland game and furbearers, and big game, and trapping in accordance with State regulations. There is no fishery at the WPA, and therefore no fishing opportunities.

Wildlife observation/photography and environmental education/interpretation.
Bear Lake NWR: The 2.4-mile Auto Tour Route is open year-round, although it may be impassable at times in winter. An ABA-accessible walking trail, with two accessible wildlife observation/photography blinds, is open March 15 to September 20. Roads open to vehicular traffic from July 1 to January 20 are available to visitors for walking and hiking. A Canoe Trail is available for nonmotorized craft only from July 1 to September 20. The 7,450-acre seasonally open (hunt) area will be closed to boating, other than boats used to access waterfowl hunting opportunities. Pedestrian access (including cross-country skiing and snowshoeing) will be allowed on service roads and dikes within this area from July 1 to February 28. The Refuge will work with the State and County to develop displays along overlooks on Highways 89 and 30 to interpret the Thomas Fork Unit. The Thomas Fork Unit will remain closed to public use.

Additional opportunities for wildlife observation and photography, interpretation, and environmental education will be available under this CCP, by provisions for providing diverse wetland habitats that allow a wide variety of waterbirds and associated species to flourish, development of additional facilities, and increased staffing and volunteer programs. Two vehicle turnouts will be constructed along the Merkley Lake Road to provide wildlife viewing and interpretation of the Mud Lake Unit. Additionally, a boardwalk and wildlife-viewing platform with interpretive panels will be constructed on the southeast border of the Refuge along North Beach Road.

Oxford Slough WPA: At the Oxford Slough WPA, a new brochure and interpretive panels located at strategic sites for viewing the WPA will be developed to educate visitors about the role of WPAs in conserving wildlife. Volunteer-led educational programs will be provided with support from Bear Lake NWR. The WPA will be closed to public access (except for trapping in accordance with State regulations) from April 1 to August 1 to reduce disturbance to colonial nesting birds.

Southeast Idaho Complex: A full-time volunteer coordinator position in the Southeast Idaho NWR Complex Office will oversee recruitment and training of volunteers and develop education programs on all four refuges within the Southeast Idaho Complex. Interns from university education programs will be used to design and conduct environmental education programs. New refuge staff will work with Scouting groups to develop programs and earn merit badges. New refuge staff will also work with partners to develop citizen science programs. Within five years of CCP completion, plans for a combined refuge office and small visitor contact station, with a small environmental education classroom on or near the Refuge, will be completed, and funding will be sought to construct these facilities.

State coordination. The Service will continue to maintain regular discussions with the IDFG. Key topics of discussion will include habitat management for waterfowl and other migratory birds; updates of waterfowl management plans; wildlife monitoring; hunting and fishing seasons and regulations, and management of Federal and State-listed species.

Tribal coordination. The Service will coordinate and consult with the Northwestern Band of Shoshone and Shoshone-Bannock Tribes of Idaho on a regular basis regarding issues of shared interest relating to traditional resources. The Service will also seek assistance from the Tribes, as needed, on issues related to cultural resources education and interpretation, special programs, and the National Historic Preservation Act (NHPA).

PacifiCorp coordination. PacifiCorp owns and manages the water control systems that divert the Bear River through the Refuge into Bear Lake and then release water through the Outlet Canal. The Refuge and PacifiCorp work together to maintain optimal water levels for wildlife and habitat on the Refuge while abiding by their 1968 agreement and applicable laws that constrain PacifiCorp's operations (Appendix M). In this context, management defines "optimal" as those water levels providing the most favorable conditions for the target habitat and species. For example, for waterfowl production, water levels should remain relatively stable throughout the breeding season and be neither so low that predators have easy access to nests, nor so high that suitable nesting habitat is reduced.

Maintain waterfowl habitat in support of Pacific Flyway planning efforts. The Pacific Flyway Council (PFC) prepares management plans for populations of swans, geese, and sandhill cranes in the Pacific Flyway (www.pacificflyway.gov). These plans help State and Federal agencies cooperatively manage migratory game birds under common goals. Defining the role and extent of waterfowl habitat, including sanctuary areas (areas closed to hunting and significant disturbance from other public uses) is a component of Pacific Flyway waterfowl management plans. Bear Lake NWR and Oxford Slough WPA will continue to manage waterfowl habitat, and will make adjustments as needed, in support of these plans (see Chapter 1).

Cooperative Land Management agreements (CLMA). The Refuge will evaluate cooperative agreements with persons for crop cultivation, haying, or the harvest of vegetative products, including plant life, growing with or without cultivation on wildlife refuge areas on a share-in-kind basis when such agreements are in aid of or benefit to the wildlife management of the Refuge (50 CFR 29.2).

Adaptive management. The Refuge will be using an adaptive management (AM) decision making process to implement management strategies authorized in the Comprehensive Conservation Plan (CCP). Adaptive management is a science-based public participation process for evaluating and adjusting a conservation effort relative to goal achievement as experience and knowledge are gained through implementation, study, and discussion. The Refuge and its collaborative partners support the fact that AM promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. As the CCP is implemented, AM would help the Refuge achieve diverse goals while enhancing wildlife benefits, advancing scientific knowledge, and improving working relationships among stakeholders.

The principle of AM is based on the recognition that ecosystem function is inherently complex which often results in knowledge gaps. AM implementation means a firm commitment to the development of measurable outcomes and the application of rigorous evaluation and monitoring methods to determine whether management goals are being met. Careful monitoring of these actions advances scientific understanding and helps adjust policies or operations as part of an on-going learning process. This is not a “trial and error” process but rather emphasizes “learning while doing,” which recognizes the importance of incorporating new information as it becomes available. AM requires flexibility and an ability to acknowledge risks/failures while using new knowledge in a constructive manner to make adjustments while building a foundation for ongoing learning/adjustment.

The Refuge is committed to a rigorous and inclusive AM approach to enhance public confidence in the ability of the Refuge to transfer the theory to practice. The Refuge recognizes as it moves forward with CCP implementation that there is a critical need for transparency. This transparency, as it pertains to AM, needs to include both the learning and decision making processes. The following discussion describes how the Refuge will move forward through AM.

INFORMATION SHARING/LEARNING – The Refuge is committed to an AM process that will bring diverse interests together through various forums to share information and site-specific results so that all those engaged, including the Refuge, can learn together. These forums will evolve through time but will include mechanisms such as the Highlands Cooperative Weed Management Area, Bear Lake Regional Commission, and working groups formed as needed. The timing and frequency of information sharing/learning will be determined by how rapidly new information is being acquired, level of partners’ interest/engagement, ecological cycles and the forum being used. The Refuge will share the results of its inventory and monitoring work. Additionally, the Refuge will be responsive to partners’ requests for open discussion and collaboration in assessing the need for adaptive changes in management.

DECISION MAKING – As the Refuge and partners learn through the AM process, new information may show the need for adjustments, confirm existing strategies or identify additional information needs. Based on the best information available at the time, the Refuge will make decisions for future management actions. As with the sharing/learning aspects of AM, the Refuge recognizes the importance of transparency for decisions made during the AM process. The Refuge is committed to bringing together interested parties to assist with the evaluation of available information and consultation about management options and their implications prior to making course changing decisions. This process does not diminish the Refuge’s legal authority to make decisions, but rather serves to enhance the decision making process by enabling the Refuge to approach issues from multiple perspectives, thereby finding creative solutions to complex challenges.

Inventory and monitoring. Current and proposed new inventorying and monitoring (I&M) policy (863 FW 1 to supersede 701 FW 2) requires refuges to prepare I&M plans. Refuge I&M plans have two sequential phases (parts):

1. A prioritized list of surveys for approval by the refuge supervisor.
2. Individual protocols based upon the finalized list of surveys.

An I&M step down plan will be developed for Bear Lake NWR within three years of the CCP’s completion. The Refuge I&M Plan will consist of three components. The first is a prioritized list of surveys and methods for the Refuge. The second provides a justification regarding how each survey informs refuge resource management decisions. The third focuses on time frames (calendar) to complete training, field work, data management and analyses, and reporting for each survey.

Carp control. Carp control is an essential element to ensure adequate habitat functions at Bear Lake NWR. Through IPM strategies (Appendix F) the Refuge will maintain carp screens on all water control structures and periodically draw down water in specific refuge impoundments for sustained periods in the winter to facilitate carp control with chemical applications of rotenone.

Invasive species control and integrated pest management (IPM). In accordance with 517 DM 1 and 569 FW 1, an integrated pest management (IPM) approach will be used, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on refuge lands. IPM will involve using methods based upon effectiveness, cost, and minimal ecological disruption, which considers minimum potential effects to non-target species and the refuge environment. Pesticides may be used where physical, cultural, and biological methods or combinations thereof, are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide is needed on refuge lands, the most specific (selective) chemical available for the target species will be used unless considerations of persistence or other environmental and/or biotic hazards preclude it. In accordance with 517 DM 1, pesticide usage will be further restricted because only pesticides registered with the U.S. Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and as provided in regulations, orders, or permits issued by USEPA may be applied on lands and waters under refuge jurisdiction.

Environmental harm by pest species would refer to a biologically substantial decrease in environmental quality as indicated by a variety of potential factors including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes. Environmental harm may be a result of direct effects of pests on native species including preying and feeding on them; causing or vectoring diseases; preventing them from reproducing or killing their young; out-competing them for food, nutrients, light, nest sites or other vital resources; or hybridizing with them so frequently that within a few generations, truly native individuals are scarce. Environmental harm can also be the result of an indirect effect of pest species. For example, decreased waterfowl use may result from invasive plant infestations reducing the availability and/or abundance of native wetland plants that provide forage during the winter.

Environmental harm may involve detrimental changes in ecological processes. For example, cheatgrass infestations in shrub steppe can greatly alters fire return intervals, displacing native species and communities of bunch grasses, forbs, and shrubs. Environmental harm may also cause or be associated with economic losses and damage to human, plant, and animal health. For example, invasions by fire-promoting grasses that alter entire plant and animal communities by eliminating or sharply reducing populations of many native plant and animal species can also greatly increase fire-fighting costs.

See Appendix F for the Refuge's IPM program documentation to manage pests for this CCP. Along with a more detailed discussion of IPM techniques, this documentation describes the selective use of pesticides for pest management on refuge lands, where necessary. Throughout the life of the CCP, most proposed pesticide uses on refuge lands will be evaluated for potential effects to refuge biological resources and environmental quality. These potential effects will be documented in "Chemical Profiles" (see Appendix F). Pesticide uses with appropriate and practical best management practices (BMPs) for habitat management as well as cropland/facilities maintenance will be approved for use on refuge lands where there likely will be only minor, temporary, and localized effects to species and environmental quality based upon non-exceedance of threshold values in Chemical Profiles.

Hazard analysis and critical control point plan. Hazard analysis and critical control points planning (HACCP) is a tool to aid natural resource managers identify critical control points in their activities to decrease the spread of invasive species. The HACCP Wizard Version 2.04 (http://www.haccp-nrm.org/Wizard/default.asp) will be used to construct plans for staff, contractors, volunteers, and other users of the Refuge to evaluate their activities and address ways to conduct their activities to limit the chance of spreading invasive species.

Fire management. Wildland fire management on Camas, Bear Lake, Grays Lake, and Minidoka NWRs are governed by the Southeast Idaho National Wildlife Refuge Complex Fire Management Plan (Appendix G). The Fire Management Plan (FMP) is written to meet Department and U.S. Fish and Wildlife Service requirements that every area with burnable vegetation must have an approved FMP. It complies with a FWS requirement that refuges review and/or revise FMPs at a minimum of five-year intervals or when significant changes are proposed, such as might occur if significant land use changes are made on or adjacent to FWS lands (621 FW 2).

The goal of wildland fire management is to plan and implement actions that help accomplish the mission of the National Wildlife Refuge System. That mission is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (095 FW 3.2).

The FMP enables the Southeast Idaho National Wildlife Refuge Complex to consider a full range of appropriate suppression strategies and to conduct prescribed fires; without it, prescribed fires cannot be conducted and only wildfire suppression strategies may be implemented. This FMP identifies and integrates all wildland fire management and related activities. It defines a program to manage wildland fires and to ensure that wildland fire management goals and components are coordinated.

The FMP identified six fire management objectives and constraints:

- Use prescribed fire and mechanical manipulation to annually simulate natural environmental processes (return to early successional status) in emergent wetland and wet meadow habitats.
- Eliminate or control invasive plant species by using a combination of mechanical, prescribed fire, and chemical treatments.
- Fire Management Unit (FMU) Appropriate Management Response objectives include managing wildfires to meet fuels and habitat objectives and to benefit migratory bird habitat.
- The waterfowl nesting season at the refuges ranges from mid-April to late summer. Prescribed fire and mechanical fuel reduction treatments will typically not take place during this time to avoid disturbing nesting habitat.
- Due to constraints such as nesting season, water level fluctuation, and fire season the Refuge will have two prescribed burn windows in spring and fall. As determined from past years' burn experiences the approximate burn windows will be: Spring-March 1 to April 15; Fall-September 20 to October 30. During these windows the above constraints can be mitigated and vegetation is cured out enough to meet prescribed burn objectives.
- General Appropriate Management Response strategy (AMR) – AMR strategy will range from full suppression to confine contain on isolated bulrush islands surrounded by water. The majority of the Refuge will use AMR full suppression, especially adjacent to private property. However there are some isolated pockets of bulrush in the Mud Lake area (southeast corner of the Refuge) that are surrounded by water. These areas will be very

difficult to access for fire suppression and a wildfire could potentially provide a resource benefit.

The FMP identified four fire management values to protect:

- High priority will be given to any wildfire on the Refuge threatening private property: the federally designated Communities at Risk, Dingle, Paris, and Bloomington are adjacent to the Refuge.
- The northeast Mud Lake colonial nesting areas used by white-faced ibis, Franklin’s gulls, herons, and egrets.
- Refuge structures.
- High voltage power lines running across the southwest corner of the Refuge.

Participation in Bear River Watershed Conservation Area (BRWCA). The Service has proposed to work with private landowners to conserve the natural resources and working landscapes of the Bear River Watershed Conservation Area (BRWCA). This project will help conserve important habitat for a variety of fish, mammals, and migratory birds, including major migration corridors connecting the northern and southern Rockies, and protect vital farm and ranch lands by acquiring conservation easements from willing sellers. Over the past several decades, the Service has developed a highly effective voluntary conservation easement program, working with landowners, to protect wildlife habitat on private lands. We recognize that conservation requires a collaborative effort across the landscape and that we must partner with private landowners to be successful. As a voluntary legal agreement between a landowner and the Service, a conservation easement is a perpetual agreement that the Service purchases from willing landowners. Conservation easements typically include habitat protection measures that prohibit development but allow for the continuation of traditional activities such as livestock grazing and haying. Land ownership and other property rights, including control of public access, remain with the landowner. Easement properties remain on the local tax rolls.

The Service has had great success using this collaborative approach in many other areas. Based on our preliminary analysis and comments we received during public scoping meetings, the Bear River Watershed should be an ideal location for this “working lands” approach to conservation. Such a collaborative approach only works when there is buy-in at all levels. The BRWCA project enjoys a high level of support from local landowners, land trusts, conservation organizations, and other agencies. However, we have recently learned that not everyone fully understands the details of the BRWCA project and that there are concerns to be discussed and resolved. Therefore we have postponed the project to allow sufficient time to meet with individuals, explain project details, and incorporate feedback into the planning document.

If the proposed BRWCA project is approved, the Service will purchase conservation easements with funds generated primarily through the Land and Water Conservation Fund Act of 1965. These funds are derived from oil and gas leases on the Outer Continental Shelf, motorboat fuel tax revenues, and sale of surplus Federal property. Easement prices offered to willing sellers will be determined by an appraisal completed by an appraiser familiar with the local market. Funding is appropriated by Congress to use for a specific project, such as the proposed BRWCA.

Land protection planning. Land protection as part of the NWRS may include fee title acquisition, conservation easements, and cooperative agreements. It is anticipated that landowners adjacent to the

Refuge will participate in the easement program offered by the BRWCA program, should that program be approved. This will afford protection to high-quality habitats surrounding the Refuge.

Attempts will continue to be made to acquire the remaining 4,461 acres of private lands within the approved refuge boundary. All lands will be purchased from willing sellers at fair market price. The Service will expand the boundary of Bear Lake NWR to include the Thomas Fork Unit. Additionally, the refuge staff will continue to evaluate the conservation needs and priorities of lands adjacent and near the existing refuge units, and the possibility of developing a new Land Protection Plan, which could expand the refuge boundary. If developed, the Plan would prioritize fee title acquisition of adjoining lands that are most critical for protection of refuge water quality and quantity; have the highest quality mixed-shrub and wetland habitat; and provide the best opportunities for habitat restoration. As with acquisition of lands within the existing boundary, any lands acquired within an expanded refuge boundary will be purchased only from willing sellers.

Participation in fish passage projects. The Refuge will work in partnership with PacifiCorp and the IDFG to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge.

Cultural resource protection and compliance. Cultural resource management is an integral part of Bear Lake National Wildlife Refuge management, not just because the law mandates it but for the unique information it can bring to understanding our environment.

Actions with the potential to affect cultural resources will undergo a thorough review before being implemented, as is consistent with the requirements of cultural resource laws. All ground-disturbing projects will undergo a review and compliance with the National Historic Preservation Act.

The following cultural resource issues are addressed in the goals and objectives of the Refuge Cultural Resource Management Plan (Appendix H):

1. Maintaining the integrity of the Refuge's cultural resources while managing and restoring wildlife habitat.
2. Consulting with federally recognized tribes on the management of Native American cultural resources in a manner that facilitates the mission of the Refuge and addresses issues of importance to Tribes.
3. Working and consulting with federally recognized tribes on the disposition of human remains, funerary objects, sacred objects and objects of cultural patrimony as defined under the Native American Graves Protection and Repatriation Act.
4. Incorporating cultural resources into an interpretive and recreation program that illustrates humankind's interaction with the natural world.

Monitor effects of public use programs on wildlife. Monitoring to assess the effects of public use on wildlife will be conducted. Area, timing, and/or conduct of public use will be modified if disturbance to wildlife or habitat degradation reaches unacceptable levels.

Reduce the Refuge's carbon footprint. The Service has developed a Strategic Plan for Responding to Accelerating Climate Change in the 21st Century (2010), and a five year Action Plan outlining specific actions needed to implement the Strategic Plan. The Action Plan calls for the Service to make its operations carbon-neutral by 2020. The Refuge will work toward this goal by replacing its current vehicles with more fuel-efficient vehicles, and by building appropriately sized, energy-efficient facilities, as funding becomes available. The Refuge will also reduce the carbon footprint of land management activities by using energy-efficient techniques, where feasible, in line with management goals. The Refuge will also explore ways of offsetting any remaining carbon balance, such as carbon sequestration.

Management of non-wildlife-dependent recreational uses. Minor recreational activities that are occasionally pursued on the Refuge are included in the appropriateness and compatibility determinations found in Appendices A and B.

Participation in planning and review of regional development activities. The Service will actively participate in planning and studies pertaining to future industrial and urban development, transportation, recreation, contamination, and other potential concerns that may affect refuge resources. The Service will continue to cultivate working relationships with county, State, and Federal agencies to stay abreast of current and potential developments, and will use outreach and education as needed to raise awareness of refuge resources and dependence on the local environment.

Volunteer opportunities and partnerships. Volunteer opportunities and partnerships are key components of the successful management of public lands, and are vital to refuge programs, plans, and projects, especially in times of static or declining budgets. In the future, successful implementation of native habitat restoration, inventory and monitoring, and environmental education and interpretation programs will likely require the use of partnerships and volunteers.

Wilderness review. The Service's CCP policy requires that a wilderness review be completed for all CCPs. If it is determined that the potential for wilderness designation is found, the process moves on to the wilderness study phase. The planning team completed a wilderness review, which can be found in Appendix D. This review concluded that Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA are not suitable for wilderness designation.

Maintenance and updating of existing facilities. Periodic maintenance and updating of refuge buildings and facilities will be necessary. Periodic updating of facilities is necessary for safety and accessibility, reducing the Refuge's carbon footprint, and to support staff and management needs.

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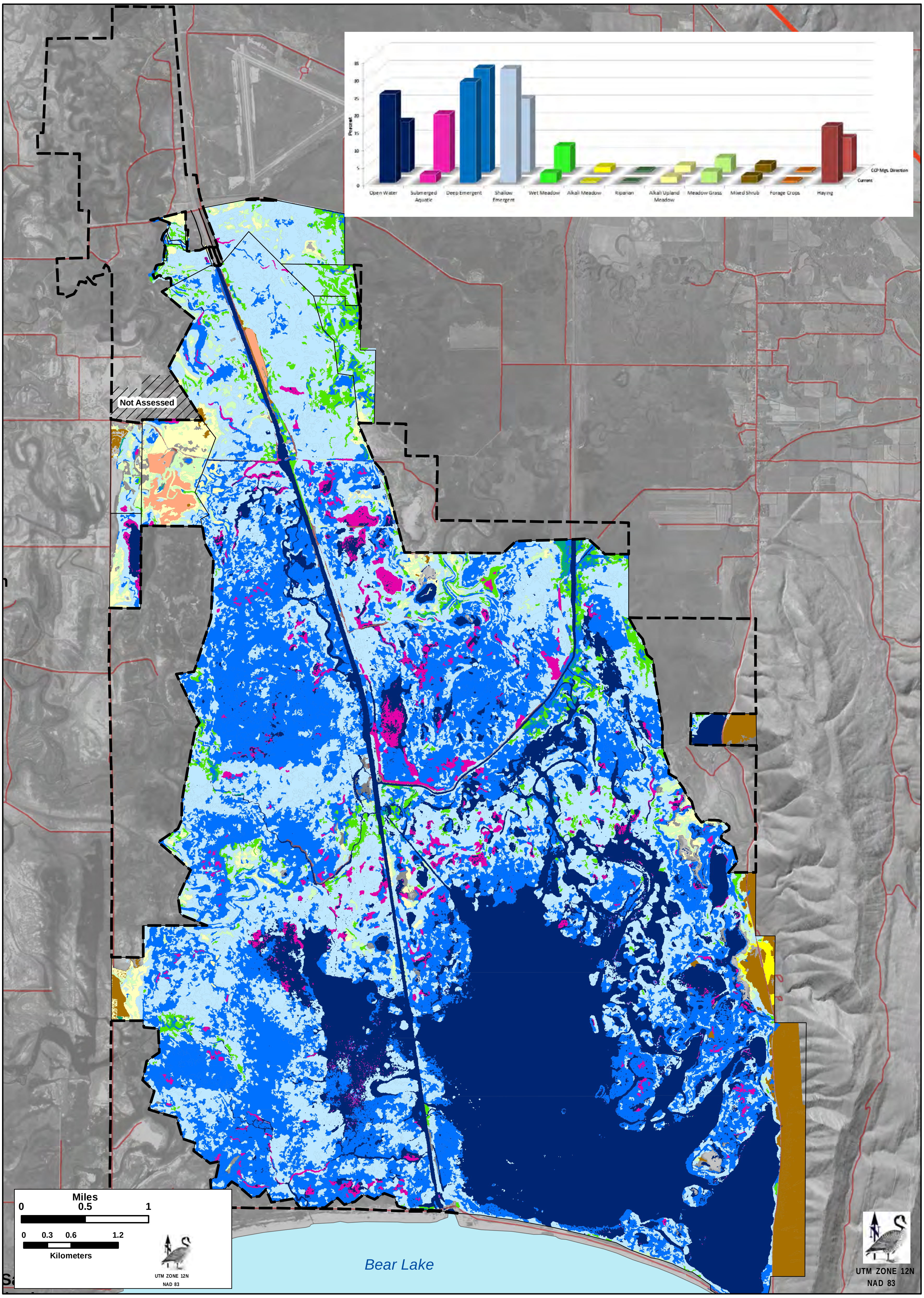
Map 4. Bear Lake NWR, Habitat Types, Current with Comparison to CCP Management Direction



Legend

- National Wildlife Refuge, Acquired
- National Wildlife Refuge, Approved
- Open Water
- Submerged Aquatic
- Deep Emergent
- Shallow Emergent
- Wet Meadow
- Alkali Meadow
- Riparian
- Alkali Upland Meadow
- Meadow Grass
- Mixed Shrub
- Forage Crops

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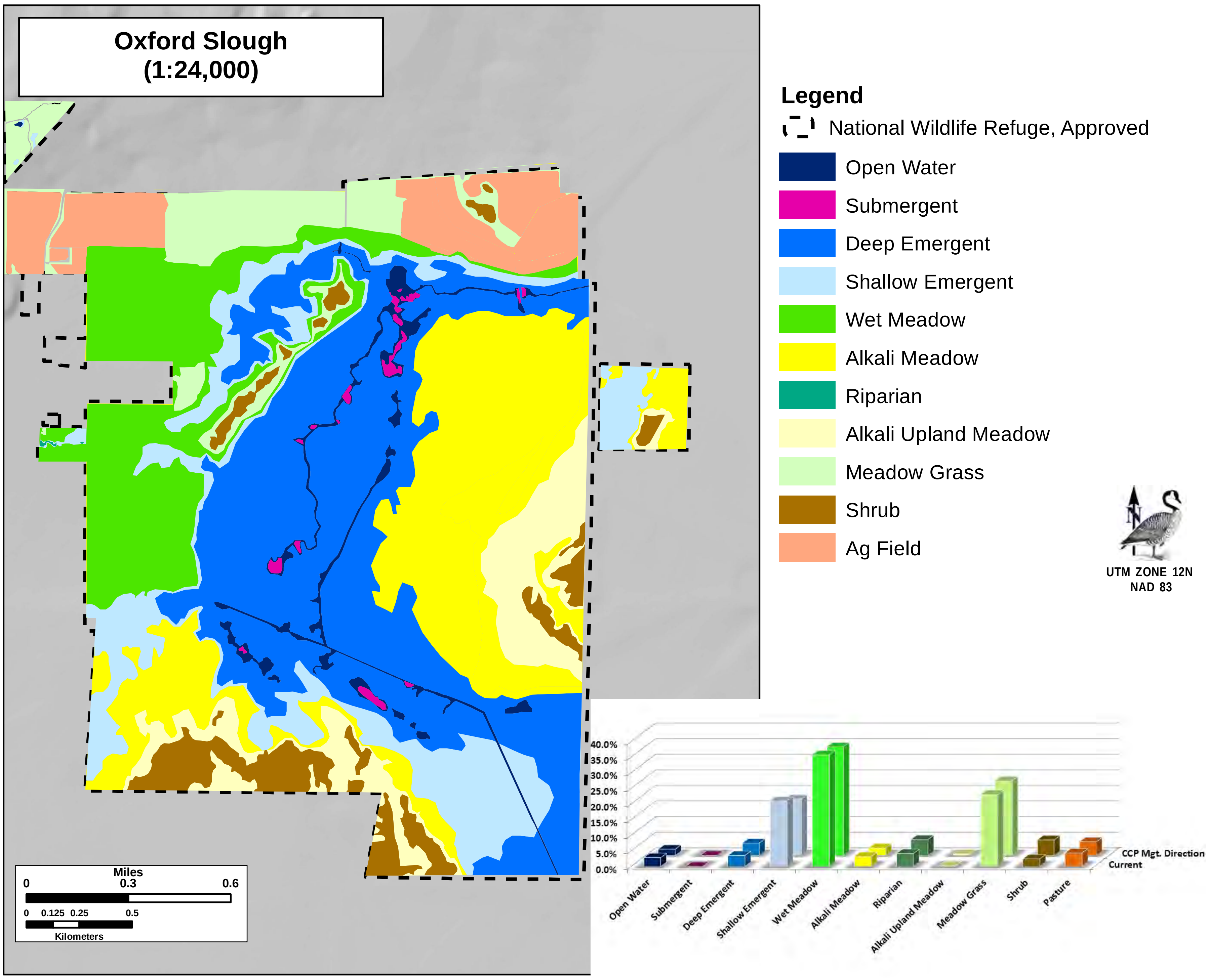
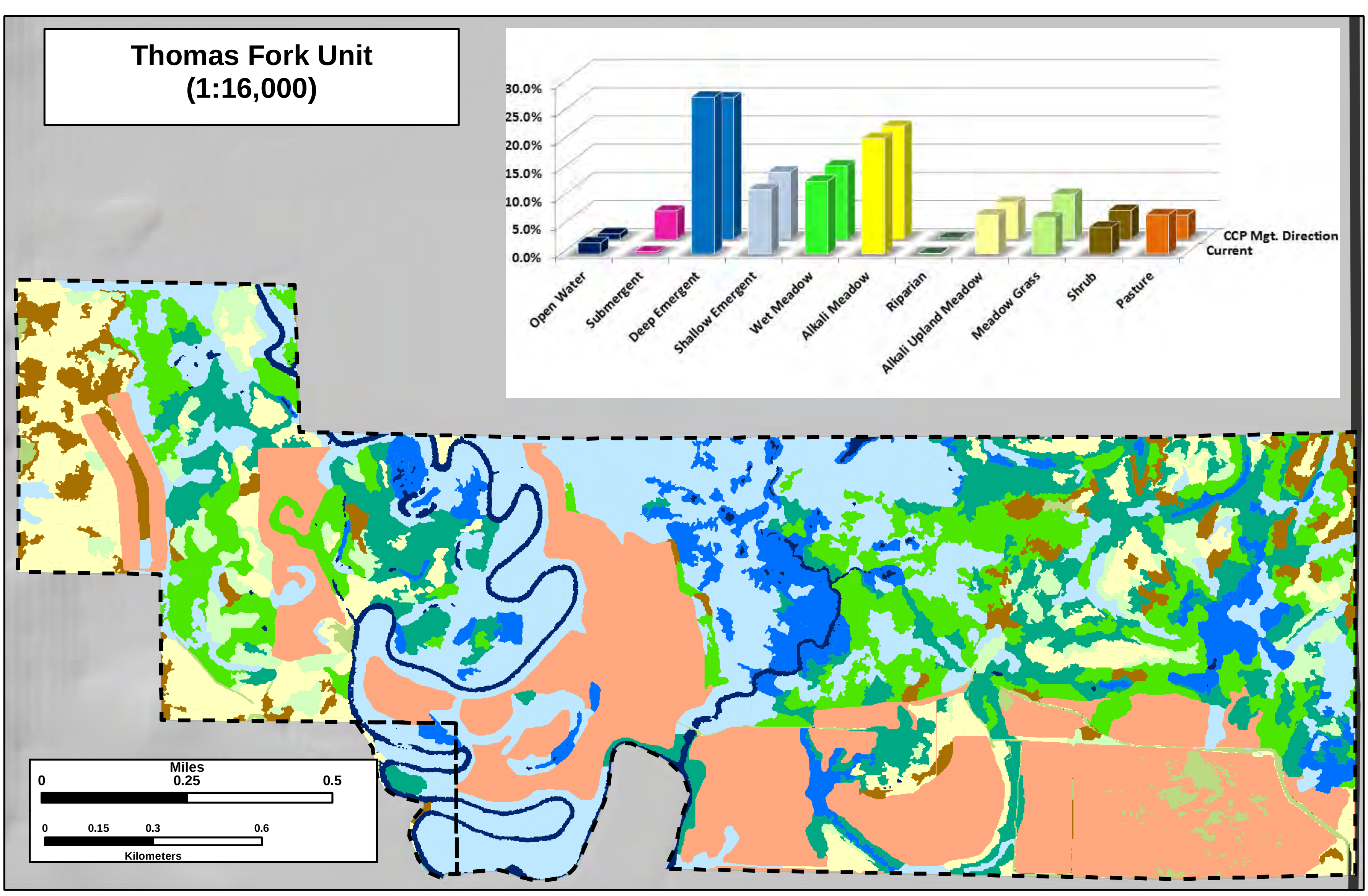
Map 5. ***Oxford Slough WPA and Thomas Fork Unit, Current Habitat Types with Comparison to CCP Management Direction***





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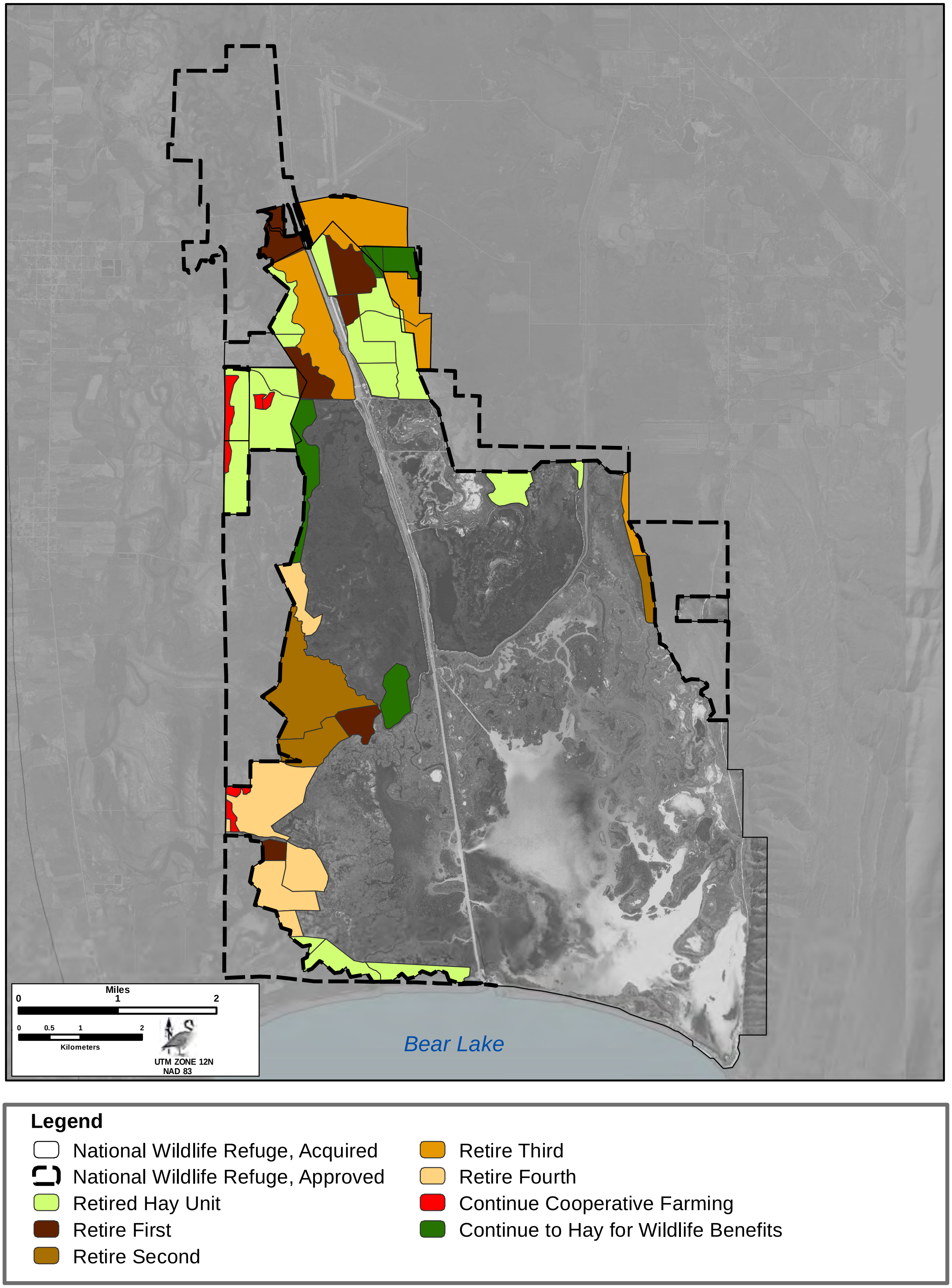
Map 6 ***Hay Unit Retirement Plan***



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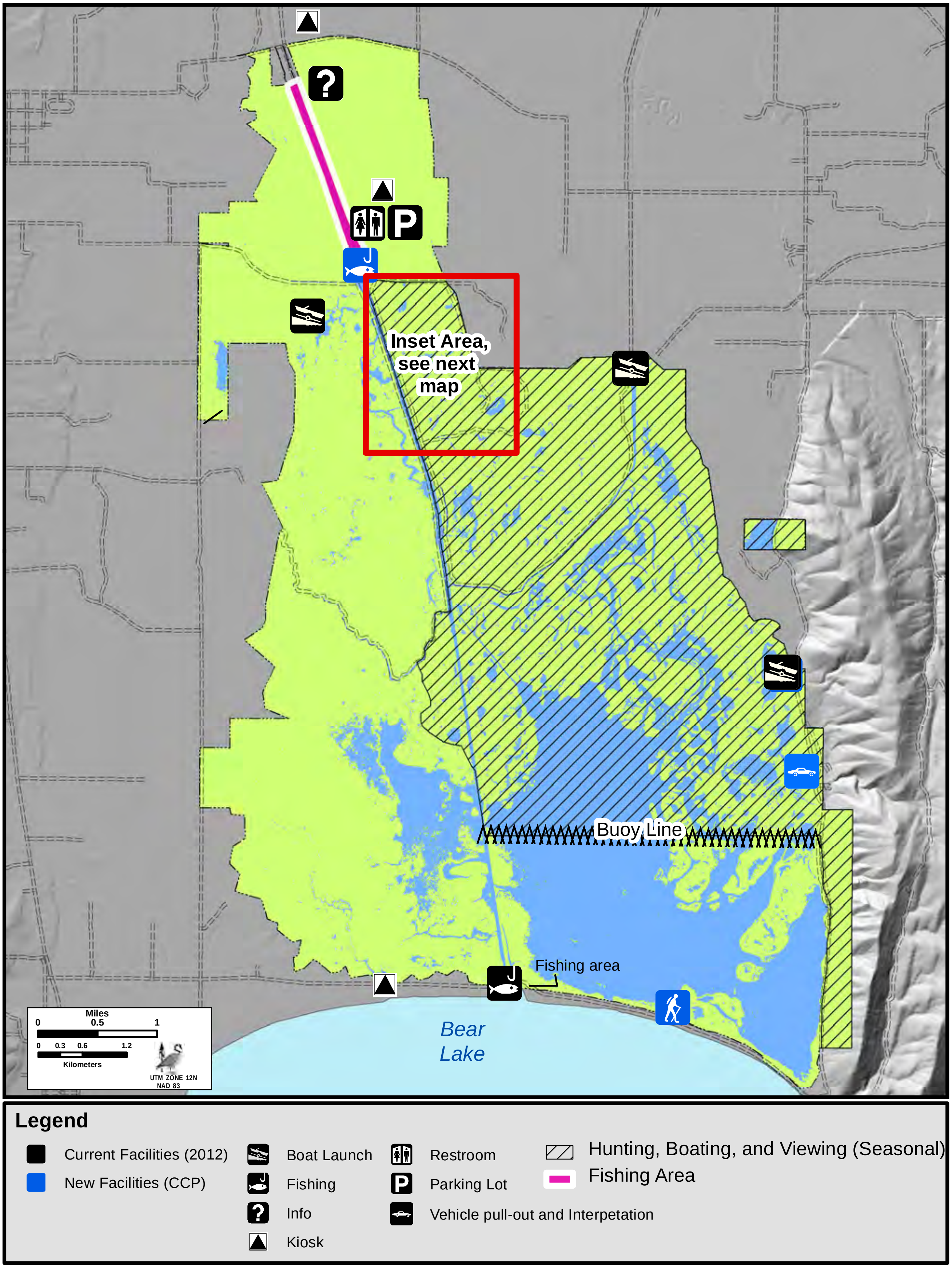
Map 7. ***Public Use Facilities***



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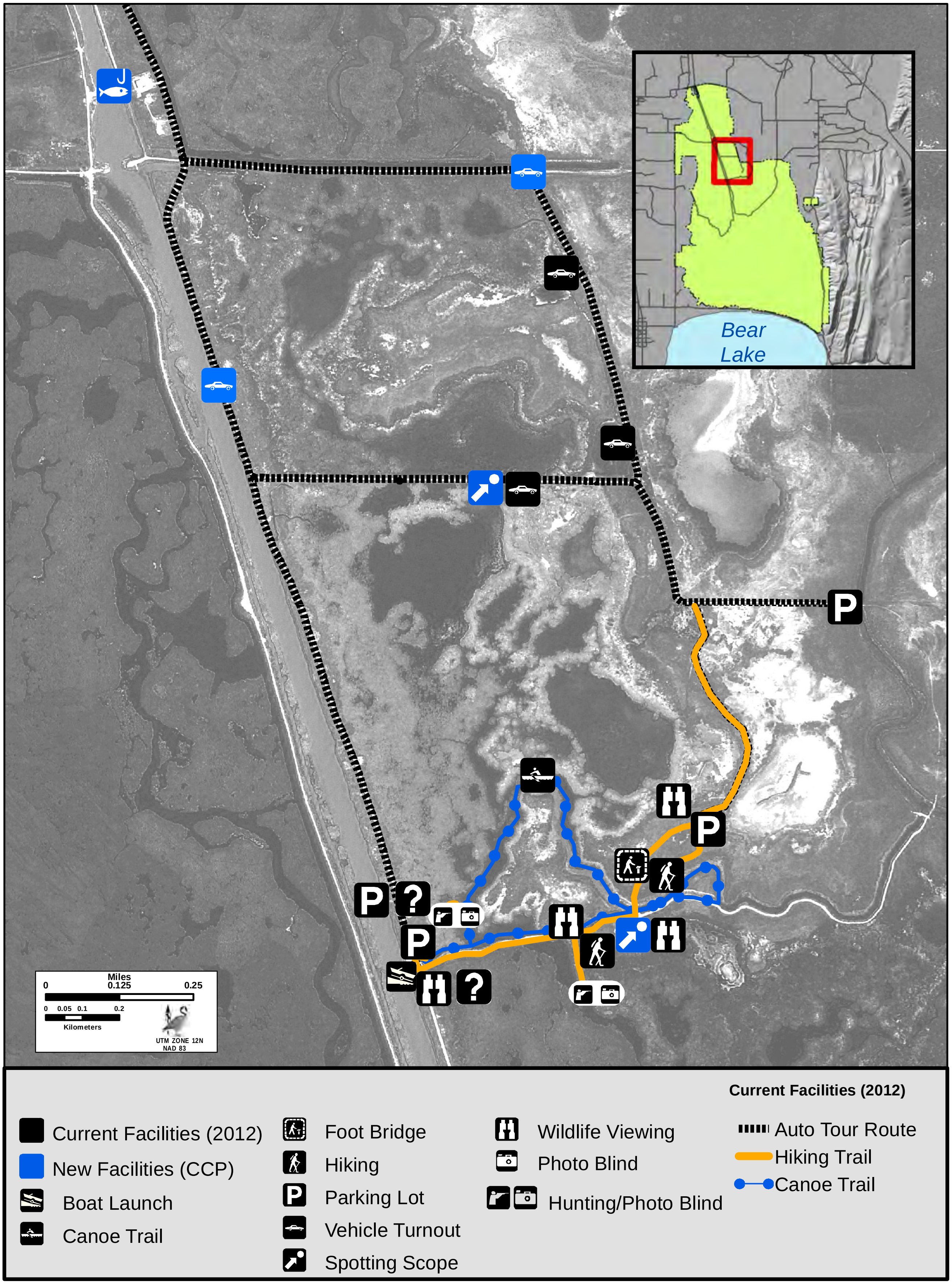
Map 8. ***Public Use Facilities***



Map Date: 04/26/2012 File:12-080-8.mxd

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Table 2.1. Summary of Future Management

	MANAGEMENT DIRECTION
THEME	**INCREASE ECOLOGICAL INTEGRITY, INCREASE PUBLIC USE** *Restore refuge habitat integrity and watershed sustainability.* *Variable wetlands* *Restore native uplands* *Restore native riparian* *Decrease agriculture* *Maintain hunting opportunities;* *Increase opportunities for wildlife observation, photography, environmental education, interpretation, and fishing.*
REFUGE MANAGEMENT APPROACH	
WILDLIFE HABITAT	• Dynamic management to partially restore/mimic ecological function and variability and improve resilience of habitats to climate change and stochastic events
WILDLIFE POPULATIONS	• Increase long-term wildlife population productivity and viability for all species
REFUGE MANAGEMENT PRINCIPLES	
WETLANDS	• Simulate seasonal natural processes by mimicking variation within “drought”, “normal”, or “flood” scenarios, while providing consistent annual acreage of wetland habitat types across the Refuge (Drought/normal/flood scenarios will be rotated among different wetland management units.)
	• Group 13 individual units, into five managed wetland Complexes to manage natural variations in hydrology
RIPARIAN	• Maintain on-refuge habitat structure and minimize stream bank erosion
	• Strategic restoration to improve continuity of stream corridor habitat and remove and minimize causal factors of stream impairment, both within the Refuge, and outside the Refuge by working cooperatively with adjacent landowners.
UPLANDS	• Maintain and protect the existing function of early successional uplands by increasing height and density of native grasses, forbs, and shrubs, while restoring resiliency to late successional uplands by reducing shrub dominated states and increasing grass and forbs

	Management Direction
Goal 1: Wetlands Tall Emergent Wetlands	
1.1 Tall Emergent Wetlands *Comprising Deep Hemi-Marsh (Open Water, Submerged Aquatic, Deep Emergent) and Shallow Emergent habitats*	• Provide an average 15,773 acres
Deep Hemi-Marsh *Comprising Open Water. Submerged Aquatic, and Deep Emergent habitats*	• Provide an average 11,599 acres • 50:50 Open Water/Submerged Aquatic: Deep Emergent ratio
1.1a Open Water Habitat	• Provide an average 2,650 acres of Open Water
	• By 2020, make recommendations on techniques to reduce sediment loading and populations of carp and non-native game fish within the Mud Lake Complex.
1.1B Submerged Aquatic Habitat	• Provide an average 3,090 acres of Submerged Aquatic
1.1c Deep Emergent Habitat	• Provide an average 5,859 acres of Deep Emergent
1.1D Shallow Emergent	• Provide an average 4,174 acres of Shallow Emergent
Goal 1: Wetlands Ephemeral Wetlands	
Ephemeral Wetlands *Comprising Wet Meadow and Alkali Meadow habitats.*	• Provide an average 2,593 acres of Ephemeral Wetlands
1.2A Wet Meadow Habitat	• Provide an average 1,932 acres of Wet Meadow
1.2B Alkali Meadow Habitat	• Provide an average 661 acres of Alkali Meadow
Goal 2. Wooded Riparian and In-Stream Wetlands	
Wooded Riparian and In-Stream Habitat	• Protect and maintain 134 acres of Wooded Riparian habitat
	• Restore 42 acres of Wooded Riparian habitat by 2027
	• Restore 5 miles of In-Stream Aquatic Riparian habitat for spawning Bonneville cutthroat trout by 2027
	• Throughout the lifetime of the CCP, the Refuge will work in partnership with PacifiCorp and the IDFG to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge
Thomas Fork Partnership	• Formulate water management agreement with the Thomas Fork Irrigation Company by 2017
Goal 3. Native Uplands	
Native Uplands (All Habitats)	• Protect and maintain 2,143 acres of Native Uplands
	• Restore 317 acres of Native Uplands

	MANAGEMENT DIRECTION
ALKALI UPLAND MEADOW HABITAT	• Protect and maintain 467 acres of Alkali Upland Meadow
	• Restore 25 acres of Alkali Upland Meadow
MEADOW GRASS HABITAT	• Protect and maintain 1,134 acres of Meadow Grass
	• Restore 214 acres of Meadow Grass
MIXED-SHRUB HABITAT	• Protect and maintain 542 acres of Mixed-Shrub
	• Restore 79 acres of Mixed-Shrub
GOAL 4. UPLAND CROPS AND HAYING	
CROPS	• Provide 154 acres of small grains and green browse annually for migratory waterfowl in upland areas.
	• Restore two agricultural fields totaling 11 acres of cropland to native upland or meadow habitat by 2016
HAYING	• Provide 1,492 acres of hayed meadow
	• Discontinue haying 2,041 acres (58% of current 3,533 hayed acres) by 2027.
	• Maintain no more than a 60:40 hayed-to-un-hayed ratio in meadows
	• At Bear Lake NWR: Hay 1,127 acres (39% of the current 2,896 hayed acres) comprising 810 acres in rotational haying and 318 acres annually hayed by 2027. • Phase in 1,769 acres in haying reductions (61% of current 2,896 hayed acres) over the life of the CCP. o Discontinue haying on 554 acres (19% of the current 2,896 hayed acres) in the first year of CCP implementation in 2013. o Discontinue haying approximately 400-410 acres (14% of the current 2,896 hayed acres) every five years, in three five-year cycles.
	• At Thomas Fork: Rotationally hay 215 acres (64% of the current 337 hayed acres) by the year 2017. • Phase in 122 acres of haying reductions (36% of current 337 hayed acres) over a five-year period.
	• At Oxford Slough: Rotationally hay 150 acres (50% of the current 300 hayed acres) by the year 2017. • Phase in 150 acres of haying reductions (50% of current 300 hayed acres) over a five-year period.
HAY RESTORATION	• Restore 2,041 acres of previously hayed meadow, upland, and shallow emergent habitat by 2027
GOAL 5. PUBLIC USE	
WELCOME AND ORIENT VISITORS	• Enhance public safety, sanitation, comfort, and orientation over

	MANAGEMENT DIRECTION
	the life of the CCP • Within five years of CCP completion, develop plan for refuge office/visitor contact point located on or near Refuge • Develop outreach program • Staff a Volunteer Coordinator Position in the Southeast Idaho NWRC Office in Pocatello, ID
WILDLIFE OBSERVATION AND PHOTOGRAPHY (BEAR LAKE NWR)	• Maintain opportunities for self-guided wildlife observation and photography on: • 2.4 mile Auto Tour Route (open year-round) • 1.9 mile ABA-accessible pedestrian trail with two accessible photography blinds (March 15-Sept 20) • 1.5 mile seasonal Canoe Trail (July 1-Sept 20) • Develop boardwalk and observation platform along North Beach Road • Develop two vehicle turnouts along Merkley Lake Road • Provide at least one guided wildlife observation/photography tour per month May-Sept. • Boating prohibited in 7,450-acre hunt areas, except to access hunting • Pedestrian access allowed on service roads and dikes in 7,450-acre hunt area, July 1-Jan 20
ENVIRONMENTAL EDUCATION AND INTERPRETATION (BEAR LAKE NWR)	• Conduct up to three annual staff-led interpretive programs by 2017. • Develop refuge-based EE program for area schools • Develop outreach program to expand public awareness of species diversity and ecology, habitat management actions, and the NWRS mission • Hire a full-time volunteer coordinator position in the Southeast Idaho NWR Complex Office and refuge position dedicated to public outreach, and developing and delivering on-site interpretive and environmental education programs.
WILDLIFE OBSERVATION, PHOTOGRAPHY, ENVIRONMENTAL EDUCATION AND INTERPRETATION (OXFORD SLOUGH WPA, THOMAS FORK UNIT)	*Oxford Slough WPA*: • Develop interpretive panels located at strategic sites for viewing the WPA. • Provide volunteer-led educational programs • Close WPA to public access (except for trapping in accordance with State regulations) from April 1-August 1 to reduce disturbance to colonial nesting birds. *Thomas Fork Unit closed to public use except:* • Develop displays along overlooks on Highways 89 and 30 to interpret the Thomas Fork Unit.

	Management Direction
Waterfowl Hunting (Bear Lake NWR)	*Bear Lake NWR:* • 7,450-acre Bear Lake NWR (40% of refuge) open to waterfowl hunting in accordance with State seasons and regulations • Two ABA-accessible hunting blinds and associated trail • Obtain easements for hunter access to Rainbow Unit and Merkley Lake Unit. • Provide refuge youth hunting opportunity the weekend prior to opening weekend and develop additional programs to attract and educate youth hunters
Waterfowl Hunting (Oxford Slough WPA, Thomas Fork Unit)	• All 1,840 acres of Oxford Slough open to waterfowl hunting. • All 1,004 acres of Thomas Fork Unit closed to waterfowl hunting.
Upland Game Hunting, Big Game Hunting, and Trapping	• Provide upland game hunting opportunities (gray partridge, sharp-tailed and ruffed grouse, sage-grouse, ring-necked pheasant, and cottontails) • Maintain closure of Bear Lake NWR to big-game hunting • All 1,840 acres of Oxford Slough WPA open to hunting of upland game and furbearers, big game, and trapping of furbearers. • Thomas Fork Unit closed to upland game and big game hunting.
Fishing (Bear Lake NWR)	• Bank fishing allowed on the Outlet Canal north of the former Paris Dike. • Close area north of the Lifton Pumping Station to fishing. • Increase quality of fishing program by constructing piers/fishing platforms. • Open fishing from refuge banks along Merkley Lake Road.

2.4 Goals, Objectives, and Strategies

Goals and objectives are the unifying elements of successful management of National Wildlife Refuges and Waterfowl Production Areas. They identify and focus management priorities, resolve issues, and link to refuge purposes, Service policy, and the Refuge System mission.

A CCP describes management actions that help bring a refuge closer to its vision. A vision broadly reflects the purposes of the Refuge or WPA, the Refuge System mission and goals, other statutory requirements, and larger-scale plans as appropriate. Goals then define general targets in support of the vision, followed by objectives that direct effort into incremental and measurable steps toward achieving those goals. Strategies identify specific tools and actions to accomplish objectives (USFWS 2002).

The goals for Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA for the next 15 years, following completion of the CCP, are presented on the following pages, in tables. Each goal is followed by the objectives that pertain to that goal. Some objectives pertain to multiple goals and have simply been placed in the most reasonable spot. Similarly, some strategies pertain to multiple objectives.

The goal order does **not** imply any priority in this CCP. Priority actions are identified in the staffing and funding analysis (Appendix C).

Readers, please note the following:
Below each objective statement are the strategies that could be employed in order to accomplish the objectives. Symbols used in the following tables include:

% percent sign
> greater than
< less than
> greater than or equal to
< less than or equal to

2.4.1 Bear Lake NWR and Oxford Slough WPA Wildlife, Habitat, and Natural Resource Goals and Objectives

GOAL 1: Provide high-quality wetland habitat at Bear Lake NWR and Oxford Slough WPA that provides for the life history requirements of focal wildlife species. On Bear Lake NWR, simulate the ecological processes and functional values of the historic Dingle Marsh.

Objective 1.1 Tall Emergent Wetlands (Permanently and Semi-permanently Flooded)

Annually provide a total of 15,773 acres of Tall Emergent wetlands on Bear Lake NWR and Oxford Slough WPA*, comprised of 11,599 acres Deep Hemi-Marsh (open water; submerged aquatic; deep emergent habitats) and 4,174 acres of Shallow Emergent habitat, with a ratio of Open Water/Submerged Aquatic: Deep Emergent of 51:49 at Bear Lake, 33:67 at Thomas Fork, and 19:81 at Oxford Slough, distributed among the following attributes and defined unit acreage ranges:

*The totals included in this objective are a summation of five management complexes of Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA.

Refuge Tall Emergent Wetland Target (All Units):
Decrease from 17,110 acres to a target of 15,773 acres

1) Bear Lake NWR:
- Tall Emergent Wetlands – Decrease from 16,073 acres to a target of 14,742 acres, acceptable range 62%-84%
  - Deep Hemi Marsh – Increase from 10,211 acres to a target of 10,967 acres, acceptable range 32%-80%
  - Ratio of Open Water/Submerged Aquatics: Deep Emergent – Increase from 49:51 to 51:49

2) Thomas Fork Unit:
- Tall Emergent Wetlands – Decrease from 273 acres to a target of 241 acres, acceptable range 19%-33%
  - Deep Hemi Marsh – Decrease from 63 acres to a target of 60 acres, acceptable range 4%-8%
  - Ratio of Open Water and Submerged Aquatics: Deep Emergent – Decrease from 44:56 to 33:67

3) Oxford Slough WPA:
- Tall Emergent Wetlands – Increase from 764 acres to a target of 790 acres, acceptable range 33.5%-55.5%
  - Deep Hemi Marsh – Increase from 554 acres to a target of 571 acres, acceptable range 23.5%-40.5%
  - Ratio of Open Water and Submerged Aquatics: Deep Emergent – Increase from 4:96 to 19:81

The attributes and acreages for the individual habitat types of Tall Emergent Wetlands are comprised of objectives for Deep Hemi-Marsh (Open Water; Submerged Aquatic; and Deep Emergent habitat) and Shallow Emergent habitat. Each of these habitats is considered under separate sub-objectives (1.1 a; b; c; and d) and will be managed as individual targets for each of the five management complexes and 13 impoundments of Bear Lake NWR to attain this refuge objective.

Definition: Tall Emergent Wetlands-Comprised of permanently flooded open water (Objectives 1.1a, 1.1b) and submerged aquatic vegetation (Obj. 1.1c) immediately proximate to semi-permanently flooded deep emergent hardstem-bulrush vegetation (Obj 1.1d) and semi-permanent to seasonally flooded shallow emergent alkali-bulrush/cattail vegetation (Obj. 1.1e). The two major components of tall emergent wetlands are:

- **Deep Hemi-Marsh**-Classified as the deeper portion of palustrine emergent wetlands. The habitat types within the "hemi-marsh" system include:
  - permanently flooded open water (Obj's 1.1a,b);
  - submergent aquatic vegetation habitats (Obj 1.1c); and
  - semi-permanently flooded deep emergent bulrush habitat (Obj. 1.1d).
  The Hemi-Marsh stage occurs when an equal 50:50 mix of deep emergent bulrush and open water/submergent habitat are present, and is considered critical to fulfilling the life history strategies of numerous wetland dependent wildlife species (Weller and Spatcher 1965).

- **Shallow Emergent Marsh**-Shallow emergent bulrush/cattail and alkali bulrush habitats (Objective 1.1e) are extensive semi-permanently to seasonally flooded habitats. While the shallow emergent is structurally similar to the deep bulrush emergent marsh, it is buffered by dense stands of deep emergent hardstem bulrush and therefore lacks immediate connectivity to open water/submerged aquatic habitats. Therefore, shallow emergent habitats are not considered a tall emergent component of the "hemi-marsh."

Strategies Applied to Achieve Objective

All Units
Use complex-specific habitat tolerance thresholds in conjunction with management prescriptions, consisting primarily of water control and secondarily of summer prescribed fire, mechanical disturbance, and chemical control, to meet predetermined annual wetland habitat objectives in any given year.
Establish long-term wetland vegetative trend monitoring sites and annually measure abiotic response to climatic variability and management strategies and techniques.
Every five years, reevaluate habitat distribution in habitat type, using GIS to determine current proportionality, and shifts by seven wetland and 4 upland habitat types.
Between five-year geospatial evaluations of habitat distribution, use sound professional judgment to annually assess habitat condition and associated percentages in habitat threshold categories for each habitat type. Where surpassed or deficient, target for prescriptive management individual units that can best meet habitat type thresholds; include in the Bear Lake NWR and Oxford Slough Annual Work Plan.
Bear Lake NWR
Simultaneously simulate "drought" (<5,915.5'), "normal" (5,920.5'), and "flood" (>5,921.5') hydrologic scenarios by manipulating Bear Lake NWR water level regimes in individual wetland impoundment units, such that an approximately equal proportion of refuge habitat is managed under high water, normal, and low water conditions across the entire refuge.
During drought cycles incorporate periodic drawdowns of deeper marsh areas to improve wetland productivity.
Thomas Fork Unit
Simulate Thomas Fork "drought" and "normal" hydrologic regimes in combination with management prescriptions and strategies formalized in the Thomas Fork Unit Annual Work Plan.
Provide "Flood" scenarios at Thomas Fork through years of excess snowpack on an unpredictable basis.
Retain spring runoff by annually setting boards at or above 6,015.0' MSL (15.0' on water staff gauge) in the Thomas Fork center structure by March 15 (or as soon as possible thereafter depending on weather conditions).
To best manage for variable wetlands and meet in-stream habitat requirements for Bonneville cutthroat trout on the Thomas Fork Unit, simulate "extreme drought" regime every seven to twelve years, by setting boards at a much lower elevation (e.g., 13.0') or pulled entirely to allow flow through the system.
Annually meet with adjacent downstream landowner on the Thomas Fork Unit to discuss applicable fisheries, water flows, and stream management concerns.

Protect refuge water rights by annually working with the Thomas Fork Irrigation Company to ensure delivery of refuge shares in the irrigation system (500 shares at present).
Oxford Slough WPA
Maintain at least one functional historic slough channel by periodically dredging or excavating sediment or established vegetation at Oxford Slough.
Approach the Idaho Department of Water Resources (IDWR) as to the efficacy of exchanging water shares in the Oxford Creek Irrigation District for Storage rights in Oxford Slough for wildlife purposes.

Sub-Objectives for Permanently and Semi-Permanently Flooded Habitats to attain "Hemi-marsh" component of Tall Emergent Wetland Objective:

Sub-Objective 1.1a: Open Water (Permanently Flooded) Habitat

Annually provide an average of 2,650 acres of Open Water habitat across all refuge units (2,612 acres Bear Lake NWR, 20 acres at Thomas Fork, and 18 acres at Oxford Slough), with > 50% of high water clarity (NTU <10) at Bear Lake NWR and >90% high water clarity at Thomas Fork and Oxford Slough, distributed among the following attributes and defined unit acreage ranges:

Benefitting Refuge Species:

- Foraging: Western grebe; American pelican; bald eagle; Forster's tern; black tern; double-crested cormorant
- Other: Mallard (molting); and muskrat (winter)

Habitat Attributes:

- Permanently flooded >12" in depth, more frequently 24-36" through the growing season, with potentially increased depths in spring due to snowmelt.
- Without emergent aquatic vegetation
- The undesirable presence and activity of carp may increase open water habitat, but the Refuge will attempt to keep open water habitat at ≤50% where low water clarity (wetland bottom cannot be easily observed (Nephelometric Turbidity Unit [NTU] >10).
- Carp controlled through chemical applications when undesirable presence of carp and/or silt as demonstrated to occur to the detriment of wetland habitat.
- When open water permanently flooded habitat is drawn down, approximately 880 acres of moist-soil annuals will replace extensive open water within the Mud Lake Unit.

Refuge Open Water Habitat Target (All Units):
Decrease from 4,632 acres to a target of 2,650 acres

1) Bear Lake NWR:
   - Open Water – Decrease from 4,568 acres to a target of 2,612 acres, acceptable range 901-4,503 ac.

2) Thomas Fork Unit:
   - Open Water/Submergent – Decrease from 28 acres to a target of 20 acres, acceptable range 10-30 ac.

3) Oxford Slough WPA:
   - Open Water – Decrease from 36 acres to a target of 18 acres, acceptable range 19-56 ac.

Strategies Applied to Achieve Objective

Bear Lake NWR
Occasionally perform a complete drawdown over summer to increase productivity of submergent plant community. Drawdown over one growing season every five to seven years or as needed, within the irrigation storage demands and flood abatement purposes of the Bear River system.
During drought or drawdown phase, use mechanical, cultural, fire, and chemical means to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain open, shallow water areas.
Maintain the Merkley Lake Unit in custodial maintenance over the 15-year period covered under this plan, due to a lack of access and water control capability.
Pursue mutually beneficial water management solutions or refuge acquisition from willing sellers of private lands surrounding the Merkley Lake Unit.
Work in partnership with PacifiCorp and other stakeholders to study and consult on the effects, desirability, and feasibility of reducing sediment loading in the Mud Lake Unit. By 2020, provide recommendations to better facilitate carp and non-native game fish exclusion.
Restore incised and downcut streambeds within riparian habitat with material appropriate for protecting streambanks from further erosion.
Use IPM techniques to limit European carp damage to submerged aquatic vegetation (see Appendix F, IPM Plan).

Rationale: Open water habitat is a permanently flooded habitat >12” in depth without emergent aquatic vegetation. Due to presence of carp and turbid Bear River inflow diversions, open water habitat can be further subdivided into high and low clarity categories. High clarity open water habitat occurs where the wetland bottom (substrate) can be easily observed (NTU readings <10), while low clarity open water habitat occurs where the wetland bottom (substrate) cannot be easily observed (NTU readings >50). Open water habitat currently covers approximately 22% of all refuge lands and >25% of Bear Lake NWR. High clarity open water habitat is only present in impounded wetland units on Bear Lake NWR, Thomas Fork Unit, and Oxford Slough WPA. Low clarity open water habitat is currently found on Mud Lake and impounded units which have not recently received carp control.

While the refuge desired condition is to convert approximately 50% of baseline open water habitat to submergent aquatic habitat, this objective cannot be achieved until mechanisms to control sediment deposition and carp movement in Mud Lake are developed. Management believes that as technology advances, techniques are and will become available to exclude carp and sediment while allowing passage of Bonneville cutthroat trout and other desirable fish species. Therefore the more realistic desired condition proposed in this CCP is to promote 100% coverage in high clarity open water habitat in impounded wetland units, at the Thomas Fork Unit, and at Oxford Slough WPA, while accepting <50% coverage in Mud Lake. Ideally, the optimal “Hemi-Marsh” relationship would be realized through a greater number of smaller open pools (1-25 acres) within emergent vegetation; however, at present, most refuge hemi-marsh habitat is comprised of a few large pools (>100 acres) ringed by emergent vegetation

Mud Lake serves as the turning basin for the entire Bear River system, which has led to high quantities of sediment entering the unit over time. Mud Lake and Bear Lake proper are operated as one unit by PacifiCorp and together they serve as a storage basin for irrigation use in the lower Bear River. The Refuge maintains an agreement with PacifiCorp (the primary water rights holder), through which target elevations are maintained within one-half foot of the 5,920.5-foot elevation, subject to the Bear River Compact, irrigation needs, and flood control. Unfortunately, this is not a solution toward solving the habitat quality issues. Currently we maintain a stable average water elevation of 5,920.5 feet ±0.5 feet UP&L datum across the entire Bear Lake NWR marsh complex through the breeding and nesting period (March-June) for waterfowl pair and brood habitat. During seasons with high runoff, it can be difficult to maintain a stable water level. Over the past several years, a minimum elevation (app. 5,920.5 feet UP&L datum) has been stabilized by April 1 and maintained to ensure hydration in the Refuge’s historic white-faced ibis colony. Coincidently, it was discovered during a recent drought (2002-2005) that desiccation led to annual plant establishment on the sediment-laden mud flats, which has led to increased fall migration use by shorebirds when water levels are returned to the unit (Casanova and Brock 2000, van der Valk 1981).

While sediment deposition and widespread carp infestation have dramatically reduced habitat quality within the 8,017-acre Mud Lake Unit, anecdotally, several species appear to select the Mud Lake Unit over other units to fulfill certain life history events. These observations warrant further study. For example, the wide open water areas provide ideal protection for molting birds, unit size provides isolation for colonial nesting waterbirds, and carp provide an ideal food source for piscivorous species (e.g., western or Clark’s grebe, double-crested cormorant, American white pelican, bald eagle). Perennial emergent hemi-marsh quality is difficult to maintain in the Mud Lake Unit; however, interim proposed drawdowns result in a moist-soil management response. The degraded substrate is desirable to annual plant communities and is also advantageous in concentrating carp for piscivorous bird utilization. The Refuge will work in partnership with PacifiCorp and other stakeholders to study and consult on the effects, desirability, and feasibility of reducing sediment loading in the Mud Lake Unit.

At present, 25% of Bear Lake NWR habitat falls under the open water category, with a target open water objective of 25% on the Mud Lake Complex. The CCP will assess the feasibility and perform engineering studies to design infrastructure to further reduce sediment loading within the Mud Lake Complex by 2020. If suitable infrastructure can be designed and developed to reduce the sedimentation rate of Bear River water diversions, the Refuge will be able to better facilitate carp and non-native game fish exclusion and dramatically decrease open water habitat within Mud Lake. Ideally, the percentage of open water would decrease to less than 10% for Bear Lake NWR through the possible development of a levee system in the Mud Lake Unit and subsequent improvement in carp control and/or sediment filtration capabilities.

There are currently no water control capabilities in the Merkley Lake/Mud Lake Unit. Water supply in the 82-acre Merkley Lake Unit primarily comes in the form of geothermal discharge from the adjacent Hot Springs mountain range. Additionally, carp have infested the unit (presumably following a flood period in Mud Lake) which has led to few management options to restore quality habitat for wildlife. The unit is hydrologically disconnected from the rest of the marsh, but does serve a minimal molting/migration function during certain years. Trumpeter swan pairs have been observed using the unit during molt and when displaced from other portions of the Refuge, thus, there is some benefit to retaining the unit. Lack of management capabilities has led to custodial maintenance as the primary management strategy; using the existing geothermal groundwater supply to maintain the open water wetland on Merkley Lake.

The Merkley Lake Unit is completely surrounded by private land and not directly connected to other refuge units. The Merkley Lake Unit has been under a custodial maintenance regime since Refuge establishment in 1968—a regime that will continue over the 15-year period covered under this plan. By pursuing strategies within the CCP to cooperatively manage water levels or acquire the lands surrounding the Merkley Lake Unit, the Refuge will remedy the identified water management and isolation challenge and decrease open water habitat within the unit.

Sub-Objective 1.1b: Submerged Aquatic (Permanently Flooded) Habitat

Annually provide an average of 3,090 acres submergent habitat across all refuge units (2,998 acres at Bear Lake NWR and 92 acres at Oxford Slough), comprising greater than 80% early successional seed and tuber species and less than 20% late successional leafy browse species, distributed among the following attributes and defined unit acreage ranges:

Benefitting Refuge Species:

- Foraging: Trumpeter swan; canvasback; redhead; northern pintail; western/Clark’s grebe; muskrat

Habitat Attributes:

- Permanently flooded >6”, but <36” in depth
- Early successional submerged habitat comprised of seed and tuber producing submerged vegetation such as pondweeds and chara.
- Late successional submerged habitat comprised primarily of leafy vegetation such as water milfoil, coontail, and mare’s tail.
- ≥50% of open water habitat is of high water clarity (i.e., wetland bottom [substrate] can be easily observed [Nephelometric Turbidity Units or NTU <50]).

Refuge Submerged Aquatic Habitat Target (All Units):
Increase from 437 acres to a target of 3,090 acres

1) Bear Lake NWR:
   - Submerged Aquatic – Increase from 430 acres to a target of 2,998 acres, acceptable range 360-3,602 ac.

2) Oxford Slough WPA:
   - Submerged Aquatic – Increase from 7 acres to a target of 92 acres, acceptable range 46-139 ac.

Strategies Applied to Achieve Objective
Bear Lake NWR
In all practicable units, periodic complete drawdown over summer to increase productivity of submergent plant community. Drawdown over one growing season every five to seven years or as needed.
During drawdown phase, use mechanical, cultural, and chemical means to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain open, shallow water areas.
Initiate inventory and monitoring efforts and control points for quagga and zebra mussel infestations.
Instigate carp removal when ≥50% of open water habitat is of low water clarity (i.e., wetland bottom [substrate] cannot be easily observed [NTU >50]).
All Units
Use IPM strategies including mechanical, cultural, biological, fire and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program).
Use IPM techniques to control beaver and muskrat damage to water control structures and dike systems, in compliance with 50 CFR 3.14, Animal Control Operations, and 7 RM 14.9, Pest Control Policy (see Appendix F, IPM Program).

Rationale: Submergent habitat provides the desirable forage base in emergent marsh wetlands but is presently the most limiting component on the Refuge. Covering only 2.1% of all refuge lands, it is a primary goal of the CCP to increase the extent of this habitat type. Submergent Habitat is permanently flooded habitat >6" but <36" in depth which is primarily comprised of aquatic submergent vegetation species such as pondweed, coontail, or water milfoil. Submergent habitat can be further subdivided into early and late successional communities. Early successional submergent habitat is comprised of seed and tuber producing submergent vegetation species such as pondweeds and *Chara*. Late successional submergent habitat comprised primarily of leafy vegetation such as water milfoil, coontail, and mare's tail. At present, <60% of refuge submergent habitat is comprised of early successional seed producing species while >40% of refuge submergent habitat is comprised of late successional leafy browse species.

The general premise of the "hemi-marsh" is that overwater nesting waterbirds require habitat to fulfill two primary life history requirements during the breeding season; nesting and brood rearing. The hemi-marsh stage provides a viable food source, diverse cover types, and vegetative structure that are used by a variety of wetland-dependent wildlife. The high biodiversity on these wetlands provide valuable invertebrate food for developing ducklings, while the emergent vegetation provides good cover from predators and bad weather. Nesting habitat (comprised of deep and shallow emergent vegetation) provides plant material necessary to construct floating or elevated nest structures, while brood rearing habitat (comprised of open water and submergent vegetation) provides the forage base for fledgling waterbirds. During spring and fall migration, hemi-marshes provide exceptional resting and stop-over sites for large flocks of waterfowl. Maximum nesting densities are realized where the deep emergent marsh component retains a complex edge, relative to the open water component, and there is a 50:50 mix of these two components within any given management unit. Ideally, this optimal relationship would be realized through a higher number of smaller open pools (1-25 acres) within emergent vegetation; however, at present, most refuge hemi-marsh habitat is comprised of a few large pools (>100 acres) ringed by emergent vegetation.

In this CCP, the desired condition is to convert approximately 50% of baseline open water habitat to submergent habitat, while maintaining a minimum of 5% of all refuge area comprised of this habitat type. Within successional stages, it will be desirable to maintain between 60%-80% of submergent habitat comprised of early successional seed producing vegetation while maintaining 20%-40% of submergent habitat in a late successional stage comprised of leafy browse dominant vegetation. Maintenance of long-term productivity of this wetland type requires the identified strategy for periodic drawdown because long-term flooding can result in the accumulation of organic material that creates low-oxygen environments unfavorable to many submerged aquatic plant species (Ponnamperuma 1972, Carpenter and Lodge 1986). In addition, unconsolidated wetland bottoms reduce water clarity, which can reduce growth of submergent plants (Keddy 2010, Robel 1961).

Carp negatively impact refuge habitats by directly uprooting submerged aquatic plants, competing with native species for limited food supplies, and stirring up sediments, which increases turbidity, reduces photosynthesis, and subsequently, integrity of wetland plant communities (Miller and Crowl 2006, Badiou 2005). Carp are the single biggest threat to refuge wetland health, and thus, warrant special consideration in the management of both submerged aquatic and open water habitat. Carp control is an essential element to ensure adequate habitat functions at Bear Lake NWR. Through proposed IPM strategies (Appendix F), the Refuge will maintain carp screens on all water control structures and periodically draw down water in specific refuge impoundments for sustained periods in the winter to facilitate carp control with chemical applications of rotenone. Rotenone is a piscicide (fish specific pesticide) known and works by binding with oxygen, thus, depleting oxygen availability in the water, which in effect, suffocates the carp. Rotenone is non-persistent, usually only present in the water for a few days following treatment, so the wetland impoundment can then be reflooded, with carp control screens in-place on appropriate water control structures.

Sub-Objective 1.1c Deep Emergent (Semi-Permanently Flooded) Habitat

Annually provide a target of 5,859 acres of deep emergent habitat across all refuge units (5,358 acres at Bear Lake NWR, 40 acres at Thomas Fork, and 461 acres at Oxford Slough), with no more than 20% early successional (<30% residual coverage from previous year's growth), 60% mid-successional (30-90% residual coverage from previous year's growth), or 20% late successional (>90% residual coverage from previous year's growth), distributed among the following attributes and defined unit acreage ranges:

Benefitting Refuge Species:
- Breeding: Franklin's gull; Forster's tern; white-faced ibis; canvasback; redhead; western/Clark's grebe; American Bittern; black tern; Caspian tern; Canada goose
- Foraging: muskrat; eared grebe
- Breeding and Foraging: yellow-headed blackbird

Habitat Attributes:
- Semi-permanently flooded or permanently flooded water 0"-36" in depth
- Emergent vegetation community comprised primarily of hardstem bulrush, but also containing cattail.
- <60% of deep emergent habitat is at mid successional stage (i.e., 30-90% residual coverage)

Refuge Submerged Aquatic Habitat Target (All Units):
Increase from 5,759 acres to a target of 5,859acres

1) Bear Lake NWR:
   - Deep Emergent – Increase from 5,213 acres to a target of 5,358 acres, acceptable range 4,503-6,304 ac.

2) Thomas Fork Unit:
   - Deep Emergent – Increase from 35 acres to a target of 40 acres, acceptable range 30-51 ac.

3) Oxford Slough WPA:
   - Deep Emergent – Decrease from 511 acres to a target of 461 acres, acceptable range 371-556 ac.

Strategies Applied to Achieve Objective
Maintain 24-30" of water by late January through winter to decrease deep emergent marsh through seasonal water level manipulations.
Protect double-crested cormorant and Franklin's gull nesting islands from disturbance and maintain the water barrier areas around them.
During drawdown phase, use mechanical, cultural, fire, and chemical means to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain open, shallow water areas.
Trigger an increase in water levels or the use of mechanical or physical disturbance when ≥60% of deep emergent habitat is at mid successional stage (30-90% residual coverage).
When conditions exceed 20% coverage of late successional residual emergent vegetation, use residual burns to remove 90-100% of the residual biomass.
Apply mechanical disturbance following a burn to increase the potential to set back succession to early or mid-successional states.

Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program).
Oxford Slough WPA
At Oxford Slough, perform an annual prescribed burn of 50-100 acres to set back succession in deep emergent communities.
At Oxford Slough, following prescribed burns, mechanically disturb to the root zone to re-establish topographic variation in associated deeper portions of the Slough that were previously leveled through agricultural practices.

Rationale: The emergent marsh is the core element of the historic Dingle Marsh and comprises approximately 80% of available habitats at Bear Lake NWR. A core element of the emergent marsh is semi-permanently flooded deep emergent habitat comprised primarily of hardstem bulrush, but also containing cattail. Semi-permanent emergent wetlands are characterized by the presence of minimum water depths between 1 and 20" for at least four growing season months. This water regime favors the establishment of emergent plant species such as common cattail, hardstem bulrush and various native/desirable sedges and spike rushes. Emergent vegetation at varying levels of residual coverage provides: nesting habitat and cover for a variety of wetland dependent wildlife species (Baldassare and Bolen 2006); overwater nesting sites for wetland dependent bird species; invertebrate substrate for foraging waterbirds and fish; lodge materials and loafing sites for aquatic mammals:, and shade and cover for all species., Emergent vegetation forms the “housing” requirement within the hemi-marsh environment. (Weller and Spatcher 1965, Weller and Fredrickson 1973, Weller 1981).

In wetlands, emergent vegetation structure and interspersion (i.e., habitat diversity on a horizontal plane) have been demonstrated to be associated with diversity and abundance of breeding-bird species in the northern prairies (Weller and Spatcher 1965, Weller and Fredrickson 1974, Kaminski and Prince 1981, Murkin et al. 1982). Specifically, northern prairie wetlands with a 50:50 ratio of interspersed emergent vegetation and open water have a higher diversity and abundance of breeding wetland bird species than those wetlands containing more or less interspersed emergent vegetation (Kaminski and Prince 1981, Murkin et al. 1982). However, since inception the term “Hemi-marsh” has usually been far too stringently interpreted and managed at too small of a spatial scale (L. Fredrickson, personal communication). Attempts at prescriptive management, similar to current management, to maintain a consistent interspersion of open water and submerged to deep emergent vegetation has too frequently resulted in invariable wetland hydroperiods. While unsustainable high short-term productivity may result from this management, it is usually followed by static habitat conditions and long-term reductions in wetland productivity. Therefore the more dynamic management of the CCP, coupled with a clear understanding of both the spatial and temporal relationships of managing natural variability in a “Hemi-Marsh”, remains essential to ensure long-term productivity of the perennial emergent marsh (Smith et al. 2004).

At Bear Lake NWR, the construction of dikes and water control structures now allow for improved hydrology and wetland function through precise manipulation of water levels. Adjustments in the timing and amount of drawdown in a unit or complex, as described in this CCP, will allow for increased hemi-marsh stage (diverse stands of emergent vegetation intermixed with equal areas of open water). Although a 1:1 ratio of open water to wetland vegetation may be desirable, it is not practical or attainable on all units at all times. Additional activities such as fire management and manipulation of muskrat populations also aid in achieving hemi-marsh conditions. From a management perspective, prescriptive and consistent marsh habitat is not desirable. Over time, consistent wetlands can become completely dominated by continuous stands of cattails, with little or no value to wildlife. On the other hand, if water levels are too deep the wetland can become devoid of emergent vegetation. Per this CCP, by attempting to mimic a natural range of variability, the Refuge’s hemi-marshes would experience periodic drying or drawdown cycles that regulate vegetation growth and promote viable muskrat populations that would assist in curtailing emergent vegetation growth.

At Bear Lake NWR, deep emergent habitat can be further subdivided into three successional stages: Early Successional (Deep emergent habitat comprised of <30% residual vegetation coverage from previous years growth), Mid Successional (Deep emergent habitat comprised of 30%-90% residual vegetation coverage), and Late Successional (Deep emergent habitat comprised of >90% residual vegetation coverage). Different levels of residual vegetation are desirable to different resources of concern based on seasonal life history requirements. (Smith and Kadlec 1986, Barker and Fulton 1979). When deep emergent stands have diverse successional interspersion, they provide countless ecosystem functions for wildlife (Beule 1979). The CCP’s approach for shifting deep emergent management toward a successional stage of 20% early, 60% mid, and 20% late would decrease late successional residual dominance. Applied water control and active manipulation and disturbance (e.g., mechanical, chemical, physical) strategies in the CCP are vital to maintaining this ratio.

Early Successional deep emergent habitat is a direct result of prescribed fire and typically lasts < two years following a burn. Only 10% of refuge units fall under this category at present. Mid Successional Deep emergent habitat falling within 30%-90% residual cover is a typical mid-successional response and currently covers approximately 40% of refuge deep emergent habitat (those burned between three to seven years prior). Late Successional Deep Emergent Habitat has greater than 90% residual cover and typically occurs >7 years following disturbance (mechanical or prescribed fire). The remaining 50% of refuge deep emergent habitat falls under this category at present. The desired condition, to maintain between 10% and 20% of refuge deep emergent habitat in an early successional seral stage (<30% residual cover), between 60% and 80% in a mid-successional stage (30%-90% residual cover), and between 10% and 20% of refuge deep emergent habitat in a late successional stage (>90% residual cover).

As time goes by without some form of physical disturbance, the percentage of residual coverage increases, often to a point where the existing community is nearly 100% residual vegetation. While used by some wildlife species, this habitat condition is mostly undesirable when exceeding 20% coverage within the habitat type. When this occurs, residual burns, or burns targeted to remove 90-100% of the residual biomass, are applied. Through this action, all residual coverage is eliminated and new growth vegetation begins to emerge. In this way, late successional deep emergent habitat is converted to early successional, which typically lasts about two years before it reenters a mid-successional phase (30-90% residual cover). When combined with water level control, prescribed fire is likely the most effective tool for directing widespread succession in Palustrine Emergent Marsh habitat types. Although fire has been used in upland grass areas, its primary utility is in altering residual vegetation coverage in deep and shallow emergent marsh habitats, or more simply, setting back vegetative succession.

While physical manipulations using mechanical disturbance techniques are longer lasting, burning covers a greater area in a shorter period. The Refuge will apply mechanical disturbance following a burn to increase the successional benefits of the tool. For example, most controlled burns at Bear Lake NWR are conducted during spring while snow cover is still on the ground. This keeps the root mass wet so that it remains unharmed by fire. As such, emergent vegetation returns quite rapidly and moves toward late successional status in a period of seven to ten years. By including disking or dredging in sections of the burn area, open pools can be maintained following reflooding. In residual burns the objective is to remove all extant vegetation and allow the community to completely regenerate. This type is most appropriate in areas such as Oxford Slough, where fire has not been a major formative process since the Refuge acquired the land in 1985.

Sub-Objective 1.1d: Shallow Emergent (Semi-permanently and Seasonally Flooded) Habitat

Annually provide a target of 4,174 acres of shallow emergent habitat across all refuge units (3,774 acres at Bear Lake NWR, 181 acres at Thomas Fork, and 219 acres at Oxford Slough), with no more than 20% containing either <30% or >90% residual coverage and no less than 10% comprising alkali tolerant species, distributed among the following attributes and defined unit acreage ranges:

Benefitting Refuge Species:
- Breeding and Foraging: Northern leopard frog; American bittern.
- Foraging: White-faced ibis; eared grebe; northern pintail; mallard; black-crowned night-heron; marbled godwit
- Other: Northern leopard frog (Winter)

Habitat Attributes:
- Semi-permanently to seasonally flooded 0”-18” in water depth
- <90% Freshwater shallow emergent habitat comprising primarily hardstem bulrush
- >10% Alkali bulrush established in water typically >1,000 parts per million (ppm) Total Dissolved Solids (TDS)
- <90% of freshwater shallow emergent habitat is at mid successional stage (i.e., 30-90% residual cover)

Refuge Shallow Emergent Habitat Target (All Units):
Decrease from 5,759 acres to a target of 4,174 acres

1) Bear Lake NWR:
    - Shallow Emergent – Decrease from 5,862 acres to a target of 3,774 acres, acceptable range 3,602-6,304 ac.

2) Thomas Fork Unit:
- Shallow Emergent – Decrease from 210 acres to a target of 181 acres, acceptable range 152-254 ac.

3) Oxford Slough WPA:
- Shallow Emergent – Increase from 210 acres to a target of 219 acres, acceptable range 185-278 ac.

Strategies Applied to Achieve Objective

Increase water flooding depths when ≥90% of freshwater shallow emergent habitat is at mid successional stage (30-90% residual coverage).

During drawdown phase, use mechanical, cultural, fire, and chemical means to re-open areas that have become vegetated with persistent emergent vegetation in order to set back succession and maintain open, shallow water areas.

Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive and undesirable plants (see Appendix F, IPM Program).

Rationale: Shallow wetlands can be highly productive for waterfowl (Smith et al. 1964) even though production fluctuates widely from year to year with wetland conditions (Dzubin 1969; Crissey 1969). Evans and Black (1956), Drewien and Springer (1969), and Jenni (1956) stressed the importance of small seasonal wetlands to dabbling ducks during spring and early summer. Kantrud and Stewart (1977) compared pair densities on a series of glacial pond types of varying permanence and found some of the highest densities of dabblers occurred on temporary ponds; in the case of blue-winged teal, extremely high densities occurred on ephemeral wetlands. Similarly, Ruwaldt et al. (1979) found unusually high densities of blue-winged teal pairs on ephemeral wetlands in South Dakota and generally high densities of waterfowl on temporary wetlands.

Semi-permanently to ephemerally flooded habitat comprised primarily of hardstem bulrush, but also containing shallowly flooded cattail and alkali bulrush, is typically flooded to a depth of 3”-24”. The primary difference between deep and shallow emergent habitat is water permanence. Shallow emergent habitats are occasionally dewatered during summer months, while deep emergent habitats are permanently wet. Shallow emergent habitat can be further subdivided by water quality with two different types found on the Refuge at present; Alkali (Shallow emergent habitat comprised primarily of alkali bulrush and established in water typically >1,000 ppm TDS) and Fresh Water (Semi-permanent to seasonally flooded habitat comprised primarily of hardstem bulrush in water typically <1,000 ppm TDS). Significant stands of alkali dominant (e.g., alkali bulrush) shallow emergent marsh currently exist only in the Rainbow Complex (Bear Lake NWR) and Oxford Slough WPA. Approximately 90% of the shallow emergent community is currently dominated by hardstem bulrush which covers approximately 30% of all refuge units.

During the summer, when seasonal wetlands are dry, resident wetland wildlife are highly dependent on semi-permanent and permanent wetlands. Basically, the two primary habitat requirements of wetland wildlife during this time period are: 1) sufficient cover and protection from predators, and 2) an abundant food supply of aquatic invertebrates. Such invertebrates are the primary source of dietary protein for ducks and other wetland birds during the breeding season (Swanson and Meyer 1977, Murkin and Kadlec 1986). Most species of wetland wildlife are dependent upon invertebrates as a direct or indirect food source during the spring and summer. For example, breeding ducks and shorebirds eat invertebrates almost exclusively, but herons eat other direct consumers of invertebrates such as fish, reptiles, and amphibians. Refuge preferred strategies for managing deep marsh habitats in semi-permanent and permanent wetlands would provide ample protection from predators, and by dewatering seasonal wetlands in the summer months, the Refuge will be able to provide an abundant food supply through a much greater abundance of invertebrates (De Szalay and Resh 2000, Euliss et al. 2004). Since invertebrate populations decline with prolonged flooding, the proposed dry period of at least two months each year in seasonal wetlands is essential for maintaining abundant populations of invertebrates (Fredrickson and Taylor 1982, Reid et al. 1989).

Shallow emergent vegetation is similar to deep emergent vegetation except that depths within this zone are typically shallower resulting in less permanency. Additionally, this habitat type contains plant species such as alkali bulrush and annual plants which provide an additional food reserve function within the hemi-marsh complex. While deep emergent vegetation forms the concentric ring around open water/submergent habitats, shallow emergent vegetation provides the interface with the ephemeral wet meadow zone. As such, the shallow emergent zone functions similarly to the deep emergent zone for wetland dependent wildlife species that require wet meadow and adjacent uplands to fulfill their life history strategies (Galatowitsch and van der Valk 1996).

Objective 1.2. Ephemeral Wetlands (Seasonally and Temporally Flooded) Wetlands

Annually provide a refuge total* of 2,593 acres coverage of shallow Ephemeral Marsh wetlands, comprised of 1,932 acres of Wet Meadow and 661 acres of Alkali Meadow habitat across all refuge units, distributed among the following attributes and defined unit acreage ranges:

*The Refuge totals included in this objective are a summation of five management complexes of Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA.
Sub-Objectives for the individual habitat types (Wet Meadow and Alkali Meadow) will collectively need to be managed as individual targets for each of the five management complexes and 13 impoundments of Bear Lake NWR to attain this refuge objective.

Ephemeral Wetlands-Classified as ephemeral emergent wetlands, these shallow marshes range from moist soil during late summer to flooded as much as 2' during spring; it is this seasonal fluctuation that produces and then concentrates food reserves for most wetland dependent wildlife species.

Refuge Ephemeral Wetland Target (All Units):
Increase from 1,556 acres to a target of 2,593 acres

1) Bear Lake NWR:
   - Ephemeral Wetlands – Increase from 553 acres to a target of 1,613 acres acceptable range 581-2,223 ac.

2) Thomas Fork Unit:
   - Ephemeral Wetlands – Decrease from 390 acres to a target of 373 acres acceptable range 325-447 ac.

3) Oxford Slough WPA:
   - Ephemeral Wetlands – Decrease from 613 acres to a target of 607 acres acceptable range 463-741 ac.

Strategies Applied to Achieve Objective
All Units
Use complex specific habitat tolerance thresholds and management prescriptions, primarily water control and secondarily prescribed fire, mechanical disturbance, and chemical control, to meet predetermined annual wetland habitat objectives in any given year.
Establish long-term wetland vegetative trend monitoring sites and annually measure abiotic response to climatic variability and management strategies and techniques.
Every five years, reevaluate habitat distribution in habitat type, using GIS to determine current proportionality, and shifts by seven wetland and 4 upland habitat types.
Use sound professional judgment to annually assess habitat condition and associated percentages in habitat threshold categories for each habitat type. Where surpassed or deficient, target for prescriptive management individual units that can best meet habitat type thresholds and include in the Bear Lake NWR and Oxford Slough Annual Work Plan.
Bear Lake NWR
Simultaneously simulate “drought” (<5,915.5'), “normal” (5,920.5'), and “flood” (>5,921.5') hydrologic scenarios by manipulating Bear Lake NWR water level regimes in individual wetland units, such that an approximately equal proportion of refuge habitat is managed under high water, normal, and low water conditions across the entire Refuge.
Properly manage marsh levels and improve water quality where possible for waterfowl production by simulating “drought” (<5,915.5') and “normal” (5,920.5'), hydrologic scenarios by manipulating Bear Lake NWR water level regimes in individual wetland impoundment units.
During drought cycles incorporate periodic drawdowns to improve wetland productivity.
Establish long-term wetland vegetative trend monitoring sites and annually measure biotic response to climatic variability and management strategies and techniques.

Use complex specific habitat tolerance thresholds and management prescriptions, primarily water control and secondarily prescribed fire, to meet predetermined annual wetland habitat objectives in any given year.
Thomas Fork Unit
Retain spring runoff by annually setting boards at or above 6,015.0' MSL (15.0' on water staff gauge) in the Thomas Fork center structure by March 15 (or as soon as possible thereafter depending on weather conditions).
Simulate Thomas Fork "drought" and "normal" hydrologic regimes in combination with management prescriptions strategies formalized in the Thomas Fork Unit Annual Work Plan.
Provide "flood" scenarios at Thomas Fork through years of excess snowpack on an unpredictable basis.
As necessary to meet habitat objectives, simulate "extreme drought" regime every seven to twelve years, by setting boards at a much lower elevation (e.g., 13.0') or pulled entirely to allow flow through the system.
Annually meet with adjacent downstream landowners on the Thomas Fork to discuss applicable fisheries, water flows, and stream management concerns.
Protect refuge water rights by annually working with the Thomas Fork Irrigation Company to ensure delivery of refuge shares in the irrigation system (500 shares at present).
Oxford Slough WPA
Maintain at least one functional historic slough channel by periodically dredging or excavating sediment or established vegetation at Oxford Slough.
Approach the Idaho Department of Water Resources (IDWR) as to the efficacy of exchanging water shares in the Oxford Creek Irrigation District for Storage rights in Oxford Slough for wildlife purposes.

Objective 1.2a: Wet-Meadow (Seasonally and Temporally Flooded) Habitat

Annually provide a target of 1,932 acres of wet meadow habitat across all refuge units (1,344 acres at Bear Lake NWR, 349 acres at Thomas Fork, and 239 acres at Oxford Slough), with greater than 60% late successional (containing >90% residual vegetation) and distributed among the following attributes and defined unit acreage ranges:

Benefitting Refuge Species:
- Breeding and Foraging: Greater sandhill crane; Wilson's phalarope; willet
- Breeding: Canada goose; black-necked stilt
- Foraging: Long-billed curlew; Franklin's gull; white-faced ibis; California gull; great egret; cattle egret; snowy egret; long-billed dowitcher; red-necked phalarope; marbled godwit; solitary sandpiper; semipalmated plover

Habitat Attributes:
- Ephemerally to semi-permanently flooded marsh dominated by low stature, flood tolerant, annual and perennial plants
- Typical aquatic emergent species include spikerush, Baltic rush, and flood tolerant grasses such as foxtail barley, saltgrass, and rabbitfoot.
- Early successional (low residual) wet meadow class occurs where <20% of the community contains dense residual cover.
- Late successional (high residual) wet meadow class occurs where >90% of the community contains dense residual cover and>20% of the community is forb dominant
- <40% of wet meadow habitat is of late successional-high residual.

Refuge Wet-Meadow Habitat Targets (All Units):
Increase from 1,095 acres to a target of 1,932 acres

1) Bear Lake NWR:
   - Wet Meadow – Increase from 500 acres to a target of 1,344 acres, acceptable range 360-1,441 ac.

2) Thomas Fork Unit:

- Wet Meadow – Decrease from 358 acres to a target of 349 acres, acceptable range 305-406 ac.

3) Oxford Slough WPA:

- Wet Meadow – Increase from 237 acres to a target of 239 acres, acceptable range 185-324 ac.

Strategies Applied to Achieve Objective

By 2027, reduce haying operations from 3,533 to 1,492 acres. Slowly phase in haying reductions over a 15-year period (2013-2027) (see Haying Objective 4.2).

Until haying operations are phased-out in 2027 (see Haying Objective 4.2), manage early (low residual) and late (high-residual) successional wet meadow for <20% of the community as dense residual cover and >90% of the community as late successional wet meadow and >20% of the community is forb dominant.

Under "normal" and "drought" scenarios for ephemeral wetlands (See Objective 1.2), seasonally re-flood wet meadow areas for Fall foraging migratory birds.

Rationale: While the vast majority (89%) of available habitats at Bear Lake NWR is tall emergent and "hemi-marsh", approximately 1,500 acres of shorter stature and seasonally or temporally flooded ephemeral marsh are a vital habitat component for breeding and foraging wildlife. The diversity and complexity of plant species within ephemeral marsh habitats provides ideal substrate for invertebrates which comprise 90% of most waterbird diets during summer months (Euliss et al. 1999, Fredrickson and Taylor 1982). However, with fall flooding during migration, the annual seeds produced by these plants provide additional forage for migratory waterbirds as well (Fredrickson and Taylor 1982, Greer et al. 2007, Brasher et al. 2007).

Wet Meadows are seasonally and temporally flooded marsh dominated by low stature, flood tolerant, annual, and perennial plants. For the majority of waterbirds, this habitat type would provide the seasonal food reserves to fulfill specific phases in their life history strategies (Pyrovetsi and Crivelli 1988, Garay et al. 1991, Kaminski and Prince 1984). Wet meadow habitats are distinguished from alkali meadows primarily by the quality of water typically hydrating the marsh. Where freshwater (<1,000 ppm TDS) input is the norm, wet meadow plants become established. Ranging from Baltic rush and annual grasses, to forbs such as curly dock, plant diversity of wet meadows is the highest of all habitat types found on Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA. Wet meadow habitats can be further subdivided by successional stage with either early successional or late successional communities found on all refuge units. Early successional status includes wet meadow habitat where less than 20% of the community contains dense residual cover. Approximately 80% of wet meadow habitat is maintained in early successional status through the Refuge's haying program. Late successional status is defined as wet meadow habitat where greater than 90% of the community contains dense residual cover and/or greater than 20% of the community is forb dominant. Less than 20% of wet meadow habitat is maintained in late successional status.

Currently, a high amount of short-cover (early successional) habitat type occurs on the Refuge and private lands adjacent to all refuge units. Conversely, it would be desirable to increase the coverage of late successional wet meadow habitat to a minimum of 60% coverage. By implementing hay management strategies to reduce the coverage of early successional wet meadow habitat to less than 40%, the Refuge will improve refuge native meadow grass structure and composition. The integrated approach in this CCP strikes a balance between managing short-cover habitat through haying, and providing dense, late successional wet meadow habitat. This approach acknowledges the factors that determine the foraging preferences of different wildlife species. Management practices under the CCP will produce habitats that are suitable for not only species who readily adapt to anthropogenic changes in habitat, but a diverse suite of species. By offsetting current agricultural haying practices on 2,041 acres, while still providing short-cover on 1,492 acres, the Refuge will provide a diverse realm of nesting and foraging habitats for both breeding and migrating wildlife during several key times in their annual life histories (Rollins 1981, Heitmeyer et al. 1989) in meadow grass habitat.

While increased access to invertebrate forage bases is the principal advantage cited for short-cover management practices (Schekkerman and Beintema 2007), an unanticipated effect of short-cover haying operations is that little vegetative complexity for hosting invertebrate substrate remains. Temporally flooded meadow wetlands are so productive because the base of the biotic pyramid is large and diverse and nutrient cycling is dynamic (Mitsch and Gosselink 1993). Because energy flows from the lowest levels of the pyramid in unhayed or mowed habitat, detritus sustains much of the biomass and structure of the community (van der Valk 1989). Excessive litter removal from haying objectives under current management affects the balance between litter removal and accumulation in the shallow habitat wetlands, causing unwanted effects upon primary and secondary wetland productivity. Small litter accumulations may not provide adequate substrate for invertebrates; however, large accumulations may alter surface hydrology through peat formation or nutrient binding (Magee 1993). Where litter accumulation is scant (current management) or heavy (Alternative 2 of the Draft CCP/EA, which was not selected for implementation), invertebrate production may be impeded because of unfavorable conditions associated with hydrology, substrate, and nutrient availability (Magee 1993). The CCP will reduce haying moderately from current levels, thereby providing a more diverse litter layer in wet meadows and various stages of litter size and decay. In comparison to the current management, the CCP optimizes management of invertebrates for a more diverse array of foraging waterbirds and wildlife.

High consumption residual burns are most effective in wet meadow habitats where residual biomass (which typically consists of past years' Baltic rush growth) has accumulated. In most situations mosaic burns are a practical and beneficial tool to apply in wet meadows. Topographic variation in meadows (often referred to as microtopography) results in small depressions where water stands for longer periods of time. These depressions are often adjacent to higher elevation areas that may not get saturated at all. This produces differing levels of residual growth which allows the fire to carry through some patches and bypass others due to lack of fuel. By applying mosaic burns in wet meadow habitat the Refuge will remove up to 70% of the residual biomass and still leave some areas of dense residual vegetation unburned. This strategy will add to the diversity of the wet meadow community.

Objective 1.2b. Alkali Meadow (Temporarily Flooded) Habitat

Annually provide a target of 661 acres of alkali meadow habitat across all refuge units (269 acres at Bear Lake NWR, 24 acres at Thomas Fork, and 368 acres at Oxford Slough), with no more than 40% of the coverage containing >90% residual vegetation and distributed among the following attributes and defined unit acreage ranges:

Benefitting Refuge Species:
- Breeding and Foraging: American avocet; Wilson's phalarope
- Breeding: Willet
- Foraging: Black-necked stilt; red-necked phalarope; marbled godwit; semipalmated plover; sanderling

Habitat Attributes:
- Ephemerally to semi-permanently flooded alkali (>1,000 ppm TDS) marsh dominated by low stature, flood tolerant, annual and perennial plants
- Typical species include pickleweed, red goosefoot, oakleaf goosefoot, and alkali sacaton.
- Early successional (high heterogeneous diversity) alkali meadow class occurs where alkali meadow contains >1 halophytic plant species (e.g., red glasswort) sharing dominance within the plant community.
- Late successional (low diversity) alkali wet meadow class occurs where red glasswort is dominant within the plant community.
- <40% of wet meadow habitat is of late successional-low diversity.

Refuge Alkali Meadow Habitat Targets (All Units):
Increase from 461 acres to a target of 661 acres

1) Bear Lake NWR:
   - Alkali Meadow – Increase from 53 acres to a target of 269 acres, acceptable range 36-360 ac.

2) Thomas Fork Unit:
   - Alkali Meadow – Decrease from 32 acres to a target of 24 acres, acceptable range 20-41 ac.

3) Oxford Slough WPA:
   - Alkali Meadow – Decrease from 376 acres to a target of 368 acres, acceptable range 278-417 ac.

Strategies Applied to Achieve Objective

Phase-in haying reductions (see Haying Objective 4.2).

Until haying operations are phased-out (see Haying Objective 4.2), manage for dynamic hydrology and early successional (high

heterogeneous diversity) alkali meadow; late successional (low diversity) alkali wet meadow class occurs where red glasswort is dominant within the plant community.
Initiate pilot study to test direct seeding and container plantings to restore target halophytic vegetation and alkali habitat function.
Under "flood" scenarios for ephemeral wetlands (See Objective 1.2), seasonally re-flood alkali meadow areas for Fall foraging migratory birds.
Rationale: Ephemeral to semi-permanently flooded alkali marsh (>1,000 ppm TDS) is dominated by low stature, flood tolerant, annual and perennial plants. Typical species include pickleweed, red goosefoot, oakleaf goosefoot, and flood/alkali tolerant saltgrass. Red glasswort, site specific to the alkali meadow habitat type, is a listed as sensitive by IDFG (Jankovsky-Jones 1997, IDFG 2005a) and a Type 4 Species of Concern by BLM (BLM 2003). This plant's sensitive status merits inclusion as a refuge focal species and its relative abundance and contribution to wetland diversity provides a suitable adaptive management threshold for alkali meadows. Alkali meadow habitats can be further subdivided by successional stage with either early successional or late successional communities found on all refuge units. Residual cover is typically very low in alkali meadow communities, thus, successional stage is rated based on diversity of the established plant community. Early successional status is comprised of a heterogeneous alkali meadow community where more than one halophytic plant species shares dominance within the plant community. Early successional alkali meadow communities are dominant where water quality input is <1,000 ppm TDS and where water management has fluctuated over time. Approximately 60% of all refuge alkali meadow is currently in early successional status. Late successional status includes a relatively homogenous alkali meadow habitat where red glasswort is dominant within the plant community. Late successional alkali meadow communities are dominant where water quality input is >1,000 ppm TDS or where water management has favored natural evaporative drawdowns over time. During the late 1980s through mid-1990s, it was recognized that portions of the larger Rainbow Unit were more conducive to management for shallower habitat values. The northern sections of the unit retained alkali soils and thus, halophytic (salt tolerant) plant species, while the middle segment had considerable topographic variation which provided an ideal situation to manage for ephemeral wetland pools adjacent to upland nesting habitat. Bear Lake NWR alkali meadows have been heavily impacted by altered hydrology, haying, mowing, and grazing. When subjected to such anthropogenic stresses as groundwater pumping and cattle grazing, alkali meadows are vulnerable to invasion by shrubs and conversion to alkali shrub communities (Elmore et al. 2006, West and Young 2000). Native seed germination and plant growth is stimulated by soil disturbance and is influenced by key soil characteristics and hydrologic conditions inherent to the site. Most formerly grazed alkali and meadow grass uplands were transformed to hay meadows in the Bear Lake Valley to provide winter forage for livestock. Continual historic disturbance (e.g., grazing, haying) in upland meadows results in more homogeneous vegetation structure (Török et al. 2011). Additionally, continual early dewatering of hay units in under current management decreases important alkali meadow grasses and increases saltbush or rabbitbrush shrubs (Manning 1999). Active seeding of alkali meadow species is warranted and required in the proposed action, as depleted seed-banks have been determined to be an initial limiting factor for alkali community re-vegetation and restoration (Jiang et al., 2009, Yan and Yang 2007).

GOAL 2: Provide high-quality riparian habitat within the watershed for focal wildlife species life history requirements, while simulating natural environmental processes.

Objective 2.1. Wooded Riparian and In-Stream Habitat

By 2027, restore a refuge total of 134 acres of Wooded Riparian habitat and restore and protect a minimum of 5 miles of in-stream habitat across all refuge units, distributed among the following attributes and defined unit acreage ranges:

Benefitting Refuge Species:

- In-Stream: Bonneville cutthroat trout; Green River pebblesnail; Bear River spring snail
- Breeding: Black-crowned night heron; Swainson's hawk
- Foraging: Greater sage-grouse; sharp-tailed grouse; Townsend's big-eared bat

Habitat Attributes:

- Ephemeral spring flooding (0-12" in depth)
- Natural stream bank and water course.
- Predominately comprised of native willow species (>90% willow by canopy cover) with wet-meadow understory.
- <10% of riparian habitat comprises non-native species.
- Cold (9-12, max 22°C), clear (turbidity <35 ppm), oxygenated water (7-9+ mg/l), pH ~6.5-8.0,
- No unnatural in-stream barriers that restrain fish passage
- Pool: riffle ratios 1:1, with sufficient flows (10-22 cm/sec) and depth (15-45 cm)
- Boulders, woody debris, undercut banks and/or over-hanging surface vegetation >25% total area to reduce predation by piscivores

Refuge Riparian Targets (All Units):
Increase from 92 acres to a target of 134 acres

1) Bear Lake NWR:
   - Riparian – Increase from 49 acres to a target of 79 acres, acceptable range 36-108 ac.

2) Thomas Fork Unit:
   - Riparian – Increase from 41 acres to a target of 51 acres, acceptable range 41-76 ac.

3) Oxford Slough WPA:
   - Riparian – Increase from 2 acres to a target of 4 acres, acceptable range 4-7 ac.

Strategies Applied to Achieve Objective
All Units
Fence naturally regenerating woodlands to exclude ungulate browsing. Fertilize if advantageous.
If natural regeneration does not adequately meet objectives, plant woodland trees and shrub species on appropriate sites. Prepare sites for planting using normal agricultural practices and equipment (e.g., herbicide applications, scrape off reed canary grass to mineral soil). Protect from trespass ungulate browse with fencing. Avoid planting isolated individual trees. Use temporary irrigation (one to three years) as needed. Hardware cloth tubes buried 6"-1' to protect individual plants from meadow voles.

Years 1-5: Fence and plant restoration areas, fertilize. Years 5-10: Measure survival rate, replant as necessary; maintain fence, fertilize and mow. Years 10-15: Control invasive species in tree/shrub plantings, remove fence at end of 15 years.
Ensure long-term refuge participation in the Bear River Watershed Conservation Area (BRWCA) project and work with private landowners to conserve the natural resources and working agricultural landscapes of the area.
Use IPM strategies including mechanical, cultural, biological, and chemical means to eradicate, control, or contain invasive plants (see Appendix F, IPM Program).
Place large woody debris if needed, as identified in habitat inventories and surveys.
Work with State of Idaho and Counties to ensure that road maintenance does not impact in-stream habitat.
Work with Forest Service watershed assessment teams to minimize erosion and sedimentation from roads and culverts on adjoining upstream USFS lands.
Bear Lake NWR
Throughout the lifetime of the CCP, the Refuge will work in partnership with PacifiCorp and the IDFG to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge.
Thomas Fork Unit
By 2017, formulate a mutually beneficial water management agreement with the Thomas Fork Irrigation Company to allow for complete in-stream water flows outside the irrigation period, after a minimum wetland elevation has been established and in conjunction with drought hydrologic scenario.
Rationale: Refuge stream courses such as St. Charles Creek (Bear Lake NWR) and Thomas Fork Creek (Thomas Fork Unit) provide critical spawning access for the State threatened Bonneville cutthroat trout (BCT) (Colyer et al. 2005). Both of these spawning tributaries have been identified as critical to the long-term survival of BCT (IDFG 2007). Considering the emphasis on optimally managing remnant palustrine emergent marsh complexes on refuge units, it becomes critical to account for adjacent private lands in supplementing seasonal habitat shortfalls and adjacent upland habitats. Additionally, it is equally important to recognize that critical riparian habitats such as those found on Thomas Fork Creek, St. Charles Creek, and the Bear River are primarily on private land. Promoting environmentally and operationally sound management practices on these lands is mutually beneficial to the Service and private agricultural operations. Enhancing these habitats will remain a primary objective of the Service. Proactive riparian conservation strategies, such as attaining a mutually beneficial water management agreement with the Thomas Fork Irrigation Company to allow for complete in-stream water flow-through outside the irrigation period, and construction of additional fish passage ladder projects at Bear Lake NWR in cooperation with IDFG, would greatly improve habitat for Bonneville cutthroat trout (BCT) on Bear Lake NWR and the Thomas Fork Unit. Colyer et al. (2005) documented the existence of a fluvial component of BCT in the Bear River and Thomas Fork and suggest that successful efforts at conservation of these fish must focus on main-stem habitats and the maintenance of seasonal migration corridors. Cutthroat trout abundance is usually correlated to the previous year’s stream discharge, the quantity of cover, and pool area (Binns and Remmick 1994). Consideration of actions to increase in-stream flow for spawning Bonneville cutthroat trout, after a minimum wetland elevation has been established, would greatly increase productivity and upstream spawning distribution (Teuscher and Capurso 2007) and protect the structural integrity of irrigation diversions and facilitate passage by greater numbers of fluvial spawning Bonneville cutthroat trout. Although refuge riparian woodlands comprise only a small proportion of habitat within the extensive tributaries of the Bear River proper, proposed strategies to actively restore refuge woodland habitat are vital to the conservation of riparian wildlife. Restoration of over 40 acres of native willow woodlands, while managing suitable areas for increased recruitment and regeneration of woodlands would represent a 46% increase in refuge woodland habitat. The increased acres would provide nesting habitat for many additional pairs of riparian dependent passerines and stop-over habitat for hundreds of migrants annually. Even small gains in riparian habitat are important, as riparian systems may attract up to 10.6 times the number of migratory birds found in surrounding upland sites in the spring (Stevens et al. 1977) and 14 times the number of species recorded during fall migration (Hehnke and Stone 1979). These differences occurred almost exclusively in the insectivorous bird foraging guild, with granivorous species being associated more with upland (Stevens et al. 1977) or altered (Heller 1978) sites. However, granivorous species do use riparian sites extensively during winter for foraging and thermal cover (F. B. Samson and F. L. Knopf, unpublished data). The disproportionately high value of restored riparian habitat values extends beyond birds to other vertebrates,

such as amphibians and reptiles (Brode and Bury 1984, Bury 1988), small mammals (Cross 1985, Doyle 1990), and big-game (Collins 1983).

Refuge involvement in community-based environmental planning and the Bear River Watershed Conservation Area (BRWCA) project will conserve the natural resources and working landscapes of the area. Management and conservation strategies (Holling and Meffe 1996, Dale et al. 2000), including those involving aquatic organisms (National Research Council 1996, Independent Multidisciplinary Scientific Team 1999), require consideration of large spatial and temporal extents and the conservation of biophysical processes rather than just individual biological and physical elements (Saab 1999). In the case of fish, such as anadromous salmon and even adfluvial Bonneville cutthroat trout, this necessitates a transition from the current focus on relatively small spatial extents with little or no consideration of temporal dimensions, to larger spatial extents (ecosystems and landscapes) over longer (i.e., 10-100 years) time periods (Reeves et al. 1995, Poff et al. 1997, Naiman and Latterell 2005). For example, Williams et al. (1989) found that no fish species listed under the ESA was ever recovered after listing and attributed this failure to the general focus of recovery efforts on habitat attributes rather than on restoration and conservation of ecosystems. To protect riparian habitat at the watershed scale, it is essential the Refuge engage and cooperate with private landowners on conservation matters of mutual interest (Bakermans 2006, Womack 2008) as proposed.

GOAL 3: Maintain and protect the existing integrity of early successional upland habitat and restore the natural range of variability and resiliency to late successional upland habitat.

Objective 3.1. Native Upland Community

Annually provide a refuge total of <u>2,143 acres</u> of native uplands, comprised of <u>467 acres</u> of Alkali Upland Meadow, <u>1,134 acres</u> of Meadow Grass, and <u>542 acres</u> of Shrub habitat across all refuge units, distributed among the defined unit acreage ranges:

*The refuge totals included in this objective are a summation of five management complexes of Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA.

Sub-Objectives for the individual habitat of this objective (Obj 3.1a, Alkali Upland Meadow; Obj 3.1b, Meadow Grass; and Obj 3.1c, Shrub) will collectively need to be managed as individual targets for each of the five management complexes and 13 impoundments of Bear Lake NWR to attain this refuge objective.

<u>Refuge Native Upland Target (All Units):</u>
Increase from 1,826 acres to a target of 2,143

1) Bear Lake NWR:
   - Native Uplands – Increase from 1,236 acres to a target of 1,489 acres acceptable range 901-1,981 ac.

2) Thomas Fork Unit:
   - Native Uplands – Increase from 257 acres to a target of 295 acres, acceptable range 226-356 ac.

3) Oxford Slough WPA:
   - Native Uplands – Increase from 333 acres to a target of 359 acres, acceptable range 258-432 ac.

Sub-Objectives to attain Native Upland Community Objective:

Objective 3.1a: Alkali Upland Meadow (Intermittently Flooded) Habitat

Annually maintain an average of <u>467 acres</u> coverage by Alkali Upland Meadow habitat across all refuge units (<u>343 acres</u> at Bear Lake NWR, <u>5 acres</u> at Thomas Fork, and <u>120 acres</u> at Oxford Slough), with no more than <u>40%</u> of the coverage as late successional habitat containing ≥90% residual vegetation and ≥10% forbs, and distributed among the following attributes and defined unit acreage ranges:

<u>Benefitting Refuge Species:</u>
- <u>Breeding and Foraging</u>: American avocet
- <u>Foraging:</u> Snowy egret

<u>Habitat Attributes:</u>
- Alkali (pH>9) habitat primarily comprised of halophytic grass species (e.g., alkali sacaton, saltgrass)
- Intermittent hydrologic regime with seasonal flooding less than 3" for less than 10 days annually.
- >60% Early successional Alkali Upland comprised of ≤10% forbs and ≤90% residual vegetation.
- <40% Late successional Alkali Upland comprised of ≥10% forbs and ≥90% residual vegetation.
- Initiate mechanical or physical disturbance to habitat when >40% of the community is ≥10% forbs and/or ≥90% residual vegetation

<u>Refuge Alkali Upland Meadow Target (All Units):</u>
Increase from 442 acres to a target of 467

1) Bear Lake NWR:
   - Alkali Upland Meadow – Increase from 313 acres to a target of 343 acres, acceptable range 180-540 ac.

2) Thomas Fork Unit:
   - Alkali Upland Meadow – Increase from 2 acres to a target of 5 acres, acceptable range 2-5 ac.

3) Oxford Slough WPA:
   - Alkali Upland Meadow – Decrease from 127 acres to a target of 120 acres, acceptable range 93-185 ac.

Strategies Applied to Achieve Objective

Use high saline fall tailwater (as opposed to freshwater spring inflows) to flood units and allow to evaporate on-site to increase alkali upland habitats.

At Bear Lake NWR and Thomas Fork Unit, apply early seasonal shallow irrigation to alkali upland soils to increase the seasonal extent and density of alkali habitat.

At Bear Lake NWR and Thomas Fork Unit, judicially apply prescribed fire in a mosaic pattern to establish early successional alkali habitat.

At Bear Lake NWR, Thomas Fork Unit, and Oxford Slough WPA, plant alkali sacaton and saltgrass, etc., to increase acreage, if needed.

Rationale: Alkali Upland Meadow is defined as alkaline (pH >9) habitat primarily comprised of halophytic grass species (e.g., alkali sacaton, saltgrass) subject to an intermittent hydrologic regime with seasonal flooding less than 3" for less than 10 days annually. It can further be subdivided into early or late successional stages based on residual material and forb content. Early successional alkali upland meadow habitat is comprised of less than 10% forbs and less than 90% residual vegetation coverage. At present, approximately 60% of refuge alkali upland meadow habitat contains less than 10% forb content and the majority retains less than 90% residual vegetation coverage. Late successional alkali upland meadow habitat is comprised of more than 10% forbs and/or more than 90% residual vegetation coverage. Approximately 40% of refuge alkali meadows contain a significant forb component; however, the majority retains less than 90% residual vegetation coverage.

Similar to the relationship between wet and alkali meadows, alkali and meadow grass uplands vary by soil pH and conductivity. Alkali uplands are typically sparsely vegetated with grass species such as alkali sacaton and saltgrass, and provide a vital nesting area for sensitive species such as American avocet and long-billed curlew (Plissner et al. 1999, Dechant et al. 2003) Without the close juxtaposition of alkali uplands to alkali wet meadows, these sensitive species would no longer frequent the Refuge because these habitats, in combination, provide the components necessary to fulfill their life history strategies.

Proposed strategies to purposefully redirect different water sources through water control structures to alter abiotic conditions of intermittently flooded uplands would have a dramatic influence on wetland and upland plant succession. Most on-refuge water sources would be considered fresh (<1,000 ppm TDS); however, tailwater from some of the irrigation companies can exceed this level and thus, contribute to increased salinity. The CCP's strategies will alter salinity levels by redirecting different water sources as conditions require in attaining identified alkali and meadow habitat objectives. For example, by flushing fresh water through a unit, a lowering of soil salinity can occur, fostering conditions for freshwater upland meadow vegetation to establish. However, when higher saline source tailwater is used and allowed to evaporate in place instead of flowing through a target unit, salinity levels will increase, thus pushing the vegetation community toward more alkali tolerant species (McKee and Mendelssohn 1989). Timing (spring inflow vs. fall tailwater) and distribution (flow through vs. evaporate in place) are water quality management prescriptions the refuge will use effectively to meet diverse upland meadow habitat type objectives.

Objective 3.1b: Meadow Grass (Intermittently Flooded) Habitat

Annually maintain an average of <u>1,134 acres</u> meadow grass upland habitat across all refuge units (<u>748 acres</u> at Bear Lake NWR, <u>240 acres</u> at Thomas Fork, and <u>146 acres</u> at Oxford Slough), with no more than <u>20%</u> of the coverage as late successional, containing >90% residual vegetation and/or >10% forbs, and distributed among the following attributes and defined unit acreage ranges:

<u>Benefitting Refuge Species:</u>
- <u>Breeding and Foraging:</u> Grasshopper sparrow; long-billed curlew; Canada goose; Wyoming ground squirrel; Uinta ground squirrel; Idaho pocket gopher
- <u>Breeding:</u> Short-eared owl; mallard
- <u>Foraging:</u> American widgeon; California gull; burrowing owl; Swainson's hawk; ferruginous hawk; merlin; Franklin's gull

<u>Habitat Attributes:</u>
- Grassland habitat comprised of native grass species, such as Great Basin wildrye and tall wheatgrass
- Intermittent hydrologic regime with seasonal flooding less than 3" for less than 10 days annually
- >80% Early successional meadow grass habitat comprised of ≤10% forbs and ≤90% residual vegetation.
- <20% Late successional meadow grass comprised of ≥10% forbs and ≥90% residual vegetation.
- <20% of community is late successional and comprised of ≥10% forbs and ≥90% residual vegetation

<u>Refuge Meadow Grass Target (All Units):</u>
Increase from 920 acres to a target of 1,134

1) Bear Lake NWR:
    - Meadow Grass – Increase from 570 acres to a target of 748 acres, acceptable range 540-901 ac.

2) Thomas Fork Unit:
    - Meadow Grass – Increase from 231 acres to a target of 240 acres, acceptable range 203-305 ac.

3) Oxford Slough WPA:

- Meadow Grass – Increase from 119 acres to a target of 146 acres, acceptable range 93-148 ac.

Strategies Applied to Achieve Objective

Assess options and cooperative farming agreements that are still economically viable for Refuge cooperative farmers, to delay haying further until late August.

Use freshwater spring inflows (as opposed to high saline fall tailwater) to flow-through flood meadow units to increase meadow grass habitats.

By 2016, restore 11 acres of previously farmed and cultivated agriculture fields to meadow grass habitat.

Rationale: Upland meadow grass habitat differs from wetland habitat based on the seasonal periodicity of hydration. While typically dry, upland meadows can be seasonally flooded to as much as 3” during spring. Upland habitats serve a vital function within the marsh complex by providing nesting sites for numerous upland nesting waterbird species; thus, without adjacent upland habitat within the marsh complex, far fewer waterbird species would frequent refuge habitats.

Meadow grass habitats are characterized by pH neutral soils and less dissolved salt, thus, a wider range of plant species can grow within this habitat type. Typically, meadow grass is taller in stature and has considerably more structural complexity than alkali uplands and is, therefore, used by a wider range of wildlife species. Similar to the juxtaposition of alkali uplands with alkali meadows, meadow grass in close proximity to wet meadow is also vitally important to a different complement of wildlife species. Upland nesting waterfowl and shorebird species such as Wilson’s phalarope are just a few of the examples.

Meadow grass habitat is comprised of native grass species such as Great Basin wildrye and tall wheatgrass, subject to an intermittent hydrologic regime with seasonal flooding less than 3” for less than 10 days annually. Similar to Alkali upland meadow habitat, meadow grass habitat can be further subdivided into early and late successional stages by the same ratio of forb and residual canopy coverage (<10% forb and/or <90% residual vegetation). Approximately 60% of meadow grass habitat is currently in an early successional stage due to periodic prescribed burns, while approximately 40% of refuge meadow grass habitat is in a late successional stage due to lack of disturbance. The current extent of meadow grass is desirable at the Thomas Fork Unit and Oxford Slough WPA. Efforts to convert additional cropland at Oxford Slough may be undertaken to increase this habitat percentage to approximately 5%. At Bear Lake NWR (3.2%), it would be desirable to increase this percentage to 5%.

Approximately 36% and 53% of agricultural fields existing at refuge acquisition were restored back to native meadow grass habitat at Bear Lake NWR and Oxford Slough WPA, respectively. Considering the minimal coverage of quality upland nesting habitat on Bear Lake NWR, it is necessary to reassess the importance of small grain production within meadow grass habitats when compared to the relative lack of upland meadow grass habitat (see objective 4.1).

Changes in hay management practices outlined in Objective 4.2 will improve refuge native meadow grass structure and composition. The integrated approach in this CCP strikes a balance in managing short-cover habitat through haying by acknowledging the factors that determine birds forage preference for dense native habitat and managed short habitat structure. Strategies for management practices to produce habitats that are suitable for not only species who readily adapt to anthropogenic changes in habitat, but a diverse suite of species is preferred over current management. By offsetting current agricultural haying practices on 2,041 acres, while still providing short-cover on 1,492 acres, the Refuge will provide a diverse realm of nesting and foraging habitats for both breeding and migrating wildlife during several key times in their annual life histories (Rollins 1981, Heitmeyer 1989) in meadow grass habitat.

Objective 3.1c: Mixed Shrub (Rabbitbrush, Greasewood, and Sagebrush) Habitat

Annually maintain an average of <u>542 acres</u> coverage by Shrub habitat across all refuge units (<u>398 acres</u> at Bear Lake NWR, <u>50 acres</u> at Thomas Fork, and <u>94 acres</u> at Oxford Slough), while using active management techniques to maintain greater than <u>60%</u> in early successional status for nesting wildlife.

<u>Benefitting Refuge Species:</u>

- <u>Breeding and Foraging:</u> Greater sage-grouse; Merriam’s shrew; Brewer’s sparrow; Wyoming ground squirrel; Uinta ground squirrel; Idaho pocket gopher; ferruginous hawk; loggerhead shrike; sharp-

tailed grouse; merlin; burrowing owl
- Breeding: Swainson's hawk; northern pintail; long-billed curlew

Greasewood Habitat Attributes:
- <25% canopy cover of mature, tall (>3') shrubs with patchy distribution
- <20% herbaceous cover
- >20% bare ground
- <10% invasive species
- <25% of community is mature tall (>3')

Sagebrush Habitat Attributes:
- 50% of the habitat retaining less than 30% canopy coverage by big sagebrush
- Sagebrush 10-28" in height
- < 10% invasive species
- <50% of community is late successional (>30% shrub cover)

Refuge Shrub Target (All Units):
Increase from 463 acres to a target of 542

1) Bear Lake NWR:
   - Shrub – Increase from 352 acres to a target of 398 acres, acceptable range 180-540ac.

2) Thomas Fork Unit:
   - Shrub – Increase from 24 acres to a target of 50 acres, acceptable range 24-51 ac.

3) Oxford Slough WPA:
   - Shrub – Increase from 87 acres to a target of 94 acres, acceptable range 74-94 ac.

Strategies Applied to Achieve Objective

All Units

Initiate upland shrub inventories to determine which sagebrush communities are currently resistant and resilient, versus those that have low resistance and resilience, as well as those with characteristics intermediate to these extremes.

Adaptive management triggered when >25% of community is mature tall (>3').

Initiate mechanical or physical disturbance to habitat when >50% of community is late successional (>30% shrub cover).

Bear Lake NWR

At Bear Lake NWR, restore small areas interspersed throughout the wetland areas and along wetland management levees and dikes by mechanically disturbing late successional shrub islands and planting native grass and forbs by 2022.

Thomas Fork Unit

At Thomas Fork, restore 26 acres of sagebrush shrub habitat through mechanical, chemical, or restorative plantings in areas impacted by past livestock grazing and now dominated by late successional sagebrush by 2022.

Oxford Slough WPA

At Oxford Slough WPA, initiate active sagebrush restoration along the periphery of agricultural areas as required to stabilize rill erosion sites by 2022.

Rationale: Shrub uplands are comprised of either early successional (rubber rabbitbrush), late successional alkali (big greasewood), or late successional climax (big sagebrush) shrub species with the dominant overstory canopy covering at least

50% of the community. Shrub habitats typically contain a native grass understory comprised of either meadow grass or alkali upland species. Shrub habitats can be divided by canopy cover percentage as an index of habitat quality with the threshold of at least 90% of the habitat type containing greater than 50% canopy coverage by the dominant shrub species. Refuge units currently contain approximately 2.2% shrub habitat by aerial coverage, roughly equally distributed among units. Oxford Slough shrub habitats are more greasewood dominant, while Bear Lake NWR and the Thomas Fork Unit have a higher proportion of big sagebrush. Due to long-term livestock grazing prior to refuge acquisition in 1995, the sagebrush community at the Thomas Fork Unit typically has less than 50% canopy coverage. The desired condition is to increase canopy coverage at the Thomas Fork Unit to a condition where greater than 90% of the coverage has greater than 50% canopy coverage by big sagebrush. All other units are within threshold.

Shrub habitat is the least variable of all refuge habitat types but serves a complementary function in the wetland complex by providing additional habitat for upland nesting wildlife. Additionally, shrub habitats provide winter cover for big game species such as moose and mule deer, while serving as the primary habitat type used by specialists such as sage grouse. Compared to sagebrush habitat surrounding refuge lands, the proportional distribution on the Refuge is quite low; however, the quality of refuge shrub habitat is far superior to any adjacent shrub habitat.

Before undertaking broad restorative efforts, the CCP calls for inventories to determine which sagebrush communities are currently resistant and resilient, versus those that have low resistance and resilience, as well as those with characteristics intermediate to these extremes (Wisdom et al. 2005a). Healthy sage-steppe communities are defined as resistant when the ecosystem maintains its structural and functional attributes in the face of stress and disturbances. Resilience entails the ability of an ecosystem to regain structural and functional attributes that have suffered harm from stress or disturbance. Current knowledge suggests that little can be done to restore vast areas of sagebrush that have already been lost and experienced threshold effects that are impossible, or highly improbable, to reverse (Bunting et al. 2002). On the other hand, many areas of existing sagebrush may be close to transitioning to undesirable habitat conditions that may be difficult to reverse (e.g., cheatgrass) and might be prevented from transitioning through management intervention. Still other areas of sagebrush are highly resistant and resilient to most human disturbances, and currently require less management intervention to retain native components and processes.

The Thomas Fork Unit is closed to the public and livestock grazing no longer occurs on the unit, which greatly enhances quality within upland habitat types, facilitates regeneration in previously disturbed areas, and minimizes the need for active management and restoration of upland habitats. Some areas of Thomas Fork sagebrush shrub habitat was particularly impacted by past livestock management and were historically dominated by late successional sagebrush. The area is now at risk of being converted to annual cheatgrass or other invasive species and active restoration is required. The benefits of the CCP in increasing plant diversity shrub monocultures include improved habitat, greater species richness and community diversity, improved aesthetics, more soil cover (Stevens 1994), and increased diversity of birds, mammals, reptiles, and insects (Reynolds 1980, Wisdom et al. 2005b).

Crop fields surrounding the northeast hillside of Oxford Slough are subject to rill erosion during summer rain events. When fallow, these erosion impacts can be particularly severe. The effects are loss of quality topsoil and water quality in the Slough as soil is transported down gradient. Active sagebrush restoration along the periphery of these agricultural areas is required to stabilize the site.

GOAL 4: Provide a supplemental on-refuge forage base for carbohydrate and protein requirements of migratory waterfowl and landbirds within the Pacific and Bear River migratory corridor.

Objective 4.1 Upland Forage Crops

Annually maintain a refuge total of <u>154 acres</u> within <u>19</u> farm fields of upland habitats as agriculture across all refuge units, while restoring <u>two agricultural fields totaling 11 acres</u> to native meadow grass habitat by <u>2016</u>, distributed among the following attributes and defined unit acreage ranges (see detail of each unit below).

<u>Benefitting Refuge Species:</u>

- <u>Foraging:</u> Greater sandhill crane; Canada goose; Swainson’s hawk; short-eared owl

<u>Habitat Attributes:</u>

- Supplemental and artificial habitat maintained through agricultural management to provide small

grain and leafy browse forage for wildlife use.
- >65% Small grain such as fall wheat or spring barley on a three year plant/one year fallow rotation
- <15% Summer fallow crop turned under the soil and left idle
- >15% Legumes (annual clover) crop turned under the soil and clover planted.
- <5% Legumes (alfalfa) planted in a 10-year cycle.

Refuge Non-Native Upland Crop Target (All Units):
Decrease from 214 acres to a target of 154

1) Bear Lake NWR:
   - Crops – Decrease from 91 acres to a target of 80 acres

2) Thomas Fork Unit:
   - Crops – Maintain 44 acres

3) Oxford Slough WPA:
   - Crops – Decrease from 79 acres to a target of 30 acres

Sub-Objectives to attain Non-Native Upland Agriculture Objective:

Objective 4.1a: Bear Lake NWR Forage Crops

Annually farm 80 acres in eight Bear Lake NWR farm fields in an approximate ratio of 70% small grain (split between fall wheat and spring barley) and 30% summer fallow/leguminous cover crop, while restoring two agricultural fields (11 acres) to native meadow grass habitat by 2016.

Bear Lake NWR Non-Native Upland Crop Target
- Crops – Decrease from 91 acres to a target of 80 acres

Defined Bear Lake NWR Targets:
- Bloomington Complex – Red Slough North Field (14.7 ac.)
- Bloomington Complex – Red Slough Center Field (14.6 ac.)
- Bloomington Complex – Red Slough South Field (10.8 ac.)
- Bloomington Complex – Alder West Field (7.6 ac.)
- Bloomington Complex – Alder East Field (7 ac.)
- Bunn Lake Complex – Spring Creek South Field (14.2 ac.)
- Bunn Lake Complex – Spring Creek NW Field (7.7 ac.)
- Bunn Lake Complex – Spring Creek NE Field (3.2 ac.)

Strategies Applied to Achieve Objective
Seek and develop partnership opportunities, and associated grant acquisition, to minimize overhead costs of agriculture management and infrastructure.
Use Cooperative Land Management Agreements (CLMA) as an alternative to force account farming, fencing, and weed control.
On five year intervals, coordinate with the Natural Resources Conservation Service (NRCS) Farm Services Agency (FSA) and the USFWS Migratory Birds Program to (1) assess geographic distribution and acreage of small grain operations in Bear Lake and Franklin Counties, Idaho, and (2) determine population trends and grain requirements to sustain greater sandhill crane and western Canada goose populations. Both factors should be critically examined before deciding to convert existing agricultural fields to meadow grass.

Annually evaluate workforce needs as indicated in the Bear Lake NWR Annual Work Plan, to determine the efficacy and/or need to develop or continue CLMAs on refuge farm ground.
Annually track cropping patterns as listed in the Bear Lake NWR Annual Work Plan to determine appropriate planting strategies for the following year. Cropping strategies may be adjusted as necessary; however, final planting should be recorded in the Bear Lake NWR Annual Work Plan.
Restore 10.7 acres of native meadow grass habitat in the following agricultural fields to minimize bird power line strikes by 2022: • North Meadows Complex – Entrance Field West (5.6 ac.). • North Meadows Complex – Entrance Field Center (5.1 ac.)
Increase public viewing opportunities of wildlife by assessing crop planting in part of the North Dingle field when it is no longer hayed.

Objective 4.1b: Thomas Fork Unit Forage Crops

Annually farm 44 acres within four Thomas Fork Unit farm fields through a rotation of 70% small grain (split between fall wheat and spring barley) and 30% summer fallow/leguminous cover crop.

Thomas Fork Unit Non-Native Upland Crop Target
- Crops – Maintain 44 acres (4.4%)

Defined Thomas Fork Unit Targets:
- Thomas Fork – Thomas Fork Unit Center Field (19.9 ac.)
- Thomas Fork – Thomas Fork Unit East Field (12.3 ac.)
- Thomas Fork – Thomas Fork Unit Lower West Field (6.2 ac.)
- Thomas Fork – Thomas Fork Unit Upper West Field (5.8 ac.)

Strategies Applied to Achieve Objective
Annually track cropping patterns as listed in the Bear Lake NWR Annual Work Plan to determine appropriate planting strategies for the following year. Cropping strategies may be adjusted as necessary; however, final planting should be recorded in the Bear Lake NWR Annual Work Plan.
Develop strategy to plant annual clover on fields scheduled for summer fallow to restore soil nitrogen, prevent erosion, and provide leafy browse for western Canada geese.
Gradually phase production to a higher percentage of fall wheat.

Objective 4.1c: Oxford Slough WPA Forage Crops

Annually farm 30 acres within two Oxford Slough WPA farm fields through a rotation of 70% small grain (split between fall wheat and spring barley) and 30% summer fallow/leguminous cover crop.

Oxford Slough WPA Non-Native Upland Crop Target
- Crops – Decrease from 79 acres to a target of 30 acres

Oxford Slough WPA Targets:
- 30 acres in the northwest corner of the unit

Strategies Applied to Achieve Objective
Every one to three years evaluate grain and hay market value compared to the fuel and labor costs and negotiate farming CLMA.
Reduce planted grain fields to 30 acres within the northwest grain fields by 2022.
Develop strategy to plant annual clover on fields scheduled for summer fallow to restore soil nitrogen, prevent erosion, and provide leafy browse for western Canada geese.
Phase production gradually to a higher percentage of fall wheat.
Implement rotational agricultural practices and reduce fall tillage to improve soil retention, reduce fertilizer costs, and reduce erosion.
Update and approve the Refuge Cropland Management Plan by 2019.
Farming cooperators to apply only refuge approved herbicides and provide a written record of chemical name, amount used, date, location, and application rates.
Farming cooperators will provide a written report and record of annual plantings to the Refuge.
Actively control weeds in farmed units through IPM program using such methods as crop rotation, mechanical treatment, biological controls, and low toxicity approved pesticides (see Appendix F).

Rationale: Most waterfowl are opportunistic feeders, and some species such as Canada geese, snow geese, mallard, northern pintails, and teal have learned to capitalize on the abundant foods produced by agriculture (Bellrose 1976). During the last century, migration routes and wintering areas have changed in response to availability of these foods (Fredrickson and Drobney 1979). Some species have developed such strong migratory traditions that many populations are now dependent on agricultural foods for their migration or winter survival (Ringelman 1990). During breeding and molting periods, waterfowl require a balanced diet with high protein content. Agricultural foods, most of which are neither nutritionally balanced nor high in protein, are seldom used during these periods. However, during fall, winter, and early spring, when vegetative foods make up a large part of their diet, agricultural foods are preferred forage except in arctic and subarctic environments (Sugden 1971). Waterfowl management during these periods is often directed at providing small grain and row crops (Baldassare et al. 1983).

At Bear Lake NWR croplands are managed, primarily for the benefit of waterfowl and sandhill cranes, but many other species benefit directly or indirectly (e.g., long-billed curlews, porcupine, sage-grouse, bald eagles). Croplands on the Refuge promote sustained use of these areas by migrating waterfowl by providing an accessible, high-energy food source during late fall and early winter as wetlands freeze up. This reduces waterfowl depredation on adjacent croplands. Currently, a total of 214 acres of planted agriculture are provided on the Refuge. The CCP will retain 154 acres of agriculture, needed to reduce wildlife depredation on adjacent private lands, and restore 11 acres of previously farmed upland habitat to native grasses and forbs.

Bear Lake NWR currently retains eight small agricultural fields on the Bloomington and Bunn Lake Complexes. The juxtaposition of these fields in close proximity to other habitats required to meet the life history requirements of identified key species justifies the continued farming of these eight small agricultural complexes. Restoration of 10.7 acres of former agriculture to native meadow grass in the North Meadows Complex West and Center Entrance Fields would reduce the risk of bird power line collisions and increase limited meadow grass habitat on the Refuge. Considering the minimal coverage by quality upland nesting habitat on Bear Lake NWR, it is necessary to reassess the importance of small grain production when compared to the relative lack of upland meadow grass habitat. Five-year evaluations of the geographic distribution and acreage of small grain production operations will assist the Refuge in determining the need to either restore any additional agriculture habitats to native meadow grass or increase agriculture production on the Refuge.

While agricultural crops are typically not limiting within the regional landscape, agricultural fields where all grain is produced and retained for wildlife use are. Additionally, landscape scale small grain production is beginning to experience a downward trend, which not only reduces grain availability for the referenced key species, but increases pressure on privately owned small grain fields (Mclvor and Conover 2003). Considering recent off-refuge conversions from small grain to alfalfa and meadow hay production, refuge agricultural crops provide a supplement as well as a depredation benefit to those local farmers still growing small grain crops.

The juxtaposition of the four agricultural fields on the Thomas Fork are in close proximity to other habitats required by identified key species, and the high number of fall migratory greater sandhill cranes justifies continuation of the program at its current level. The planting of annual clover on the Thomas Fork fields scheduled for summer fallow would restore soil nitrogen and prevent erosion (Doran et al. 1987). In the absence of irrigation water or fertilizer, spring crops must be planted following snowmelt and are then subject to annual rainfall patterns for grain production. By slowly phasing to fall planted wheat, crops would begin growing in fall, lie dormant through winter, and then take maximum advantage of snowmelt during early spring growth periods. Similar to spring planted crops, fall planted crops produce grain for the next fall migration; however, fall planted crops would provide additional refuge browse during spring/early summer for geese.

At present, migratory needs of key wildlife species compared to the relative paucity of small grain production in the surrounding landscape justifies the continuation of a scaled-back farming program at Oxford Slough WPA. As the only Waterfowl Production Area in Region 1 of the Fish and Wildlife Service, the extent and quality of upland habitat for upland nesting waterfowl is also critical. To that end, the Refuge must balance agriculture forage crop production with suitable upland nesting cover. Previously, the Refuge restored approximately 53% of historic agricultural fields at Oxford Slough by planting native upland grasses to produce nesting cover. When judiciously applied, prescribed fire applications would continue to maintain native meadow grass communities to early successional status (<90% residual cover and <10% forb cover) to ensure restored habitats are in optimal conditions for wildlife nesting. A Cooperative Land Management Agreement (CLMA) has been in effect since WPA acquisition in 1985. In exchange for a portion of refuge crops and haying rights in the west meadows area, the cooperative farmer assumes all farming, fencing, and weed control responsibilities. The amount of grain and hay to be removed is based on the amount of labor and materials provided by the cooperator. Annual evaluations of the grain and hay market in comparison to the fuel and labor costs would ensure the effectiveness of the CLMA.

Fall tillage as an agricultural practice eliminates valuable winter food and cover for wildlife and causes soil nutrient loss. By implementing a refuge conservation tillage system in the CCP, the Refuge will improve soil retention, reduce fertilizer costs, and reduce erosion. Generally, as soil-conserving measures increase, upland wildlife habitat quality also improves (Lines and Perry 1978; Miranowski and Bender 1982). Among the benefits of the rotational practices proposed by the Refuge in CCP are higher soil organic matter and nitrogen, lower fossil energy inputs, yields similar to those of conventional systems, and conservation of soil moisture and water resources, which is especially advantageous under drought conditions (Pimentel et al. 2005).

Objective 4.2 Haying

By 2027, decrease refuge hayed habitat from 3,533 acres to 1,491 acres, to provide no more than a 60:40 hayed to unhayed ratio of short cover within refuge ephemeral meadow and shallow emergent habitats.

Benefitting Refuge Species:
- Short-Cover foraging birds:
  - Meadow Foraging Guild (e.g., greater sandhill crane, long-billed curlew, Canada goose, western meadowlark, American robin, cattle egret
  - Grazing Waterfowl Guild (e.g., American wigeon, American coot, gadwall, Canada geese)
- Short-Cover Nesting birds:
  - Upland Nesting Guild (e.g., long-billed curlew, black-necked stilt, killdeer).

- Dense cover nesting birds:
  - Upland Nesting Waterfowl Guild (i.e., northern pintail, mallard, cinnamon teal, northern shoveler, gadwall)
  - Meadow Nesting Shorebird Guild (i.e., Wilson’s phalarope, willet, common snipe)
  - Secretive Marsh Bird Guild (i.e., American bittern, Virginia rail, sora rail)
  - Shallow Over-water Nesting Marsh Bird Guild (i.e., black tern, marsh wren, red-winged blackbird, yellow-headed blackbird, northern harrier).

Habitat Attributes:
- Un-hayed alkali upland meadows and meadow grass habitats.
- Low density herbaceous grass and forbs mowed 2-4" in height with bare ground, or a light vegetative

litter.

- Taller native or non-native herbaceous cover, at least 10-12" in height, dense enough to effectively conceal a passerine, shorebird, or duck nest from overhead or lateral view.

Refuge Hay Target (All Units):
Decrease by 57.8% from 3,533 acres to a target of 1,492 acres.

1) Bear Lake NWR:
   - Hay – Decrease by 61% from 2,896 acres to a target of 1,127 acres

2) Thomas Fork Unit:
   - Hay – Decrease by 37% from 337 acres to a target of 214 acres

3) Oxford Slough WPA:
   - Hay – Decrease by 50% from 300 acres to a target of 150 acres

Sub-Objectives to attain Haying Objective:

Sub-Objective 4.2a: Bear Lake NWR Haying

4.2a-1: By 2027, hay 1,127 acres of the current 2,896 hayed acres; comprised of 810 acres of rotational hayed habitat and 318 acres annually hayed habitat using CLMAs, negotiated sales, and bid units.

4.2a-2: By 2027 modify refuge habitats hayed from 95% of wet meadow and 25% of shallow emergent habitats, to haying only 60% of wet meadow and 5% of shallow emergent habitats.

4.2a-3: Implement a 1,769 acre haying reduction over 15 years, by:

- Discontinuing haying 554 acres (in the first year of CCP implementation in 2013.
- Discontinuing haying approximately 400-410 acres every five years, in three five-year cycles.

Sub-Objective 4.2b: Thomas Fork Unit Haying

4.2b-1: By 2017, hay 214 acres of the current 337 hayed acres;

4.2b-2: By 2017 modify refuge habitats hayed from 94% of wet meadow habitat, to haying only 60% of wet meadow habitat

4.2b-3: Implement a *123 acre* haying reduction *over five years*

Sub-Objective 4.2c: Oxford Slough WPA Haying

4.2c-1: By 2017, hay 150 acres of the current 300 hayed acres;

4.2c-2: By 2017 modify refuge habitats hayed from 92% of wet meadow habitat, to haying only 50% of wet meadow habitat

4.2c-3: Implement a 150 acre haying reduction over five years, by: • Discontinuing haying 30 acres every year for five years.
Strategies Applied to Achieve All Haying Objectives
Bear Lake NWR
Phase in haying rotations and incremental reductions every five years, over a five-year cycle: 2013-2017; 2018-2022; 2023-2027.
Haying cooperators to apply only refuge-approved herbicides and provide a written record of chemical name, amount used, date, location, and application rates.
Haying cooperators will provide a written report and record of annual hay harvest to the Refuge.
Assess feasibility and benefits of delaying dewatering of hay units until after August 1 and hay removal operation initiation until mid-to-late August.
At Bear Lake NWR, gradually convert negotiated sale units to CLMAs or bid hay units until objective target is attained.
Develop a rotation of hayed areas among those units best suited for haying. Reduce dense stands of grass that have an abundance of accumulated litter by using prescribed fire or mechanical means prior to putting back into haying rotation.
Monitor wildlife use on hayed and unhayed units to inform future management decisions regarding hay program.
Assess local Bear Lake Valley hay values at least every three years, or more often if needed, to ensure CLMAs are being conducted at a fair market value.
Actively control weeds in hayed units through IPM program using such methods as crop rotation, mechanical treatment, biological controls, and low toxicity approved pesticides (see Appendix F).
Thomas Fork Unit
At Thomas Fork, gradually reduce the CLMA hay units until objective target is attained; retain minimum acreage needed to reduce wildlife depredation on adjacent private lands.
Oxford Slough WPA
At Oxford Slough, maintain hayed acres along west edge of unit for wildlife and as fire protection for the adjacent town of Oxford.
At Oxford Slough, rehabilitate fields of monotypic dense nesting cover (DNC) by interseeding native grasses and forbs and/or plowing/disking dense vegetation and abundant litter.
Rationale: Approximately 3,533 acres (90% of wet meadow habitat and 10% of shallow emergent habitat) is currently maintained in early successional status through the Refuge's haying program, comprised of negotiated sale, bid units, and CLMAs. These hayed areas provide short-cover habitat for wildlife such as greater sandhill cranes, long-billed curlew, and Canada geese (Eldred 2009, La Sorte and Boecklen 2005). At Bear Lake NWR, 2,896 acres are currently hayed. Among management complexes, these hay units cover between 1.2% (Mud Lake Complex) and 73% (North Meadows Complex) of the total habitat area. This is the dominant management activity in the ephemeral marsh and upland meadows. Upon refuge establishment, negotiated sale permits were awarded to individuals and entities that had previously hayed the lands of Bear Lake NWR. When the Refuge was established, individual landowners adjacent to the hayed fields and with livestock operations in the Bear Lake Valley were given first priority to secure USFWS permits and continue their haying operations. These permits require that wetland units be dewatered annually during late summer/early fall for hay removal, regardless of habitat condition or necessity from a habitat management standpoint. Because of the hay unit distribution, entire units may need to be dewatered annually by August 1st to facilitate hay removal; often at a time when fledgling waterbirds require these shallowly flooded habitats to reach flight stage. The Refuge has increasingly favored the use of CLMAs and bid units to achieve specific habitat management objectives. With this process, established early successional (i.e., short cover) wet meadow thresholds can be used to determine where and when hay management is appropriate.

Short stature, wet meadow hay ground provides open areas for sandhill crane foraging. Birds selecting short cover include the following guilds: the meadow guild represented by the sandhill crane, western meadowlark, and cattle egret; the grazing waterfowl guild represented by American widgeon, Canada goose, American coot, and gadwall; and the upland-nesting shorebird guild represented by the long-billed curlew, American avocet, black-necked stilt, and killdeer. When juxtaposed with dense cover late successional wet meadow habitat (unhayed) and other palustrine emergent marsh habitat types, short cover can provide seasonally valuable habitat for their use. Birds selecting dense cover for foraging and nesting include the following guilds: upland nesting waterfowl guild represented by northern pintail, mallard, cinnamon teal, northern shoveler, and gadwall; the wet meadow nesting shorebird guild represented by Wilson's phalarope, willet, and common snipe; the secretive marsh bird guild represented by American bittern, Virginia rail, and sora rail; and the shallow over-water nesting marsh bird guild represented by black tern, marsh wren, red-winged blackbird, yellow-headed blackbird, and northern harrier. Other species also benefit from haying; however, other management tools, such as mowing and burning, provide the same habitat characteristics, and additionally, leave nutrients within the unit and in the case of mowing, provide invertebrate substrate. While hayed wet meadow habitat is certainly not in limited supply throughout the Bear Lake Valley, it does provide some habitat benefits for wildlife.

The Refuge recently evaluated the haying program at the Bear Lake NWR and Thomas Fork Unit. Large and medium sized units with native plants of short stature or low growth form that creates a short cover aspect to the unit would be very similar to a mowed field. Small hay units with relatively robust, tall vegetation adjacent to areas already being hayed were deemed to be of more value in an unhayed state to provide tall and/or dense cover. These units, comprised of 554 acres, were not determined to benefit wildlife from haying and are slated for cessation of haying within one year of CCP implementation.

Hay units that could benefit from a reduction in haying or a rotation of the areas hayed were inherently very large or adjacent to extensive hayed fields on private property. In these units, a rotation or reduction of hayed area would provide more diversity in characteristics of vegetation height and cover. The reduction-rotation will be phased in over three five-year cycles (see Tables above). Hay units of medium and small size adjacent to dense and/or tall cover vegetation or units that were hayed in irregular patterns, were determined to provide adequate diversity of height and cover. These units will continue being hayed as they are currently.

Approximately 337 acres or roughly 94% of all wet meadow habitat on the Thomas Fork Unit are currently hayed. Based on the overall hay management goal to maintain a roughly 60:40 split of hayed vs. unhayed wet meadow habitat, the CLMA will be gradually reduced in five years. The Thomas Fork Unit hayed area is east of the Thomas Fork Creek and constitutes a mosaic of large hayed expanses interspersed with areas of tall emergent vegetation that are essentially sloughs and marsh that are too wet to hay. The Thomas Fork Unit is an important migration habitat for sandhill cranes, so providing short cover through the haying program is a reasonable management strategy. As well, the short cover can be valuable to Canada geese and long-billed curlews. The species that select dense nesting cover are currently restricted to the tall emergent unhayed areas. By reducing and rotating hayed areas, thereby creating a higher diversity of habitat on the unit, the overall wildlife value could be increased.

Approximately 300 acres or roughly 92% of all wet meadow habitat on Oxford Slough WPA are currently hayed. A total reduction of 150 acres of hayed habitat by CLMA in future agreement cycles will maintain a roughly 60:40 split of hayed-to-unhayed wet meadow habitat. At Oxford Slough WPA, the 227 acre West Meadows area presently contains the only fresh water, wet meadow habitat on the Refuge. As such, conditions are conducive to establishing seasonally flooded meadow grasses as well as the typical, wet meadow complement of species. At present, a majority of this habitat is hayed annually, leaving little habitat for wildlife use, and more importantly, corridors with suitable cover for wildlife access to and from the WPA. Through an equitable distribution of hayed vs. unhayed area (60:40), the distribution of early and late successional habitat threshold will be met and all wildlife species using the area would benefit. The Refuge will continue to hay along the west border abutting the town of Oxford to maintain a Wildland-Urban Interface (WUI) fire break.

Early successional wet meadow habitats created through hay management provide optimal open foraging areas for several wetland dependent wildlife species such as greater sandhill cranes, Canada geese, and white-faced ibis. However, this short statured habitat provides little vegetative complexity for invertebrate substrate, the principal food resource produced through this management practice. While increased access to invertebrate forage bases is the principal advantage cited for short-cover management practices (Schekkerman and Beintema 2007), an unanticipated effect of short-cover haying operations is that little vegetative complexity for hosting invertebrate substrate remains. Temporally flooded meadow wetlands are so productive because the base of the biotic pyramid is large and diverse and nutrient cycling is dynamic (Mitsch and Gosselink 1993). Because energy flows from the lowest levels of the pyramid in unhayed or mowed habitat, detritus sustains much of the biomass and structure of the community (van der Valk 1989). Excessive litter removal from current haying practices negatively affects the balance between litter removal and accumulation in the shallow habitat wetlands, causing unwanted effects upon primary and secondary wetland productivity. Small litter accumulations may not provide adequate substrate for invertebrates; however, large accumulations may alter surface hydrology through peat formation or nutrient binding (Magee 1993). Where litter accumulation is too scant (under current management) or heavy (Alternative 2 of the Draft CCP/EA, which was not selected for implementation), invertebrate production may be impeded because of unfavorable conditions associated with hydrology, substrate, and nutrient availability (Magee 1993). By moderately reducing haying from current levels the Refuge will provide a more diverse litter layer in wet meadows and various stages of litter size and decay. In comparison to current management, the management direction optimizes management of invertebrates for a more diverse array of foraging waterbirds and wildlife. A 60:40 mix between hayed:unhayed habitat provides an ideal mix to promote production and availability of food reserves when combined with optimal water level management (i.e., flooding during spring to enhance invertebrate use and drawdown during summer to concentrate invertebrates).

A confounding indirect effect in current hay operations requires the Refuge to dewater wetland units annually during late summer to facilitate hay removal. This type of annual drawdown must currently happen out of necessity, regardless of wetland habitat condition or objectives, in order to accommodate hay operators and permit hay removal. Because of the hay unit distribution wetland units are dewatered annually by August 1st to facilitate hay removal and provide short-stature grasses; often at a time when fledgling waterbirds require these shallowly flooded habitats to reach flight stage. The CCP will moderately reduce meadow and upland haying operations to maintain inundation of wetland shallow marsh and wet meadow habitat through the summer. By decreasing haying operations and regaining as much as possible of the former hydrograph, refuge management will increase temporary and seasonally flooded habitats through properly timed inundation to provide an adequate hydrologic regime for wet meadows and the invertebrate insects migratory waterbirds are dependent upon.

Goal 5: Increase public understanding and appreciation of wildlife, and build support for Bear Lake NWR and the Oxford Slough WPA by providing opportunities for visitors to participate in safe, quality wildlife-dependent recreation and education programs, while minimizing wildlife disturbance.

Objective 5.1 Conduct Outreach

Conduct outreach to community, conservation, and outdoor recreation groups by 2014 to expand public awareness of wetland and upland species diversity and ecology, habitat management of Bear Lake NWR and the Oxford Slough WPA, and the mission of the National Wildlife Refuge System.

Strategies Applied to Achieve Objective

Staff a full time volunteer coordinator position in the Southeast Idaho NWR Complex Office to oversee recruitment and training of volunteers and develop education programs on all four refuges within the Southeast Idaho Complex, and the Oxford Slough WPA.

Staff an additional Refuge Law Enforcement Officer position in the Southeast Idaho NWR Complex Office to assist in law enforcement on all four refuges within the Southeast Idaho Complex, and Oxford Slough WPA.

Develop Outreach and Communications Plan for the Refuge, including key messages and audiences, and communication strategies.

Providing *at least three* annual guided wildlife-based refuge tours to youth groups and the public by 2017, that deliver key messages described in Objective 5.1.

Participate in *at least one* community event annually (e.g., 4th of July Parade, Bear Lake County Fair, or Raspberry Days).

Hire a full time volunteer coordinator position in the Southeast Idaho NWR Complex Office and refuge position dedicated to public outreach, and developing and delivering on-site interpretive and environmental education programs.

Rationale: Outreach is crucial to distinguish the Service’s National Wildlife Refuge System, the only national system of lands and waters managed to benefit wildlife and prioritize wildlife-dependent public uses, from other public lands. When the public knows and understands the role of the Service, the Refuge System, Bear Lake NWR and the Oxford Slough WPA, it results in several benefits. By increasing public understanding and appreciation of the Refuge’s wildlife and habitat resources, the Refuge expects increased public support for protecting and enhancing refuge lands, thereby achieving the overall goal of protection and stewardship of wildlife. A greater understanding of refuge regulations and policies, and the reasons behind them, reduces violations necessitating Law Enforcement. Outreach programs must be carefully designed in order to be successful. Design of outreach programs begins with identification of key messages and target audiences, and culminates in the development and delivery of specific tools or programs.

Bear Lake NWR has a very small staff with only three permanent employees, and limited on-site presence. The Thomas Fork Unit and Oxford Slough WPA are unstaffed and there is little public awareness of the benefits these units provide. Small staff size not only limits refuge interaction with the public, but also limits opportunities to conduct outreach. Currently the refuge relies primarily on its Web site and brochures as outreach tools. However, there are opportunities to improve outreach about the Refuge and WPA, through both print and electronic media and direct interaction with the public. Hiring a full-time Volunteer Coordinator for the SE Idaho Refuge Complex will allow the Refuge to leverage partnership and volunteer opportunities in order to develop new programs (e.g., interpretation, environmental education, and guided tours). Hiring one position dedicated to visitor services will allow the Refuge to conduct outreach, and improve visitor services programs on Bear Lake NWR and the Oxford Slough WPA.

Objective 5.2 Welcome and Orient Visitors

Within the lifetime of the CCP, improve existing operational capacity of refuge public-visitor contact and orientation to better serve the visiting public, including people with disabilities, by enhancing the visiting public's safety, sanitation, comfort, orientation, and ease of access to the Bear Lake Refuge and Oxford Slough WPA.

Strategies Applied to Achieve Objective

Within five years of CCP completion, develop a Visitor Contact Point and Site Plan to determine the best site location for the refuge office, contact points, and possible Visitor Contact Station and other considerations (e.g., access, parking, utilities, ownership, disturbance, cultural resources, public safety concerns).
Place directional signs to the Refuge at the junction of Highways 30 and 89 in Montpelier and at the junction of W. Center Road and Dingle Road in Dingle.
Provide visitor information at refuge entrance and headquarters.
Revise the Refuge's general brochure with improved text, maps, and photographs.
Revise the Refuge's Web site with improved photos, navigation aids, and maps. Provide interactive Web capability for visitors to electronically post wildlife observations/photos. Post PDF files of all publications on refuge Web site.
Continue to obtain base-line data on visitation; conduct counts/observations to back up/calibrate traffic counter data.
Provide visitor sign-in/comment stations at trail heads and photography/hunting blinds. Develop means for visitors to "sign in" and record wildlife observations electronically (directly to Web site or social media).
Thomas Fork Unit: Develop off-refuge visitor orientation facilities, signage, and interpretive panels at areas strategic for wildlife viewing on seasons and species of wildlife that could be seen (see Objective 5.4 below).
Thomas Fork Unit: Develop and provide to the public an informational brochure specific to the Thomas Fork Unit.
Oxford Slough WPA
Improve visitor orientation facilities, signage, and interpretation.
Develop and provide to the public an informational brochure specific to Oxford Slough WPA.

Rationale: Bear Lake NWR has a very small staff with only three permanent employees, and limited on-site presence (the office is located 8.5 miles north of the Refuge in Montpelier, and few visitors stop by the office. A maintenance building is located on-site.) The Thomas Fork Unit is unstaffed and closed to the public. The Oxford Slough WPA is also unstaffed, and is managed through the Southeast Idaho NWR Complex. Small staff size not only limits refuge interaction with the public, but also limits opportunities to conduct outreach and develop and deliver visitor services programs. It is envisioned that the Refuge will continue to rely on "self-serve" facilities in order to limit any additional work load, and improve/enhance these facilities to make them as user-friendly as possible. However, there are opportunities to improve outreach about Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA, through both print and electronic media. As noted in Objective 5.1, hiring refuge complex and/or refuge positions dedicated to volunteer and visitor services management will allow the Refuge to conduct outreach, improve visitor services programs and leverage partnership and volunteer opportunities in order to develop new programs (e.g., interpretation, environmental education, and guided tours).

Most visitors do not stop by the refuge office, which is located 8.5 miles to the north in Montpelier. It is desirable to have an office/visitor contact station on or near the Refuge, which will increase opportunities to conduct outreach with visitors and increase staff presence on the Refuge. Potential sites include the Dingle Bottoms Road, the current refuge maintenance building, the southern portion of Merkley Lake Road that passes through the eastern portion of the Refuge (Bear Lake County hopes to secure funds to pave this road), the southwest area of the Refuge along North Beach Road and Power Line Road, and off-refuge in the city of Paris near the junction of Highway 89 and East 2nd North Street. In the CCP, these sites will be evaluated in the step-down Visitor Contact Point and Site Plan within five years of CCP completion.

Objective 5.3 Wildlife Observation and Photography

5.3.a. Increase opportunities at Bear Lake NWR for guided and self-guided wildlife observation and photography by annually maintaining a 2.4 mile year-long accessible auto tour loop, 1.9 mile seasonally accessible pedestrian trail with two accessible photography blinds, a 2-mile year-long accessible boardwalk, a 1.5 mile seasonal Canoe Trail, and two vehicle pullouts/observation areas.

5.3.b. Provide wildlife viewing and photography opportunities at Oxford Slough WPA.

Strategies Applied to Achieve Objective
Bear Lake NWR
Maintain the 2.4-mile long Auto Tour Route in its current configuration.
Auto Tour Route open year-round to auto, foot, dog walking, and bicycle traffic, as weather and road conditions permit, including on hunt days.
Allow winter use of the Auto Tour Route (when road closed to vehicle traffic due to weather/road conditions) by snowshoers, cross-country skiers, and walkers.
Provide up to two additional pullouts/wide spots/passing areas for vehicle passage on the Auto Tour Route.
Provide seasonal spotting scope along Auto Tour Route turnout.
Maintain the 1.9-mile accessible pedestrian trail, with two accessible wildlife observation/photography blinds, in its current configuration.
Accessible 1.9-mile pedestrian trail open March 15-Sept 20.
Provide a seasonal spotting scope on the accessible pedestrian trail with a view of the cormorant and gull breeding islands.
Pedestrian access (including cross-country skiing and snowshoeing, as conditions permit) allowed on service roads and dikes only within the 7,450-acre seasonally open area (hunt area), July 1-Feb 28.
Nonmotorized boats allowed on the 1.5-mile Canoe Trail, July 1-Sept 20. Motorized and nonmotorized boats are allowed in the 7,450-acre seasonally open area (hunt area) for waterfowl hunting access only, Sept 20-Jan 15.
Bicycling allowed on roads open to vehicle traffic year-round, including the Auto Tour Route.
Dog walking will be allowed on the 2.4-mile Auto Tour Route and 1.9-mile seasonal pedestrian trail (open March 15-Sept. 20) of Bear Lake NWR. Dog walking will also be allowed on 2-mile North Beach Road boardwalk. Dogs must be leashed at all times and remain on roads and trails.
Develop a boardwalk and an elevated wildlife viewing platform along the southeastern side of the Refuge adjacent to North Beach Road.

Develop one turn-out and one major vehicle turn-off with a small parking area, interpretive/informational panels and seasonal spotting scope, on refuge property along the southern portion of Merkley Lake Road.

Conduct *at least one guided wildlife-based refuge tour per month* from May-September. Tours will be advertised on the refuge Web site, Complex Friends Group website and newsletter, and Audubon and local tourism bureau websites. Guided tours will be limited to 15 visitors and slots will be filled on a first-come, first-serve basis.

Develop and manage a website that provides a “virtual tour” of the Refuge with images of wildlife in their natural settings throughout the seasons.

Periodically monitor and evaluate public-use sites and programs to determine if objectives are being met and the refuge resources are not being degraded.

Monitor disturbance to waterfowl and waterbirds by public use on the Auto Tour Route, walking trails, and Canoe Trail.

Restrict use to daylight hours and do not allow camping, overnight use, or fires.

Oxford Slough WPA

Allow free-roam access by foot (including cross-country skiing and snowshoeing) and nonmotorized boats August 1-March 31. Between April 1 and July 31, visitors must remain on the access road, parking area, or designated viewing area(s).

Provide one or more viewing areas with information on seasons and species of wildlife that could be observed and photographed (see Objective 5.4).

Restrict use to daylight hours and do not allow camping, overnight use, or fires.

Rationale: In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide wildlife observation and photography opportunities wherever they are compatible with refuge purposes.

Bear Lake NWR currently has a very small staff with only three permanent employees. Therefore, it is important that facilities developed to facilitate all public uses, including wildlife observation, hunting, and fishing, are mostly “self-serve” in order to limit any additional work load. Currently facilities for self-guided wildlife observation and photography include a 2.4-mile auto tour route, a 1.9-mile accessible walking trail. According to the CCP, we will enhance the auto tour route with additional turnouts, enhance the walking trail with a spotting scope and photography blind, and add two vehicle turnouts/observation platforms along the Merkley Lake Road on the southeast side of the Refuge. We also propose to develop an approximately 2-mile boardwalk trail along North Beach Road. Initially the work load will increase to develop facilities proposed in the CCP, but once established we anticipate only minimal periodic maintenance will be required.

From 1999 to 2004, annual recreation visits averaged 4,280 annually. Later estimates include off-refuge visitor using North Beach Road and Merkley Lake Road, which run adjacent to or thorough the Refuge. In 2010, total visitation was estimated to be 12,360 but this included 4,000 off-refuge visitors using North Beach Road and 1,000 visitors using Merkley Lake Road. Therefore, visitors using refuge facilities will be 7,360, still a substantial increase in recent years. The Auto Tour Route was the most popular activity; 20% of visits were for photography; less than 10% of visitors used pedestrian facilities. Most visitation occurs in the spring and summer months. When cold weather arrives in the fall, visitor use drops significantly.
Most visitors to the Refuge at this time are waterfowl hunters. Currently, wildlife disturbance should be minimal due to the low visitor numbers and the fact that most visitors stay on the Auto Tour Route, but it could be anticipated to increase with the projected uptick in summer tourists and second home construction in the Bear Lake Valley. We propose to monitor visitor use and wildlife disturbance and make adjustments to the program if disturbance issues are documented.

The Auto Tour Route (ATR) is currently open to vehicle traffic (vehicles licensed for highway use only), bicycling, walking, dog walking (under control of owner), cross-country skiing, and snow shoeing. The ATR is open to vehicles year-round (dependent upon presence of snow/ice). Based upon data gathered from a vehicle traffic counter installed on the ATR the summer of 2010, from 44 to 130 vehicles used the ATR per month with the peak occurring in September. Few visitors are seen to walk the ATR, and generally no one walks their dogs on the ATR. Dogs on the Refuge are generally concurrent with their use as retrievers during waterfowl hunting season. Perhaps as many as five visitors per year ride bicycles on the Refuge. Given these low numbers, conflicts between vehicles, people walking (with or without dogs), bicyclists, or any other visitor uses on the Auto Tour Route are negligible to nonexistent.

In addition to roads and trails, pedestrian access (including cross-country skiing and snowshoeing as conditions permit) and both motorized and nonmotorized boating are allowed within the 7,450-acre seasonally open area (hunt area). The original intent of allowing foot and boat access to this area was to facilitate waterfowl hunting. At this time, most if not all, visitors that use this area are waterfowl hunters. Because all but about 300 acres of this area is wetland or open water, chest waders are needed to access the area on foot. However there are concerns about safety, wildlife disturbance, and user group conflicts associated with allowing the concurrent use of the area by both hunters and non-hunters. Therefore, in the CCP we propose to allow pedestrian access (including cross-country skiing and snowshoeing, as conditions permit) on service roads and dikes within this area, from July 1-February 28.

While self-serve programs can work well, opportunities to observe and learn about wildlife are greatly enhanced though guided programs. Although more staff-intensive, these programs increase visitor success in seeing wildlife, provide greater opportunities to convey key messages (e.g., wildlife and habitat conservation, viewing techniques/ethics), and have the potential for high return for effort (e.g., volunteer recruitment.) At Bear River Migratory Bird Refuge, their guided tour program is their most popular program, and slots are always filled to capacity. Guided tours provide opportunities to serve a targeted audience while minimizing undesirable impacts to wildlife. At Bear Lake there are approximately five months when weather is good enough, demand high enough, and birds are reliably present, to warrant regular guided tours. However additional staffing and volunteers will be required to develop this program, as well as interpretive and educational programs (see Objectives 5.1, 5.4).

Oxford Slough WPA is currently open year-round to hiking and nonmotorized boating. This has the potential to cause disturbance to nesting colonies of Franklin's gulls and white-faced ibis. Franklin's gulls are particularly sensitive to human disturbance early in the breeding cycle and again during the chick phase, and would abandon with excessive human exposure (Guay 1968). Abandonment of nests is less likely with young than eggs but may still occur with repeated disturbance (Burger and Gochfeld 1994). White-faced ibis are also susceptible to colony abandonment resulting from human intrusion into colonies during the early nesting period (Ryder and Manry 1994). Oxford Slough WPA is considered a globally important bird area due to the presence of large colonies of these species. Although visitation is low (estimated at 150 annually), the WPA is currently unstaffed, making it impossible to monitor disturbance to nesting colonies or adequately enforce regulations such as setback areas from colonies. Consequently, we propose closing the WPA to access by foot or boat during the nesting and rearing season for these species, April 1-July 31. Access by foot (including cross-country skiing and snowshoeing) and nonmotorized boat will be allowed from August 1-March 31.

Objective 5.4 Environmental Education and Interpretation

By <u>2020, develop formal environmental education programs</u> for <u>K-12</u> students, which serves <u>300 students</u> annually and delivers messages about wetland values and functions and watershed health, with emphasis on Bear River watershed and the life histories and habitat needs of waterfowl and waterbirds.

Strategies Applied to Achieve Objective

Bear Lake NWR
Hire permanent staff to develop refuge-specific curricula for environmental education and interpretation programs that meet State standards, deliver teacher training, and oversee EE
Conduct teacher training workshops based on programs at Bear River Migratory Bird Refuge. In the interim, encourage local teachers to attend workshops at Bear River Refuge.
Host at least one Field Day event at Bear Lake NWR for 4th and 5th grade students annually.
Use interns from university education programs (ISU, USU) to design and conduct EE programs (e.g., field trips and/or teacher training workshops).
Provide opportunities for Scouts to earn Canoeing badges on the 1.5-mile Canoe Trail.
Develop additional on-refuge opportunities for Scouting programs (Birding Badge, Conservation Badge, and "leave no trace").
Working with partners, develop citizen science programs that involve students from multiple grade levels in monitoring activities, e.g., water quality monitoring, macrobiotic surveys.
Provide interpretive signs along the Auto Tour Route in order to orient visitors to the larger landscape and the NWRS mission.

Thomas Fork Unit: work with Idaho State and Bear Lake County to develop displays along overlooks on Highways 89 and 30 to interpret the Thomas Fork Unit's role in the NWRS, its importance in the Bear River Watershed, and as part of the Oregon-California Trail.
Oxford Slough WPA
Provide volunteer-led educational opportunities for youth groups (schools and scouts) and the general public. The focus at Oxford Slough WPA will be on waterfowl and colonial nesting birds, and the importance of reliable water supplies to successful waterfowl production.
Develop one or more viewing areas at strategic areas that will allow visitors to enjoy wildlife from a distance, with interpretive panels describing seasons and species of wildlife that could be observed and photographed (see Objective 5.4).
Rationale: Environmental education and interpretation play a key role in encouraging current and future generations to engage in environmentally responsible behavior like supporting the protection of habitat for wildlife through the National Wildlife Refuge System. Currently, with no visitor services staff for the Refuge or the refuge complex, there is no active EE program on the Refuge. The refuge manager accommodates requests from school and Scout groups on an as-needed basis. Generally, the Refuge has historically served K-8th grade students. A half-time SCEP ORP conducted EE programs and teacher training from 2002-2005. This included hosting 200 4th and 5th grade students (three buses at approximately 75 each) for a Field Day event. Between 2002 and 2005, the "Project Wild" curriculum was used. Funding for the position was lost and as a result formal EE activities were discontinued. With limited staff and time available, the most feasible way for the Refuge to offer high-quality EE and interpretive programs is to hire a full-time Visitor Services Manager who would also recruit and oversee volunteer staff to implement the program. The former SCEP ORP suggested that the "Flying Wild" curriculum be used in the future. Strategically placed interpretive media including information panels, brochures, and posters and the refuge Web site are currently used by the Refuge, and will continue to be developed and used to educate the public about wildlife and habitat while reducing wildlife disturbance.

Objective 5.4 Provide Quality Waterfowl and Upland Game Hunting Opportunities

Objective 5.4a Provide a quality and safe waterfowl hunting program (ducks, geese, coots, and snipe) on <u>7,450 acres</u> (40% of the Refuge including the Salt Meadow, Rainbow Sub-impoundment, Rainbow, and Mud Lake Units) of Bear Lake NWR Refuge that includes youth and disabled hunters, and minimizes conflicts between hunters, adjacent landowners, and other user groups. **Objective 5.4b Provide a quality, safe hunt for upland game (gray partridge, sharp-tailed and ruffed grouse, sage-grouse, ring-necked pheasant, and cottontails) on <u>300 acres</u> of Bear Lake NWR.**
Strategies Applied to Achieve Objective
Retain hunting closures on the Thomas Fork Unit.
Allow hunting of waterfowl (ducks, geese, mergansers, and coots), common snipe, and upland game (gray partridge, sage-grouse, sharp-tailed grouse, ruffed grouse, pheasants, and cottontail rabbits) on designated areas of the Refuge in accordance with State seasons and regulations.
Hunters may possess only approved nontoxic shot while in the field.
Allow hunting of waterfowl and upland game on 7,450 acres of the Refuge on the following units: Salt Meadow, Rainbow sub-impoundment, Rainbow, Mud Lake north of the buoy line and east of the County Road, and Merkley Lake.
Nonmotorized and motorized boats to aid waterfowl hunting are permitted on the designated waterfowl hunting area (Salt Meadow, Rainbow sub-impoundment, Rainbow, Merkley Lake units, and the Mud Lake Unit north of the buoy line) from September 20-January 15.

Motorized and Nonmotorized boats and boaters must be in compliance with all applicable refuge, U.S. Coast Guard, and Idaho State laws.
Air thrust boats are prohibited.
Post a speed limit for boats of 15 mph in the waterfowl hunting area.
Provide five boat ramps for use by waterfowl hunters: Paris, Rainbow West (two ramps), Rainbow East, and from Merkley Lake Road.
Provide two ABA-accessible hunting blinds and associated trails at Bear Lake NWR. Give first priority of ABA-accessible blinds to disabled hunters.
Provide a Youth Hunt at Bear Lake Refuge one weekend prior to the opening of the regular waterfowl hunt season.
Retain the youth hunt weekend prior to opening of the regular waterfowl hunt season and develop additional programs to attract and educate youth hunters.
Create a tear sheet with map for hunters and post printable PDF file of refuge Web site.
Sign hunter access points, parking areas, and boat ramps. Hunt areas and no hunting zones will be posted at least two weeks before the hunting season begins.
Obtain a secure easement for hunters to access the Rainbow Unit.
Obtain a secure easement for hunters to access the Merkley Lake Unit.
Only portable blinds or temporary blinds constructed of natural vegetation can be used in the waterfowl hunting area. Blinds will be available for general use on a first-come, first-served basis. Portable blinds must be removed from the Refuge at the end of each day.
All personal property, including decoys and boats, must be removed from the Refuge at the end of each day.
Hunters must obey all State, Federal, and refuge-specific hunting regulations.
Hunting dogs do not have to be leashed but must be under hunter control at all times.
No camping, overnight use, or fires.
Conduct law enforcement, maintain hunting facilities, and monitor wildlife disturbance or impacts.
Rationale: The term “quality” refers to a reasonable opportunity to shoot waterfowl or other game on a hunt visit. In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide hunting and fishing opportunities where compatible with refuge purposes. Hunting, trapping and fishing are considered by many to be legitimate, traditional recreational uses of renewable natural resources. The National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd et seq.) provides authority for the Service to manage the Refuge and its wildlife populations and permits hunting on a National Wildlife Refuge when it is compatible with the purposes for which the Refuge was established and acquired. National Wildlife Refuges exist primarily to safeguard wildlife populations through habitat preservation. The word “refuge” includes the idea of providing a haven of safety for wildlife, and as such, hunting might seem an inconsistent use of the National Wildlife Refuge System (Refuge System), therefore refuges are considered “closed until open” to recreational hunting. However, the Service habitat that normally supports healthy wildlife populations produces harvestable surpluses that are a renewable resource. Hunting and fishing, as practiced on Bear Lake NWR since its inception, does not pose a threat to the wildlife populations. The decision to permit hunting and fishing on national wildlife refuges is made on a case-by-case basis that considers biological soundness, economic feasibility, effects on other refuge programs, and public demand. The results of those decisions can be found in Appendix B (Compatibility Determinations). Hunting is currently allowed on Bear Lake NWR in accordance with State seasons and regulations. There are currently 7,450 acres of Bear Lake Refuge open to waterfowl (duck, goose, coot, and snipe) hunting. The Thomas Fork Unit is closed to

hunting. The Refuge has two ABA-accessible hunt blinds and is the only facility in the local area that provides waterfowl hunting opportunities to disabled hunters. Hunt blinds are allocated on a first-come, first serve basis, with disabled hunters taking priority. No reservations, refuge permits, or fees are required. There is currently little hunting pressure on the Refuge. Waterfowl hunt visits are estimated at 185 annually.

Hunters may access the hunt area on foot from parking areas, or by boat (motorized or nonmotorized, with the exception of air thrust boats). Five boat launches are available at Bear Lake NWR. Hunters can access the Refuge one of three ways:
a) via the main entrance road, which leads to three boat launches;
b) the Merkley Lake Road on the east side of the Refuge provides access to an unimproved launching area, and
c) from a gated private road that runs north-south along the Rainbow Canal. This unimproved “road” is a two-track through pasturelands. Hunters must get permission from the landowner to use the road. This road leads to a mowed parking area and primitive boat launch within the refuge boundary. Both the road and parking area can become wet and muddy.

The south boundary of the hunting area within Mud Lake is delineated by a row of orange buoys. Disturbance to wildlife caused by motorized boats used during the hunting season can be a concern. The refuge waters are shallow overall, so hunters use relatively smaller boats and engines. Hunters generally come in small groups of two to four people. The size of a boat motor is in proportion to the size of the boat and the number of hunters it is carrying. Although putting a limit on the size of motors would be easier to enforce (and get compliance on) than posting speed limits or no wake zones, this might not be practicable due to the variation in size of boat and number of passengers. Hunters are wary of disturbing waterfowl as they navigate to their preferred sites to prepare for hunting, so they are generally motoring quietly and slowly. Posting a speed limit of 15 mph may be harder to enforce, but will serve as a reminder to hunters to proceed safely. This will be an effective means of limiting noise, wildlife disturbance, and disturbance to other hunters caused by larger boats and motors.

Hunting for upland game birds (gray partridge, sharp-tailed grouse, sage-grouse, ruffed grouse, and ring-necked pheasant) and cottontail rabbits is allowed on 7,450 acres of the Refuge in accordance with State seasons and regulations. However numbers of these upland game species are low on the Refuge and their distribution is limited to 300 acres of upland habitat along the Merkley Lake Road. Therefore opportunities to hunt upland game on the Refuge are limited. Although hunting of sage-grouse will continue to be allowed in accordance with State regulations, in recent years more restrictive regulations have been put in place due to declining sage-grouse populations. In 2011, the State-designated Area 1 (which includes Bear Lake NWR) was closed to sage-grouse hunting. The Thomas Fork Unit is closed to hunting.

5.4c Provide quality, safe waterfowl, upland game, and big game hunting, and trapping programs on 1,840 acres (100%) of the Oxford Slough WPA that includes youth and disabled hunters; and minimizes conflicts between hunters, adjacent landowners, and other user groups.

Strategies Applied to Achieve Objective

Hunting of waterfowl and other migratory game birds, upland game, furbearers, and big game is allowed in accordance with Idaho State seasons and regulations.

Recreational trapping of furbearers is allowed in accordance with State seasons and regulations.

Hunters may possess only approved nontoxic shot while on the WPA, with the exception that lead shot and slugs may be used to hunt turkey and deer.

Nonmotorized boating to aid waterfowl hunting is permitted. No motorized boats are permitted on the WPA.

Temporary blinds of natural vegetation may be constructed, but such blinds are available for general use on a first-come, first served basis. Construction of permanent blinds is prohibited.

Develop and provide an information panel and brochure or tear sheet describing hunting and trapping opportunities and regulations.

In conjunction with Bear Lake NWR efforts, develop and administer a youth waterfowl hunt program.

Develop an ABA-accessible hunter access trail and parking area.

Hunters must obey all State, Federal, and refuge-specific hunting and trapping regulations.

Hunting dogs do not have to be leashed but must be under hunter control at all times.
No camping, overnight use, or fires.
Post Hunting and No-Hunting signs at least two weeks before hunting season begins.
Conduct law enforcement, maintain hunting facilities, and monitor wildlife disturbance or impacts.
Southeast Idaho Complex staff will monitor colonies of white-faced ibis and Franklin's gulls. If disturbance caused by trapping is documented, seasonal restrictions would be instituted.

Rationale: The term "quality" refers to a reasonable opportunity to shoot waterfowl or other game on a hunt visit.

The Oxford Slough WPA is administered by the Southeast Idaho NWRC in Pocatello, ID, to preserve small natural wetlands and their associated uplands. Waterfowl Production Areas (WPAs) are public lands purchased by the Federal government for the purpose of increasing the production of migratory birds, especially waterfowl. WPAs are wetlands or grasslands critical to waterfowl and other wildlife, acquired pursuant to the Migratory Bird Hunting and Conservation Stamp Act or other statutory authority. Federal Duck Stamp revenues are the primary funding source for the purchase of these lands. Every dollar spent for the purchase of a Federal Duck Stamp goes directly toward the acquisition of waterfowl habitat. Waterfowl production areas are administered by National Wildlife Refuges (NWR) or Wetland Management Districts (WMD). Unlike National Wildlife Refuges, Waterfowl Production Areas are subject to all of the provisions of the Migratory Bird Conservation Act except the inviolate sanctuary provisions (16 U.S.C. 718(c)). By regulation, all Waterfowl Production Areas are open to public hunting, provided that all forms of hunting or entry on all or any part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations. All of the Oxford Slough WPA (1,878 acres) is open to hunting on a first-come, first serve basis (see Appendix B, Compatibility Determinations). No blinds are provided. Facilities are limited to a small parking lot which is accessed via a County road (Oxford Road) that leads to a gravel refuge entrance road. No reservations, refuge permits, or fees are required. Currently the WPA receives low hunting use, mostly from local residents.

Hunting for waterfowl and upland game (ruffed grouse, gray partridge, sage-grouse, sharp-tailed grouse, ring-necked pheasants, mourning doves, Eurasian collared-doves, sandhill cranes, turkeys, American crow, cottontail rabbits, and snowshoe hares) and hunting for big game (deer, elk, moose, pronghorn, black bear, and mountain lion) is currently allowed on Oxford Slough WPA in accordance with State seasons and regulations, except that by Federal regulation, hunters may possess only approved nontoxic shot; with the exception that lead shot and slugs may be used to hunt turkey and deer (50 CFR 32.2 (k), amended May 12, 2000). Although hunting of sage-grouse is permitted in accordance with State regulations, in recent years the State has enacted more restrictive seasons and limits due to declining sage-grouse populations. In 2011, Area 1 (which includes the Oxford Slough WPA) was closed to sage-grouse hunting.

Trapping of resident furbearers (northern river otter, American beaver, muskrat, mink, American badger, red fox, and bobcat) by the public is allowed on the WPA in accordance with State and Federal regulations. The entire WPA is open to trapping (see Appendix B, Compatibility Determinations). By regulation (50 CFR 31.16), lands acquired as WPAs are open to public trapping unless closed under the authority of 50 CFR 25.21. Animals classified by Idaho as "predators" or "unprotected" can be taken (via hunting or trapping) year-round. Coyotes, raccoons, jackrabbits, skunks, weasels, Columbian ground squirrels, starlings, feral pigeons, and others, are included in this category. While most trapping occurs after the breeding and rearing seasons for waterfowl and waterbirds, trapping seasons for certain species (American beaver, muskrat, and mink, October 22-April 15, and American badger and red fox, July 1-June 30) overlap with the breeding season for waterfowl and colonial nesting waterbirds (Franklin's gull and white-faced ibis.) At current levels, the impact of trapping activity on waterfowl is low because waterfowl disperse during the nesting and brood rearing periods. Trapping does however, have the potential to impact colonial nesting birds, which are extremely sensitive to disturbance. To date no disturbance of nesting colonies due to trapping activity has been documented on the WPA. Colonies will be monitored and if disturbance is documented, seasonal restrictions on trapping will be instituted.

Objective 5.5 Provide Quality Fishing Opportunities

Provide a quality, safe fishing program for trout, yellow perch, suckers, chub, and carp and bowfishing opportunities for carp on Bear Lake NWR

Strategies Applied to Achieve Objective

Sport fishing is allowed on designated areas of Bear Lake NWR in accordance with State regulations subject to the following conditions:

1. Boats are prohibited in the fishing area.
2. Use and possession of lead weights or sinkers is prohibited.

Allow bank fishing in the Outlet Canal north of the former Paris Dike. Close the area immediately north of the Lifton Pump Station to fishing.

Improve access to bank fishing (including bow fishing) by constructing one or two piers or platforms in those areas already open for fishing.

Open banks along Merkley Lake Road for fishing, in conformance with State fishing regulations.

Rationale: The term "quality" refers to a reasonable opportunity to catch fish.

In accordance with the National Wildlife Refuge System Administration Act of 1996, as amended, refuges are encouraged to provide fishing opportunities where compatible with refuge purposes. Only two small areas of the Refuge are currently open to fishing. Because so many quality opportunities to fish are available in the surrounding area (Bear Lake proper is considered a blue ribbon fishery), use of the Refuge for fishing is low. However, we still want to provide a safe and enjoyable opportunity to fish on Service lands for those desiring the activity. Visitors currently fish from riprap; we propose adding fishing platforms to improve visitor safety and comfort. The area along Merkley Road is closed to fishing; we propose to open this area to bank fishing since pockets of water stay open late in the season, probably due to hot springs. Improved water quality would not result in increased fishing opportunities over time.

In some areas bow fishing for carp is a popular activity, and the potential to develop a bow fishery for carp exists on the Refuge. Bow fishing is unlikely to significantly reduce the carp population, and would therefore have limited value in habitat restoration. However, it does create an opportunity for the Refuge to provide youth with wildlife-dependent recreation and to educate visitors about water quality and invasive species issues. Bowfishing classes could be aimed at a youth audience (e.g., Scout groups) and paired with education about habitat and water quality, and the impacts of invasive species.

Objective 5.6 Volunteers and Partnerships

Develop partnerships, a strong volunteer base, and a Friends Group to assist with developing and delivering visitor services programs at Bear Lake NWR and the Oxford Slough WPA.

Strategies Applied to Achieve Objective

Create new position for the SE Idaho Refuge Complex to oversee environmental education and volunteer programs. The Complex staff position will be responsible for recruiting volunteers, covering logistics, and overall training. Refuge staff will then be responsible for on the job training and day to day supervision.

Develop and build Friends Group to support the SE Idaho Refuge Complex.

Develop partnerships with regional universities to develop and deliver EE programs and teacher training, and conduct surveys and monitoring to support refuge biological goals and objectives (also see Environmental Education, Objective 5.4).

Rationale: The Refuge has had a small cadre of volunteers who have helped with Christmas Bird Counts and mid-winter eagle surveys. Youth Conservation Corps crews in 2009 and 2010 performed a variety of important services such as facilities maintenance, fence construction, and weed control. However, the Refuge's small staff limits its ability to recruit, train, and manage volunteers. A Visitor Services Manager position at the SE Idaho Refuge Complex will allow the Refuge to grow its volunteer program to perform a variety of tasks in important areas, including building and maintaining visitor facilities, conducting visitor services programs, and habitat restoration and management.

Friends Groups within the National Wildlife Refuge System have become numerous over the past 10 years. Friends Groups essentially "adopt" individual refuges or complexes, advocate for their needs, and provide both financial and volunteer support to accomplish many essential tasks and projects. Friends Groups not only directly benefit refuges, but also empower members to become advocates for refuges, and conduct outreach that increases public awareness of, and involvement with, National Wildlife Refuges. This occurs both through direct contact and increasingly, through the Web and social media. Currently there is a fledgling friends group dedicated to Camas NWR. Members of this group have agreed to support other refuges within the Complex, as needs and opportunities arise, but their primary focus would be on Camas. Working to establish new friends groups within the Complex will broaden the support base and provide more benefits to each refuge. Bear Lake NWR would support these new Friends Group since they would play a critical role in providing volunteer support for the Refuge's biological and public use programs, and as an advocate for protecting refuge wildlife and habitat within Southeast Idaho.

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Chapter 3
Physical Environment

Spring storm over Oxford Slough/USFWS

Chapter 3. Physical Environment

3.1 Climate

3.1.1 General Climate

The climate of Idaho is largely influenced by the Rocky Mountains, lying far to the east, and the maritime winds of the Pacific Ocean, more than 300 miles to the west. The Rocky Mountains present a barrier to the westerly flow of the atmosphere carrying moisture from the Pacific Ocean. However, southeast Idaho has a more continental climate than the rest of the State. Summer winds from the south bring moisture from the Gulf of Mexico and the Caribbean, along with thunder, lightning, and rain. Summer monsoonal moisture intrusions are infrequent and significantly modified by the arid Great Basin of Utah and Nevada (NWS 2010).

According to the Köppen climate classification system, the Bear Lake watershed is made up of three predominant climate types: Mediterranean (Csa), Humid Continental, Mild Summer (Dfb), and Highland (Visher 1966). The Humid Continental, Mild Summer (Dfb) Climate covers the majority of the watershed's lowlands and valleys, including the Bear Lake NWR. The Dfb climate type clearly experiences all four seasons (Gabler et al. 1997). Summers are mild; on occasion warm tropical air will invade from the south but rarely lasts more than a few days at a time. Winters are long, cold, and moderately severe. The Dfb climate type receives approximately the same amount of rainfall as the Csa climate type, but almost all of it comes as snow during the winter months (Roylance 1982).

Spring months are normally wet and windy. Winds of 20 to 30 mph may persist for days at a time. Weather conditions fluctuate quickly during the spring. Afternoon temperatures in the 30s and 40s with precipitation in the form of rain or snow may occur after a period of sunny skies and afternoon temperatures in the 60s or 70s. Thunderstorms are not uncommon, and are usually accompanied by rain showers and occasional snow. Low elevation snowpack usually melts quickly during the spring, but high elevation snowpack can persist into late June (NWS 2010).

Summer may begin suddenly with a rapid change to warm and dry weather. Home heating is usually not required after the first week in June, but chilly nights can persist into early July. Showers and/or thunderstorms are common from late spring through summer. These storms often produce very localized precipitation. Thunderstorms are seldom severe, and tornadoes occur infrequently in the area. Brief heavy rain, lightning, small hail, and gusty winds may cause very localized damage at times. Long periods of excessively hot weather in July and August are uncommon. Afternoon temperatures often rise into the 90s, however low humidity usually results in overnight temperatures in the 50s or even cooler. The average growing season is around 120 days, extending from late May to late September (NWS 2010).

During especially cold outbreaks, snowfall may accumulate to a depth of several feet or more. Cloudy and unsettled weather is common during the winter with measurable precipitation occurring on about one-third of days (NWS 2010).

Temperature

Bear Lake National Wildlife Refuge (NWR), Thomas Fork Unit, and Oxford Slough Waterfowl Production Area (WPA) are all part of the Bear River Basin and have typical mountain continental temperatures with a wide range between summer and winter, and between day and night.

Autumn ushers in cooler weather with daytime highs generally in the 70s in early fall dipping into the mid-40s by mid-November with generally dry conditions. Autumn storms are usually very fast moving, and seldom persist for more than a few days. Continuous home heating is seldom needed until mid-October. The first cold wave with highs below 20 and lows around 0 or lower may arrive anytime between late November and Christmas (NWS 2010). During winter, brisk southwesterly winds often persist for days or weeks. These winds may moderate cold winter conditions, producing unusually mild temperatures compared to surrounding areas. There are usually a number of days each winter when temperatures remain below freezing. Sub-zero temperatures usually occur only a few days each winter. However, arctic air masses periodically invade the region, bringing temperatures well below zero for extended periods of time (Toth et al. 2005).

Bear Lake NWR

Bear Lake NWR is located in a mountain-ringed valley at an elevation of approximately 5,925 feet. Data at the Western Regional Climate Center (WRCC) station 105275 (Lifton Pumping Station) from 1919-2010 indicate that a maximum temperature of 99˚F occurred on July 27, 1931, while the record low was -41˚F on February 2, 1985 (WRCC 2010a). High temperatures range from 84-97˚F mostly in July and August. Low temperatures range from -7˚ F to -41˚ F from December to March, but mostly in January and February.

Thomas Fork Unit

The Thomas Fork Valley, at the border of Wyoming and Idaho, is at an elevation of 6,060 feet. Temperature data from the WRCC station 480915 at Border, Wyoming, reveal that a record low temperature of -60˚ F occurred on February 8, 1929, and a record high of 102˚ F on July 30, 1934. Mean winter temperature is 14.5˚ F; spring, 37.3˚ F; summer, 60˚ F; and fall, 40.6˚ F (WRCC 2010c).

Oxford Slough WPA

At the 4,750-foot elevation, Oxford Slough WPA is situated in a north-south trending valley at the foot of Oxford Peak, immediately to the west. Data from the closest WRCC station (station 107346 in Preston, ID, 10 miles from Oxford Slough) show a record high temperature of 101˚F on July 10, 1985, and a record low of -31˚ F on February 2, 1982. Mean temperature for winter is 23.9˚ F; spring, 45.2˚ F; summer, 66.7˚ F; and fall, 46.6˚ F (WRCC 2010b).

Precipitation

Bear Lake NWR

Refuge weather data from 1968-2002 indicate that the average annual rainfall is 11.56 inches. Data from the Lifton Pumping Station record an annual precipitation high of 19.17 inches in 1982 and a low of 4.36 inches in 1988. Mean precipitation for winter is 2.07 inches; spring, 3.10; summer, 2.47; and fall, 2.71. Mean snowfall for winter is 24 inches; spring, 9.7 inches; summer, 0 inches; and fall, 6.3 inches. A record snowfall of 67.5 inches occurred in 1982 (WRCC 2010a).

Thomas Fork Unit

Mean annual precipitation from 1902-1993 was 13.53 inches, with a high of 23.25 inches in 1983 and a low of 6.18 inches in 1910. Mean winter precipitation is 3.47 inches; spring, 3.61; summer 2.93; and fall, 3.52. Mean annual snowfall for this same time period is 67.1 inches, with a high of 149.6 inches in 1936. Mean snowfall in winter is 107.2 inches; spring 17.3; summer, 0 inches; and fall, 11.1 inches (WRCC 2010c).

Oxford Slough WPA

Mean annual precipitation from 1964-2010 was 16.68 inches with a high of 25.60 in 1983 and a low of 12.61 in 1969. Mean precipitation for winter is 4.24 inches; spring, 4.94; summer, 3.24, and fall, 4.26. Mean annual snowfall for this same time period is 46.6 inches. Record high snowfall was 92 inches in 2005. Mean snowfall in winter is 36.1 inches; spring, 6.5; summer, 0 inches; and fall, 3.9 inches (WRCC 2010b).

Wind and Severe Weather Events

Windstorms are fairly common in Idaho and have resulted in disruptions of power, but usually only minor damage to structures. Summer brings the strongest windstorms to the refuge along with thunderstorms, lightning, rain, and hail.

Waterspouts observed over Bear Lake in 1996 and 1998 were accompanied by wind gusts of up to 80 mph. The waterspouts lifted some of the lake water a short distance into the air, but caused no serious damage nor inflicted any injury. Small tornados touched down over open land around Bear Lake in 1954, 1965, and again in 2004. In each instance the tornado remained on the ground for only a short time with a path mostly over open fields. Small outbuildings and trailers were damaged in the 1954 and 1965 instances but no damage was reported in 2004 (National Weather Service, Western Regional Headquarters *in* Palacios et al. 2007a). The Tornado Project (1999) reported only one tornado in Bear Lake County between 1880 and 2000, on June 10, 1998, with a F0 rating. No deaths or injuries were reported. Three tornadoes were reported in Franklin County, where Oxford Slough WPA is located, during this same period. These tornadoes occurred on June 30, 1982, May 21, 1986, and May 5, 1995. The severity of these storms on the Fujita Tornado Scale ranged from F0 (40-72 mph) to F1 (73-112 mph).

Bear Lake NWR

From December 2007 to August 2010, Montpelier's weather station (MAS719) recorded high winds ranging from 6 to 29 mph mostly originating from the southwest. Average wind gusts for this same time period ranged from 8 to 54 mph, with the strongest gusts occurring February through August and originating from the southwest. Average wind speeds range from 0.1 to 2.8 mph, again originating primarily from the southwest (WUI 2010a).

From January 1, 1950 to April 30, 2010, the National Climatic Data Center (NCDC) reported 22 storm events in Bear Lake County. No deaths or injuries were recorded in this 60 year interval from severe weather. The most severe event measured was 2 miles from Georgetown and occurred on March 25, 2006, with winds reaching 88.61 mph. Several downed power lines and poles and power outages were reported and property and crop damage was recorded at $125,000 and $14,000, respectively (NCDC 2010).

Thomas Fork Unit

From December 2007 to August 2010, the Border, WY weather station (MITD35), adjacent to the Thomas Fork Unit, recorded high winds ranging from 10 to 41 mph mostly originating from west-northwest. Average wind gusts range from 12 to 47 mph, with the strongest gusts occurring anywhere from winter through summer, and originating from the northwest. Average wind speeds range from 1.2 to 5.9 mph, originating mostly from the southwest (WUI 2010b).

Oxford Slough WPA

From December 2004 to August 2010, the Preston, ID, weather station (KIDPREST1) recorded high winds ranging from 14 to 35 mph, originating primarily from the south-southwest to the west-southwest. Average wind gusts range from 20 to 57 mph, with the strongest gusts coming from the northwest to the west-southwest and occurring mainly in April through October (WRCC 2010b). From January 1, 1950 to April 30, 2010, the NCDC reported 29 storm events with the most severe winds clocked at 93.21 mph on March 25, 2006 in the Preston area, about 10 miles from Oxford Slough WPA. One injury, no deaths, $59,000 of property damage, and crop damage of $50,000 was reported (NCDC 2010).

Climate Cycles in the Intermountain West

In addition to the familiar daily, seasonal, and yearly fluctuations in weather, there are longer term natural variations in the Earth's climate. Past variation in the Earth's climate has been cyclical, as opposed to being random or following linear trends. Cycles in the Earth's climate are nested and on multiple time scales, from year to year (interannual) to decades, centuries, and millennia. Various cycles are caused by independent physical mechanisms. Thus, for example, there are major glacial (cold) and interglacial (warm) periods on multimillennial time scales, caused by changes in the Earth's orbit around the Sun. Other cycles in the Sun's activity drive climate variations at the century scale. Cyclical patterns in circulation of the oceans and atmosphere lead to decadal (30 to 40 year) patterns, such as the Pacific Decadal Oscillation (PDO), which affects the west coast of North America. Cycles in the ocean-atmosphere system also lead to interannual variations in climate, such as the El-Niño/La Niña cycle (ENSO, for El-Niño Southern Oscillation). Climate at any one time is an expression of all of these nested mechanisms and cycles operating together (USFS 2010a). El Niño/La Niña Southern Oscillation (ENSO) events are linked to ocean temperatures in the tropical Pacific and last six to18 months. In El Niño years, ocean temperatures are warmer than average; in La Niña years, cooler. A single warm or cool PDO phase lasts 20-30 years, and the strongest signal for the PDO is in the north Pacific. The triggering cause of the PDO phase shift is not understood. The potential for temperature and precipitation extremes increases when ENSO and PDO are in the same phases and thereby reinforce each other. This additive effect is also seen in the region's streamflow and snowpack. When ENSO and PDO are in opposite phases, their opposite effects on temperature and precipitation can cancel each other out, but not in all cases and not always in the same direction (CIG 2009).

During La Niña events, winters in the northwestern U.S. tend to be colder and wetter than average, and winters in the southwestern U.S. tend to be dryer and warmer than average (Goodrich 2007). The changes in storm tracks and weather events associated with ENSO can also influence other climate patterns. However, the teleconnections between ENSO and the other patterns are not as well understood as ENSO itself. During El Niño events, winters in North America tend to be warmer than average in the north and wetter than average in the south. The Intermountain West region is in an area that does not show a distinct anomaly due to El Niño (CPC 2005).

The PDO reflects decadal changes in sea surface temperatures (SST) in the northern or "extra-tropical" Pacific Ocean (Mantua 2001; Goodrich 2007). When the PDO is positive, the SSTs in the northern Pacific Ocean are colder than average, and when the PDO is negative, the SSTs in the northern Pacific Ocean are warmer than average precipitation tends to be above average in the southwestern United States and portions of the Intermountain West region. When La Niña and the positive PDO are in phase, and SSTs in the Pacific are below average, winter precipitation tends to be below average in the southwestern United States, including parts of Utah. Finally, during a negative PDO event and a neutral ENSO, winter precipitation is above average for most of the west (Goodrich 2007).

3.1.2 Climate Change

Note: Much of the following section is derived from Ashton, I. W. (2010), "Observed and projected ecological response to climate change in the Rocky Mountains and Upper Columbia Basin: A synthesis of current scientific literature" and Rieman and Isaak (2010), "Climate change, aquatic ecosystems, and fishes in the Rocky Mountain West: implications and alternatives for management."

A growing body of scientific evidence has emerged supporting the theory of human-caused global climate change. During the 20th century, the global environment experienced increases in average worldwide temperatures, sea levels, and chemical concentrations. Average annual air temperatures on the earth's surface have increased by 1.3°F since the mid-19th century (Solomon et al. 2007). Furthermore, the increasing trend in global temperatures over the last 50 years is approximately twice the trend of the previous 50 years (IPCC 2007). Globally, during 11 of 12 years from 1995 to 2006, surface temperatures are the warmest on record since 1850 (IPCC 2007).

Climate change is having significant effects on organisms and ecosystems worldwide. Changes in the western United States have been particularly noticeable in the last century, with increases averaging 0.5-2˚C (0.9-3.6˚F) in mean annual temperatures, depending on elevation (Diaz and Eischeid 2007, Pederson et al. 2010). Warmer winters and springs have resulted in more precipitation falling as rain instead of snow, reduced snowpack, earlier snowmelt, earlier streamflow from snowmelt, an eight- to ten-day advance in the onset of spring on average across the West, more frequent large fires, and possibly an increase in insect outbreaks and plant mortality (Cayan et al. 2001, Stewart et al. 2005, Breshears et al. 2005, Mote et al. 2005, Knowles et al. 2006, Westerling et al. 2006, Raffa et al. 2008, Pederson et al. 2010). Important changes for fishes and their habitats will be driven by two factors that are the principal components of climate: air temperature and precipitation. Air temperatures across the Rocky Mountain West are warming faster than global averages and have increased by about 1˚C (2˚F) over the last century. Changes in precipitation are less consistent, but slightly drier summers and wetter winters are anticipated in the northern Rocky Mountains while the southern Rockies will probably experience generally drier conditions (Rieman and Isaak 2010).

The preponderance of evidence suggests that the magnitude of these changes has been influenced by human activity. Barnett et al. (2008) used nested climate and hydrological models to attribute most of these changes in the West to greenhouse gas emissions and their impact on global and regional climate. Another modeling study suggests that these changes are caused by a blend of anthropogenic forcing and Pacific and Atlantic decadal variability (Wang et al. 2008).

Predicted Future Ecological Trends in the Intermountain West

Projected temperature increases for the coming century are expected to increase the proportion of winter precipitation falling as rain, increase the frequency of winter flooding, reduce snowpack, increase winter streamflow, result in earlier peak streamflow, and decrease late spring and summer streamflows (Mote et al. 2005, Hamlet et al. 2007). Unless otherwise noted, projected trends were abridged from Ashton (2010). Climate has been changing across the Rocky Mountains in association with global patterns. However instrumental records suggest that mean annual air temperatures during the 20th century increased by approximately 1˚C (2˚F) (Saunders et al. 2008 *in* Rieman and Isaak 2010), which is considerably more than the 0.6˚C increase in global temperatures for the same period (IPCC 2007). The larger increase is due to warming rates that are faster over land masses than over the ocean (the global average includes both), but the Rocky Mountain West also has been warming more rapidly than other areas of the conterminous United States (Saunders et al. 2008 *in* Rieman and Isaak 2010).

Temperature and Precipitation

Since 1900, temperatures have increased 0.5-2˚C (0.9-3.6˚F) in most areas of the western United States (Pederson et al. 2010, Ray et al. 2008) but cooling has occurred at some sites (Ray et al. 2008, CIG 2010). The rate of change varies by location and elevation but is typically a 1ºC (2˚F) increase since the early 20th century (Hamlet et al. 2007). Temperature increases are more pronounced during the cool season (Hamlet and Lettenmaier 2007). In the northern U.S. Rockies, annual rates of increase are roughly two to three times that of the global average (Vose et al. 2005, Bonfils et al. 2008, Pederson et al. 2010, Hall and Fagre 2003), a pattern that is evident at northern latitudes and higher elevation sites throughout the West (Diaz and Eischeid 2007, National Assessment Synthesis Team 2001). Rises in temperature appear to be accelerating where mean regional spring and summer temperatures for 1987 to 2003 were 0.87˚C (1.57˚F) higher than those for 1970 to 1986, and were the warmest since 1895 (Westerling et al. 2006).

Trends in precipitation in the Intermountain West Region are far less clear. Instrumental data from the last century show modest increases for much of the northwestern United States (Mote et al. 1999, Mote 2003, Mote et al. 2005), but no directional trends for parts of the southern Rockies (Ray et al. 2008). Natural variability in precipitation is evident in the instrumental record for all of the climate regions, and long-term drought conditions during the last century impacted large areas within the region. Although 20th century droughts had substantial socioeconomic and ecosystem impacts, there is ample evidence that they were not as severe, in terms of duration and magnitude, as a number of drought events that occurred during the last millennium (Cook et al. 2007, 2004; Meko et al. 2007).

Temperatures in the region are generally expected to increase by approximately 1-2˚C (2-4 ˚F) during the next 50 years with natural variation over years to decades. Precipitation is less well understood, but the projection for total annual precipitation suggests that the dominant pattern in North America will be a wetter climate in the northern tier and a drier climate in the southwestern United States. These and other predicted changes for the Rocky Mountains and Upper Columbia Basin are outlined in Table 3.1 below.

Air Quality

A warmer climate will make it more difficult to meet U.S. air quality standards, particularly for ozone (Field et al. 2007, Karl et al. 2009). Changes in climate affect air quality by changing wind patterns and ventilation rates, precipitation, dry deposition, chemical production and loss rates, natural emissions, and background concentrations (Jacob and Winner 2009). For instance, higher temperatures increase the oxidation of sulfur and nitrous oxides, and precipitation changes will influence the distribution of acids deposited across the landscape (Bernard et al. 2001).

Some of the better understood effects from a warmer climate include increased ground-level ozone formation and increased particulate matter derived from forest fires. Ozone formation generally increases at higher temperatures due to increased gas-phase reaction rates (Aw and Kleeman 2003). The rate at which volatile organic compounds are produced from natural sources, such as trees, will also increase with increasing temperatures (Guenther 2002). This may be somewhat offset by the inhibitory effect of carbon dioxide (CO_2) on isoprene production (Young et al. 2009), as isoprene is one of the more significant ozone precursors emitted by vegetation. Most models find that even with current emission rates, there will be a widespread increase in ground-level ozone during the summer over the next century (Jacob and Winner 2009). This is consistent with historical data that show a consistent increase in ozone with temperature in polluted areas (Jacob and Winner 2009). In the West, however, decreases in background concentrations of ozone (due to increased water vapor) may offset increases in ozone due to temperature (Jacob and Winner 2009).

Biodiversity

With a 1˚C (2˚F) increase in average global temperature, the Intergovernmental Panel on Climate Change (IPCC) estimates that up to 30 percent of all species will be at increased risk of extinction (Field et al. 2007). While such models and estimates include uncertainties, there is little or no evidence that climate change will slow species loss (SCBD 2003). The Secretariat for the Convention on Biodiversity (2003) predicted four impacts on biodiversity as a result of climate change: (1) the climatic range of many species will move poleward or upward in elevation; (2) many species that are already vulnerable, such as rare endemics and threatened and endangered species, are likely to become extinct; (3) changes in the frequency, intensity, extent, and locations of climatically and non-climatically induced disturbances will affect how and at what rate existing ecosystems will be replaced by new plant and animal assemblages; and (4) some ecosystems, such as high mountain ecosystems, arid ecosystems, remnant native grasslands, and ecosystems underlain by permafrost, will be particularly vulnerable to climate change. Diversity will decline where habitats are found in small discrete patches, such as alpine tundra and lakes, and where warming contributes to habitat loss.

Productivity

Although primary productivity is projected to increase moderately due to longer growing seasons and elevated CO_2 concentrations, net ecosystem and biome productivity may decline due to increased disturbance, drought, and changes in community structure. While models project that a modest warming will lead to greater tree growth in the United States (Ryan et al. 2008), there will be spatial and temporal variations depending on other factors that limit productivity at a given site (Ryan et al. 2008). This may result in a pattern of initial gains in productivity followed by declines. The areal extent of drought-limited ecosystems is expected to increase by 11 percent for each 1˚C (2˚F) of warming in the continental United States (Bachelet et al. 2001). For widespread species such as lodgepole pine (*Pinus contorta*), a 3˚C (5˚F) temperature increase would increase growth in the northern part of its range, decrease growth in the middle range, and decimate southern forests (Rehfeldt et al. 2001). Where climate change leads to conversions of vegetation type (e.g., woodland to grassland), strong impacts on productivity will occur (Izaurralde et al. 2005).

Phenology

With continued warming, we should expect to see a continued advance of spring in the Intermountain West Region. Compared to 1950 to 1970, streamflow and peak snowmelt are occurring one to four weeks earlier (Stewart et al. 2005). Lack of good phenology data make predictions difficult, but changes in the timing of spring will likely affect the timing of reproduction, emergence, and migration of numerous species, which may affect community structure and function. On the other hand, phenological events that are tied to day length, such as the emergence of many plants, are not expected to change. While evolutionary adaptations to climate change can be rapid, it is generally thought that they are not rapid enough to counter the negative effects that climate change will have on many species (Parmesan 2006). One concern is the development of asynchronies among interacting and dependent species. For instance, there is the potential for increased stress for marmots in the early spring because while marmots are emerging earlier, there has been no change in the emergence of food plants in the area (Inouye et al. 2000). Mismatches in the phenology of birds and their prey have been documented in other parts of the United States and the globe and have been linked to population declines (Both et al. 2006, Wormsworth and Mallon 2008).

The key uncertainties in understanding the response of phenology to climate change lie in the rate at which phenological changes occur and how fast species will adapt to new seasonal regimes. Manipulative experiments suggest that other global changes, such as changing CO_2 concentrations and increased nutrient availability, may dampen the phenological response to warming (Cleland et al. 2006). As a result, it will be difficult to predict the magnitude and direction of response for many species. There are also apparent contradictions between individual species and ecosystem level responses (Steltzer and Post 2009). Moreover, it remains unknown how often and how many species' interactions will be affected by the development of asynchronous life histories. Finally, the largest changes to date are related to earlier spring onsets; less is known about phenological changes to climatic trends in other seasons.

Wildland Fire

Most evidence supports the hypothesis that future climate changes will cause increases in the frequency, intensity, severity, and average annual extent of wildland fires (Field et al. 2007, Ryan et al. 2008). Models project that numerous aspects of fire behavior will change, including longer fire seasons, more days with high fire danger, increased natural ignition frequency and fire severity, more frequent large fires, and more episodes of extreme fire behavior (Brown et al. 2004, Bachelet et al. 2007, Westerling and Bryant 2008). The best evidence, however, is for increases in the average annual area burned (McKenzie et al. 2004, Flannigan et al. 2006, Bachelet et al. 2007). For instance, McKenzie et al. (2004) predict that a mean temperature increase of 2.2°C (4.0°F) will increase the annual area burned by wildfire by 1.5 to 5. In another study, it is predicted that the median annual acres burned in the Upper Columbia Basin and northern Rockies would increase from about 0.5 million acres (0.2 million ha) in 1916 to 2006 to 0.8 million acres (0.3 million ha) in the 2020s, 1.1 million acres (0.4 million ha) in the 2040s, and 2.0 million acres (1 million ha) in the 2080s (Littell et al. 2009).

While there is strong evidence that climate change will increase the number of fires, and particularly the area burned each year, uncertainties remain. First, historical patterns of precipitation are linked to fire and synoptic weather features that drive fire growth, such as high pressure ridges and wind patterns, but models differ in their projections for these climate variables. Other factors, such as increases in non-native, annual grass invasions, may alter fire dynamics, making predictions based on climate alone difficult. Finally, and perhaps most importantly, if fires and other stand-replacing disturbances occur more frequently, the resulting landscape pattern may limit the size of future fires and total area burned (Collins et al. 2009).

Plant and Wildlife Disease

Climate change will likely increase the range, frequency, severity, and impact of plant and wildlife disease (Harvell et al. 2002). The IPCC states with very high confidence that climate change will increase the risk and geographic spread of vector-borne infectious diseases, including Lyme disease and West Nile virus, and changes in precipitation will increase water-borne disease (Field et al. 2007). Diseases will likely move farther north and into higher elevations. For example, the tick that causes Lyme disease, *Ixodes scapularis*, is limited by cold temperature, and models suggest that its range limit could shift north by 200 kilometers (124 mi) by the 2020s and 1,000 kilometers (621 mi) by the 2080s (Ogden et al. 2006). In some cases, climate change may adversely affect the disease rather than the host. For instance, fungal diseases dependent on moist conditions may decrease in a warmer, drier future (Harvell et al. 2002, Frankel 2008).

Invasive Species

The spread and impact of invasive species is driven mainly by changes in land use, increasing urbanization, disturbance, and alteration in management practices, but climate change may exacerbate the extent of invasions. Climate change is generally expected to increase the spread of invasive species through direct effects on habitat suitability and the indirect effects of altered nutrient availability and disturbance regimes (Dukes and Mooney 1999). The IPCC has very high confidence that disturbances such as wildfire will continue to increase and this will facilitate invasions (Field et al. 2007). In general terms, invasive species are expected to differ in their response to climate change from native species because they possess traits such as broad climatic tolerances and robust dispersal mechanisms that enable them to better adapt to changing conditions. Hellman et al. (2008) identified five consequences of climate change on invasion dynamics: altered invasion pathways, changes in environmental constraints, altered distribution of existing invasive species, altered impacts of invasive species, and a change in management effectiveness. An example of an altered invasion pathway would be an increase in recreational boat traffic as a result of warmer temperatures in previously snow-covered areas resulting in an increase in the spread of nuisance species.
Here are some examples of how climate change is expected to alter invasion dynamics in the region.

- Stream temperatures are expected to warm with warmer air temperatures and lower flows, increasing the amount of suitable habitat for warm-water fishes by an estimated 31 percent nationwide (Mohseni et al. 2003).
- Warmer temperatures may increase the impact of invasive species. In the Columbia River, for example, increasing temperatures have caused smallmouth bass (*Micropterus dolomieu*) to consume more native salmon (Petersen and Kitchell 2001), and whirling disease is more virulent in warmer streams (Rahel and Olden 2008).
- Earlier melting of snowpack will alter streamflows, may increase disturbance and flood events, and favor invasive species. It is predicted that such changing conditions may increase rainbow trout (*Oncorhynchus mykiss*) invasions in Colorado (Fausch et al. 2001). However, native species such as cottonwoods could benefit from larger spring flood events that facilitate establishment and recolonization (Scott et al. 1999).

- Bradley et al. (2009) examined the current and potential distributions of five problematic plant invaders in the West (cheatgrass, knapweed, yellow star thistle, tamarisk, and leafy spurge) based on the current climatically suitable habitat and maps of future habitat based on an ensemble of global climate models. They found that precipitation was the most important predictor of plant distribution and that warming temperatures alone may have little effect on range expansion. Most species were expected to expand in some areas while contracting in others. For example, they predict that the risk of cheatgrass invasion will increase in Montana, Wyoming, Idaho, and Colorado, but decrease in parts of Nevada and Utah.

Table 3.1. Summary of Projected Climate Changes in the Rocky Mountains and Upper Columbia Basin (based on McWethy et al. in press).

Climate Variable	General Change Expected	Range of Change Expected	General pattern	Confidence
Temperature	Increase	1.5-2.1˚C (2.7˚-3.4˚F)	Increases slightly greater in the summer	High
Precipitation	No change	2-5% increase in winter, 0-4% decrease in summer	Increase in winter, decrease in summer	Moderate for winter; low for summer
Drought	Increase in frequency and severity	Varies with magnitude of temperature and evaporation change	Greatest impact in summer	High
Temperature Extreme Events	Increase of warm events, decrease of cold events	Varies with magnitude of tem-perature change	Increase in frequency and length of hot events	High
Precipitation Extreme Events	Potential for decreased frequency coupled with increased intensity	Uncertain	Potential for more intense spring and summer floods	Uncertain

Effects of Climate Change upon Intermountain West Communities

Warming temperatures and changing precipitation regimes will likely alter plant and animal communities throughout the region. Since the timing and magnitude of response to climate change is certain to vary by species, future community assemblages may not have current analogs. Below are concepts that are common across all communities and discuss some of the more specific observed and projected responses to climate change for wildlife species and sagebrush, grassland, and wetland ecosystems.

Sagebrush and Grasslands

Over the short term, the greatest threats to grasslands and sagebrush ecosystems come from oil and gas development, increasing urban and agricultural development, and invasive species. However, wildfires are increasing and likely to intensify in a warmer future with drier soils, longer growing seasons, and more severe droughts (Field et al. 2007), and these may cause large changes in grassland and sagebrush ecosystems. Direct impacts on big sagebrush, a keystone species throughout its range, may also be severe (Smith et al. 1997). The species is not fire tolerant and once removed from large disturbances, is very slow to recover (Smith et al. 1997). Weed invasion typically follows removal of sagebrush (Prevey et al. 2010), and this disturbance will likely be exacerbated by drought-induced stress on the species (e.g., Poore et al. 2009).

Modeling suggests that climate change will likely increase net primary production in grasslands and decrease soil carbon, but high annual variability in plant production makes these projections uncertain (Parton et al. 2005). Nutrient cycling and plant production are expected to occur more rapidly in response to climate change than changes in community composition (Parton et al. 1994). Climate change is also expected to cause major changes in grassland and sagebrush distribution across the landscape (Bachelet et al. 2001). Range expansions of woody species are predicted to continue, particularly the expansion of pinyon-juniper into sagebrush steppe and grasslands (Rowland et al. 2008), resulting in a decrease in sagebrush and an increase in woodlands across the West. Changes in grassland cover are more subtle, but cover is generally predicted to decrease (Bachelet et al. 2001). Cremer et al. (1996), who used an earlier generation of downscaled global circulation models to predict the response of warming and reduced precipitation scenarios in eastern Washington, suggested that native sagebrush would decline and a less productive, invasive-annual dominated grassland would persist or increase. Such a shift has major implications for sagebrush-obligate vertebrates such as certain bird species (Knick et al. 2005). Climatic suitability models suggest that by 2100 sagebrush communities in Nevada, southern Idaho, Utah, Colorado, and eastern Wyoming may be at risk of loss due to climate change; regions in southwestern Wyoming will be at less risk (Bradley 2010).

There are a number of uncertainties in projecting the response of grasslands and sagebrush to climate change. First, regional, elevational, and grassland type may strongly influence response. A recent estimate of the velocity of climate change across biomes found that temperature changes will occur much more quickly in xeric shrublands and flooded grasslands than in other biomes, and much more slowly in montane grasslands (Loarie et al. 2009). Second, the magnitude and velocity of changes caused by the strong link between invasive species, fire, and grasslands and sagebrush is difficult to estimate. Third, precipitation and drought rather than temperature will likely drive changes in grasslands, and they are more difficult to predict. Fourth, the future impact of grazers is difficult to estimate, particularly as grassland fragmentation increases. Finally, many grassland and sagebrush systems are actively managed through livestock grazing, invasive species control, and prescribed and suppressed fire.

Aquatic Resources and Wetlands

Climate change will significantly impact regional aquatic resources and will likely make it more difficult to achieve water quality standards nationwide (Field et al. 2007). While there are likely to be regional variations, projected effects across the West include loss of glaciers, less snow, earlier peak flows, less streamflow, warmer water temperatures, more frequent droughts, and more intense storms.

At the current rate of melting, it has been suggested that Glacier National Park’s remnant glaciers will be gone in the next 25 to 30 years (Hall and Fagre 2003) due to increases in summer temperatures and a reduction in winter snowpack. Streamflow may increase during this initial period of melt, but flows will decline when the glaciers disappear (Morris and Walls 2009). Total winter precipitation may increase but overall snowpack is projected to decline throughout the West. For example, with a 4˚C (7˚F) temperature increase and doubling of atmospheric CO_2 in Loch Vale Watershed at Rocky Mountain National Park, models predict a 50 percent reduction in snowpack and four to five weeks earlier increases in soil moisture and runoff compared to mean onset of spring conditions from 1984 to 1998 (Baron et al. 2000). Rieman and Isaak (2010) summarized: "These changes also diminish recharge of subsurface aquifers that support summer baseflows (Hamlet et al. 2005) (Mote et al. 2005), and flow declines during this period are also apparent across many Rocky Mountain Streams (Rood et al. 2008; Stewart et al. 2005). In watersheds with densely forested vegetation, these declines may be exacerbated as warmer climate increases water loss through evapotranspiration (Hamlet and Lettenmaier 1999; Hamlet et al. 2007)."

The loss of winter snowpack will greatly reduce the major source of groundwater recharge and summer runoff, resulting in a potentially significant lowering of water levels in streams, rivers, lakes, and wetlands during the growing season (Mote et al. 2005; Barnett et al. 2008). With warmer temperatures and increasing droughts, municipal and agricultural demands for water are likely to increase, drawing down freshwater resources even further (National Assessment Synthesis Team 2001). Lower summer base flows reduce the amount of instream habitat for invertebrates and fish and cause a reduction in stream-side groundwater tables which are important for sustaining riparian vegetation communities (Stromberg et al. 1996; Scott et al. 1996). Reduced water depths may also increase the vulnerability of sensitive species (e.g., amphibians) to harmful ultraviolet radiation (Kiesecker et al. 2001).

In addition to the shift in the quantity of water, climate change may reduce water quality due to increased erosion and decreased dilution of pollutants. Decreases in snow cover and more winter rain on bare soil are likely to lengthen the erosion season (Walker et al. 2001), which could lead to average phosphorus concentrations in streams increasing 25 to 35 percent (Walker et al. 2001). Predicted increases in the severity and frequency of floods may also contribute to increases in erosion, as well as affect ecological processes that are sensitive to changes in the probability distributions of high flow events such as habitat stability, biodiversity, and trophic structure (Konrad and Booth 2005, Hamlet and Lettenmaier 2007). Degradation of water quality will likely lead to a reduction in or loss of sensitive stream species (Waters 1995).

Warming air temperatures and a reduction in glacial inputs will lead to warmer water temperatures across the West. Surface and bottom water temperatures of lakes, reservoirs, rivers, and estuaries are projected to increase from 2 to 7˚C (4-13˚F) (Fang and Stefan 1998, 1999; Hostetler and Small 1999; Gooseff et al. 2005). Warmer waters may lead to oxygen depletion, a change in fish distribution, an increase in algae and zooplankton in coldwater lakes, and a loss of some species. Species that are isolated in habitats near thermal tolerance limits or that occupy rare and vulnerable habitats like alpine wetlands may become extinct (Williams et al. 2007), and fish such as trout that are dependent on cool waters will likely decline (Williams et al. 2009; Pederson et al. 2010). In contrast, many fish species that prefer warmer water, such as largemouth bass and carp, may expand their ranges if surface waters warm (Battin et al. 2007). Warmer waters may also cause aquatic diseases and parasites to become more widespread (Hari et al. 2006).

Wetlands are among the most significantly altered ecosystems in North America due to stressors such as changes in hydrology from flow regulation, groundwater pumping, fill placement, overgrazing by domestic and native ungulates, atmospheric deposition, and biological invasion (Patten 1998, Zedler and Kercher 2005). Over the last 200 years, wetland areas have declined approximately 56 percent in Idaho, 50 percent in Colorado, 38 percent in Wyoming, and 27 percent in Montana (OTA 1993). Like other freshwater ecosystems, wetlands are considered extremely vulnerable to climate change, which is projected to diminish their number and extent and cause a decline in associated flora and fauna (Field et al. 2007). Wetlands are already facing widespread degradation so that even small reductions in precipitation could exacerbate wetland loss.

A few of the wetland types considered at greatest risk globally are found in the Intermountain West Region including riparian wetlands in arid zones, peatlands, and alpine wet meadows (OTA 1993, Burkett and Kusler 2000). But despite the recognition of the increasing role of climate change in altering wetland functions (e.g., Baron et al. 2000), there is a paucity of studies in the Rocky Mountain-Columbia Basin region that document climate-driven declines in wetland function or extent. One exception is a recent article describing changes in hydrology leading to wetland desiccation in Yellowstone National Park (McMenamin et al. 2008). Currently, the biggest losses are in the marshes on Yellowstone's northern range. It is expected that loss of wetlands will result in a corresponding loss in biodiversity and critical functions such as carbon storage in peat and water storage (OTA 1993).

Warmer temperatures will affect the growth and reproduction of wetland species by increasing decomposition rates and evaporation from wetlands and their water supplies, reducing peat accumulation, and thawing upper layers of permafrost in alpine wetlands (Burkett and Kusler 2000, OTA 1993). Where warmer temperatures lead to increased fire severity and extent, peat bodies, particularly those in a matrix of forest, will be at risk. Where warmer temperatures cause an increase in wetland decomposition rates and reduce peat accumulation, carbon storage will be reduced.

Greater changes in wetlands are expected to result from altered precipitation as it affects soil and vegetation conditions (Winter 2000). Many models project wetter winters in the Region, but any positive effect of increased winter flows for wetlands is expected to be outweighed by drier summers and warmer temperatures. It is predicted that wetlands response will first become evident in water table changes and alterations in the formation and duration of soil anoxic conditions. Alterations in the composition of short-lived and then longer-lived perennial plants will follow. Soils may be altered after many decades unless fire occurs. Alterations of plant cover and soil permeability may act in a feedback loop to further modify the hydrological cycle. Some wetlands, such as forest wetlands and wet meadows, are particularly sensitive to hydrological changes and a reduction in the water table of a few inches could convert wetlands to upland habitats (Kusler 2006).

Reduced groundwater flow due to lower snowpack, earlier melt dates, or reduced summer precipitation could result in lower water tables in wetlands dependent on groundwater inputs (Poff et al. 2002). Riparian wetlands will be sensitive to precipitation because changes in the timing and magnitude of flooding will affect the flux of water, nutrients, sediment, and biota between main river channels and riparian wetlands (Hauer et al. 2007).

Wildlife

There are numerous uncertainties involved in predicting wildlife responses to climate change, the largest being that associated with vegetation change. Shifts in vegetation and habitat availability, whether caused by climate or land use change, will have strong impacts on wildlife populations. Another uncertainty results from the lack of the basic life-history data needed to estimate vulnerability. How biotic interactions will be altered and to what degree this will affect populations remains unknown. Phenotypic plasticity and behavior adaptations may allow species to respond to change in unpredictable ways. The responses of wildlife to non-climate stressors such as fire, disease, and invasive species may dampen or strengthen responses to climate change.

There is evidence that warmer temperatures and changes in precipitation have caused range shifts, asynchronies, altered migration and hibernation patterns, increases in disease prevalence, and ultimately a reduction in the population size of many species (Walther et al. 2002, Root et al. 2003). Moreover, climate change can strongly affect animal populations through its effects on disturbance regimes, disease, land use, and invasive species. The predicted responses of wildlife to climate change are that:

- Many species' ranges will move northward and upward in elevation.
- Species will respond differentially, creating non-analog communities and asynchronies among interacting species.
- In most cases, climate changes will be more rapid than evolutionary adaptations.
- Species that are mobile, genetically diverse, show wide physiological tolerances, and have generalist diets will respond the most positively.
- Temperature-limited and snow-adapted species are at particular risk to a changing climate.
- Wildlife associated with habitat types and communities such as spruce-fir, alpine and sagebrush that are expected to decline are at greater risk.
- The effects of climate change could be particularly profound for native fishes and aquatic ecosystems of the Rocky Mountains because those systems often lack resilience and are strongly dependent on temperature and streamflow regimes that are already documented to be changed (Rieman and Isaak 2010).

Potential Changes to the Refuge

There have been no specific studies documenting potential effects to the Refuge from future climate change. There have already been major and irreversible changes to refuge habitats and wildlife due to Bear River diversions, flow regulation, diking, introduced species, land conversion to agriculture, and surrounding land uses. The impacts of climate change will be difficult to distinguish from these other impacts, at least in the near term. However based on the various climate modeling scenarios for the Pacific Northwest, several potential problems are envisioned. For example, populations of Bonneville cutthroat trout, which occur in St. Charles Creek on Bear Lake NWR and on the Thomas Fork Unit, are projected to be at increased risk of extirpation due to climate change. Williams et al. (2009) assessed the extirpation risk to local populations of native cutthroat trout, including Bonneville cutthroat trout, based on the combined stressors of habitat fragmentation and climate change. An upper thermal limit of 24°C (75.2°F) was applied to Bonneville cutthroat trout. Temperatures at or above these limits were considered "unsuitable." Marginal habitat range for Bonneville cutthroat trout was defined as 22.1-24.0°C (71.8-75.2°F). They applied a 3° C (37.4°F) temperature increase to 1970-2000 mean July air temperatures. This increase has been projected as the most likely scenario for the western United States within this century (CIG 2004).

Although the Bear Lake and the Thomas Fork subwatersheds were considered at low risk for winter flooding and summer temperatures above the maximum limit for Bonneville cutthroat trout, the Thomas Fork subwatershed is considered at high risk for wildfire, while the Bear Lake subwatershed is considered at medium risk. The Thomas Fork area is of particular significance because it contains some of the most abundant and well distributed populations of BCT in Idaho, and is considered a stronghold for this subspecies (Teuscher and Capurso 2007). In the Bear Lake NWR area, which is included in IDFG's Pegram management unit for BCT, BCT have been extirpated from Bloomington Creek, which flows into the Refuge from the west (see Figure 3.1) but persist in low numbers in Paris Creek, St. Charles Creek, and the Bear Lake outlet (Teuscher and Capurso 2007; see Chapter 4).

The Oxford Slough area, which is included in the IDFG's Riverdale management unit for BCT, is at high risk for wildfire and winter floods, and at medium to high risk for summer temperature (see Williams et al. 2009, Figs 3-5). However, current status of BCT in tributaries on the west side of the Bear River in this management unit (including Oxford Slough) is unknown (May and Albake 2005).

3.2 Hydrology

The Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA are all within the Bear Lake Watershed of the Bear River Basin. This watershed encompasses all lands draining to the Bear River between Stewart Dam, below the Idaho-Utah border, and Alexander Dam, near the town of Soda Springs, Idaho. The highest point in the watershed is Meade Peak (9,957 feet). The lowest elevation is below Alexander Reservoir (5,712 feet). Bear Lake and Bear Lake NWR are the major hydrologic features of the Idaho portion of this watershed.

3.2.1 Bear River

The 500-mile Bear River originates in the mountains of Utah's High Uintas Wilderness Area, meanders through Wyoming and Idaho, and reenters Utah, emptying into the Great Salt Lake. The Bear River is the largest river, with respect to discharge, in the Western Hemisphere whose water does not flow to an ocean (Dion 1969). Although the Bear River is the major river in the watershed, it does not directly feed Bear Lake itself. It enters Idaho near Border, Wyoming, enters the Bear Lake Valley transversely just north of the lake, but then flows northward. Sediments in the lake indicate that the Bear River flowed naturally into Bear Lake several times in the past (Dean et al. 2006 in Colman 2006); however, the lake and river have been separated for the past 8,000 years.

The 7,500-square-mile Bear River Watershed (see Chapter 1, Map 1) is divided into six sections: the Upper Bear, Central Bear, Bear Lake, Middle Bear, Middle Bear-Logan, and Lower Bear-Malad. Two thousand seven hundred acres of the watershed are in Idaho, 3,300 in Utah, and 1,500 in Wyoming. The watershed is encircled by mountains, ranging in elevation from over 13,000 to 4,211 feet, creating a closed basin that does not drain to the ocean (BRWIS 2010). The Bear Lake watershed section is shown in Figure 3.1 below.

Major tributaries to the Bear River in Idaho include Thomas Fork, Montpelier Creek, and Georgetown Creek, which drain the Preuss and Aspen Ranges; St. Charles Creek, Bloomington Creek, Paris Canyon Creek, Liberty Creek, and Eight-mile Creek, which drain into the Refuge from the eastern slopes of the Bear River Range; Soda Creek, which drains the Five-mile Meadows area; Cottonwood Creek, which drains the Portneuf Range; Mink Creek and Cub River, which drain the western slope of the Bear River Range; and Bear Lake, which in turn is fed by springs and streams originating in the Bear River Range and on Bear Lake Plateau (Dion 1969).

While the Bear River historically connected to the Dingle Marsh (currently Bear Lake NWR) through side channels and flooding overflows, the marsh and river remained separated from Bear Lake by a natural sand bar. At the turn of the 20th century, the Bear River was artificially re-connected to Bear Lake. Man-made dams and canals now divert the Bear River through the marshes of Bear Lake NWR and into Bear Lake to store Bear River water for irrigation, which is also now used for flood control. When irrigation demands increase during the summer, water flows back into the marsh from Bear Lake and then again into the Bear River downstream from the diversion dam (see Bear River and Bear Lake Hydropower Operations, below).

3.2.2 Bear Lake

Bear Lake, which lies just south of the Refuge, has a surface area of 112 square miles and a volume of 6,550,871 acre-feet. The lake is stratified in summer-spring where warmer, lighter water overlies colder, denser water. During the winter months the mixing processes of winds and surface cooling break down the layers, and the lake freezes over. Typically, Bear Lake freezes over three out of five years.

Historically, Bear Lake was a closed basin, fed by relatively small local streams and groundwater input. The Bear River Range, to the west of the lake, is mostly underlain by Paleozoic carbonate rocks, in which a karst drainage is well developed, containing probably the most reliable aquifers in the area (Bear Lake County Planning and Zoning Commission 2002). Presumably this aquifer contributes large amounts of groundwater to the lake. Significant groundwater throughflow presumably accounts for the lake's oligotrophic, mesosaline character (Colman 2006).

The melting of the winter snowpack provides the primary source of streamflow in the Bear Lake basin. A long-term streamflow record starts in 1927 for the Bear River at Stewart Dam, where the Rainbow Canal diverts river water into Bear Lake. In high runoff years, water flows past Stewart Dam and continues down the river. Average annual observed streamflow at Stewart Dam is 356,900 acre-feet from 1971 through 2000. Seventy-three percent of the annual streamflow, 261,100 acre-feet, occurs from March through July, the snowmelt runoff season. Monthly volumes are the highest in May and June, averaging over 70,000 acre-feet each month. Low streamflow levels occur from August through February, with monthly average volumes in the 11,000 to 16,000 acre-feet range. Seasonal streamflow volumes vary and depend on winter snowfall and saturation of the basin. March through July runoff volumes have ranged from less than 10 percent of average during consecutive dry years to over 260 percent of average during consecutive wet years (USACE 1989).

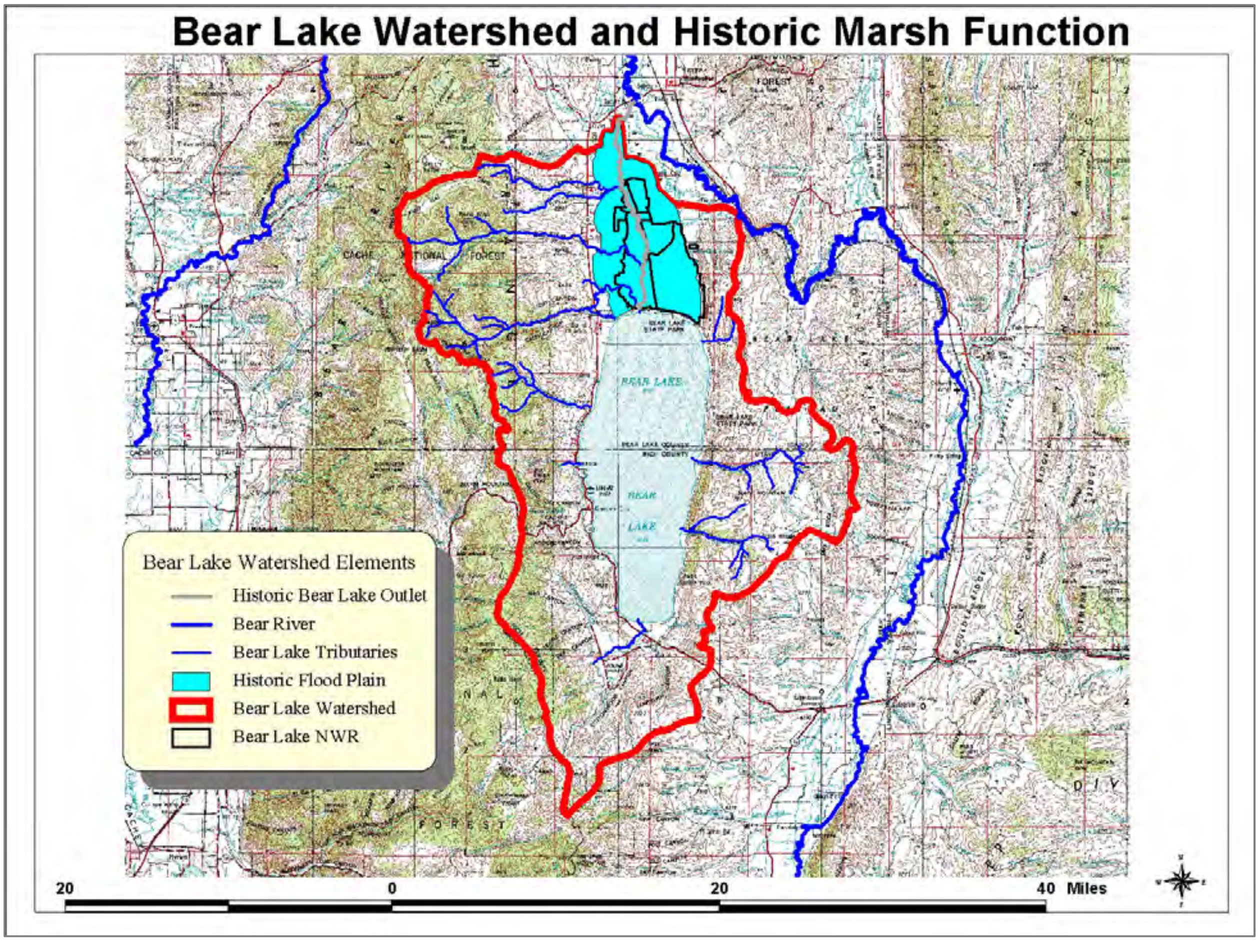


Figure 3.1. Bear Lake watershed and historic marsh function.

The key inflow tributaries for the Lake are North and South Eden Creeks from the east; Fish Haven, St. Charles, Cheney, and Swan Creeks from the west; and Spring and Big Creek from the south. These four major and three minor tributaries to the lake, excluding the Bear River, drain a 228 square mile watershed (Fig. 3.1). An average of 66,000 acre-feet (106 million cubic yards) of water per year enters the lake from this watershed. In an average year, total tributary input to Bear Lake during the spring runoff period is approximately 580 cubic feet/second, causing the Lake to rise approximately 4.5 feet between April and July (Lamarra et al. 1986). The total tributary input in 2004, one of the driest years in this watershed, during the spring runoff period was 164 cubic feet/second. During this year Bear Lake's elevation rose only 1.5 feet during spring runoff. The total tributary input in 1997, a wet year, during the spring runoff period was 638 cubic feet/second, causing the lake to rise 7.5 feet during spring runoff (USGS 2006).

Today, water diverted from the Bear River accounts for the majority of the waters entering Bear Lake (Lamarra et al. 1986). The remaining water enters from streams in the endemic (all surface waters except Bear River) Bear Lake drainage, in-lake springs, or through direct precipitation on the Lake itself. Water levels of Bear Lake have fluctuated annually since use as a reservoir began; 2.8 billion cubic yards of water were diverted from the Bear River into Bear Lake during the years of 1975 and 1984. During the same time period, low and high annual Bear River inputs were 15.8 and 450 million cubic yards for 1977 and 1980 respectively (Lamarra et al. 1986). Much of the water entering Bear Lake through its tributaries and Bear River diversions is evaporated during the summer months: over 55 inches on average (5 percent of the lake's total mean volume, or 528 million cubic yards) (Palacios et al. 2007a).

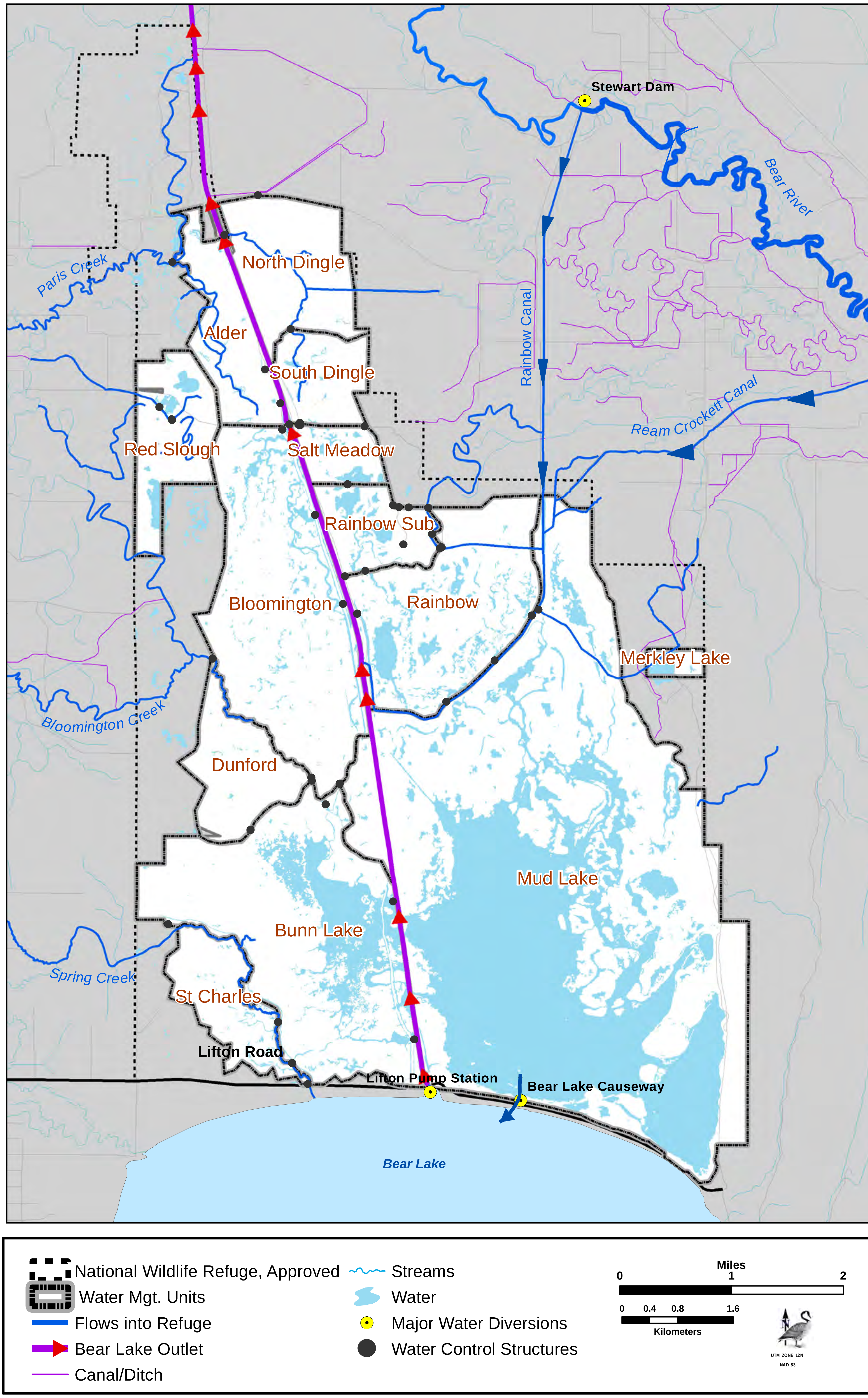
Bear River and Bear Lake Hydropower Operations

Bear Lake, the Dingle Marsh, and the Bear River have been connected to each other at various times throughout prehistory. Their most recent separation occurred about 8,000 years ago and endured until the Bear Lake project came to fruition. This project, consisting of inlet and outlet canals, control structures, and pumps, was begun around 1907 and completed in 1918. The modifications of the Bear River and Bear Lake to provide for irrigation and power production forever altered the natural hydrology of the river, marsh, and lake. The refuge marsh, particularly Mud Lake, now serves as a water storage and transfer facility. The effects of alterations of the historic hydrologic system to the habitats of Bear Lake NWR are described in Chapter 4.

At the turn of the century, irrigators wishing to use Bear Lake as a storage reservoir conceived a plan to divert the Bear River into Bear Lake (Gagstetter and Mesner 2006). In 1898, diverting water from Bear River to Bear Lake was considered a viable solution to overly abundant natural flows in the early summer followed by late summer low flows, inadequate for irrigation. In 1902, Telluride Power Company (later called Utah Power and Light) constructed inlet and outlet canals in an effort to divert Bear River water into the lake for later release during the agricultural growing season.

The point of diversion of the Bear River is located approximately 5 miles south of Montpelier, Idaho, at Stewart Dam. The Bear River water enters via a canal that enters Mud Lake, and then Bear Lake. The purpose of the Rainbow and Dingle Inlet Canals was to more efficiently divert Bear River water through Dingle Marsh into Bear Lake. The mixed lake and river water exits just west of Mud Lake with the help of Lifton Pumping Station. Map 9 shows location and configuration of the canal systems on the Refuge.

Map 9. ***Hydrology***



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Water is returned to the river below the Bear Lake outlet with an annual average of 776.9 cubic feet per second due to inputs from other tributaries. Figure 3.2 (from Lamarra et al. 1986) documents water levels in Bear Lake proper as a reservoir from 1915 to 2005. The highest annual input from the Bear River occurred in 1980 at 450 million cubic yards; the lowest occurred in 1977 at 15.8 million cubic yards (Palacios et al. 2007a). Water entering the Bear Lake system is primarily from diversion of the Bear River, with some water coming from streams, springs, and precipitation (Palacios et al. 2007a).

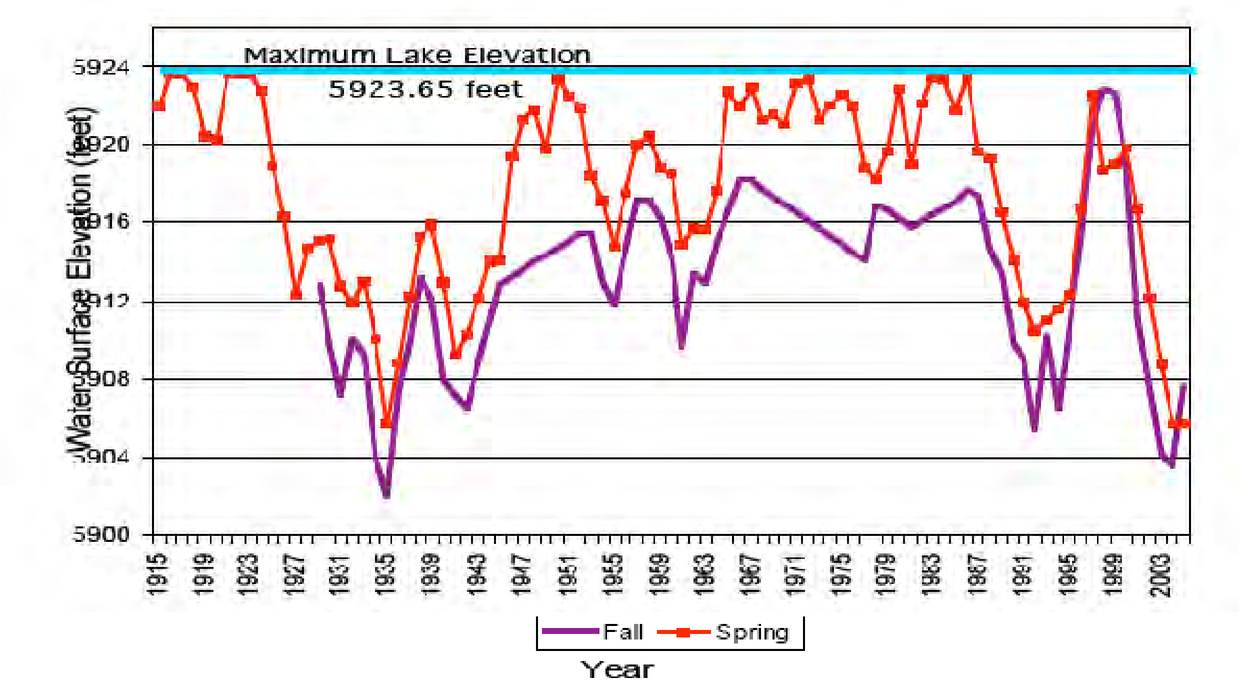


Figure 3.2. Utah Power water levels reported at Lifton Pump Station 1915-2005.
Flat line indicates "full pool" at 5,923.65 feet above sea level (From Lamarra et al. 1986; in Palacios et al. 2007a).

During an extended drought, PacifiCorp uses over 20 vertical feet of Bear Lake for supplemental irrigation downstream. Hydroelectric power is produced incidentally, as a secondary benefit, after the water is released from Bear Lake for irrigation or flood control. This release, along with the natural flow of the Bear River, passes through five on-river hydropower stations along the Bear River below Bear Lake, providing 94 percent of the hydroelectric generating capacity in the Bear River Basin. A sixth plant, the Cove Dam, was decommissioned and removed in 2006. The five remaining hydroelectric developments are Last Chance, Soda, Grace, Oneida, and Cutler. These are all part of the Bear River Hydro Project.

During the 40 years following completion of the Lifton complex, extensive litigation occurred to decide the water allocations and distribution of Bear River waters. Today, PacifiCorp regulates the flow of the Bear River through the Refuge and south into Bear Lake proper. Water use is governed, in part, by the Bear River Compact of 1958 (as amended in 1978). The Bear River Compact is a collaborative effort by the states of Utah, Idaho, and Wyoming that provides for the distribution of water on the Bear River and a reserved portion of the storage capacity in Bear Lake. In 1958, the Bear River Commission was created to manage water use along the entire length of the Bear River. However, the Commission is not directly involved in the operation of the river unless conditions exist that trigger provisions of the Compact. Rights to direct flow in the three administrative divisions of the Bear River are administered by the states under state law. General watermasters are appointed by the respective state engineers to operate the river reaches and canal diversions in their region (Palacios et al. 2007a).

PacifiCorp merged with UP&L in 1989; the resulting company is currently called PacifiCorp and controls the operation of Bear Lake. The lake is operated with two main goals: water storage for irrigation and flood control along the Bear River. Power generation is considered a by-product of the main goals (UDWR 2000). Recognizing the extreme high and low water elevations that can occur in Bear Lake, the Compact reserved all Bear Lake waters below 5,914.61 feet to be maintained for irrigation, and that water could not be released for the sole purpose of hydropower generation (Bear River Compact 1963). Water levels are not allowed to go above the historic high water elevation of 5,923.65 feet or below the historic low of 5,902.00 feet. Since the mid 1960s, UP&L, and later PacifiCorp, operated Bear Lake to a target elevation of 5,918 feet for flood control purposes (BRC 1997; Bear River operations agreement, 2000).

The 1968 agreement between PacifiCorp and the U.S. Fish and Wildlife Service stipulated that the water level in Mud Lake (a portion of Bear Lake NWR) would be maintained at an elevation of 5,920.50 plus or minus a half foot, subject “to all prior commitments, including particularly the terms of the Bear River Compact and provided, nevertheless, that the maintenance of said level is dependent upon the availability of water and acts and occurrences over which the Power Company has no control.”

Downstream water users, citizen groups around Bear Lake, and PacifiCorp signed the “Bear Lake Settlement Agreement” in 1995. The agreement provides, among other things, that starting at a lake elevation of 5,914 feet, downstream users will restrict their call for Bear Lake stored water. This reduction in use added additional stabilization of lake levels and encouraged conservation within the provisions of the Compact and the parameters of the states (BRC 1997).

Currently, less than half (about 40 percent) of the total flow of the Bear River is allocated and controlled under the Bear River Compact. Taking into consideration current uses and existing water rights in all three states, only a portion of the non-allocated water in the Bear River (i.e., water that is not “assigned” to or “owned” by any one user) can be put to new uses. In Utah, for example, there is an average annual flow of about 275,000 acre-feet left in the Bear River that can be put toward new uses. The State of Utah sees unallocated water in the Bear River as an untapped water source. After years of study, the Bear River Development Act was passed in 1991 by the Utah State Legislature (Gagstetter and Mesner 2006). This plan allocates 220,000 acre-feet of the 275,000 acre-feet of non-allocated water in Utah. Part of the plan includes:

1. Connecting the Bear River to a pipeline and/or canal to Willard Bay;
2. Constructing a conveyance and treatment facility to deliver water from Willard Bay to the Wasatch Front, including the Jordan Valley and Weber Basin Water Conservancy Districts;
3. Building a new dam or enlarging existing dams in the Bear River Watershed.

Hydrology of Refuge Wetlands

Bear Lake NWR is within the Intermountain West, a region comprised by portions of eight states including eastern Washington and Oregon, northeast California, northern Nevada and Utah, western Wyoming and Montana, and Idaho. Due to its arid to semi-arid climate, wetlands are scarce in the region (Ratti and Kadlec 1992). Wetlands in the Intermountain West region account for about 1 percent of the surface area (1.6 million acres) compared to 6 percent (22.5 million acres) in the Midwest region (Dahl 1990).

Bear Lake NWR

While it is uncertain how the Bear Lake NWR marsh (locally referred to as Dingle Swamp) functioned prior to development of the Bear River irrigation system, it is apparent that for the last 8,000 years or so the local topography restricted the Bear River to an isolated flood plain, with no major inflow connection to Bear Lake. This does not rule out the possibility that in extreme high flow conditions, side channels could have formed, thus creating an inflow mechanism to Bear Lake; however, most researchers agree that this was never a dominant process within the Bear Lake Valley.

Conversely, it is likely that Bear Lake occasionally contributed to flow within the Bear River system. As snowmelt from the adjacent Wasatch and Hot Springs mountain ranges began to fill Bear Lake, Dingle Swamp would have received excess inflow, which ultimately, may have hydrated portions of the estimated historic extent of the 25,000-acre Dingle Marsh. Water levels would have increased to an as yet unknown critical elevation, with additional flow following an outlet channel back to the Bear River system (Bundy 2007). One such possible outlet channel can still be delineated on present day aerial imagery.

The Bear River, historically referred to as the “white mud river,” would have received a freshwater influx at the Bear Lake outlet channel confluence, which likely would have improved downstream water quality. This influx would have been seasonal (mid-April through June) and highly dependent on annual snowpack amounts and spring temperature variation. The process would have led to increasing water levels in the Dingle Swamp through the spring and early summer months, followed by rapid desiccation through summer as the outlet channel removed water to the Bear River (Bundy 2007). Therefore, water level fluctuation in the marsh system may have been extreme (3-5 feet during high runoff years) and occurred within an abbreviated two- to three-month window.

The primary difference between current and historic conditions is that historically these fluctuations would have occurred over and above a 30-35,000-acre base wetland. Natural barriers such as a long sand bar at the Bear Lake/Dingle Swamp interface and at the Bear River near the present-day town of Bennington, would have retained an extensive marsh system in most years (Bundy 2007). Thus, it is assumed that large historical marsh water level increases would have occurred during spring and early summer, followed by relatively stable conditions as water levels dropped below the natural berm elevation. Among year variation, related to periods of low snowpack, may have led to prolonged desiccation of the marsh.

This variation is supplemented by relatively stable peripheral wetlands created by the Valley’s unique soil stratigraphy. Groundwater movement from adjacent mountain ranges would have created a variety of perennial and ephemeral habitats around the marsh fringe where heavy, impenetrable clays rise near the surface. Water is pushed up at these points, creating relatively stable wetlands. During spring runoff, these wetlands would have been flooded, and the heavy clay bottom would have retained this water within depressions. Groundwater movement would have maintained the wetlands through high evaporative periods in summer.

The diversion of the Bear River via the Rainbow Inlet Canal and construction of the Outlet Canal permanently changed the historic Dingle Marsh. Currently, the Outlet Canal has drained portions of the refuge marshes while the Rainbow Canal has caused significant siltation. The canal system and storage of Bear River water has resulted in seasonal fluctuations that did not occur historically.

The 8,017-acre Mud Lake Unit serves as a storage basin (along with Bear Lake proper) for irrigation use in the lower Bear River Watershed. The Refuge maintains an agreement with PacifiCorp (the primary water rights holder), through which target elevations are set, at the Refuge's request, to meet wildlife requirements. PacifiCorp controls and manages five major water control structures that affect the Refuge: Stewart Dam, Rainbow Dam, the Lifton Pump Station, the Causeway, and the Paris Dike. The Stewart and Rainbow Dams divert the Bear River into the Mud Lake Unit of the Refuge through the Rainbow Inlet Canal, the Causeway funnels water from the Refuge into Bear Lake proper, the Lifton Pump Station moves water from the lake back into the Refuge via the Outlet Canal, and the Paris Dike is the last mechanism (associated directly with the Refuge) to regulate flows to downstream irrigators.

Bear Lake NWR Water Management and Infrastructure
Today, the lands that comprise the Bear Lake NWR are the only remaining segment of the once historically extensive marsh. Following natural environmental fluctuations, overall wetland levels may have fluctuated historically from valley-wide coverage in flood years to only a few hundred wetland acres during drought years. These processes were important in developing the wetland habitats that exist on the Refuge today, but historic hydrologic periodicity has been dramatically altered and these wide fluctuations are no longer desirable, considering the loss of wetland habitat throughout the Bear Lake Valley, and the wildlife species that depend on the annual availability of wetlands (Bundy 2007). Current management is intended to simulate these natural environmental processes, while retaining roughly the same wetland acreage on an annual basis.

The Service has developed a vast infrastructure of wells, pumps, ditches, dikes, and water control structures capable of providing wetland habitats within these highly modified hydrologic conditions. The Refuge's infrastructure allows for independent water management within a series of nine compartmentalized wetland units (see Map 9 above). Wetland units can be rotated based on the condition of habitat in a given year. The infrastructure allows for independent water management within series of two to three wetland units, arranged as complexes throughout the Refuge (Bundy 2007). Rotation of wetland complexes maintains overall marsh health by setting back succession as units become dense with emergent vegetation.

Prior to refuge establishment, conservationists recognized that creation of impoundments would be beneficial to migratory waterbird use (see Chapter 4). Initially, several low-level levees were constructed to create "small impoundments" for waterbird use during low water periods. However this strategy was not applied widely, since many of these levees would be underwater during high water periods, and thus subject to extreme erosion and high annual maintenance costs.

During the 1980s, refuge managers adopted a more aggressive approach, and developed permanent levees capable of withstanding flood conditions. Construction of the 2,113 acre Rainbow Unit was initiated in 1980 to isolate the northeast portion of Mud Lake from the combined effects of sediment deposition and carp movement. Established at an elevation of 5,925' UP&L datum (5,923.65' is considered flood condition), the levee was constructed along the west and north banks of the Rainbow inlet canal, and along the east bank of the Bear Lake outlet canal. Completion of the Rainbow Unit allowed for effective carp control, improving water quality and habitat conditions in the unit (see Chapter 4).

During the late 1980s through mid-1990s, it was recognized that portions of the larger Rainbow Unit should be managed independently for different habitat values. The northern sections of the unit retained alkali soils and thus, should be managed for halophytic (salt tolerant) plant communities, while the middle segment had considerable topographic variation which provided an ideal situation to manage for ephemeral wetland pools adjacent to upland nesting habitat. The southern half was comprised of a deeper water zone more suitable for perennial (permanent) water maintenance. Through the construction of the northern Salt Meadow and central Rainbow Unit sub-impoundment levees, water could be managed to provide the most desirable water levels to maintain these different habitats. Four more impoundments were developed on the west side of the outlet canal from the late 1990s to present (Bloomington, Bunn Lake, Dunford, and St. Charles Creek).

Management Complexes on Bear Lake NWR

Four management complexes currently exist on Bear Lake NWR: the North Meadows Complex, the Bunn Lake Complex, the Bloomington Complex, the Rainbow Complex, and the Mud Lake Complex (see Map 9 above). These total 18,050 acres, of which 92 percent is considered wetland habitat. Management of the complexes is described below.

North Meadows Complex (1,792 acres; three units.) Historically this complex has been managed for hay production by maintaining ephemerally flooded habitats for upland nesting waterfowl, shorebird and greater sandhill crane use, and foraging waterbirds that nest on other parts of the Refuge. Hydrologically isolated from Bear River inflow, water levels are maintained through a combination of snowmelt, groundwater influx, and water rights associated with Paris Creek, Dry Lake Canal, and Black Otter ditch companies (Bundy 2007). Water levels have followed a typical historic hydrograph with high spring flows, followed by rapid summer drawdown, and a slight increase in wetland water levels during fall. This simulates a natural abbreviated flood-drought scenario.

The **Alder Unit** (592 acres) receives a large proportion of fall/winter Paris Creek flows outside of the irrigation season. Past management has focused on holding these flows and increasing water levels to a full pool stage by April 1. At this point, water levels are maintained for breeding waterbirds through mid-July, when water is then released to facilitate hay removal. Normal-flood hydrologic regimes are maintained in most years. Long-term management of the Alder Unit has been focused on producing ephemeral wet meadow habitat for sandhill cranes, as well as breeding and migratory waterfowl/shorebird use. The unit also contains several hay permits, thus, the typical annual cycle has been spring flood followed by August 1 desiccation. These permits have dictated drawdown schedules for the Alder Unit; however, spring and fall water levels can still be used to simulate natural hydrologic periodicity using Paris Creek tail water (Bundy 2007). Changes to the haying program (see Appendix B, Compatibility Determinations) may enhance the Refuge's ability to simulate natural hydrologic periodicity on this unit.

The **North Dingle Unit** (794 acres) receives a large proportion of spring flows from Black Otter Irrigation Company tailwater, which can either be received through Keetch Drain at the north end of the unit, or removed to the Bear Lake outlet canal. These flows typically arrive during two seasonal periods; early-mid May and mid-late June. Water timing concurrently stimulates and then concentrates invertebrate resources during these two pulse periods, which greatly benefits foraging waterbirds. Management will be focused on opportunistically pulsing water during these periods unless habitat tolerance thresholds are surpassed, requiring either drought or flood regimes to correct the habitat imbalance. Long-term management of the North Dingle Unit has also been focused on producing ephemeral wet meadow habitat for sandhill cranes, as well as breeding and migratory waterfowl/shorebird use. The unit also contains several hay permits, thus, the typical annual cycle has been spring flood followed by August 1 desiccation. These permits will continue to dictate drawdown schedules for the North Dingle Unit; however, spring and fall water levels can still be used to simulate natural hydrologic periodicity using Black Otter Irrigation Company tail water (Bundy 2007). Changes to the haying program (see Appendix B, Compatibility Determinations) may enhance the Refuge's ability to simulate natural hydrologic periodicity on this unit.

The **South Dingle Unit** (405 acres) is currently managed within the North Dingle Unit and is not yet completely constructed. However, over the next 10 years, modifications to the haying program may lend to independent management capabilities within the southern third of the unit (see Appendix B, Compatibility Determination Haying). This provides an opportunity to fulfill a deficiency in perennially flooded habitat in the North Meadows Complex. As conditions change, an increasing emphasis will be placed on managing the South Dingle Unit for palustrine emergent hemi-marsh habitat. Long-term management of the proposed South Dingle Unit has been identical to the North Dingle Unit, which has also been focused on producing ephemeral wet meadow habitat for sandhill cranes; as well as breeding and migratory waterfowl/shorebird use. The unit currently contains one hay permit. The South Dingle Unit can be managed for the full range of natural hydrologic regimes and permanent water can be provided throughout the year (Bundy 2007). See Appendix B, Compatibility Determinations, Haying.

The **Bunn Lake Complex** (3,526 acres, 3 units) is currently being completed. It is designed to fulfill three separate management functions; fisheries restoration (St. Charles Creek Unit), quality hemi-marsh for over-water nesting birds (Bunn Lake Unit), and semi-permanent marsh with adjacent uplands (Dunford Unit). In combination, these three units provide an optimal mix of habitat for a wide diversity of wetland dependent wildlife needs (Bundy 2007). However, more so than in any other complex, the needs fulfilled are specific to the individual management units.

Wetland management within the Bunn Lake complex is dependent on three separate water sources; Bear River inflow/Mud Lake storage (Bunn Lake Unit and secondary source for Dunford Unit), St. Charles Creek flow (primary source for St. Charles Creek Unit), and Bloomington Creek flow (Dunford and Bunn Lake units). While historic hydrologic regimes including flood, normal, and drought cycles can still be simulated, each unit is more conducive to maintaining a specific regime, as opposed to simulating all three. For example, the St. Charles Creek Unit can be fluctuated between the three simulated regimes, but in-stream flow must be retained in all years for Bonneville cutthroat trout passage. Therefore, flood and normal cycles will be the desired regimes in most years. Conversely, the Dunford Unit is currently subject to annual hay removal and must be at least partially dewatered to facilitate access; thus, normal-drought cycles would be better simulations in most years. Seasonal acreage will be maintained through rotation of hydrologic simulations, with emphasis placed on the most appropriate rotation to meet individual unit needs (Bundy 2007).

The **Bunn Lake Unit** (2,448 acres) is situated immediately adjacent to the Bear Lake outlet canal and Mud Lake, thus, it is the deepest unit in the complex and most conducive to maintaining hemi-marsh habitat. Prior to construction, this unit was subject to carp infestation, which greatly inhibited aquatic submergent plant growth. Surprisingly, very little sediment appears to have been deposited within the unit. This leaves the substrate in good condition to stimulate growth within this limiting habitat type. Carp removal, as is proposed under the Bunn Lake project, will ensure that new growth submergent plants are not uprooted through their activity. The Bunn Lake Unit will be managed to maintain hemi-marsh habitat with emphasis on simulating normal and flood hydrologic regimes. Drought will only be applied when existing conditions, based on habitat tolerance thresholds, require adaptive management treatment (Bundy 2007).

Prior to construction, Bunn Lake was managed concurrent with Mud Lake, which has historically been managed as much to meet irrigation demands as for wildlife habitat requirements. Through a 1968 agreement with PacifiCorp, water levels have been raised until April 1, stabilized through the waterbird nesting season, and then consistently lowered prior to August 1 to meet terms of hay permits on the periphery of the unit (Bundy 2007). Through construction of the Bunn Lake levee, this unit can now be independently managed to simulate natural hydrologic periodicity, with an emphasis on maintaining perennial emergent hemi-marsh around the core Bunn Lake area.

Initially, the proposed **Dunford Unit (**568 acres) was a part of the Bunn Lake Unit. Higher elevations found within the northern portions of Bunn Lake provided a unique opportunity to isolate and independently manage the Dunford Unit for upland nesting and migratory waterbirds (Bundy 2007). Combined with the Bunn Lake and St. Charles Creek units, the Dunford Unit provides the missing upland and ephemeral marsh components of the complex. To maintain this component, the overall management emphasis will be to promote normal and drought conditions in most years, with periodic flood regime simulation to stimulate the seed bank. Unlike the Bunn Lake Unit, the Dunford Unit is situated at a higher elevation, and thus, is conducive to independent management to provide more adjacent upland nesting habitat (Bundy 2007).

The 510-acre **St. Charles Creek Unit** is a direct result of a local community-based working group developed to promote restoration of the Bear Lake Bonneville cutthroat trout fishery (BCT). Through a fish ladder located at the southeast comer of the unit, spawning BCT could access the St. Charles Creek Unit, and ultimately, the upper reaches of the creek for spawning. Therefore, an emphasis on managing the unit to meet BCT life history requirements is required. Normal and flood hydrologic simulations will be the desired course in most years; however, drought conditions will be applied as necessary to meet habitat tolerance thresholds when conditions dictate. During drought simulation, a minimum elevation of 5,919.5' UP&L datum will be maintained to facilitate spawning access during late spring and returning fry access during fall (Bundy 2007).

The local community-based St. Charles Creek Working Group was able to cooperatively develop and fund a 14 grant, multiple benefits project for fish passage, water quality improvement, private lands irrigation, and wetlands restoration. The Group was able to develop a watershed scale initiative to restore 14,619 wetland/riparian acres (14,119 Federal, 500 private) and improve water quality on 6-11 miles (2 Federal, 4-9 private) of the middle Bear River system. This was largely due to leadership provided by the IDFG (Richard Scully; Region 5 fisheries biologist), the Bear Lake County Commission (Conrad Michaelson; County Commissioner), the Service, and the 62-member St. Charles Creek Working Group.

The Group examined mechanisms and restoration strategies to perpetuate natural spawning of Bear Lake, BCT in St. Charles Creek, Idaho. Over the three years since December 2002, the Group met 20 times, developed four independent focus groups, and expanded their vision to create the following set of goals:

1. St. Charles Creek Fisheries and Riparian System Restoration
2. Irrigation System Delivery and Efficiency Improvements
3. Wetlands Protection and Enhancement
4. Bear Lake Water Quantity and Quality Enhancements

To complete all restoration actions described in the Group's proposal, the overall price tag was $4,820,586 of which $2,151,000 were grant funds and $2,669,586 were Federal, State, corporate, and local community cash/in-kind matches. In order to secure the necessary funding, a series of 14 grant applications to complete 13 projects, involving contributions from 36 separate partners, was initiated.

The overall initiative involved construction of 16 new water control structures; 4.85 miles of levee; development or renovation of six St. Charles Creek System irrigation structures; restoration of 6-11 miles of riparian habitat on St. Charles Creek, Spring Creek, and the Middle Bear River; and irrigation delivery improvement/wetland restoration on approximately 600 acres of private ranch land. From an ecological perspective, this equates to restoration or enhancement of 14,619 wetland/riparian acres in12 separate Federal and private management units, as well as direct water quality improvements on approximately 6-11 miles of the middle Bear River system.

Granting Agencies:

- Fisheries Restoration and Irrigation Mitigation Act (FRIMA)
- IDFG - Habitat Improvement Program (HIP)
- Idaho Governor's Office of Species Conservation (OSC)
- Intermountain West Joint Venture - Cost Share (IWJV)
- National Fish and Wildlife Foundation (NFWF)
- Natural Resources Conservation Service - Wetlands Reserve Program (WRP)
- North American Wetlands Conservation Act (NAWCA)
- PacifiCorp - Environmental Coordination Committee (ECC)
- PacifiCorp - Green Fund
- Rhodia North America
- U.S. Army Corps of Engineers - Mitigation
- U.S. Fish & Wildlife Service - Challenge Cost Share (CCS)
- U.S. Fish & Wildlife Service - Partners for Fish and Wildlife (PFW)

Partners: Bear Lake County Commission, Bear Lake County School District, Bear Lake Regional Commission, Bear Lake Soil and Water Conservation District (SWCD), Bear Lake Watch, Dahl Warren, Franklin County SWCD, Glenn Transtrum, Martin Mast, Monte Transtrum, St. Charles Creek Working Group, St. Charles Creek Irrigation Company, Various Private Landowners, Rod Drewien, Boy Scouts of America, Bridgerland Audubon Society, Portneuf Audubon Society, Ducks Unlimited, Idaho State University Museum of Natural History, LIFE Inc., Paris Lions Club, Trumpeter Swan Society, Trout Unlimited, Utah State University, Aquascreen Inc., PacifiCorp, Rhodia North America, Idaho Department of Environmental Quality, Idaho Department of Fish and Game, Idaho Transportation Department, Idaho Office of Species Conservation, Fisheries Restoration and Irrigation Mitigation Act, Intermountain West Joint Venture, Migratory Bird Conservation Commission, Natural Resources Conservation Service, U.S. Forest Service, and U.S. Fish and Wildlife Service.

Bloomington Complex (2,521 acres, two units). Only one of the Bloomington Complex's two management units is capable of intensive water level management. However, this unit provides the most equitable mix of upland through wetland habitats of any complex on the Refuge (Bundy 2007). The northwest comer of the Bloomington Unit, combined with the Red Slough Unit, provides an optimal mix of upland and emergent hemi-marsh habitats for use by a maximum diversity of wildlife species. Alkali upland habitats in Red Slough may require intensive treatment to provide suitable dense nesting cover, but water rights in the Dry Lake Canal Company and easy access for fire equipment allow these treatments to be applied. A focus of the complex will be restoration of upland habitats and maintenance of the extensive hemi-marsh habitat in the Bloomington Unit (Bundy 2007).

Prior to construction, the 2,040 acre **Bloomington Unit** was subject to sediment deposition from the Bear Lake outlet canal and unregulated carp movement, which resulted in poor quality habitat throughout the unit (see Chapter 4, History of Refuge Management). Following completion of the project in 2000, aquatic plant communities responded immediately followed by increased nesting use by the overwater nesting waterfowl guild. Water levels in the unit have been fluctuated, following a spring flood/summer drawdown to facilitate hay removal. This strategy has been successful and will remain the emphasis for water management on the Bloomington Unit. The simulation of all defined hydrologic regimes (i.e., flood, normal, and drought cycles) will be used in accordance with defined thresholds for individual habitat types (Bundy 2007).

The **Red Slough Unit** (481 acres) is hydrologically isolated from remaining refuge habitats, and is tied to groundwater discharge from adjacent farmlands, as well as delivery of limited water rights in the Dry Lake Canal Company. As a result, the unit can become almost entirely desiccated during extreme drought periods. While this may be desirable under extreme circumstances, in most years a minimum of 4 percent permanent water and 8 percent ephemeral water should be maintained. Because the Red Slough Unit functions more as a terminal basin, there is a direct tie to irrigation use in the Dry Lake Canal system. As such, irrigation/groundwater inflows occur throughout May and June which results in maximum wetland acreage in mid-late June, similar to the estimated historic pattern. This condition has resulted in establishment of the sensitive red glasswort plant community, one of a few alkali marsh systems on the Refuge. Other than to supplement water supplies through water rights in the Dry Lake Canal Company through low water years, the emphasis will be on retaining the current hydrograph (Bundy 2007).

Rainbow Complex (2,113 acres, three units). The Rainbow Complex contains three hydrologically independent units using either water from the Bear River/Mud Lake system or irrigation tail water from the Black Otter Irrigation Company. Recent improvements within the complex allows for fully independent water management capabilities and the opportunity to divert tail water into one of three separate areas. Based on this capability, the Rainbow Complex has the most management flexibility of any complex on Bear Lake NWR and can be managed for nearly all identified key resource guilds (Bundy 2007). Additionally, the Rainbow Complex contains all identified habitat types and plant communities that exist on Bear Lake NWR at present (Bundy 2007).

Wetland management is regulated by 18 separate, existing or proposed water control structures, which can be used in one of three capacities; using Bear River inflow, passing water from unit to unit, or optimizing use of tail water from the Black Otter Irrigation Company. This provides the opportunity to manage each unit for its primary capacity, or simulating various hydrologic periodicities as necessary to fulfill identified habitat attribute thresholds. More than any other complex, the capability to rotate simulations among management units is provided, which allows this public use area complex to provide a showpiece for the visiting public (Bundy 2007).

Situated at the southern end of the Complex, the 1,437 acre **Rainbow Unit** maintains the deepest depressions, and thus the best capability to maintain palustrine emergent hemi-marsh. The Rainbow Unit has the best ratio of open water to emergent and the widest diversity of submergent plant communities within the open water zone (Bundy 2007). This provides the best opportunity to maintain hemi-marsh habitats for overwater and colonial nesting waterbirds, with a management emphasis on using flood or normal hydrologic regimes in most years. Drought will be used to meet habitat type requirements; more specifically, residual coverage thresholds within the deep emergent habitat type (Bundy 2007).

The Refuge's first large wetland restoration effort, the Rainbow Unit has served as the template for successive wetland impoundment developments on Bear Lake NWR (see Chapter 4, History of Refuge Management). Prior to development, it was managed concurrent with Mud Lake which has historically been managed as much to meet irrigation demands as for wildlife habitat requirements. Additionally, proximity to the Rainbow inlet canal resulted in heavy sediment deposition throughout open channels and pools within the unit, which continues to inhibit marsh management for a diverse and healthy wetland ecosystem. Removal of carp led to increased water clarity and water level fluctuation has provided opportunities to use mechanical disturbance to alleviate the effects of sediment accumulation (see Chapter 4). Through construction of the Rainbow levee, this unit can now be independently managed to simulate natural hydrologic periodicity, with an emphasis on maintaining perennial emergent hemi-marsh (Bundy 2007).

Following construction of the Rainbow Unit, it was recognized that the northern portions of this unit were at a slightly higher elevation, and thus, conducive for managing semi-permanent and ephemeral habitats adjacent to uplands for foraging and upland nesting wildlife. This unique juxtaposition led to the concept of managing individual wetland complexes, but required independent water management capabilities provided through the 2004 Rainbow Complex enhancement project (Bundy 2007). Through development of a new water control structure on the 434 acre **Rainbow Unit Sub-impoundment**, water could now be independently controlled to maintain the ephemeral nature of this unit, while further providing opportunities to simulate flood and drought to maintain overall ecosystem health.

The Rainbow Unit Sub-impoundment ranges from an alkali ephemeral wetland in the east, to a perennial emergent hemi-marsh in the western portion of the unit. Construction of a wildlife observation trail effectively divided the unit into an eastern and western half, which allows semi-independent management of the alkali and hemi-marsh components. When combined with the adjacent alkali upland and meadow grass habitats, it provides the best opportunity to provide habitat for upland nesting waterbirds. Management emphasis will be on maintaining a normal hydrologic regime in most years, with flood simulation dependent on snowpack/seasonal runoff and drought simulation as required, to meet specific habitat management thresholds (Bundy 2007).

The 242-acre **Salt Meadow Unit** was the first impoundment constructed on Bear Lake NWR (see Chapter 4, History of Refuge Management) and currently serves as the focus of the Refuge's auto tour loop. Similar to the Rainbow Unit subimpoundment, it also maintains an alkali eastern half and a shallow emergent hemi-marsh to the west. Continual flood/drought cycles over the unit's life history has led to establishment of unique, alkali tolerant plant communities, which provides added diversity within the Rainbow complex ecosystem (Bundy 2007).

Situated at a higher elevation than other Rainbow complex units, Salt Meadow has an added challenge in maintaining water levels throughout the growing season. Snowmelt tends to raise annual spring water levels. However, depths are typically inadequate to maintain through summer evaporative periods. A pump in the Bear Lake outlet canal has been proposed to subsidize water during high summer evapotranspiration periods, and thus, minimize this problem in the future (Bundy 2007). With the pump in place, it additionally provides an opportunity to partner with the State of Idaho, to manage a State-owned playa section immediately adjacent to the eastern border. Water maintained in this section would greatly enhance habitat availability for migrating and breeding shorebirds and hydrating the northern segment of the sub-impoundment. Therefore, a more artificial regime is proposed for the Salt Meadow Unit, to maintain perennial habitat for migratory birds. This will require an emphasis on normal/flood hydrologic simulations, with drought simulation used to accomplish specific habitat tolerance objectives (Bundy 2007).

Mud Lake Complex (8,099 acres, two units). The Mud Lake Complex retains the highest acreage of upland/shrub habitat (eastern boundary) and riparian habitat along the northern boundary (immediately adjacent to the Rainbow inlet canal). Unfortunately, wetland habitat within this complex is subject to extreme sediment transport from the Bear River, and is subject to unregulated carp movement. Nearly 90 years of sediment deposition has led to poor germination substrate for most wetland plants, which is further exacerbated by carp movement into, activity within, and the associated turbidity throughout the unit (See Chapter 4, Invasive Species). The Merkley Lake Unit retains a proportionally high acreage of upland/shrub habitat but the lake itself suffers from equally challenging water quality issues (Bundy 2007).

Mud Lake and Bear Lake proper are operated by PacifiCorp as one unit in terms of water storage. Mud Lake serves as the turning basin for the entire Bear River system, which has led to high quantities of sediment entering the unit over time. Because it serves as a storage basin for irrigation use in the lower Bear River, water quantity is not a problem. However, water quality is an issue, and there are no easy solutions to meeting the obvious management challenge. The Refuge maintains an agreement with PacifiCorp (the primary water rights holder), through which target elevations are set, at the Refuge's request, to meet wildlife requirements. Unfortunately, this is not a solution toward solving the habitat quality issues. Over the past several years, a minimum elevation (app. 5,920' UP&L datum) has been stabilized by April 1 and maintained to ensure hydration in the Refuge’s historic white-faced ibis colony. During the previous four drought years (2003-2007), this was desirable in sharing the burden with the rest of the system. Coincidently, it was discovered during this period that desiccation led to annual plant establishment on the sediment-laden mud flats, which has led to increased fall migration use when water levels are returned to the unit (Bundy 2007).

Sediment deposition and widespread carp infestation have dramatically reduced habitat quality within the 8,017 acre **Mud Lake Unit**, but surprisingly, several species have adapted to these conditions and preferentially select the Mud Lake Unit to fulfill certain life history events. For example, the wide-open water areas provide ideal protection for molting birds, the unit’s large size provides isolation for colonial nesting waterbirds, and carp provide an ideal food source for piscivorous species. Perennial emergent hemi-marsh quality is difficult to maintain in the Mud Lake Unit; however, facilitated drawdown results in a moist-soil management response. This has led to a change in management philosophy. The degraded substrate is desirable to annual plant communities and is also advantageous in concentrating carp for piscivorous bird use. Therefore, it appears that normal/drought simulations will be the more appropriate management strategy for the Mud Lake Unit, while working within the constraints of irrigation storage demands and flood abatement purposes within the Bear River system (Bundy 2007).

Water supply in the 82-acre **Merkley Lake** Unit primarily comes in the form of geothermal discharge from the adjacent hot springs in the mountain range to the east. Additionally, carp have infested the unit (presumably following a flood period in Mud Lake) which has led to few management options to restore quality habitat for wildlife. The unit is hydrologically disconnected from the rest of the Refuge, but does serve a minimal molting/migration function during certain years. Trumpeter swan pairs have been observed using the unit during molt and when displaced from other portions of the Refuge, thus, there is some benefit to retaining the unit. Lack of management capabilities has led to custodial maintenance, using the existing geothermal groundwater supply to maintain the open water wetland on Merkley Lake (Bundy 2007).

Figure 3.3. Bunn Lake levee construction, March 2006.

Dingle Marsh Tributaries
Three major tributaries (all on the west side of the Bear Lake Valley) feed Mud Lake and the Dingle Marsh, now part of Bear Lake NWR: from north to south, Paris Creek, Bloomington Creek, and St. Charles Creek. St. Charles Creek is a perennial stream, while Paris Creek and Bloomington Creek are seasonal streams. However, during drought cycles and low precipitation years all of these streams seasonally dry up, or are diverted for irrigation purposes (Palacios et al. 2007a). From late July thorough mid-April, total tributary flows into Mud Lake are low, between 100-200 cubic feet/second. Thereafter, flows increase with spring snowmelt. The first week of June typically has the highest rates of runoff and then falls off rapidly over the next seven weeks. In an average year, streamflow of St. Charles Creek during the spring runoff period is approximately 130 cubic feet/second (Lamarra et al. 1986). In 2004, one of the driest years in this watershed, streamflow during the spring runoff period was 39.9 cubic feet/second, while in 1997, a wet year, streamflow was 179.0 cubic feet/second (USGS 2006).

Thomas Fork Unit

Thomas Fork Watershed
The Thomas Fork is a fourth order tributary to the Bear River that drains the 150,100-acre Thomas Fork watershed. The Thomas Fork Watershed is a part of the Central Bear River Watershed, the smallest watershed in the Bear River Basin, draining 523,800 acres. On its 45-mile northward journey through the open sagebrush valleys of this watershed, the Bear River drops just under 200 feet (BRWIS 2010). The main tributaries of the Thomas Fork in Idaho are Preuss, Dry, and Raymond Canyon Creeks. Diversions exist on all these streams preventing water from reaching the main stem of the Thomas Fork except during spring runoff (USFS 2001).

Water Management
The existing riparian/marsh complex on the Thomas Fork Unit historically expanded and receded according to snowpack in the adjacent mountain ranges and subsequent flows in both the Bear River and Thomas Fork Creek. In periods of high snowmelt, the Bear River would exceed its banks and flood

lands within the Thomas Fork Unit. Conversely, in low flow periods, wetlands would become desiccated following flow and subsequent transfer to the River (Bundy 2007). These processes were instrumental in developing the proportional habitat coverage existing at present and the current hydrologic periodicity (when supplemented with refuge water rights) is conducive to continuing this regime.

The unit can be further divided into two management units; the Center Unit and Thomas Fork Creek. **Thomas Fork Creek** (2.75 miles) streamflow patterns are essentially the same as occurred historically until the irrigation season begins around the 1st of May. This allows for the natural hydrologic periodicity to function from roughly September 30 until May 1 when irrigators begin flooding agricultural fields. The Refuge maintains approximately 500 shares in the Thomas Fork Irrigation Company which allows the Refuge to artificially maintain both wetland levels and instream flow during critical late spring/early summer months necessary to support spawning by Bear River Bonneville cutthroat trout, as well as nesting and brood-rearing by a wide variety of nesting and migratory, wetland and riparian dependent wildlife species (Bundy 2007).

During the irrigation season, spring flows subside rapidly, depleting wetland acreage during a period when waterbirds need it the most. Water rights within the Thomas Fork Irrigation Company are usually adequate to maintain desirable levels during summer months, that when combined with levee construction at the south end of the 335 acre **Center Unit**, allow for simulation of various elements of the natural hydrology (Bundy 2007). Mimicking these natural seasonal variations provides an opportunity to use some of the seasonal allocation to supplement instream flow, either by direct use of the water right during simulated drought periods, or by associated wetland groundwater discharge during simulated flood periods (Bundy 2007). Map 10 (below) shows water management infrastructure on the Thomas Fork Unit.

Oxford Slough WPA

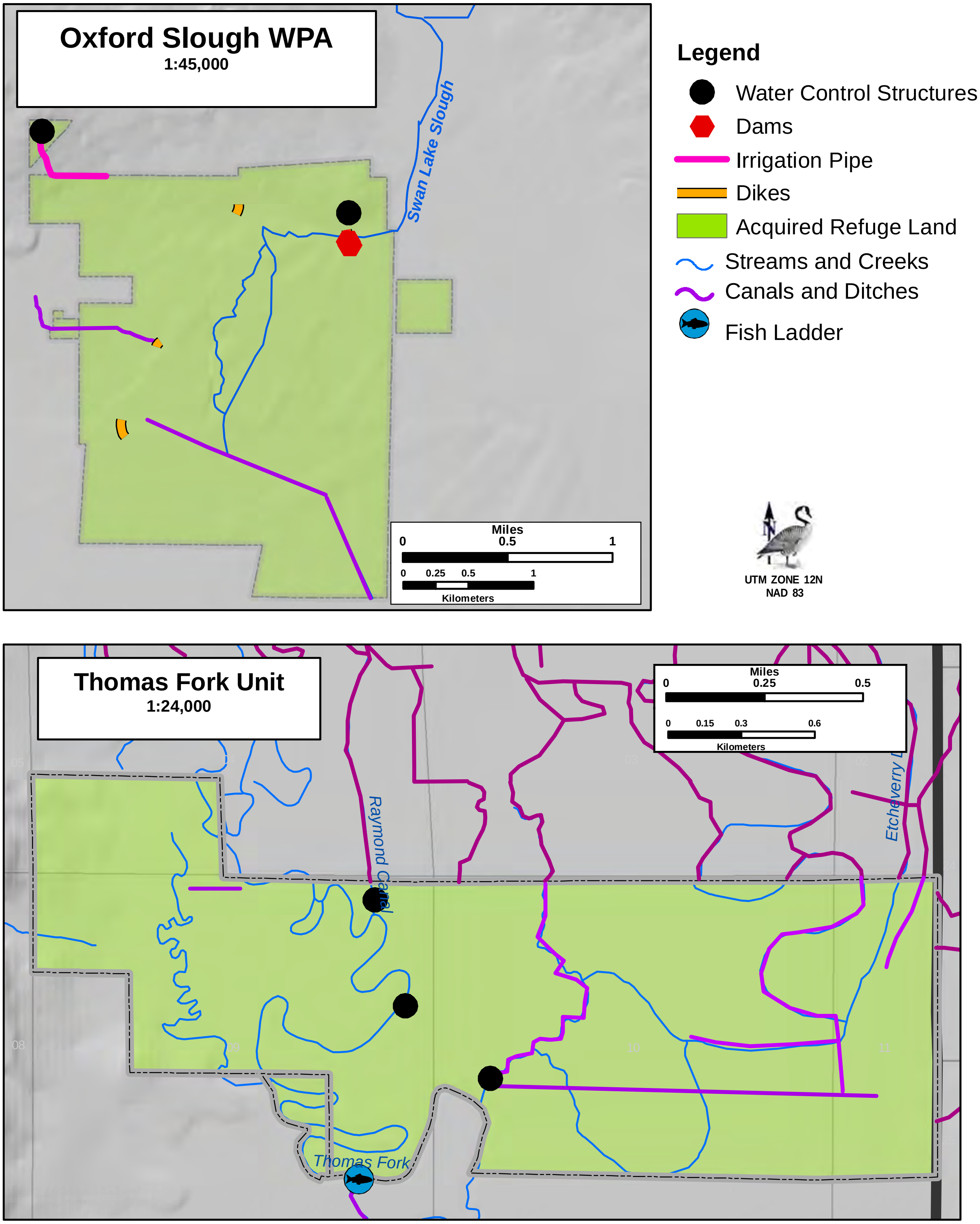
Oxford Slough is considered part of the Middle Bear Watershed, which includes all land that drains to the Bear River from below Alexander Dam in Idaho to Cutler Dam in Utah. Oxford Reservoir, just north of Oxford Slough, is a major waterbody of the watershed (BRWIS 2010).

The Oxford Slough Waterfowl Production Area (WPA) was acquired to protect remaining portions of Oxford Slough, a natural catchment for runoff from the adjacent mountain ranges to the west. Oxford Slough is located on the northern end of the Cache Valley approximately 6 miles southeast of Red Rock Pass, the division between the Bear River drainage to the south and the Snake River Drainage to the north. The Slough sits in a large wetland basin that spans from the Bannock Range on the west to the Portneuf Range on the east. The primary source of water for Oxford Slough is Swan Lake, which lies about 2 miles north of the slough. The sources of Swan Lake water are drainages from two mountain ranges: the Bannock range to the west and the Bear River range to the east. Secondary sources of water for Oxford Slough are Davis, Michael, and unnamed creeks draining off Oxford Ridge to the west. Oxford Slough is perched above, and is the source of water for Deep Creek, which drains south from the slough into the Bear River (Jankovsky-Jones 1997).

While historic records were not available for the Oxford Slough area, basin geomorphology and associated streamflow would suggest a widespread flood scenario, followed by a flowthrough system during the remainder of the year. Heavy spring flows from Oxford Creek, northwest of the WPA, and Stockton Creek, spilling from the north, would have exceeded Deep Creek's outlet capacity, likely resulting in flooding during spring runoff in most years. As flows subsided during the summer, it is assumed that streamflow would maintain the basin and flow through to the Deep Creek outlet. Thus in most years, the Slough is assumed to have been semi-permanently to permanently flooded, with relatively little fluctuation in levels throughout the year. The palustrine emergent marsh complex likely covered most of the present valley seasonally. Oxford Slough probably did not become desiccated except during extreme drought conditions.

Land use changes and associated increasing demands on limited water resources have dramatically altered flow patterns and extent of Oxford Slough. Land use demands and over-appropriated water rights result in virtually no semblance of a natural hydrologic periodicity. The slough is mostly dependent on runoff and irrigation return flows from the Oxford Creek Ditch Company; annual streamflow in Oxford Creek and surrounding tributaries is insufficient to support wetland habitat during critical summer months. The historic palustrine emergent marsh complex has been reduced to a fraction of its former size and becomes desiccated much more rapidly than the historic hydrologic regime would have allowed (Bundy 2007). Further, demands on water often result in complete desiccation of the 580 acre Oxford Slough system by mid to late summer, when fledgling waterbirds depend on the wetlands. The current situation necessitates seeking alternative solutions to making the most of the limited water currently available. It is also necessary to evaluate the need for agricultural and meadow hay water rights, which the WPA retains through the Oxford Creek Irrigation District, and evaluate mechanisms to develop these rights for wetland storage/wildlife purposes (Bundy 2007). Map 10 shows water management infrastructure on the Oxford Slough WPA.

Map 10. ***Hydrology***



To preserve the quality of our map, this side was left blank intentionally.

Floods

The probability of flooding in Idaho occurs generally during the spring snowmelt, especially in April and May. Small streams feeding Bear Lake, Mud Lake, and the Dingle Marsh may experience flooding during years of high mountain precipitation or rapid snowmelt. Rapid snowmelt and associated runoff can increase silt-loads and turbidity, which can persist into the summer (Palacios et al. 2007a).

Flooding of Bear Lake itself is not an issue. PacifiCorp's regulation of water levels is stipulated to remain at or below flood stage. To accomplish this PacifiCorp has established a late winter lake target elevation of 5,916 to 5,920 feet to assist in spring flood mitigation, leaving a buffer of 5.56 feet or 390,000 acre-feet for basin flood control each year at the typical elevation of 5,918 feet. The Utah Comprehensive Emergency Management team (2000) has not identified any areas of large flood potential adjacent to Bear Lake that are not associated with the Bear River (Palacios et al. 2007a).

In 1993 major flooding occurred from the headwaters of the Bear River in Wyoming and Idaho all the way to the Great Salt Lake in Utah. In May a large spring storm dumped 8 inches of wet snow and rain in the Bear Lake watershed. Preceded by several weeks of cool wet weather, the saturated soils around UP&L's structure between the refuge marsh and Bear Lake failed and the entire 60 foot wooden structure was washed out, dumping thousands of acre feet of water and tons of silt into Bear Lake. This event essentially drained over 80 percent of the Refuge's 13,200-acre Mud Lake and West Canal units in a 24-hour period. The water also washed away the approaches to the county bridge that provided access to North Beach State Park and the east side of Bear Lake. The original causeway channel was 60-80 feet wide. The washout moved 3,900 cubic feet per second (cfs) of water through this opening at its peak, eroding the banks severely and increasing the width of the channel to 200-300 feet (Gagstetter and Mesner 2006).

The Rainbow Inlet Canal was flowing around 2,000 cfs of Bear River runoff at this time, adding to the problem. While 3,900 cfs roared through the failed causeway, the Lifton pumping facility was running wide open, moving 5,900 cfs of water through it and into the Bear Lake. An estimated 25,000 to 30,000 acre-feet of water drained from Mud Lake and with it thousands of tons of silt washed into Bear Lake. The high rates of flow were due to the 14.2 foot gradient difference between Mud Lake (5,921.54 feet) and Bear Lake (5,907.34 feet).

Flooding impacts downstream were severe. Shoreline flooding on the Great Salt Lake caused an estimated $240 million in damages to Interstate 80, mineral industries, railway systems, sewage treatment plants, wildlife habitat, recreation areas, and public and private property (UDWR 2010).

3.3 Topography and Bathymetry

The topography of Bear Lake NWR, Thomas Fork Unit, and Oxford Slough WPA are all very similar because they are situated in relatively flat valleys shaped by the dynamics and erosive ability of various large and small water courses. Bear Lake NWR has very little noticeable difference in elevation throughout the majority of its extent, and generally slopes very gently downward from north to south. Although the Refuge units are lowland marshy areas, they are surrounded by the high, rugged mountain ranges. The eastern edge of Bear Lake NWR partially extends up the steep slope of Merkley Mountain.

The main portion of the Thomas Fork Unit is very flat, but slopes slowly upward about 20 feet at its western boundary. The Oxford Slough WPA is generally level but has a perceptible slope, higher in the northern portion of the unit and inclining downward to the south. Within these mostly flat units, variations in water depth and soil type exist to create a variety of habitats favorable to a wide range of wildlife.

3.4 Geology and Geomorphology

3.4.1 Bear River Watershed

The Bear River Watershed includes both the northwestern section of the Basin and Range Physiographic Province, and the Bear Lake and Overthrust sections of the Middle Rocky Mountain Province (MRMP). The Basin and Range Province is characterized by uplifted block-faulted mountain ranges and down-dropped basin valleys created by extensional tectonism initiated during the last 10 to 20 million years (IDDEQ 2007; USDA/NRCS 2010). In Bear Lake County, these features form a series of gently sloping terraces and alluvial fans along steep uplands and mountain slopes. The mountain ranges are roughly parallel and trend north to northwest. The Bear River Range is part of an older thrust-fault complex related to formation of the Rocky Mountains. The range has since been block-faulted as part of the Basin and Range Province (USDA/NRCS 2010). The eastern part of the county, including the Thomas Fork Unit, is in the Middle Rocky Mountains Province, characterized by low-angle thrust faults and cyclic folding. The Preuss Range and Bear Lake Plateau, to the east of Bear Lake NWR, formed in a series of north-trending anticline and syncline folds that are part of the Rocky Mountains overthrust (compressional folding and faulting) (USDA/NRCS 2010).

3.4.2 Bear Lake NWR

Bear Lake NWR, at elevation 5,925 feet, is part of the Bear Lake Basin (Valley), bordered on the west by the Bear River Range (part of the Wasatch Range), and on the east by the Bear Lake Plateau and the Merkley Mountains. Prominent features of the Bear River Range include Paris Peak (9,573 feet), Bloomington Peak (9,314 feet), and Swan Peak (9,081 feet). Alluvial fans and small flood plains soften the grade at the base of the range (BRC 1983).

Although the Bear Lake Valley lies within the Basin and Range Province, it is not a typical “basin and range” structure, but rather it is a graben (a basin formed by an elongate block of rock down-dropped between roughly parallel faults). The elongated north-south trending basin lies between two active fault systems at the boundary between the Basin and Range Province and the Colorado Plateau. The Bear Lake graben is about 5 miles long and 4.3-8.6 miles wide, and extends across the Utah-Idaho border (Palacios et al. 2007b).

The overall structure of the basin is that of an eastward-tilting half graben, controlled by a master normal fault along the east margin of Bear Lake (Colman 2006). This fault, the East Bear Lake Fault, is a high-angle normal fault with mostly vertical slip, where a mountain block moves upward relative to an adjacent downward-moving valley block. With a total vertical displacement of nearly 10,000 feet (Link and Phoenix 1996), the East Bear Lake Fault is the dominant geologic feature that created the scenery and topography of the area. The down dropped (west) side of the fault is the deep sediment-filled basin that contains Bear Lake, while the up thrown (east) side of the fault is a steep, linear mountain front of exposed bedrock. The highly fractured rock of the steep mountain front erodes and is deposited on the narrow, rocky beaches of Bear Lake's eastern shore (Utah Department of Natural Resources 2005).

Bear Lake, which is approximately 20 miles long and 8 miles wide, covers more than 112 square miles and straddles the Idaho-Utah border. It is 208 feet at its deepest point with an average depth of 94 feet. The north and south shores are natural beach bars. Beyond the bar at the north end is Dingle Marsh, whose open-water portion is called Mud Lake and is the home of the Bear Lake National Wildlife Refuge (Palacios et al. 2007b).

Figure 3.4. Panoramic aerial view of Bear Lake, looking to the northwest.
The steep face of Merkley Ridge, the upthrown east side of the East Bear Lake Fault, is visible on the east shore of the lake. The Bear River Range lies to the west of the lake. Mud Lake and the Dingle Marsh (Bear Lake NWR) lies to the north of the lake. Courtesy Dr. William Bowen, Idaho Atlas of Panoramic Aerial Images, 2006 (http://130.166.124.2/idaho_panorama_atlas/index.html).

3.4.3 The Thomas Fork Unit

Located in the Thomas Fork Valley at the border of Wyoming and Idaho, this narrow valley runs north to south and is bordered on the east by the Sublette Range (highest point is Wyoming Peak at 11,363 feet), on the north by the Gannet Hills, and on the west by Sheep Creek Hills (6,506 feet) and the Preuss Range with Meade Peak its highest point at 9,957 feet (USFS 2001).

The Thomas Fork Unit occurs in an area midway between the Middle Rocky Mountain Province (MRMP) and Basin and Range Provinces. The mountains around the valley are representative of the overthrust's folds and faults, while the valley itself is characteristic of the Basin and Range's down-thrown blocks (USFS 2001). A down-thrown block is the side of a fault that appears to have moved downward relative to the other side.

3.4.4 Oxford Slough WPA

Oxford Slough WPA lies in the Cache Valley of Idaho-Utah, at the foot of Oxford Peak (9,282 feet), immediately to the west. The northern part of the Cache Valley is surrounded by three mountain ranges. The Bear River range comprises the mountainous, eastern edge of the Cache Valley with most of its tributaries flowing west into the lower elevations of the basin within Cache Valley. The crest of this range lies about 20 miles to the east of Oxford Slough WPA. The Portneuf Mountain Range lies to the north of the Cache valley with Bear River entering Cache Valley through a narrow canyon between the Portneuf Range and the Bear River Range. The northwestern edge of the Cache Valley is bounded by the Bannock Range, which lies about 15 miles northwest of Oxford Slough. Elevations in northern Cache Valley range from 9,328 to 4,434 feet where the Bear River enters Utah. The elevation difference, slope, and southwest aspect allows the subbasin to have two runoff periods, a low valley runoff in April and May and a highland runoff in June and July (IDDEQ 2006). Oxford Creek is one of the many streams that flow into the valley to create the Oxford Slough, which acts as a natural catchment for runoff from the mountains to the west. It drains into Deep Creek, which flows south to meet the Bear River (IDDEQ 2008).

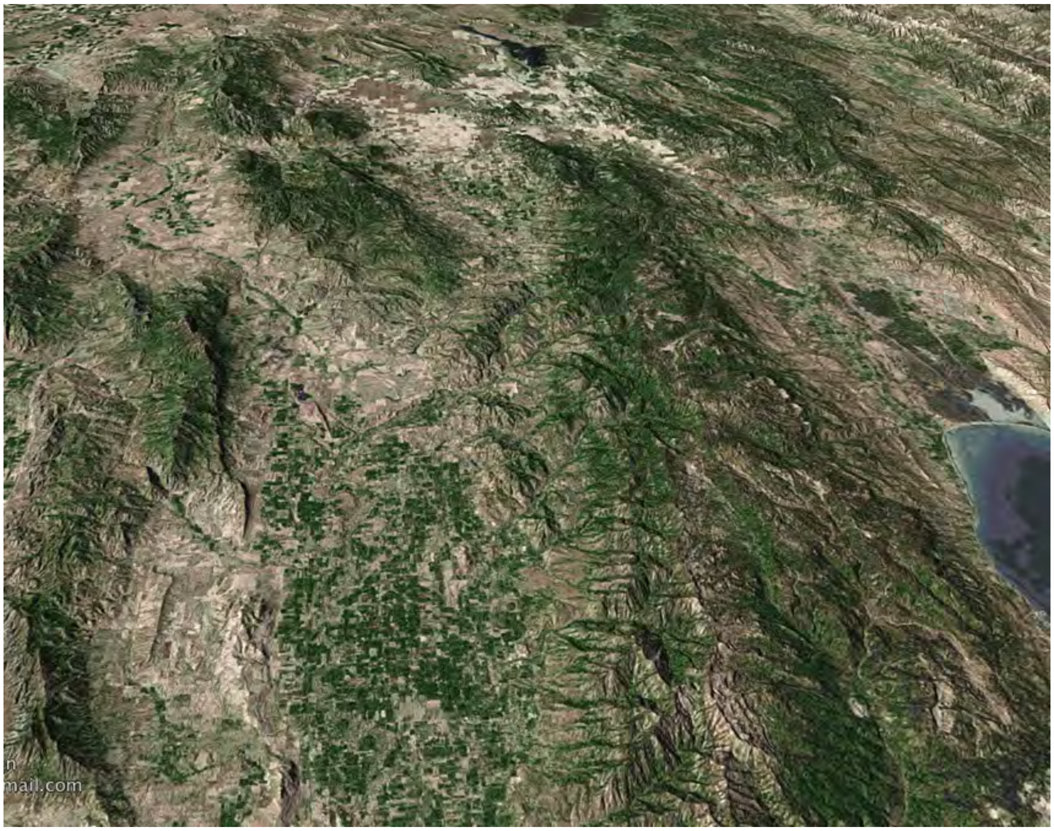


Figure 3.5. The Cache Valley of Utah-Idaho looking north. Oxford Peak, the Twin Lake Reservoir and Oxford Slough are visible in the left center of the view. The Bear River Range and Bear Lake are to the west.
Courtesy Dr. William Bowen, Idaho Atlas of Panoramic Aerial Images, 2006 (http://130.166.124.2/idaho_panorama_atlas/index.html).

Geologic History

For roughly 500 million years, during much of the Paleozoic and Mesozoic periods, the Bear Lake Basin was inundated by an inland sea. This sea would retreat and then advance, leaving limestone and sandstone deposits scattered around the valley. Marine deposits from the Permian period created the Phosphoria Formation, centered in southeast Idaho, but extending into northeastern Nevada, northern Utah, western Wyoming, and southwestern Montana. This formation contains both the thickest and richest phosphate deposits in the western United States, and production of phosphorus and its byproducts (such as fertilizer) contributes significantly to Idaho's economy. While phosphate-rich water may have originated and upwelled from deeper ocean waters, phosphate-rich sediment accumulated, was reworked and deposited as sediment in the relatively shallow waters of an embayment at the edge of the continental shelf (Digital Atlas of Idaho 2000).

This abruptly changed during the Laramide Revolution some 70 million years ago, when the land experienced violent earthquakes that buckled the surface and forced the sea bottom upward to 20,000 feet. Sea bottom limestone was now in direct contact to quartzite layers that had been formed millions of years earlier (Parson 1996 in Palacios et al. 2007b). This period created the present-day landscape of the Bear Lake Valley, with evidence of the over thrusting evident along the cliffs surrounding the basin. These forces continue to shape the land today.

Bear Lake NWR is located in the Idaho-Wyoming-Utah Overthrust belt, which extends from the Snake River Plain to near Salt Lake City and is part of the Cordilleran Foreland thrust belt that extends from Alaska to Mexico. Folding and thrusting occurred during the late Jurassic to early Cretaceous, when movement began on the Paris Thrust, the westernmost thrust plate. Compressional tectonics ended in the Cretaceous Period. Subsequently, the area underwent a period of extensional tectonics in the Miocene Epoch, during which high-angle normal faults cut across the older rocks and Mesozoic folds and thrusts. These large and extensive block fault systems formed the north-trending ranges and valleys of the Basin and Range province.

The major thrust plates in the Bear Lake area is the Paris Overthrust, containing the Bear River Range on the west of the Bear Lake Valley, and the Meade Overthrust, containing the mountains of the Preuss and Aspen Ranges to the northeast of the Bear Lake Valley (IDDEQ 2007). The Bear River Range contains Lower Paleozoic and Late Proterozoic rocks of the Paris thrust plate. The Paris thrust extends along the east side of the Bear River Range and places these older rocks over younger Paleozoic rocks of the Meade thrust plate. The Meade thrust plate contains the rich phosphate deposits of the Permian Phosphoria Formation (Digital Atlas of Idaho 2000).

Geologic History of the Bear River
Historically, the Bear River flowed to the north and was a tributary of the Snake River. About 140,000 years ago, lava flows near present-day Soda Springs, Idaho blocked the Bear River channel and diverted the river to the south into the Great Basin. Erosion of the lava dam probably allowed the Bear River to eventually drain oceanward again; however, about 35,000 years ago, another volcanic debris slide cut off this northerly route and deflected the river to the south through present day Soda Springs and into the Great Basin instead of westward toward present day Pocatello, resulting in its current almost circular route to the Great Salt Lake.

Bear River flows into the Pleistocene Lake Bonneville (which at its maximum extent covered an area 12 times the size of the Great Salt Lake) greatly increased the ancient lake and contributed to the causes of the Bonneville Flood 14,500 years ago. With the increased pressure of waters from the Bear River, failure of the natural dam at Red Rock Pass near Downey, Idaho occurred. Lake Bonneville broke free, spilling northward through the Snake River Plain at the rate of 935,000 cubic yards of water per second and almost completely emptying the lake in about 20 days. The remnant of this ancient lake is the current day Great Salt Lake in Utah (Link and Phoenix 1996).

The Bear River has, on multiple occasions, connected to the Bear Lake during high water periods. Estimates of Bear Lake water levels during the last 30,000 years indicate that the Bear River has flowed intermittently into Bear Lake. Dominant sediments in cores indicated that Bear River water flowed into Bear Lake from 30,000-17,000; from 14,000-11,000; and from 9,000-8,000 years ago (Rosenbaum 2004).

Geologic History of Bear Lake
Approximately 10 million years ago, the Bear Lake Basin was formed through the crustal extension and subsequent faulting of the area, when the East Bear Lake Fault began dropping the valley downward and tilting it eastward with respect to the Bear Lake plateau.

The age of Bear Lake itself is uncertain, but a 1975 seismic study revealed 380 m of lake sediments above bedrock along the eastern side of Bear Lake (Skeen 1975). This trend was confirmed in an acoustic survey completed by the USGS in 1997. Their radiocarbon dates indicated a sedimentation rate varying from 0.85 mm/yr on the east side to 0.215 mm/yr on the west side of the lake. At that rate, 380 meters (1,247 feet) of lake sediment means the lake is at least 455,000 years old (USGS 2001a). Using land-based deep seismic data, Evans et al. (2003) estimated that lacustrine sediments in the Bear Lake basin are approximately 3 km deep. Assuming this 3 km sediment thickness and the sedimentation rate of 0.5 meters (1.6 feet) per 1,000 years for the 2000 drill core (Colman et al., in press) near the center of the present lake, then the basin and its oldest sediments are at least 6 million years old (Colman 2006).

Unlike pluvial lakes Thatcher and Bonneville, which formed in closed basins and were therefore regulated by climatic fluctuations, the early conditions within the Bear Lake Valley remained open, with a northward drainage along the Bear River. The Bear River flowed into Bear Lake, creating beaches and other shoreline features (e.g., terraces) well above today’s lake level. The town of Garden City is just above one of these terraces, formed about 7,700-8,200 years ago (USGS 2001b). At times of high water, Bear Lake’s length increased from 30 km (about 18 miles) to 82 km (51 miles), almost all to the north. The higher lake levels have been estimated at 25 feet above today’s level (Williams et al. 1962), but USGS surveys in 1998-1999 suggested that the lake may have reached as high as 75 feet above present levels. These very high levels may have occurred early on, about 130,000-600,000 years ago (USGS 2001b).

Bear Lake expanded again 28,000 years ago, when earthquakes triggered landslides that dammed the north end of the valley near present-day Georgetown, Idaho, blocking drainage of the Bear River to the north. Water from the Bear River flooded the valley (USGS 2001a). Early conditions within the lake indicated a widespread bay and marsh ecosystem. At its maximum extent, the lake extended as far north as Pescadero, Idaho (Palacios et al. 2007b). Most of the lake was shallow with deeper water impounded at the southern end of the valley. (Although prehistoric Lake Bonneville covered much of Utah during this period, it never actually connected to Bear Lake but at times was as near as 30 miles to the west.)

Over the last 28,000 years, the major water level fluctuations in the Bear Lake Valley have been the result of downcuttings of the northern valley outlet and two periods of faulting within the southern Bear Lake Valley. Eventually the river eroded down through the landslide, allowing more and more of the lake to drain out, until only an isolated pool of water was left in the deepest basin (USGS 2001a).

The lake took its present-day configuration approximately 8,000 years ago, when faulting along the east and west shores isolated the lake from its major drainage networks (primarily the Bear River). Thereafter, the only water sources entering the lake were from springs, local runoff, and precipitation. Tectonic activity lowered the valley differently, resulting in two distinctly different wetlands: 1) marshes and shallow bays (historically the Dingle Marsh, now Bear Lake NWR) in the northern Bear Lake Valley and, 2) deep Bear Lake to the south (Robertson 1978).

The Holocene era (10,000 years ago to present) was a time of large fluctuations in water cycles in the intermountain west. Drought cycles and disconnection from Bear River waters led to low Bear Lake water levels that would have averaged 45 feet lower than historic averages. Similar hydrological regimes during this era have been documented from other regions of the west by using tree ring analysis (Rosenbaum 2004).

Geologic Hazards

The Basin and Range Physiographic Province has been undergoing active tectonic uplift since the middle Miocene Age (approximately 10 million years ago). Faults are generally located at the base of the ranges and are considered active in a geological sense. In this border area of the Basin and Range province, there are faults scattered throughout the mountain areas as well. The return period for major earthquake events is between 450 and 5,000 years for these faults. Earthquakes can vary from those not felt to a Modified Mercalli rating of VIII that would be destructive. Major earthquakes have occurred in this area during historic time, with at least 43 measurable events recorded between 1880 and 1983. This active geologic process has been responsible for the uplifting of the mountains and consequent maintenance of alluvial fan building processes in the region (USDA/NRCS 2010).

The Bear Lake basin (graben) developed from fault subsidence that continues today, slowly deepening the lake along the eastern side. McCalpin (1993, 2003) reviewed the tectonic history of the Bear Lake Basin and showed that the area is seismically active, as evidenced by displaced Holocene strata and several historical earthquakes (Colman 2006). The East Bear Lake Fault has experienced four to six episodes of normal faulting in the last 40,000 years, the most recent of which occurred about 2,500 years ago. The western margin of the graben is largely flexural, but it is also marked by normal faults (the West Bear Lake Fault zone), which experienced movement as recently as about 7,000 years ago (McCalpin 2003 in Colman 2006). The West Bear Lake Fault zone is thought to be the source of the November 10, 1884, magnitude 6.3 Bear Lake earthquake (with a Modified Mercalli rating of VII), which resulted in considerable damage to structures (Evans et al. 2003 in Colman 2006; USDA/NRCS 2010).

The faults around the lake are still active, but large magnitude earthquakes are relatively infrequent. Three quakes of magnitude 7+ on the eastern fault and 2 on the western fault have shifted the valley floor by as much as 18.4 feet in the last 6,500 years (USGS 2001a). The most recent earthquake of that size was about 2,000 years ago (Palacios et al. 2007b). A severe earthquake along the Bear Lake fault would almost certainly trigger landslides in the area. Most of the resulting slides and slumps would occur in unconsolidated material along the east shore of the lake. Additionally, long periods of shaking caused during earthquake episodes create ground cracking and movement along the established fault lines (Kaliser 1972 in Palacios et al. 2007b).

Both consolidated and unconsolidated materials are frequently subject to failure and slippage on slopes. Clear evidence indicates that slides occurred in the past in the Bear Lake area and that today there is not complete stability. Old slides around the periphery of the lake are responsible for damming the outlet of Bear River and for the rising of the Bear Lake level (Williams 1962 in Palacios et al. 2007b). The west side of the lake gives evidence to having slid in several places leaving areas of exposed fracturing. The bedrock formations in the area are either inherently weak or have been weakened through subsequent earth movements and pressures. The same is true on the talus slopes along the east shore of the lake. Cobbles and boulders at the road’s edge, along with dead trees on the slope, indicate recent rock movement (Kaliser 1972 in Palacios et al. 2007b). Seiche waves generated by landslides or an earthquake in the North and South Eden deltas could potentially submerge, with destructive force, the opposite slopes (Kaliser 1972 in Palacios et al. 2007b).

3.5 Soils

The valley bottoms on the Bear Lake, Thomas Fork, and Oxford Slough areas are comprised of nearly level to gently sloping flood plains and stream terraces that formed in recent alluvial material. Bear Lake Valley is a broad alluvial and lacustrine (lake) basin filled with fine- to coarse-grained lake and river deposits. The valley sides are comprised of gently sloping to moderately sloping fan remnants. The upper fans and lower slopes are covered with Tertiary Age volcanic tuff, sedimentary sandstone, limestone, siltstone, and conglomerate. These features grade into steep and very steep hills and/or mountains (USDA/NRCS 2010). Percentages of soil types on refuge units are from the NRCS Web Soil Survey (USDA/NRCS 2011).

3.5.1 Bear Lake NWR

The following soil types cover more than 99 percent of Bear Lake NWR:

- Dinswamp mucky peat, 0 to 2 percent slopes, found in marshes, 31.5 percent of unit
- Bloomington mucky silt loam, 0 to 2 percent slopes, found in lakebeds, 20.3 percent of unit
- Water, 17.7 percent of unit
- Bear Lake-Bear Lake complex, ponded, 0 to 1 percent slopes, found in floodplains, 15.6 percent of unit
- Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes, found in floodplains, 9.5 percent of unit
- Dingle muck, 0 to 2 percent slopes, found in marshes, 4.5 percent of unit

The Dinswamp, Bloomington, and Dingle soil types are nearly level, very poorly drained, very deep soils formed in organic matter over silty alluvium, found on marshes and lakebeds. With high water tables, the major use of all three soil types is for wildlife habitat. As noted above (page 21), groundwater movement from adjacent mountain ranges historically created a variety of perennial and ephemeral habitats around the marsh fringe where heavy, impenetrable clays rise near the surface. Water is pushed up at these points, creating relatively stable wetlands. During spring runoff, these wetlands would have been flooded, and the heavy clay bottom would have retained this water within depressions. Groundwater movement would have maintained the wetlands through high evaporative periods in summer.

Dingle Series
Dingle series soils are very poorly drained; runoff is slow or very slow; and permeability is moderately slow. These soils have a water table two feet above the surface (ponded) to 0.5 feet below the surface at some time from October to July. Ponding is frequent or occasional for brief to very long periods. These soils are used mainly for wildlife habitat. Vegetation is bulrush, sedges, and cattails (National Cooperative Soil Survey 2008). Dinswamp soils and Dingle muck are found in marshes and composed of herbaceous organic material over mixed silty lacustrine deposits. The typical profile of Dinswamp soil is mucky peat to a depth of 12 inches, silty clay loam to 40 inches, and fine sandy loam from 40 to 60 inches (page 26). The profile of Dingle muck is muck to 23 inches, and silt loam from 23 to 60 inches.

Bear Lake Series

The Bear Lake series consists of very deep, poorly to very poorly drained soils on low terraces and bottomlands. They formed in alluvium from lake sediments. Permeability is moderately slow to slow. They are poorly to very poorly drained; slow or very slow runoff; moderately slow or slow permeability; with frequent, occasional, or rare flooding for brief periods January through June. They are used mainly for hayland or meadow pasture. Vegetation is mainly sedges, rushes, cattails, alkali cordgrass, inland saltgrass, alkali bluegrass (National Cooperative Soil Survey 2008). Within the Bear Lake-Bear Lake complex, ponded soil type, Bear Lake ponded soils have a parent material of mixed silty and clayey alluvium and are poorly drained. The seasonal high water table minimum depth ranges from soil surface to 10 inches. The typical soil profile is silty clay loam to a depth of 63 inches. Marshes occur on Bear Lake ponded soils. Bear Lake soils have a parent material of mixed silty and clayey alluvium. They are poorly drained. The seasonal high water table minimum depth is about 10 to 18 inches. The typical soil profile is slightly decomposed plant material to 2 inches, and silty clay loam from 2 to 63 inches (USDA/NRCS 2010).

Bear Lake-Chesbrook-La Roco complex

The Bear Lake series is described above. The Chesbrook series consists of very deep, poorly drained soils formed in silty alluvium on flood plains, stream terraces or lake terraces. They are poorly drained, with slow runoff and moderately slow permeability. Occasional or rare flooding occurs for brief periods April through June. Chesbrook soils are used for non-irrigated and irrigated pasture. The potential natural vegetation is sedges and reeds (National Cooperative Soil Survey 2008). Chesbrook soils have a parent material of mixed silty alluvium, and are poorly drained, with a seasonal high water table minimum depth is about 8 to 25 inches. The typical profile is slightly decomposed plant material 0 to 2 inches; and silt loam, 2 to 62 inches (USDA/NRCS 2010).

The La Roco series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium. La Roco soils are on flood plains and flood plain steps and have slopes of 0 to 2 percent. Permeability is moderate. They are somewhat poorly drained, with negligible to low runoff and moderate permeability. They are frequently flooded for short durations during April through May in most years, and at other times following periods of intense rainfall. They are mainly used for cropland, pastureland and hayland. The potential natural vegetation is mainly saltgrass, bluegrasses, cheatgrasses, and in places rabbitbrush, shrubby cinquefoil, bluebunch wheatgrass, western wheatgrass, sedges, rushes, giant wildrye, alkali cordgrass, willow, basin big sagebrush, threetip sagebrush, and/or forbs (National Cooperative Soil Survey 2008). They have a parent material of mixed alluvium over sandy and gravelly alluvium, and are somewhat poorly drained. Dry meadows are typically found on this soil type. The typical soil profile is silty clay loam, 0 to 20 inches; silt loam, 20 to 42 inches; fine sandy loam, 42 to 49 inches; very fine sandy loam, 49 to 59 inches; and extremely gravelly loamy sand, 59 to 62 inches (USDA/NRCS 2010).

Bloomington Series

The Bloomington series consists of very deep, very poorly drained soils formed in lacustrine sediments. These soils are found on lakebeds and are comprised of lacustrine deposits. They are very poorly drained; runoff is slow or very slow; permeability is moderately slow. These soils have a water table one foot above the surface (ponded) to 10 inches below the surface at some time from October to July. Ponding is frequent to occasional for brief to very long periods. The primary use is for wildlife habitat. Vegetation is Baltic rush, bluejoint reedgrass, and sedges (National Cooperative Soil Survey 2008). The typical soil profile of Bloomington mucky silt loam is muck and mucky silt loam to 10 inches, silty clay loam from 10 to 48 inches, and silt loam from 48 to 60 inches (NRCS/USDA 2010).

Other soil types are found on 1 percent or less of the Refuge. Soils found on steeper slopes on the east side of the Refuge include Cedarhill gravelly silt loam, dry, 10 to 40 percent slopes, 1.0 percent of unit; Buist gravelly silt loam, 4 to 12 percent slopes, 0.3 percent of unit; Mumford-Sprollow complex, dry, 50 to 75 percent slopes, 0.1 percent of unit; and Wursten silt loam, dry, 4 to 12 percent slopes, 0.1 percent of unit.

Thomas Fork Unit

The following soil types cover more than 97 percent of the Thomas Fork Unit:

- Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes, 51.1 percent
- Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes, 24.2 percent of unit
- Lago-Bear Lake complex, 0 to 1 percent slopes, 21.9 percent of unit

Bear Lake and Lago soils are nearly level, somewhat poorly to very poorly drained, very deep soils formed in mixed silty alluvium; on flood plains (Bear Lake) and low stream terraces (Lago). Their major uses are for pastureland, hayland, irrigated grain, and wetland wildlife habitat.

The Lago series consists of very deep, somewhat poorly drained soils formed in silty alluvium. They occur on flood plains, drainageways, and floodplain steps. Runoff is slow and permeability is moderately slow. Lago soils are rarely to occasionally flooded for brief periods from April through June in most years, and at other times following periods of intense rainfall. Lago soils are used for non-irrigated cropland and rangeland. Typical crops consist of grass hay. The current vegetation is annual bluegrass and clovers (National Cooperative Soil Survey 2008). The typical Lago soil profile is silt loam to 19 inches, silty clay loam from 19 to 38 inches, silt loam from 38 to55 inches, and fine sandy loam from 55 to 60 inches. The Bear Lake soil profile is slightly decomposed plant material from 0 to2 inches and silty clay loam from 2 to 63 inches. Typical plant associations on this soil type are wet and dry meadows. Characteristics of the other major soil types are described under Bear Lake NWR above (NRCS/USDA 2010).

Small amounts of Merkley silt loam (1.4 percent of unit); Ovidcreek silt loam (0.6 percent of unit); Bezzant gravelly silt loam (0.3 percent of unit); and Lago silt loam (0.5 percent of unit) also occur on the unit.

Oxford Slough WPA

The following soil types cover approximately 99 percent the Oxford Slough WPA:

- Bear Lake-Downata complex, 0 to 1 percent slopes, 41.5 percent of unit
- Bear Lake-Downata-Thatcherflats complex, 0 to 1 percent slopes, 25.5 percent of unit
- Picabo-Thatcherflats complex, 0 to 1 percent slopes, 22.9 percent of unit
- Oxford-Banida complex, 4 to 12 percent slopes, 4.8 percent of unit
- Oxford-Banida complex, 2 to 4 percent slopes, 4.1 percent of unit

Soil descriptions below are from the National Cooperative Soil Survey (2008). The Bear Lake series is described above. The Downata series consists of very deep, poorly and very poorly drained soils that formed in silty alluvium derived from mixed sources. Permeability is moderately slow. These soils are on flood plains and low stream terraces and have slopes of 0 to 1 percent. They are poorly to very poorly drained; runoff is very slow to ponded; permeability is moderately slow. These soils are frequently flooded and/or ponded from January through June for brief periods of three to five days. They are used mainly for meadow hay and pasture. Most Downata soils have been drained so that hay can be harvested. Potential natural vegetation is grasses, sedges, and rushes.

The Thatcherflats series consists of very deep, moderately well drained soils formed in silty alluvium on stream terraces. Slopes range from 0 to 2 percent. Permeability is slow. They are moderately well drained, with slow runoff and slow permeability. Rarely, flooding for brief periods (March through July) occurs. Thatcherflats soils are used for nonirrigated and irrigated pasture. The potential natural vegetation is greasewood and other vegetation adapted to saline soils.

The Picabo series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium. Picabo soils are on stream terraces and flood plains and have slopes of 0 to 2 percent. They are somewhat poorly drained and moderately permeable. The water table is at 2 to 4 feet from October to May. They are mainly used for cropland and pastureland. Natural vegetation includes shrubby cinquefoil, wildrose, redtop, saltgrass, and sedges.

The Oxford series consists of very deep, moderately well drained soils that formed in lacustrine deposits and alluvium derived from mixed sources. Oxford soils are on dissected lake terraces. They are moderately well drained, with medium to very high surface runoff and very slow permeability (low or moderately low saturated hydraulic conductivity). Oxford soils are used dominantly for dryland cropping. Natural vegetation is assumed to have been basin big sagebrush, bluebunch wheatgrass, and sod-forming grasses.

Small amounts of Parleys silt loam, 0 to 4 percent slopes (0.3 percent of unit) and Yeates Hollow-Manila-Softback complex, 12 to 40 percent slopes (0.9 percent of unit) also occur on the WPA.

3.6 Fire

The fire season for the State of Idaho runs from May 15 to October 20. However, the season may vary according to local conditions and fire is possible as early as late February. Generally, spring moisture reduces the fire potential early in the season. Fall rains, followed by snowfall in November, end the fire season.

The Bear Lake Valley experiences infrequent wild land fires due to its high elevation, cool temperatures, high relative humidity, and abundance of water and wetlands. The valley floor is a fairly benign fire environment with flat topography and fuel types of primary Type III bulrush emergents and short grass wet meadows (hayed) Type I (see section on fire models below). There are small areas of grassland shrub fuel types as well. Fires are caused by human activity and by spring and summer thunderstorms. Most of these are small and quickly burn themselves out in the wetland vegetation. Especially during drought years, fires in surrounding foothills (grassland, sage-steppe, and forests) off-refuge can be significant at times (August-September), requiring considerable resources to control.

We assume that the historic role of fire on Oxford Slough WPA is very similar to the Bear Lake area except that the elevation of the Preston/Oxford area is some 1,300 feet lower, with drier conditions during the summer months. Historically, and continuing to the present day, farmers and ranchers have periodically burned some of the emergent sloughs and ditches during the spring to improve water movement to their lands. Summer lightning strikes and human caused fires (e.g., fires along the

Union Pacific Railroad right-of-way on the east side of Oxford Slough WPA) occurs infrequently, but can result in significant grassland and shrub fires (100-1,000 acres in size) in and around Oxford Slough WPA.

3.6.1 Pre-settlement fire history

Houston (1973 as cited in Wright and Bailey 1982) stated that fire return intervals in mountain big sage brush (as found at Grays Lake, Bear Lake and Oxford Slough) in Yellowstone National Park was 20 to 25 years. Since these refuges are lower in elevation than the Park, the fire return interval was probably a little shorter, somewhere between two to 25 years.

3.6.2 Post-settlement fire history

Not much is known about fire history at Bear Lake NWR prior to refuge establishment, except that ranchers settling in the valley during the late 1860s used spring burns through marsh and grassland vegetation to improve forage for their livestock. At times, fall fires set by ranchers created problems by igniting peat areas in the wetlands and burning meadows and stacked hay.

The fire history of Bear Lake NWR between 1971and 2001 was one of infrequent wild land fires. Most of these were human caused or lightning caused. Spring thunderstorms sometimes will ignite small marsh fires within the Refuge in dead emergent vegetation prior to June green regrowth. These fires are small in size (<200 acres) and quickly burn themselves out against water channels or green vegetation. Fires number from none in wet years to three to four in drier years, particularly during springs with more thunder cell activity.

Wild land fires in mid- to late-summer can grow quickly in the steep, brushy terrain of the Merkley Ridge area along the southeast side of the Refuge. With a wind, fires can move quickly off-refuge on to BLM, State, or private range lands, sweeping to the top of Merkley Ridge. The area has burned several times in the past at various locations along the county road. There have been approximately six to eight eastside fires over the past 15 years. During drought years there have been two to three of these types of fires along the East County Road. Many of these fires appear to have been human caused (both deliberately set along the county road, and accidental, caused by a careless smoker), while some were started by lightning. Most were well under 2,000 acres in size overall, and refuge lands burned was less than 200 acres.

3.6.3 Prescribed fire history

The typical valley fire season is considered to be May 15 through October. Prior to 1990 little planned burning was done. Between 1988 and 1990 several small controlled burns were initiated in bulrush strands by the Complex Biologist. These burns were conducted in order to gather data from fire effects on invertebrate populations and on water chemistry. A total of nine burns were conducted and none was larger than ¼ acre.

Since 1992, the Refuge has had a fairly active, but small prescribed burning program. Approximately 16 prescribed burns have been completed since 1992. Approximately 6-8 percent of the Refuge’s emergent habitat is burned each year in early March or October, while the marsh water levels are lower and the dead bulrush more exposed. During this time marsh burning is relatively easy with snow and ice on meadows and channels acting as the control points. The burn effort usually involves a total burn acreage of 20-2,140 acres depending on the year. Burn areas are carefully selected with the objective of burning expansive dense bulrush areas of the marsh in a patchwork of un-burned emergent stands intermixed with burned areas that are immediately flooded with 1-2 feet of water. This creates an excellent interspersion of open water and nesting bulrush for waterfowl and other marsh wildlife to use. This condition lasts through two growing seasons. The marsh burns are rotated to new areas of the marsh needing treatment each year.

Two prescribed burns have been conducted at Oxford Slough WPA by the FWS since its purchase in 1985, a 55-acre burn in April 2003 and a 67-acre burn in April 2004. The 2003 burn was conducted to control weeds and increase grass vigor, while the 2004 burn was intended to remove residual vegetation in dense bulrush areas.

Bear Lake NWR fuel models and fire risk

Fuel Models 1 and 3 are those represented on Bear Lake NWR (about 20 percent and 80 percent, respectively). If a fire were to burn off an area of the marsh during a dry period, the peat layers of the marsh could burn for a long period of time or until the water table rises.

Table 3.2. Fuel Model Composition Bear Lake NWR

Fuel Model	Percentage
Fuel Model 1 Drier Grasslands and Hayed Wet Meadow	15%
Fuel Model 3 Emergent Vegetation and Un-hayed Wet Meadow	65%
Fuel Model 5 Grassland and Shrub	3%
Open Water	17%

(Fuel Model descriptions are taken from Anderson 1982)

The refuge terrain is flat with the exception of the refuge lands that extend 0.25 mile up the steep slopes of Merkley Ridge along the East County Road. Wild land fire in the Refuge’s heavy bulrush stands with a strong wind can become very large fires that quickly move across the marsh. The marshes numerous open water areas and two large canals create fire control points that limit fire movement.

The wet meadow and grassland areas of the Refuge vary between Type 1 and 3 fuels on flat terrain. Many of these wet meadows are hayed and/or grazed to short grass stubble by August. The drier un-hayed grasslands along the northwest part of the Refuge have heavy fuels, which have the potential for significant wild land fire activity. Roads and private grazed lands adjacent to these areas may limit fire movement on or off-refuge.

A large percentage of the habitat at Bear Lake NWR consists of heavy emergent (primarily bulrush) residual cover in the large marsh. This type 3 fuel model burns easily during the early spring (prior to green up) and fall periods (after frosts kill the stems). The main marsh area of the Refuge is some 14,000 acres in size with 3,000 acres of this being open water. The bordering wet meadows areas around the edge of the marsh total around 2,500 acres in size and would be classed as Type 1 fuel in a hayed condition and Type 3 fuel in an un-hayed condition. The wet meadows consist of *Juncus* spp., *Carex* spp., and a variety of water tolerant grasses. The Refuge also has some drier habitats of grasslands (1,300 acres, Type 1 fuel) and shrub/grassland mixes (300 acres, Type 5 fuel). The drier grass species include: saltgrass, alkali sacaton, several species of wheatgrass, and basin wildrye. Some of this shrub (sagebrush, greasewood) and grassland habitat is located on the steep slopes of Merkley Ridge on the east side of the Refuge.

Oxford Slough WPA fuel models and fire risk

Oxford Slough WPA's main marsh area is some 710 acres size and is primarily bulrush emergents, with some cattail (a Type 3 fuel model). The WPA has expansive drier type grasslands with some wetlands along its east and southwest regions that are more alkali in nature (saltgrass, alkali sacaton, small alkali playas and some taller type grasses). Within this 830 acre area are also scattered patches of greasewood and sagebrush patches. These grasslands are primarily Fuel Type 1, grading into Type 3-5 in some areas of brush and grass. The north end of Oxford Slough WPA is dominated by hilly cropland area, 80 acres of DNC planting and irrigated crops along the northwest area of the WPA. Croplands total 180 acres. The west side vegetation consists of wet meadow grasslands, some brush, areas of reed canary grass, *Juncus* spp., and other water tolerant grasses. Much of this area is hayed each year providing a mix of short and taller cover types.

Table 3.3. Fuel Model Composition for Oxford Slough WPA

Fuel Model	Percentage
Fuel Model 1 alkali grasslands:	44%
Fuel Model 1 hayed wet meadow:	9%
Fuel Model 3 wetland emergents:	38%
Cropland:	9%

The WPA marsh does not have significant amounts of open water control areas and should lightning strike the main marsh area in late summer most of the slough would burn off. The Union Pacific railroad has a track that runs from north-south along the east boundary of the WPA and train activity has caused wild land fires in the past that have moved onto the WPA and burned several hundred acres of grasslands on the east side. These types of fires are infrequent. The wet meadow areas along the west side are hayed annually under a cooperative farming agreement. The small town of Oxford lies is adjacent to the WPA and is considered to be a critical control area to prevent any wild land fire movement close to Oxford's scattered residences and meadow lots. Most of this area is hayed to short stubble in July which would reduce flame lengths and rate of spread.

3.7 Environmental Contaminants

3.7.1 Bear Lake NWR

Burch et al. (2004) conducted a study at Bear Lake NWR to ascertain if contaminants from agricultural and mining activities in the area might be impacting the habitat and wildlife on the Refuge. Three inactive phosphate mine sites were identified that might affect the Refuge: Bloomington Canyon Mine, Paris Canyon Mine, and the Hot Springs Mine. Organochlorine concentrations in sediment, plants, fish, and bird eggs were not found at levels harmful to aquatic resources. No organochlorine compounds (OC) were detected in sediment or plant samples, two OCs were detected at low concentrations in fish tissues, and four OCs were detected at low concentrations in eggs. Inorganic concentrations were analyzed in sediment, water, invertebrates, fish, and bird eggs. As with OCs, bird egg tissue had low levels. However, arsenic, cadmium, chromium, copper, manganese, and strontium, were elevated in sediments and exceeded guidelines and/or effects thresholds. Concentrations of lead in invertebrates sampled from Paris Creek were within the range known to cause dietary effects to fish, and zinc levels in fish tissue were well above what is considered to be background levels and exceeded concentrations reported to cause effects in birds (Burch et al. 2004).

The Hot Springs Mine is a historic phosphate mine that is currently owned by Rhodia, Inc., and is located east of the Refuge near the Bear Lake Hot Springs. The original property consisted of 12 patented lode claims, four unpatented lode claims, and one unpatented mill site. There are two locations of adits and tunnels that occur within the mined area. The location of concern is the North Lake Area, which lies on Federal Lands. The North Lake Area consists of one adit (the North Lake Tunnel) located on the west face of Merkley Mountain, and lies approximately 65 feet up the face of the mountain. A waste rock spoil pile lies between the adit and Bear Lake County Road. The adit was partially filled in by Rhodia in 2003. At the east end of the adit, there is a 1,200 foot vertical shaft that rises to the surface of the east side of the mountain.

Burch et al. (2004) found that contaminants from the Hot Springs Mine continued to migrate into Mud Lake. The Service met with personnel from Idaho Department of Environmental Quality, Rhodia, Inc., and the Bureau of Land Management to discuss reclamation options. The Hot Springs Mine Reclamation Plan was completed in September 2004, and the associated reclamation construction was conducted in the fall of 2005. Post reclamation monitoring was not conducted in 2006 because the fall seeding of the waste rock dump covers didn’t allow for vegetation growth until the 2006 season (MWH 2010).

The Reclamation Plan states that environmental monitoring will be performed once a year for five years, initiating the first year after the implementation of the alternative. The first year of post reclamation monitoring occurred in 2007, the second year of monitoring was conducted July 17, 2008, and the third was conducted May 28, 2009. The fourth round of sampling was conducted on May 14, 2010 (MWH 2010). The fifth year of monitoring occurred in the summer of 2011, but results have not been received to date.

Over the last four sampling events, surface water has never exceeded either the preliminary risk-based benchmark (PRBB) or the background level for selenium in water (MWH 2010). However, sediment sample results for the last four years have been inconsistent. In 2007, one of the two sediment samples had a detectable level of selenium at 2.9 mg/kg, which is above the current background and preliminary risk-based benchmark level of 2.6 mg/kg dw. However, the other sample collected in 2007 was below these benchmarks at 1.4 mg/kg dw. In 2008, no sediment sample exceeded the PRBB or the background levels for selenium. In 2009, one sample exceeded these selenium benchmarks at 7.1 mg/kg dw. However, the other sample had a selenium level of 1.2 mg/kg. This year neither of the two sediment samples exceeded the sediment benchmarks. The area where sediment samples are collected is immediately down gradient of the North Lake Area reclamation and adjacent to Mud Lake. The main road is located between Mud Lake and the North Lake Area reclaimed mine dump and serves to block any overland flow of water/sediments into the lake. There is no evidence of surface erosion on the reclaimed area and the windblown component of tailings transport has been eliminated by the vegetative cap (MWH 2010).

Based on the 2010 vegetation data at the North Lake Area, the 95 percent upper confidence limit of the mean for selenium in vegetation is 17 mg/kg, which is above background (3.0 mg/kg) and the preliminary risk-based benchmark (5 mg/kg). In the past the North Lake Area has shown little or no selenium in vegetation. In 2010 however, levels of selenium in vegetation in the North Lake Area are elevated in three of the five samples (MWH 2010).

3.8 Air Quality

The Idaho Department of Environmental Quality (IDDEQ) monitors air and water quality at several locations around the State. Landowners burn irrigation ditches to reduce vegetation that can block water flows; sometimes they burn crop residue; and they regularly burn rubbish piles. Both Bear Lake and Franklin Counties are subject to temperature inversions when air movement is restricted, so poor air quality can be exacerbated at these times. Wildfires can also impact air quality, especially if they occur during an inversion. Due to the rural nature of the area, there are many unpaved roads and fields that might be laying fallow. High winds can blow dust and dirt from these areas, negatively impacting air quality (IDDEQ 2007).

IDDEQ records for annual emissions of particulates measured in tons per year (TPY) in Bear Lake County are as follows: oxides of sulfur: 34 TPY; oxides of nitrogen: 2,103 TPY; ammonia: 361 TPY; volatile organic compounds: 2,380 TPY; and particulate matter with an aerodynamic diameter of 2.5 micrometers or less: 359 TPY.

Oxford Slough WPA is located in Franklin County, which is in the Idaho portion of the Cache Valley. The Utah portion of the Cache Valley contains the city of Logan. The Cache Valley has violated the 24-hour particulate matter standards. IDDEQ has air quality monitors in both Franklin and Preston, ID, that show the air in the Cache Valley being reasonably consistent throughout. Therefore IDDEQ believes that as data are collected, the Franklin and Preston monitors will also show a violation of the particulate matter standards. For Franklin County, these data are as follows: oxides of sulphur: 57 TPY; oxides of nitrogen: 851 TPY; ammonia; 1,221 TPY; volatile organic compounds: 2,290 TPY; and particulate matter: 447 TPY (IDDEQ 2007).

3.9 Water Quality

3.9.1 Bear River

Since 2006, the main stem Bear River has been monitored quarterly at 21 locations as part of a collaborative Tri-State monitoring agreement amongst Utah, Wyoming, and Idaho (IDDEQ 2011). IDDEQ has divided the Idaho portion of the Bear River Watershed into Management Reaches and Receiving Water Reaches (IDDEQ 2006).

Management Reach 1 extends from the Idaho-Wyoming state line to the Causeway at Bear Lake. This Reach is designated as water quality limited for flow, nutrients, and sediment. Coldwater aquatic life and salmonid spawning are beneficial uses being affected by water quality. Pollutant sources include background loads received from Wyoming. Sheep Creek and Thomas Fork feed into this stretch of the reach (see Thomas Fork Unit, below). The Bear River is diverted at Stewart Dam into Bear Lake NWR's marsh and into Bear Lake proper through a causeway. Total phosphorus (TP) and total suspended solids (TSS) data at the state line station reveal that the river has exceeded the TP target 30 percent of the time and the TSS target 33 percent of the time. An increase in TP loading occurs up to Stewart Dam, however, for the entire reach TP decreased due to the filtering action of the wetland vegetation in Bear Lake NWR's marsh. During low basin runoff the excess load of TP is 22 kilograms per day; and during upper basin runoff the excess is 51 kg/day (IDDEQ 2006).

Management Reach 2 begins at the Bear Lake NWR outlet to Alexander Reservoir. Nine tributaries enter this Management Reach and contribute 5-25 percent of the load gain; the rest is from nonpoint sources. Total phosphorus exceeds targets in this reach during all hydrologic periods. Base winter flows were 21 kilograms of TP per day, and upper basin runoff was 319 kilograms of TP per day. For TSS the excess was 2,300 kg/day during upper basin runoff and 27,900 kg/day for summer base flow (IDDEQ 2006). Management Reach 3 goes from Alexander Reservoir to the Oneida Narrows. None of the Service's units covered under this CCP occur in this Management Reach (IDDEQ 2006).

Management Reach 4 extends from the Oneida Reservoir to the Idaho-Utah state line. This reach is on the §303(d) list for flow, nutrients, and sediment. The beneficial uses affected by too much sediment are salmonid spawning and cold-water aquatic life. Livestock grazing, agriculture, and urban activities could be sources of pollutants. Extreme stream bank erosion can contribute an overabundance of sediment. Tributaries to this reach frequently exceeded phosphorus targets contributing up to 75 percent during high runoff and from 6-30 percent during the rest of the hydrologic periods. The upper basin runoff hydrologic period resulted in 62 kilograms of TP per day. The lower basin runoff resulted in TP of 272 kg/day. Base flow exceedance was 80 kg/day of TP (IDDEQ 2006).

3.9.2 Bear Lake and Bear Lake NWR

The Idaho Department of Environmental Quality classifies Bear Lake as a Receiving Water Reach. It is not on the §303(d) list. The water quality flowing out of the Causeway and into Bear Lake exceeded targets for TP in two out of four hydrologic periods. These periods occur when Bear River water is filling Bear Lake and are a major phosphorus source. Upper basin runoff produces 51 kg TP/day and lower basin runoff is 22 kg TP/day. In the summer and winter base flow periods, no excess phosphorus enters Bear Lake. The total suspended solids mass does not exceed the TMDL (total maximum daily load) limits established at the Causeway station (IDDEQ 2006).

Bear Lake NWR's marsh is located immediately upstream from the Causeway station and removes up to 70 percent of the TSS and TP prior to reaching this station and entering Bear Lake. However, Bear Lake NWR's marsh is a source of sediment and phosphorus when water is sent downstream out of Bear Lake back to the Bear River. This results in an excess mass of 219 kg TP/day and 27,900 kg TSS/day at the Receiving Water Reach of Management Reach 2, Alexander Reservoir (IDDEQ 2006).

Water Quality

The following analysis of water quality in Bear Lake is from Palacios et al. 2007(a):

The completion of the pumping station inevitably modified Bear Lake's physical and chemical characteristics. The water quality discussed in this section is based on conditions as they have existed since the pumping station began operating in 1918. The water flowing into Bear Lake from both its Utah and Idaho tributaries were in compliance with state mandates for designated uses during their last review (USEPA 2002). The waters within Bear Lake are also in compliance with the State of Utah beneficial use designation. Designations for these waters are for primary contact recreation, secondary recreation contact, coldwater fish and aquatic life, and for irrigation and stock watering (Utah Division of Administrative Rules 2006). Water chemistry according to Judd (1997) and recognized by the Utah Division of Water Quality is outlined in Table 3.4. The measurements are annual averages for the given years.

Table 3.4. Water quality data for Bear Lake in years 1993 and 1995 as determined in Utah's Lakes and Reservoirs Classification and Inventory (Judd 1997).

Water Quality Data				
Parameter	**1993 Surface Column**		**1995 Surface Column**	
Transparency (feet)	15.4		14.8	
Total Phosphorus (ug/L)	20.0	18.0	5.0	6.0
Total Suspended Solids (mg/L)	1.7		2.0	
Total Hardiness (mg/L)		289.0	294.0	
Total Alkalinity (mg/L)		247.0	241.0	
Ammonia (mg/L)		.03		.03
Nitrate/Nitrite (mg/L)		.02		.01

The Clean Lakes Program, established in 1972 as section 314 of the Federal Water Pollution Control Act, sampled Bear Lake in 1982 to set a baseline assessment for future inventory and classification. Monitoring stations are available at the North Beach Idaho State Park and by Garden City for ongoing data sampling. These original studies determined that phosphorus, potassium, and nitrogen, although sparse in the shallow water, are adequate enough in the deep-water to support varied plant growth.

Specific studies designed to determine which nutrient limits growth of algae indicated that phosphorus and/or nitrogen almost always were the limiting factors. Sigler (1972) found nitrogen to be limiting more than half the time, whereas Birdsey Jr. (1989) suggests that phosphorus limited algal growth more often. In 2004, however, the Ecosystems Research Institute conducted a water chemistry analysis that showed relatively low levels of nitrogen and phosphorous throughout the year. Figures 3.6 and 3.7 on the following pages illustrate this trend.

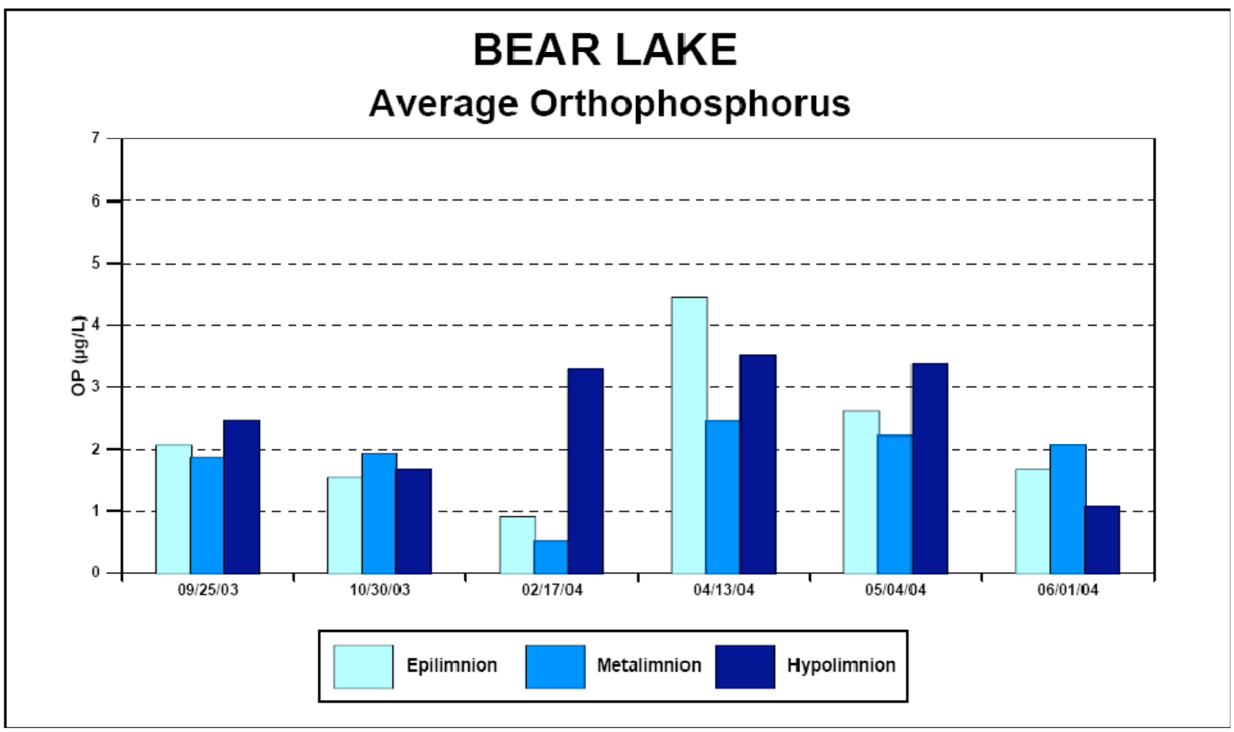


Figure 3.6. Phosphorus concentrations for Bear Lake 2003-2004.
Epilimnion= shallow water, metalimnion=mid water and hypolimnion= deep water. Orthophosphorus is phosphorus that is usable by biological organisms (Ecosystems Research Institute 2005).

Nitrogen to phosphorus ratios indicated that the lake is likely to be phosphorous limited. The Ecosystem Research Center further determined there is significant nutrient loading by Bear River water as it enters the Lake through the Marsh. Smoak and Swarzenki (2004) claim that despite increased nutrient loading since the diversion of Bear River waters, chemistry does not appear to have changed significantly likely due to binding of nutrients to calcium in the water column and subsequent precipitation to and storage in sediment. The amount of biologically available nutrients is not associated with increased input of total nutrients.

The Ecosystems Research Institute (2005) produced a data summary, a report listing the Total Mass Daily Load (TMDL), and a report of the water quality for the Bear River drainage in Idaho. An excerpt from that report describes the conditions of concern for Bear River waters as they enter into Bear Lake proper:

“[T]he outflowing water quality at the Causeway station exceeds the TMDL criteria for total phosphorus in two of the four hydrologic periods. Because these periods occur during the filling cycle for the lake, these exceedances represent a significant source of phosphorus to Bear Lake. The largest exceedance occurs during upper basin runoff (51 kg TP/day) followed by lower basin runoff (22 kg TP/day). In the summer and winter base flow periods, no excess phosphorus enters Bear Lake. The total suspended solids mass does not exceed the TMDL limits established at the Causeway station.”

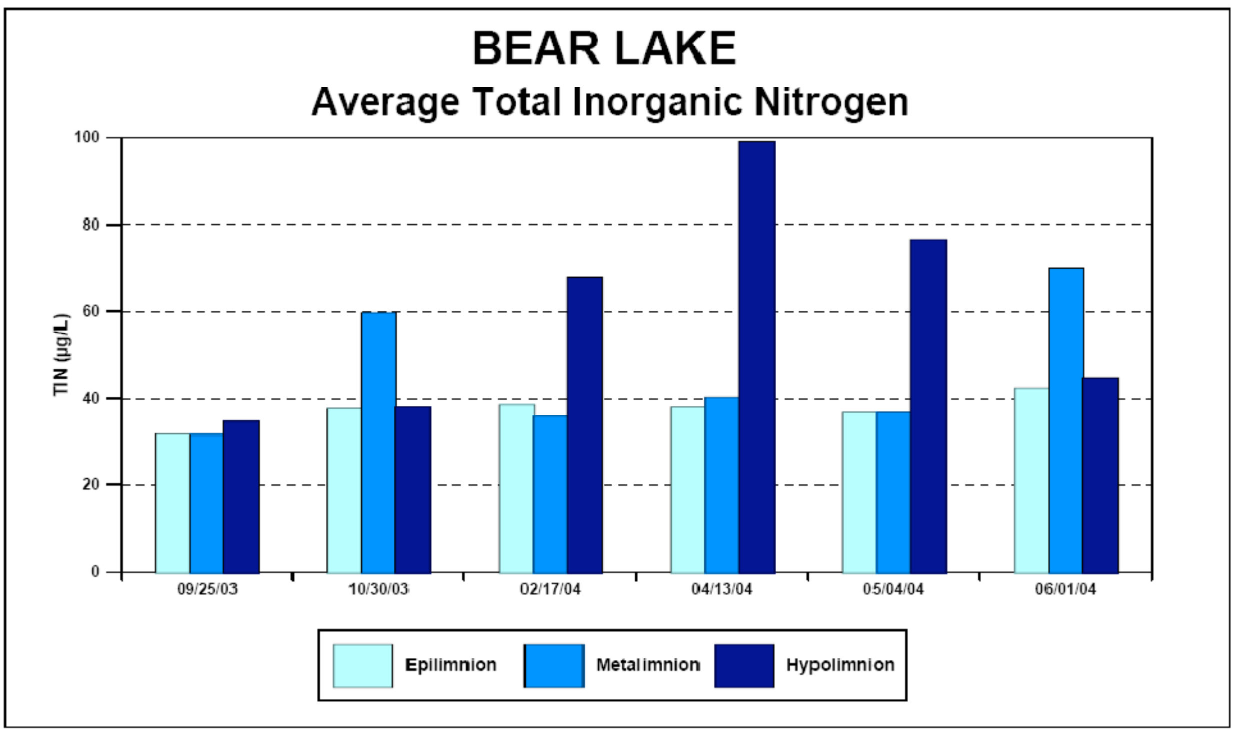


Figure 3.7. Nitrogen concentrations for Bear Lake 2003-2004.
Epilimnion= shallow water, metalimnion=mid water and hypolimnion= deep water (Ecosystems Research Institute 2005).

Figure 3.8 and Table 3.5 (below) express visually the levels of phosphorus loading in the marsh during inflow and outflow from the lake. Excess loadings are based upon a criterion of 0.05 mg TP/l and 60 mg TSS/l during runoff season and 35 mg TSS/l during base flows. A total of 276 data points are represented in these figures.

Non-point pollution sources include the following: grazing, urban runoff, agricultural runoff, and feedlots. Natural inflows to the reservoir have deteriorated since the valley has been used for intensive agriculture. In addition, winter feedlots for livestock have destroyed streams that once were spawning grounds for cutthroat trout. The valley floor is composed of lake deposits in the form of layers of permeable sand and impermeable clay, which drain agricultural runoff directly into the lake rather than allow them to disperse. There are no discharging point sources of pollution in the immediate watershed. However, there are point source discharges into the Bear River prior to its diversion into the lake. One major discharger is the Evanston Wastewater Treatment Plant in Evanston, Wyoming (Judd 1997).

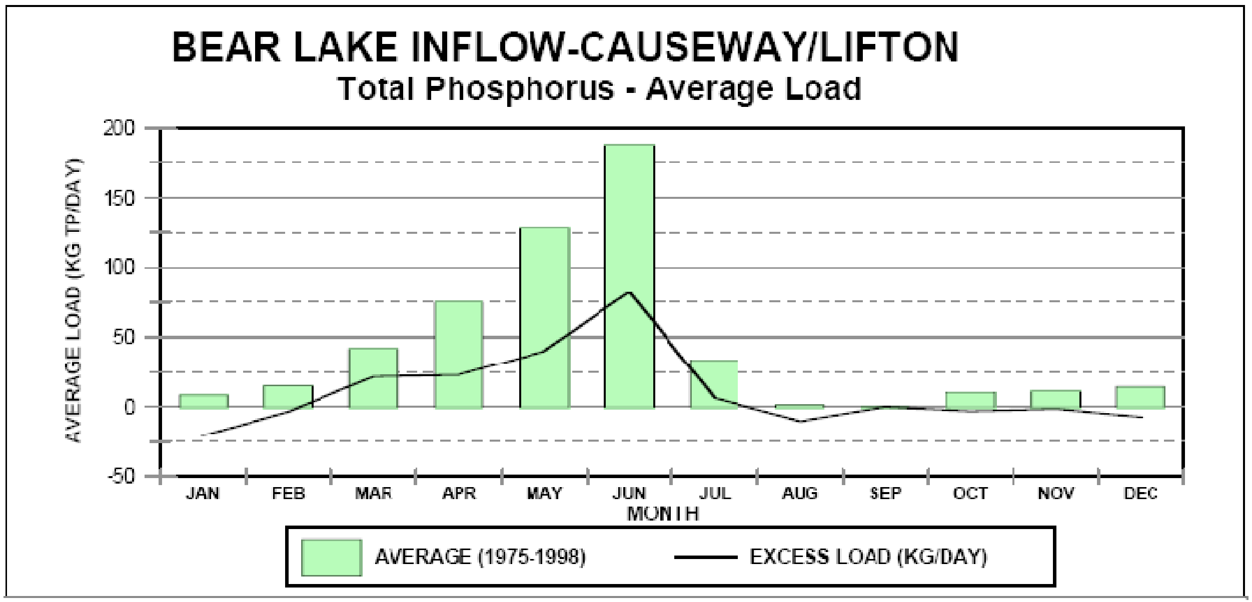


Figure 3.8. Distribution of total phosphorus loads by month and excess total phosphorus for all inflows into Bear Lake.
(Ecosystems Research Institute 2005).

Table 3.5. Average (1975-1998) Water quality data for selected parameters at the Bear Lake Causeway and Lifton Pumping Station (Ecosystems Research Institute 2005).

Month	Average Concentration mg/L)	Average Mass (kg/day)	Excess Mass over Criteria (kg/day)
Total Phosphorus			
January	0.015	8.16	-20.60
February	0.061	14.70	-3.51
March	0.073	41.70	21.50
April	0.061	74.90	22.90
May	0.067	128.00	39.90
June	0.072	188.00	82.40
July	0.044	33.70	6.12
August	0.029	1.15	-10.30
September	0.051	0.001	0.00
October	0.043	10.40	-3.04
November	0.040	10.80	-1.57
December	0.038	14.10	-7.30
Total Suspended Solids			
January	7.74	7,880	-9,470
February	6.31	1,230	-11,300
March	30.90	16,000	-6,110
April	21.40	31,400	-19,000
May	30.40	75,700	-31,700
June	23.00	64,700	-52,900
July	16.70	12,500	-17,400
August	16.30	0.363	0
September	12.40	0.3	0
October	12.10	6,690	-5,260
November	26.10	5,910	-2,740
December	19.00	13,000	-1,920

Note: Negative values under heading “Excess mass over Criteria” indicates kg/day lower than threshold criteria.

3.9.3 St. Charles Creek

St. Charles Creek, which flows through the Refuge, is on the §303(d) list for nutrient and sediment problems. Beneficial uses for this creek are cold-water aquatic live, salmonid spawning, secondary contact recreation, agricultural supply water, industrial water supply, wildlife habitat, and aesthetics. The St. Charles Creek is notable for its use by Bonneville cutthroat trout (see Chapter 4). IDDEQ considered this creek to meet its beneficial uses after assessment with the Beneficial Use Reconnaissance Program (Smith and Banks 2008).

3.9.4 Thomas Fork of the Bear River

Based on data from 1999-2000, estimated sediment and nitrogen loads in the Thomas Fork did not exceed the targets, while total phosphorus did. IDDEQ felt that more sampling sites and more frequent sampling would improve their data set and take into account load allocations by hydrologic period—base flow vs. runoff at a minimum. Seasonal variations may show that load allocations are exceeded at certain times of the year. Having a more reliable data set will improve water quality management, which is important for the Thomas Fork in and of itself, but also important since the

Thomas Fork contributes nitrogen, phosphorus, and suspended solids to the Bear River. Livestock and agricultural practices may be sources of pollutants. In addition, riparian condition and bank stability should be evaluated for their impacts on sediment loads. As with the Bear River, the primary beneficial uses of this reach are for cold-water aquatic life and salmonid spawning. Thomas Fork is particularly important for the presence of Bonneville cutthroat trout. In 2006, the BRC completed streambank restoration work on the Thomas Fork and the main stem Bear River near the Idaho/Wyoming border, contributing to improved water quality (IDDEQ 2011).

Dry and Preuss Creeks are tributaries to the Thomas Fork. Preuss Creek (which includes Beaver Creek and Fish Creek) is on the §303(d) list for habitat alteration and sediment, while Dry Creek is §303(d) listed for nutrients and sediment. (Habitat alteration is not a pollutant as defined by CWA Section 502(6). TMDLs will be developed for pollutants such as sediment or nutrients.) The 2006 TMDL reported that more data were needed for analyses of sediment and nutrient loads, but preliminary indications were that these creeks were not supporting their beneficial uses (IDDEQ 2006). The 2011 TMDL (IDDEQ 2011) reported that adequate data have been collected to complete an assessment and development of load allocations for these streams. TMDLs for Sediment and Total Phosphorus have been developed for Dry Creek, and for sediment for Preuss Creek.

Dry Creek was listed for nutrients (total phosphorus) and sediment. Water chemistry was measured on Dry Creek in June and October 2006. Based on those data, a 1 percent reduction in total phosphorus is recommended during spring runoff and a 0 percent reduction is prescribed during base flow. Streambank and substrate conditions indicated that sediment was a pollutant of concern in Dry Creek. Streambank erosion inventories conducted in 2008 showed that streambanks on Dry Creek were 44 percent erosive and depth fines yielded a result of 48.66 percent fine material in streambed substrate where salmonid spawning is most likely to occur. Therefore, a 54 percent reduction in streambank erosion is recommended in this TMDL (IDDEQ 2011).

Preuss Creek was listed on the §303(d) list for habitat alteration and sediment. In 2008 IDDEQ staff collected data on the condition of streambanks on Preuss Creek and determined that the banks were 76 percent unstable, well below the established target of 80 percent stable. A load allocation of 437 tons per year was assigned, which calls for a 74 percent reduction in sediment from streambank erosion (IDDEQ 2011).

3.9.5 Oxford Slough and Deep Creek

Oxford Slough is part of the Southern Middle Bear sub basin area delineated by IDDEQ to facilitate water quality monitoring (IDDEQ 2008). Deep Creek drains the Oxford Slough, flows into the Bear River, and is considered its own small watershed. Deep and Mink Creeks are the sources of water for the Twin Lakes Irrigation System that is part of this sub basin. These creeks feed into the Twin Lakes Reservoir. Deep Creek is on the §303(d) list for unknown pollutants. Evaluations of the Beneficial Use Reconnaissance Program data indicate the stream is not supporting its primary beneficial use of cold-water aquatic life. Sampling indicates excessive suspended solids and phosphorus. Livestock grazing, agriculture, eroding stream channels and banks may be contributing to these exceedances (IDDEQ 2006). The required load reduction for Deep Creek to meet the TMDL is 6,492 lbs total phosphorus per year and 4,252,611 lbs total suspended sediment per year (IDDEQ 2008).

3.10 Visual Quality

Bear Lake, immediately south of the Refuge, is well known for its scenic beauty. The water quality of Bear Lake itself is key to the visual quality of the region and the lake's economic uses, which are centered on tourism (recreational boating, fishing, and beach use). The Refuge's Mud Lake contributes to maintaining the water quality of Bear Lake by acting as a settling basin for Bear River sediments; however this creates water quality and habitat issues on the Refuge itself (Palacios et al. 2007a). For more information on factors affecting water quality in Bear Lake, see sections on Hydrology and Water Quality, above.

Air quality also has major impacts on visual quality. Prescribed burning has the potential to impact the visual quality of both the Refuge and surrounding areas. The *Smoke NEPA Guidance Describing Air Resources Impacts from Prescribed Fire* (Story et al. 2005) addressed the effects of burning on visibility, and was intended to guide the user in selecting and preparing the appropriate level of air quality analysis related to prescribed fire activities. After the appropriate level of modeling is completed, air quality and visibility impacts can be described qualitatively including the expected duration of impacts. This can be based on meteorology and best professional judgment regarding the transport of pollutants to Class I areas, downwind communities, and other sensitive areas. The risk to humans and Visibility PM Particulates from prescribed burning is outlined in the table 3.6.

Table 3.6. Visibility and PM Particulates (from Story et al. 2005)

Categories	24hr $PM_{2.5}$ (µg/m^3)	8hr $PM_{2.5}$ (µg/m^3)	1 hr $PM_{2.5}$ (µg/m^3)	Visibility (miles)
Good	0-15	0-22	0-40	>11
Moderate	15-40	22-58	40-80	6-11
Unhealthy for sensitive people	40-65	58-93	80-175	3-6
Unhealthy for all people	65-150	93-215	175-300	1.5-3
Very unhealthy	150-250	215-358	300-500	0.9-1.5
Hazardous	>250	>358	>500	<0.9

EPA's 1980 visibility rules (40 CFR 51.301-307) were developed to protect mandatory Class I areas from human-caused impairments reasonably attributable to a single or small group of sources. In 1999, EPA promulgated the Regional Haze Rule (40 CFR 51.308-309), which calls for states to establish goals for improving visibility in mandatory Class I areas and to develop long-term strategies for reducing the emissions of air pollutants that cause visibility impairment.

The regional haze regulations apply to all states, including those states that do not have any Class I areas. Plans in states without Class I areas must address the emissions from any sources that may reasonably be anticipated to cause or contribute to visibility impairment of any Class I area outside that state. The Regional Haze regulations require states to demonstrate reasonable progress for improving visibility in each Class I area over a 60-year period during which visibility should be returned to natural conditions (Story et al. 2005).

Due to the effects of prescribed burning on the environment, the Refuge will follow guidelines, law and policy when planning for the use of such management activities.

3.11 Surrounding Land Uses

The Idaho portion of the Bear River Watershed is about 1,785,380 acres. Of this area 751,420 acres are rangeland, 599,180 acres are in agriculture, forests take up 300,324 acres, 61,902 acres is water, while wetlands occupy 44,774 acres, and lastly urban areas comprise about 10,964 acres. Land ownership acreage is about 1,021,867 privately owned; the U.S. Forest Service owns 462,350 acres; Bureau of Land Management, 165,692; Bureau of Reclamation, 2,543; U.S. Fish and Wildlife Service, 16,960; the State of Idaho, 76,607; and water, 39,362 (IDDEQ 2006).

In the Idaho portion of the Bear Lake sub basin, five primary uses occur on private land (389,003 acres). About 27 percent (183,275 acres) of land is in crops, 21 percent (144,061) is rangeland, 5 percent (36,064 acres) is reservoirs, 1 percent (3,195 acres) is streams, and the remaining 3 percent (22,408 acres) is urban and roads. The total area in this sub basin is 642,359 acres. Federal land ownership is as follows: Bureau of Land Management has 32,649 acres (5 percent); U.S. Fish and Wildlife Service, about 16,932 acres (~3 percent); and U.S. Forest Service, 223,654 acres (35 percent). The State of Idaho owns about 2 percent or 14,602 acres (Smith and Banks 2008).

Around Bear Lake itself, land use in the high mountains is for grazing, watershed protection, and recreation. The foothills are also used for grazing, as well as dry land farming, and recreation, including vacation homes. The valleys are the primary residential areas while providing cattle grazing and haying, irrigated farming, and native grass pastures (Palacios et al. 2007a).

Land use in the Southern Middle Bear sub basin includes recreation, urban and roads (6,052 acres), rangeland (90,442 acres), dry cropland (51,534 acres), irrigated cropland (66,544), open water (1,475 acres), and rivers, creeks, and riparian areas (2,987 acres) for a total of 218,944 privately owned acres. Developed areas include summer homes or ranchettes. Recreation occurs in the surrounding mountains and on streams and reservoirs. State lands total 9,949 acres, Bureau of Land Management owns about 9,585 acres; U.S. Fish and Wildlife Service have 1,878 acres; and the U.S. Forest Service has 291,965 acres (Smith 2008).

Land use categories in the Thomas Fork watershed analysis area (which includes part of Wyoming) are urban, agricultural, rangeland, forested land, water, wetlands, barren land, and tundra. Of the total 150,100 acres that make up the watershed, 33 percent is private land, 63 percent is Federal land, and 4 percent is State land. Approximately 4 percent of the watershed is being used for irrigated cropland, 3 percent for non-irrigated cropland, 5 percent for irrigated pastureland, 2 percent for non-irrigated pastureland, 19 percent for private rangeland and forestland, and 67 percent for public rangeland and forestland (USFS 2001).

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Chapter 4
Biological Environment

Immature black-crowned night-heron/© Mike Baird

Chapter 4. Biological Environment

This chapter addresses the biological resources and habitats found on the Refuge. However, it is not an exhaustive overview of all species and habitats. The chapter begins with a discussion of biological integrity (historic conditions and ecosystem function), as required under the Refuge Administration Act, as amended. The bulk of the chapter is then focused on the presentation of pertinent background information for habitats used by each of the Priority Resources of Concern (ROCs) and other benefitting species designated under the CCP. That background information includes descriptions, conditions and trends of habitats and threats (stresses and sources of stress) to the habitats and/or associated ROCs. This information was used to develop goals and objectives for the CCP.

4.1 Biological Integrity, Diversity, and Environmental Health

The National Wildlife Refuge System Administration Act, as amended, directs the Service to ensure that the biological integrity, diversity, and environmental health (BIDEH) of the Refuge System are maintained for the benefit of present and future generations of Americans. In simplistic terms, elements of BIDEH are represented by native fish, wildlife, plants and their habitats as well as those ecological processes that support them. The Refuge System policy on BIDEH (601 FW 3) also provides guidance on consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on the refuges and in associated ecosystems, that represents BIDEH on each refuge.

Water level management is the overriding factor affecting most refuge habitat management strategies for nesting birds and wildlife, particularly water birds and muskrats. Management efforts focus on maintaining a given emergent-marsh-to-open-water habitat ratio using water level manipulations, prescribed fire, and mechanical disturbance. Currently, agricultural small grains and native and hayed short-cover areas at the Refuge complement wetland habitats by providing foraging habitat for key bird species such as sandhill cranes, Canada geese, and long-billed curlews. Restoration of native grasses and short-cover vegetation could also provide foraging and cover habitats adjacent to wetlands.

Riparian habitats comprise a small but important component of refuge ecosystems. Native fishes historically present within the refuge waters included Bonneville cutthroat trout. Since the creeks that historically supported Bonneville cutthroat trout do not originate on refuge lands and significant portions of the watersheds lie outside the Refuge, upstream activities have major impacts on refuge water quality and quantity.

Sage-steppe is a small component of refuge lands. Widespread population and habitat declines have been projected for numerous sagebrush associated species. A growing sense of urgency over the outlook for sagebrush-dependent wildlife has spawned sagebrush planning and restoration efforts within Idaho.

The Bear Lake watershed, of which Bear Lake National Wildlife Refuge is a part, has undergone dramatic alteration over the past century which has ultimately affected the biological integrity, diversity, and environmental health of the region's ecosystems. There were three separate periods which led to the wetlands succession and current habitat conditions at Bear Lake NWR:

- Pre-1900: Historic conditions were characterized by high spring fluctuation and summer-winter stabilization of water levels in the marsh; freshwater discharge to the Bear River; a 30-35,000 acre core-marsh base, and an extensive, stable peripheral marsh complex. These conditions are described in section 4.1.1 below.

- 1900-1968: Characterized by a dramatic annual fluctuation in marsh water levels to achieve irrigation purposes; a highly turbid through-flow system; a 17,000 acre core marsh base; and a reduced peripheral marsh and wetland function (see section 4.1.2 below).
- 1968-Present: Characterized by stabilized water levels in the marsh through the breeding season to achieve wildlife and irrigation purposes; late summer drawdown for hay removal; a highly turbid through-flow system; a 17,000 acre core marsh base; a further reduced peripheral marsh and wetland function (see section 4.1.2 below).

The most significant changes to the region's ecosystems include:

- The diversion of the Bear River into Bear Lake via the Rainbow Inlet Canal in the early 1900s;
- Changes in the hydrology of the Bear River due to irrigation diversions and dam operations;
- Conversion of bottomlands to agricultural lands (including diking and draining) and major loss and/or degradation of wet meadow and riparian habitats; and
- Loss of native species, accompanied by a large influx of nonnative and invasive plants and animals into the system.

This section discusses the connection between these landscape level changes and the current vegetation and wildlife on the lands and waters occupied by the Bear Lake NWR, the Oxford Slough WPA, and the Thomas Fork Unit. This summary is not a complete analysis of all factors related to changes in native vegetation, fish and wildlife. Much of the information presented here is based upon the planning team's knowledge of the area.

4.1.1 Historic Descriptions of Habitat and Wildlife

Bear Lake NWR

The marshes constituting what is now Bear Lake NWR are the southern remnant of a wetland system that was historically much larger and more extensive (Bundy 2007). Depending on natural water fluctuations, an estimated 30,000 to 35,000 acres of the immediate area was historically open water and marsh, with nearby sites consisting of upland grasslands, wet meadows, and shrub-steppe vegetation.

Historically the Bear Lake marsh was fed to varying degrees by (1) spring overflow from the Bear River (which flows to the northeast of the marsh proper), (2) feeder streams from the Wasatch Range west of the marsh, (3) underground seepage from Bear Lake proper, and (4) springs. On a large scale, the marsh would have likely been flooded early in the year, for several months, by spring runoff, and been subjected to late summer desiccation (Bundy 2007). Wetland plant communities change with the depth, duration, timing, and frequency of flooding (Fredrickson and Taylor 1982). This spatially and temporally variable hydrology, influenced by surface and groundwater, precipitation, snowpack, and runoff, would have resulted in a diverse, ever-changing complex of wetland types and extent, ranging from linear or patchy woody riparian habitats to temporary, seasonal, semi-permanent, and permanent wetland types. This habitat diversity would have in turn supported a wide variety of wetland-dependent plant and animal species.

While it is uncertain how the Bear Lake NWR marsh (locally referred to as Dingle Swamp) functioned prior to development of the Bear River irrigation system, it is possible to infer historic function, based on examination of local geography (see Bundy 2007). For example, it is likely that local topography restricted the Bear River to an isolated floodplain, with no major inflow connection to Bear Lake. This does not rule out the possibility that in extreme high flow conditions, side channels could have formed, thus creating an inflow mechanism to Bear Lake. However, there is no evidence to suggest that this was ever a dominant process within the Bear Lake Valley (Bundy 2007).

Conversely, it is likely that Bear Lake contributed to flow within the Bear River system. As snowmelt from the adjacent Wasatch and Hot Springs mountain ranges began to fill Bear Lake, Dingle Swamp would have received excess inflow, which ultimately, would have hydrated the entire marsh complex. Water levels would have increased to an as yet unknown critical elevation, with additional flow following an outlet channel back to the Bear River system. This outlet channel can still be seen on present-day aerial imagery.

The Bear River, historically referred to as the “white mud river,” would have received a freshwater influx at the Bear Lake outlet channel confluence, which likely would have improved downstream water quality. This influx would have been seasonal (mid-April through June) and highly dependent on annual snowpack amounts and spring temperature variation. The process would have led to increasing Dingle Swamp water levels through the spring and early summer months, followed by rapid desiccation through summer as the outlet channel removed water to the Bear River. Therefore, water level fluctuation in the marsh system would have been extreme (3-5 feet during high runoff years) and abbreviated within a two- to three-month window (Bundy 2007).

The primary difference between historic and current conditions is that these fluctuations would have occurred over and above a 30-35,000-acre base wetland. In most years, the extensive marsh system would have retained water in spring due to natural barriers such as a long sand bar at the Bear Lake/Dingle Swamp interface, and at the Bear River near the present-day town of Bennington (Bundy 2007). Thus, it is assumed that large marsh water level increases would have occurred during spring and early summer, followed by relatively stable conditions as water levels dropped below natural berm elevations. Year to year variation, related to periods of low snowpack, may have led to prolonged desiccation of the marsh.

Freshwater input and widely fluctuating spring water levels, as are estimated in the historic system, led to greater plant diversity and overall environmental health. The benefits of water level fluctuation include:

1. Periodically inundating traditionally dry areas;
2. Periodically desiccating traditionally wet areas;
3. Stimulating migratory bird food resources such as invertebrates and the seeds of annual plants; and
4. Facilitating nutrient processing through creation of a diverse plant community.

Each plant is adapted to a different set of environmental characteristics, primarily driven by the depth, duration, timing, and frequency of flooding. Where conditions remain stable, only a few plants survive; however, where conditions vary, more plants can adapt to the conditions. These plants produce seeds, tubers, rhizomes, and other reproductive components which in turn, are deposited within the soil. Often referred to as “the soil seed bank,” these seeds and other propagules remain viable for many years and are ready to germinate or regrow when the right conditions return (Bundy 2007).

Other natural processes such as fire and grazing by native herbivores, e.g., bison (*Bison bison*), pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*), would likely have been infrequent, but intense during periods when they were in effect. Tied to annual variation in marsh hydrologic cycles, fires were most likely to occur during late summer, particularly hot, dry summers during drought periods, presumably triggered by lightning strikes from summer thunderstorms. Such late summer fires would have reduced residual cover in emergent communities, most likely across the entire marsh. These fires would have been intense, and would have resulted in peat burns in areas of high residual cover accumulation. These long burning root mass fires could have lasted from several days to several weeks and likely would have created deep, open pools within the marsh once high water returned. While the frequency of these widespread fires is uncertain, they would have provided a valuable stimulus to marsh succession, and ultimately, promoted overall marsh health (Bundy 2007).

Hydrologic periodicity would also have been linked to grazing intensity. Considering the traditional grazing patterns of native ungulate species, it is likely that grazing animals had little influence on marsh vegetation. Heavy snowfall during winter would have made marsh vegetation relatively inaccessible to these large herbivores. The exception to this would have been localized winter concentrations throughout the entire Valley.

Through the estimated hydrologic extremes, seasonally deep water habitat used by migratory birds such as common loon (*Gavia immer*) would have occurred within the marsh during peak spring runoff, followed by the variety of habitats existing on the present marsh as drawdown occurred through the summer. However, these seasonally variable wetlands were supplemented by relatively stable peripheral wetlands created by the Bear Lake Valley's unique soil stratigraphy. Groundwater movement from the adjacent mountain ranges would have created a variety of perennial and ephemeral habitats around the marsh fringe where heavy, impenetrable clays lie near the surface. Water is pushed up at these points, creating relatively stable wetlands. During spring runoff, these wetlands would have been flooded, and the heavy clay bottom would have retained this water within depressions. Groundwater movement would have maintained the wetlands through high summer evaporative periods. Thus, with the exception of deep water habitat, the same wetland types and associated wildlife species seen today were likely present historically. The primary difference between historic and current conditions is the seasonal availability and distribution of habitats.

Oxford Slough WPA

While historic records are not available for the Oxford Slough area, basin geomorphology and associated streamflow would suggest a widespread flood scenario, followed by a flow-through system during the remainder of the year. Oxford Slough sits in a large wetland basin that extends from the Bannock Range on the west to the Portneuf Range on the east, and is perched above the Deep Creek system located to the south and emptying into the Bear River. Heavy spring flows from Oxford Creek (located northwest of the WPA) and Stockton Creek (spilling from the north) would have exceeded Deep Creek's outlet capacity, likely resulting in flooding during spring runoff in most years. As flows subsided during the summer, it is assumed that streamflow would have maintained the basin and flowed through to the Deep Creek outlet. Thus in most years, Oxford Slough is assumed to have been semi-permanently to permanently flooded, with relatively little fluctuation in levels throughout the year. Oxford Slough probably did not become desiccated except during extreme drought conditions (Bundy 2007).

Thomas Fork Unit

The riparian/marsh complex on the Thomas Fork Unit historically expanded and receded depending on snowpack in the adjacent mountain ranges and subsequent flows in both the Bear River and Thomas Fork Creek. In periods of high snowmelt, the Bear River would overtop its banks and flood lands within what is now the Thomas Fork Unit. Conversely, in low flow periods, wetlands would become desiccated following flow and subsequent transfer to the Bear River. These processes were instrumental in developing the proportions of habitat types existing at present. The current hydrologic periodicity (when supplemented with refuge water rights) is conducive to continuing this regime (Bundy 2007).

Vegetation Communities

Bear Lake NWR

The natural (native) wetland types that would have historically been present at Bear Lake NWR included perennial emergent hemi-marsh (open water, submerged aquatic plants, shallow and deep emergent habitat), ephemeral marsh (wet meadows, alkaline meadows), and palustrine forested wetlands (riparian willow and cottonwood) (Bundy 2007).

Adjacent to these wetlands, the native upland habitat types that would have historically been present include alkali upland meadow, meadow grass, and shrub. Upland vegetation included salt grass, various wheatgrass species, alkali sacaton, and wild rye (Bundy 2007). Sagebrush, rabbitbrush, and various wheatgrasses occurred on the east side of the Refuge near Merkley Mountain, with greasewood dominated habitats on uplands to the south and west. As is still the case today, these uplands were interspersed with numerous small wetlands.

Oxford Slough WPA

The natural (native) wetland types that would have historically been present at Oxford Slough WPA included perennial emergent hemi-marsh (open water, submerged aquatic plants, shallow and deep emergent habitat), ephemeral marsh (wet meadows), and alkali upland meadows (See Appendix E for detailed descriptions of these habitat types.)

Thomas Fork Unit

The natural vegetation that would have historically been present on the Thomas Fork Unit included instream habitat, riparian habitat (primarily willow), and mixed sagebrush upland and meadow grass habitat along the western boundary. (See Appendix E for detailed descriptions of these habitat types.)

Birds

Bear Lake NWR

Dingle Swamp (now the Refuge) has historically provided an extensive and important area of marsh habitat that serves the needs of ducks, geese, and other migratory waterbirds. It is a major nesting area for the Great Basin Canada Goose and the Greater Sandhill Crane. Duck production is important and Dingle Swamp is a major resting and feeding area for waterfowl during spring and fall migration periods (USDOI 1966).

Bird records are sparse, but one might expect that the birds common on the Refuge today were also present historically. These include pied-billed and western grebe; American bittern; snowy egret; great blue heron; white-faced ibis; Canada goose; mallard, canvasback, green-winged teal, northern shoveler, etc.; northern harrier; American coot; sandhill crane; common snipe; Franklin's gull; and Forster's tern.

Oxford Slough WPA

Although historic records are scanty, it is likely that historically the Oxford Slough area supported large numbers of nesting ducks (mallard, gadwall, cinnamon teal, northern shoveler, and northern pintail), Canada geese and sandhill cranes, and nesting colonies of white-faced ibis, snowy egrets, black-crowned night-herons, and Franklin's gulls. The area would also likely have supported large numbers of migrating waterfowl and sandhill cranes.

Thomas Fork Unit

Historical records for the Thomas Fork Unit area are also in short supply. Populations of migratory birds that use riparian habitat, especially willow habitats, would have been higher than they are at present due to the large expanse of willows that occupied the valley bottom. Riparian habitat has been reduced through pasture development and the elimination of willows, straightening of Thomas Fork and Salt Creek, settlement, livestock grazing, water diversions, and noxious weed introductions (USFS 2001). Sage grouse populations have observed to decrease as the red fox population increased (USFS 2001).

Mammals

Bear Lake NWR

Historically, intense but infrequent grazing by native herbivores (bison, pronghorn, mule deer, and elk) occurred within the Bear River and Bear Lake valleys. Bison bones found in the Bunn Island area of Bear Lake NWR suggest that bison may have frequented this area as flood water subsided through the Bear Lake outlet channel. This would have produced lush wet meadow grasses along the channel length, which runs immediately adjacent to Bunn Island. Bison may have grazed this area at high intensity during the short growing season.

The discovery of bison bones on Bunn Island provides further evidence of the extreme environmental fluctuations in the historic system, as one theory suggests that this herd was isolated and likely drowned during an unusually high water period. Regardless, it is assumed that if grazing were a formative process within the marsh, it likely occurred as either a high intensity/short duration event as bison moved from one location to the next, or as a late growing season or possibly, winter event.

Bison and pronghorn no longer exist in the Bear Lake Valley. Inventory and monitoring should be conducted to determine the diversity and density of the ungulate species remaining on the Refuge. Bear Lake was originally named Black Bear Lake due to the abundance of black bear in the area. These are rarely seen today.

Oxford Slough WPA

Records of mammals at the slough are virtually nonexistent. As at Bear Lake and the Thomas Fork, it is likely that elk, mule deer, moose, bison, grizzly, Canada lynx, wolves, and wolverine roamed the area. Beaver and muskrat were undoubtedly more abundant before extensive trapping of these species occurred.

Thomas Fork Unit

Bison, grizzly bear, wolf, and lynx are some of the wildlife species that have been extirpated from the area, primarily due to man (USFS 2001). Elk and deer populations were low approximately 40-50 years ago and moose populations were lower 20 years ago (USFS 2001). Size estimates of pre-European beaver populations in North America were 60-400 million animals or the equivalent of 10-60 animals per mile of stream and river (USFS 2001). Trapping nearly eliminated the beaver population and the subsequent quantity and quality of riparian habitat declined (USFS 2001). Today, population size estimates are 6-12 million animals, a fraction of the original numbers (USFS 2001).

4.1.2 Changes to Wildlife and Habitat Since 1800

The area surrounding what is now Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit was inhabited seasonally by pre-Shoshonean and Shoshone peoples for thousands of years (Hutchison and Jones 1993). These peoples used a variety of wildlife (Derig 1996) and plant resources in a subsistence lifestyle, without any discernable long-term negative impacts. The introduction of the horse among the Northern and Eastern Shoshone increased grazing impacts in certain areas (e.g., river bottoms in the vicinity of winter camps), and also increased use of certain wide-ranging species, such as bison. However, the Bear Lake, Oxford Slough, and Thomas Fork areas were used only seasonally, and therefore these impacts would have been relatively minor.

Between approximately 1812 and 1845, hundreds of fur trappers used this area, trapping beaver and other fur-bearers (otter, muskrat, mink) (Russell 1965, Wishart 1979, Utley 1997, Gowans 2005) and hunting big game (bison, pronghorn, bighorn sheep, elk and mule deer) in an unsustainable manner (Wuerthner 1986a, 1986b). For example, in the 1820s bison and other large game was abundant in the Snake River Plain, but by 1834 trader Warren Ferris was already noticing declines (Wuerthner 1986b). By the late 1840s, the Shoshone and Bannock had to leave the Snake River Plain and hunt bison near Bear Lake and in present day Montana, and by 1860 bison were nearly extirpated from Idaho (Wuerthner 1986a, 1986b). Other large game declined apace. The large scale fur trade ended by 1845 as beaver were trapped out (Wishart 1979), but trapping for other furbearers (mink, otter) and subsistence hunting for mule deer, white-tailed deer, and elk continued in the region through the 1860s (Anderson 1940).

The Oregon Trail came through the area beginning in 1840. The trail crossed both above and below the Thomas Fork Unit (Hutchison and Jones 1993). By 1841, Oregon Trail travelers began crossing the Bear Lake valley. They entered the valley near the point of the present community of Border about where U. S. Highway 30 enters Idaho, generally parallel the line of the Bear River as it journeys northwest. The banks of Clover Creek, now known as Montpelier Creek, were favored camping places for the travelers (see Chapter 5). Much of the traffic on this segment of the trail occurred between early and late July. Livestock grazing and hunting by emigrants were noted as causes of decline in traditional plant and animal food sources used by the region’s Shoshone bands (see Chapter 5).

Bear Lake NWR--Grazing and agricultural development

Thomas L. “Peg-leg” Smith had oxen, beef and dairy cattle, and a herd of 300-500 horses at his trading establishment near “Big Timber” (present day Dingle) during 1848-1850 (Derig 1996), marking the first year-round livestock pasturing in the Bear Lake area. After Congress passed the Homestead Act of 1862, settlers were offered 160 acres of land in exchange for a minor filing fee and a promise to reside on the land and improve it. This led to rapid settlement of the region. Paris was established in 1863, and Montpelier and Oxford in 1864. The first permanent farming and ranching settlements in the Thomas

Fork area were settled about the same time (Hutchison and Jones 1993). Farming and grazing, with the associated landscape alterations (e.g., draining wetlands and digging canals for irrigation) occurred early in the settlement period and continued unabated through the early 1900s (see below).

The fertile lowlands of the Bear Lake watershed support productive farms and livestock, and three fourths of the land is used for agriculture, primarily grazing. Livestock and haying operations account for the greater part of the Bear Lake County, Idaho revenues.

Livestock grazing had major effects on wildlife and habitat. Native grasses and forbs were not adapted to heavy grazing pressure; grazing therefore opened the door to the spread of non-native plant species. Non-native pasture and forage grasses were also intentionally introduced. These grasses had a competitive advantage under heavy grazing pressure, and permanently altered many plant communities. Livestock grazing in riparian areas allowed non-native bromes and reed canarygrass to invade and largely replace the native understory plant community in adjacent sagebrush and greasewood communities.

Bear Lake NWR--Alteration of the Bear River-Bear Lake hydrologic system

As described by Palacios et al. (2007a), increased agricultural development in the area occurred with the completion of the Federal land surveys in the late 1870s. The transcontinental railroad passed through the basin during this same period and brought significant numbers of new settlers into the area. Since the easily irrigated land had already been claimed, the irrigation of new land required more sophisticated construction techniques and a great increase in the amount of water to be used.

While small scale diversion from the Bear River to produce meadow hay likely occurred during the late 1800s, it was not until 1909 to 1918 that the Stewart Diversion Dam, the Rainbow Inlet Canal, the Outlet Canal, and the Lifton Pumping Plant were built. Several large canals were built in the basin below Bear Lake around the turn of the century. Experiments in raising beets proved highly successful and the Utah-Idaho Sugar Company bought stock in several existing canal companies that were having financial problems. The Utah-Idaho Sugar Company secured rights to the Bear River for power production as well as for irrigation. In 1912, Utah Power and Light Company purchased the hydroelectric property and the accompanying water rights, ensuring virtual control of the Bear River waters below Bear Lake.

The Bear River was joined and disconnected to Bear Lake, Mud Lake, and the Dingle Marsh several times throughout the geologic history of the system. During the last 8,000 to 12,000 years, the Bear River has been separated from the lake and marsh. Bear River waters flowed into Mud Lake and Dingle Marsh (the present-day Bear Lake NWR), but were separated from Bear Lake itself by a natural sand bar. In the late 1800s developers conceived a plan to divert the Bear River into Bear Lake. Subsequently, the Telluride Power Company developed a diversion system within the Bear River, where a significant portion of flow could be stored in Bear Lake for future irrigation use. This project led to three major structural changes to the Bear River/Bear Lake system:

1. Construction of Stewart Dam across the Bear River, which ultimately redirected flow to the south.
2. Construction of the Rainbow Inlet Canal to carry redirected flows into Dingle Swamp.
3. Development of Lifton Road and Pump Station which enhanced storage capabilities in Bear Lake and created an infrastructure capable of delivering stored water during summer months when water was more limited in the system.

In 1911 the Telluride Power Company completed the water diversion on the Bear River and began water diversion into Mud Lake via the Dingle Canal (See Chapter 3, section 3.3, Hydrology, for a complete description of Bear River and Bear Lake hydrologic associations). In that first year, 40 million cubic yards of water were diverted and stored for irrigation releases (USU 1995).

The diversion of the Bear River via the Rainbow Inlet Canal and construction of the Outlet Canal permanently changed the historic Dingle Marsh. The Outlet Canal has drained portions of the refuge marshes while the Rainbow Canal has caused significant siltation, particularly in Mud Lake. Not only was Dingle Swamp isolated from Bear Lake through creation of Lifton Road on the north shore of Bear Lake, it now served as the turning basin for the entire Bear River system. Where once clean water flowed from the adjacent mountain ranges into the Bear River, the river now carried its heavily sediment-laden waters into the marsh and Bear Lake. This not only changed water quality and marsh bottom characteristics in the Dingle Swamp, but also altered the hydrologic periodicity (Bundy 2007). The canal system and storage of Bear River water resulted in seasonal fluctuations that did not occur historically. Where the marsh used to fluctuate widely during spring but remained relatively stable thereafter, it now fluctuated widely throughout the growing season. The intent of the new irrigation system was to retain all spring flows, which would subsequently be released throughout the year for combined irrigation and power generation use. The result on the wetland ecosystem was wide fluctuation with less seasonal stability, compounded by the introduction of turbid Bear River water.

Turbid water tends to limit photosynthesis, and therefore both seed germination and plant growth. Those plants that do survive are uprooted by carp (*Cyprinus carpio*), which had been introduced in 1882 and are now widespread (see section 4.6.2 below). The foraging action of carp further contributes to turbidity. The combination of turbid water and carp creates a relatively sterile wetland ecosystem, resulting in limited productivity of aquatic vegetation and waterfowl.

An additional confounding factor is the effect of sediment deposition on germination substrate. Some plants require a stable marsh bottom comprised of clay materials. This is necessary to support plants with extensive root systems, as in the case of tall emergent plant species such as cattail and hardstem bulrush that attain heights in excess of six feet. Redirection of the Bear River has resulted in a reliable source of water for the Refuge, but also excessive sediment deposition throughout the Mud Lake system. This sediment load primarily consists of silt and fine clay particles, which ultimately deposit in the marsh bottom. Unlike clay, silt particles do not bind to each other and do not create the stable marsh bottom required by some plants. Instead, the silt particles tend to accumulate in loose horizons that have attained depths of greater than four feet in some locations. At these locations, the existing plant community is either relatively homogenous, or in most cases, non-existent (Bundy 2007).

Although grazing by native ungulates was not a major factor in development of the marsh, fire was. The natural frequency and intensity of fire in the Dingle Marsh has been all but eliminated through the absence of long-term drought and associated lack of residual material dry enough to carry fire. The natural role of fire in the Bear Lake Valley has been modified by human actions; however, Refuge management has attempted to mimic natural fire regimes, where appropriate, through prescribed burns. Elimination of fire results in increased accumulation of residual material in many wetland plant communities. While this is desirable to some wildlife species, continued accumulation inhibits new vegetative growth, which greatly impairs wetland succession. Additionally, lack of intensive “peat burns” has reduced the number of open water pools available for over-water nesting wildlife species. Without disturbance, emergent vegetation continues to encroach on these open water areas, which could ultimately result in a homogenous emergent vegetation community.

In summary, alterations to the historic system have been substantial and include:

1. The Bear River now flows to Bear Lake;
2. Bear Lake and the refuge marsh (Dingle Swamp) have been separated and now serve an irrigation function;
3. Water control structures in the new system are used to regulate water levels; and
4. Carp have been introduced in the Bear River watershed.

These modifications have altered the following historic marsh processes:

1. The marsh now functions as a turbid, through-flow system as opposed to the historic, freshwater discharge system;
2. Sediment deposition occurs at a greater frequency than before the system was modified;
3. Excessive turbidity decreases plant germination and growth. The few species and individual plants that do germinate are further inhibited by carp activity;
4. The natural spring high water runoff has been replaced with water levels that are regulated annually (rather than seasonally) by storage of spring runoff and release of this stored water in summer; and
5. Absence of drought has led to less frequency of disturbance (e.g., fire) which has resulted in homogenous emergent communities with excessive residual vegetation that is not dry enough to carry fire.

These modifications were noted during the early 1950s in a graduate study sponsored by the Idaho Department of Fish and Game that examined muskrat use and waterfowl breeding success on the Dingle Marsh (Reeves 1954). The author discovered that muskrat populations had been reduced to a fraction of their estimated historic density and that fluctuating water levels greatly diminished waterfowl nesting success. From an estimated historic population of 45,000-75,000 muskrats, only 11,000 remained in 1952. Similarly, only 700 Canada geese (300 adults) and an estimated 2,275 ducks were produced annually. Study recommendations were:

1. To develop an agreement with Utah Power and Light (UP&L) to stabilize water levels during critical muskrat and waterfowl life history events;
2. To develop strategies for silt control (at current deposition rates, it was postulated that the marsh would become a homogenous bulrush stand within 50-75 years); and
3. To eliminate grazing and burning on upland sites.

Through the remainder of the 1950s and early 1960s, an effort was made to manage the remaining marsh for waterfowl and muskrat production, initially through the Idaho Department of Fish and Game. However, it was recognized that because the State did not have the resources to effectively manage the marsh, and because waterfowl populations cross State boundaries, the Bureau of Sport Fisheries (now the U.S. Fish and Wildlife Service) would be the more practical management entity. Despite initial opposition by adjacent landowners, Bear Lake NWR was established in 1968. Concurrent with refuge establishment, the Bureau entered into an agreement with Utah Power and Light (now PacifiCorp) that would stabilize water levels during the waterfowl and muskrat breeding seasons and maintain an elevation within ½ foot of 5,920.5 feet UP&L datum annually. This management practice continues to the present.

Bear Lake NWR—Urban and Industrial Development

Communities in the Bear River basin are presently encountering various intensities of growth and development due to new residential, commercial, and agricultural development. In general, the development is distributed unevenly throughout the basin with much heavier concentration occurring south of Grace, Idaho and continuing into Garden City. Around the Bear Lake area, development is spreading outward from the lake shore and up the sides of the foothills. The west and south shores of Bear Lake are primarily privately owned summer home sites, while the east shore is mostly State owned with multiple access points. Residential development includes about equal amounts of permanent housing and seasonal (summer and winter) residences. The commercial and service growth in the area is directed more toward the tourist/recreational growth of the region as opposed to support services for either the agricultural or year-round residential sectors (Toth et al. 2005).

Oxford Slough WPA

At Oxford Slough, land use changes and associated increasing demands on limited water resources have dramatically altered flow patterns and wetland acreage. Historically, the palustrine emergent marsh complex probably seasonally covered the majority of the present valley floor. This marsh complex has been reduced to a fraction of its former size, and becomes desiccated much more rapidly than the historic hydrologic regime would have allowed. As a result, Oxford Slough wetlands do not remain hydrated during the waterbird brood-rearing period during most years, which requires alternative solutions to making the most of the limited water currently available.

Thomas Fork Unit

On Thomas Fork Creek, streamflow patterns are essentially the same as occurred historically between September 30 until May 1st when the irrigation season begins, and irrigators begin flooding agricultural fields. After May 1, the Refuge artificially maintains both wetland levels and instream flow during critical late spring/early summer months, which mimics the natural regime before settlement and development for agriculture occurred. Agricultural diversions would have lowered wetland and stream levels below levels that the Refuge now maintains.

4.1.3 History of Refuge Management

Bear Lake NWR

Bear Lake NWR was established in 1968. Prior to 1978 Bear Lake NWR was a satellite refuge of Grays Lake NWR, 35 miles north of Soda Springs, ID. One refuge manager was responsible for both refuges, with an assistant manager assigned to each station. The office for both refuges was in Soda Springs. However, Bear Lake NWR had a part time office in Montpelier. In 1977, the Refuge leased the office, shop, and yard at 370 Webster St., which they occupied in 1978 and continues in use today. On May 8, 1978, the Southeast Idaho Refuge Complex (SIRC) was established. The SIRC included four refuges, each with a manager, overseen by a Project Leader located in the SIRC office in Pocatello.

Habitat and Water Management

Calendar Year 1969 was the first full year of water management carried out under the 1968 agreement between the Utah Power and Light Company and the Bureau of Sport Fisheries and Wildlife, now the U.S. Fish and Wildlife Service (Service), which required that UP&L maintain water levels within ½ foot of 5,920.5feet UP&L datum annually whenever feasible, within control of irrigation water and storage programs as detailed by the Bear River Compact, which controls spring flows into Bear Lake proper.

Managers immediately knew that the combination of widely fluctuating water levels and abundant carp was severely impacting the growth of submerged aquatic plants, even in permanent pools. They recognized that stabilization of water levels and rough-fish (carp) control would improve habitat, but hypothesized that there could also be problems with water quality or soil characteristics. Managers also saw that dense stands of hardstem bulrush (*Scirpus acutus*), cattail (*Typha* spp.), and wiregrass (*Juncus balticus*) made for unproductive waterfowl habitat. However, in the Refuge's early years, lack of resources (money, time, and staff) prevented managers from addressing these issues. Managers experimented with (unspecified) upland plantings to provide more food for waterfowl in particular, although they complained that not enough suitable uplands existed on the Refuge to expand the plantings if the experimental planting proved successful. In addition, diving ducks would receive no benefit from upland plantings. Managers felt that the Refuge would remain deficient in wildlife food supplies until impoundments could be constructed. Impoundments would provide control over water levels, turbidity, and carp populations, and would facilitate propagation of valuable submergent or emergent aquatic plants.

Slowly managers began to construct impoundments on the Refuge by building up dikes and levees along naturally higher areas and controlling water flows with stop logs and screw gates. The Annual (Fiscal Year) Narrative for July 1, 1973-June 30, 1974 relates that a 15-acre carp exclosure was erected along the east side of the Refuge and that spring growth in the carp exclosure showed vigorous growth of alkali and three-square bulrush.

In 1978, the only place the Refuge was able to control water levels was on the newly constructed Salt Meadow Unit (Annual Narrative). This dike enclosed approximately 280 acres, of which 240 acres was water and emergent vegetation. The Refuge opened the screwgates on the water control structures to fill the impoundment. When UP&L started to release water for downstream irrigators, the Refuge closed the screwgates to retain higher water in the impoundment. The water quality and waterfowl use of this new impoundment was greatly increased due mainly to the exclusion of carp. That year, the Refuge and YACC (Young Adult Conservation Corps) personnel transplanted alkali bulrush plants to the mudflat area in the southeast corner of the Salt Meadow impoundment. Plants were obtained between the east dike and the Refuge boundary and from a side channel of the Outlet Canal north of the Airport barley field. The bulrush was planted within six inches of the 1978 high water elevation.

During August 1979, Mud Lake was lowered to 5,919.48 feet to permit dredging on the Outlet Canal by UP&L. Since the original dredging of the canal system in 1917, a large sandbar had formed at the confluence of the Rainbow and Outlet Canals. This hindered the movement of water in the canals and also presented an obstacle for hunters' boats.

In 1980, the Refuge received funding under the Bicentennial Land Heritage Program (BLHP) to construct the Alder and Rainbow dikes. However, a buried peat layer presented construction problems. Since construction of the canal and storage system in the earlier 1900s, two to 2 ½ feet of silt were deposited in the construction area (and probably more in some areas of the Refuge). In order to keep the amount of peat in the dike to a minimum, the borrow depth was increased to get more clay while discarding some of the peat.

While the discovery of the peat later slowed construction, it dramatically illustrated the role of silt in the loss of valuable wetland habitat. Two types of peat were found (for simplicity called black and yellow). The black peat was nearly 100 percent organic matter, 12-18 inches thick, and corresponded to the original emergent vegetation area of the marsh. The yellow peat was about 50 percent organic matter, 6-12 inches thick, and corresponded to the original open water habitat. Between 60-80 percent of previous shallow open water was covered with thick emergent vegetation due to siltation.

The refuge manager attempted to completely dewater the Rainbow Unit during the fall of 1981 to remove carp, but was unsuccessful because construction activity delayed the effort. The water level was low enough during the winter to result in a partial winterkill of 3,000-5,000 carp throughout the unit. With the partial winterkill the water quality improved considerably compared to previous years.

In 1983, the 1,800-acre Rainbow Unit was drawn down to apply rotenone for carp control after the nesting season was completed and the water began to recede. Subsequently, water quality in the Rainbow Unit was excellent. The blocked off portion of the old Rainbow Canal, borrow areas, and former mud bottom and mud flat areas, developed extensive stands of submergent vegetation, which included sago pondweed, watermilfoil, curly pondweed, white water buttercup, and yellow water buttercup. Numerous redhead pairs, singles, and broods were observed throughout these areas where few, if any, were observed in previous years. To aid the re-establishment of submergent vegetation within this unit as well as the Salt Meadow Unit, sago pondweed (*Stuckenia pectinata*) tubers were planted in late May of 1984 with the help of local Boy Scouts.

The Rainbow Dike, which was begun in 1980, was finally completed in 1987. The dike was created by building up the edge of the Rainbow Inlet Canal, which had been constructed in the early 1900s to bring water from the Bear River into Bear Lake. Water control structures and fish barriers were installed to keep carp out of the new Rainbow Unit. In 1988, carp control was conducted on both the Rainbow and Dingle Units.

The Annual Narrative for Calendar Year 1990 relates the challenges of managing the Refuge during a drought year. During the early summer, the Refuge marsh was kept at levels favorable for nesting birds despite the drought conditions. PacifiCorp (which merged with UP&L in 1989) did an excellent job using what runoff was available and pumping water from Bear Lake to maintain the Refuge at a productive level. This struggle to keep water levels in the marsh adequate for waterfowl needs while pumping from Bear Lake was very expensive kilowatt wise, and also required additional efforts to keep the inlet channel from Bear Lake to the Lifton pump station dredged free of silt and sand.

Discussions were held in mid-August to determine the advantages and disadvantages of a complete drawdown of the refuge marsh, primarily the Mud Lake and West Canal units. (Note: The West Canal Unit has, as of 2010, been further subdivided into the Bloomington, Bunn, and Dunford Units.) Managers decided to move forward as quickly as possible in draining the marsh. The benefits of a drawdown during this severe drought cycle outweighed the negative impacts, and PacifiCorp was asked to pull boards at the Paris Dike and to lower marsh levels in a steady manner. The Mud Lake and West Canal Units comprise almost 14,000 acres of fairly permanent marsh. These units are rarely dry, except along the shallower edge areas.

The objectives of the drawdown were as follows:

1. To follow the natural weather pattern and allow the marsh to go through a much needed drying cycle. This would:
    a. Dry up bottom muck to allow aeration and nutrient cycling through deep cracking and vegetation decay.

   b. Consolidate 1.5-4-foot-deep soft bottom mucks into a firmer bottom substrate in the deeper portions of the marsh to produce better quality and quantities of aquatic plants in the future.
   c. Remove carp from large areas of the marsh by drying up areas, flushing fish downstream, and freezing out fish in shallow pools held low over the winter.
   d. Flush the stagnant and nutrient laden water in the Mud Lake and West Canal pools downstream, replacing it with fresher Bear River water during January.
2. To cooperate with PacifiCorp on adjusting our water needs during the drought period. This puts the Refuge in-line along with the sacrifices made by other water users and helps reduce excessive PacifiCorp expenditures during this low water period.

In late August several boards were pulled at the Paris Structure and the marsh levels began to drop. The elevation of Mud Lake at this time was 5,919.95 feet. The amount of area that could be drained and how quickly it would drain was uncertain, since this had never been done before. During this time the Rainbow Unit was receiving irrigation water from the Hogaeson Channel. Since this unit had good quality carp-free water, it was not drained so that the Refuge could provide for fall migratory bird use.

In 1991, wet spring weather increased a poor winter snowpack to almost normal levels. Heavy rains during the May-June period allowed normal season meadow flooding and improved marsh elevations.

In 1992, water flows were well below average. Normal flows in April are around 2,000 cubic feet per second (cfs), but only 146 cfs was recorded. The Lifton pumps were turned on April 24 to augment downstream flows to irrigators. This is the earliest recorded date for turning on the Lifton turbines. Bear Lake levels dropped to a low of 5,905.4 feet by November. Snowpack levels in December were much improved over this same time in 1991. Although flows from the Bear River into the refuge marsh were minimal, the winter filling schedule set up with PacifiCorp brought marsh levels in Mud Lake to 5,921.3 feet by April. This was a good operating level for migratory bird use, especially waterfowl, and PacifiCorp attempted to minimize any substantial drops over the short term.

On May 6, 1993, a large spring storm dumped 8 inches of wet snow and rain on the Bear Lake area. This was preceded by several weeks of cool wet weather. At approximately 7:30 AM, the saturated soils around PacifiCorp's causeway between the refuge marsh and Bear Lake failed and the entire 60-foot wooden structure washed out, dumping thousands of acre feet of water and tons of silt into Bear Lake. This event essentially drained over 80 percent of the Refuge's 13,200-acre Mud Lake and West Canal units in a 24-hour period. The water also washed away the approaches to the County bridge that provided access to North Beach State Park and the east side of Bear Lake. The original Causeway channel was 60 to 80 feet wide. The washout moved 3,900 cfs of water through this opening at its peak, eroding the banks severely and increasing the width of the channel to 200-300 feet.

The Rainbow Inlet Canal was flowing around 2,000 cfs of Bear River runoff at this time, adding to the problem. While 3,900 cfs roared through the failed Causeway, the Lifton pumping facility was wide open, moving 5,900 cfs through it into Bear Lake. An estimated 25,000 to 30,000 acre-feet of water drained from Mud Lake, and with it, thousands of tons of silt. The high rates of flow were due to the high gradient difference between Mud Lake at 5,921.54 feet (PacifiCorp datum) to Bear Lake's low level of 5,907.34 feet, a difference of 14.2 feet. Although marsh levels were quickly falling in the vicinity of the Causeway failure, the staff gauge at north end of the marsh still read 5,921.59 feet at noon on May 6. By the morning of May 7, water levels had dropped to a drained level of 5,918.5 feet. At this point the Refuge still had full water levels in the flooded Alder and Dingle Units and the

Rainbow and Salt Meadow Units were also nearly full. These areas were protected from drainage by impounding dikes and totaled some 3,000 acres. In addition to this, the Mud Lake area, which was impacted the most, did not completely drain. The northern third of Mud Lake retained sheet water to several inches over much of the bulrush encircled wetlands. Also, many of the channels and ponds within the expansive West Canal area of the marsh retained water.

During this time of year the refuge marsh was at its optimal level for migratory waterfowl, and marsh and waterbird use and production. Of particular concern were the impacts that this rapid dewatering of a large portion of the marsh would have on the peak of the substantial Canada goose hatch that occurs at this time each year. PacifiCorp and the Refuge discussed impacts and immediate needs, and PacifiCorp proceeded quickly to minimize the Refuge's potential biological losses. Bear Lake County reacted initially to calls for assistance, blocking off the washed out roads and beginning haul operations on a coffer dam to restore the marsh and provide one lane access across the eroded channel. As work progressed on the coffer dam, the marsh level began to rise and by May 26 the main marsh level was back to a near full level of 5,920.85 feet.

Also in 1993, two rehabilitation and enhancement projects were completed. The first was the Hoageson Slough project, which involved the construction of meandering channels and five islands in a 30-acre bulrush-choked wetland. The second project was in the north Red Slough area to improve water availability near adjacent grasslands. Solid emergent stands of vegetation were opened up and a defined channel into Red Slough to the south was developed as well as five small ponds and islands. During November, all islands and spoil areas were seeded to native grasses and legumes.

In late March 1994, cottonwood starts were cut along the Bear River and planted in small groupings around the Refuge where the water table could be easily penetrated. The objective was to provide a few additional loafing, nesting, and roosting areas. There were only a few cottonwoods on the Refuge in 1994. The 30 cottonwood starts did well initially, but as the dry summer wore on most new growth dried up due to the drought conditions and the lowering groundwater level.

A new dike project was also begun in 1995 to further partition the Rainbow Unit, the 1.1-mile dike of the sub-impoundment. In 1996, a two-mile portion of Bloomington Creek was cleaned. Silt had built up in this stretch over the last 60 years causing problems with water backing up on areas where haying occurred west of the Refuge. The project also allowed construction (using the cleaning spoil) of a low level dike/road that would follow the creek meanders to refuge uplands within the marsh, allowing access for management purposes such as haying or prescribed burns. The dike would also be the southern leg of the proposed 1,900-acre Bloomington Impoundment, a project working with Ducks Unlimited and the Intermountain West Joint Venture.

In 1996, the Rainbow, Alder, and Dingle Units were drawn down for carp control. Production of aquatic plants (sago pondweed and muskgrass, *Chara* spp.) in the Rainbow Unit during the following summer was excellent. The carp exclosures placed within the proposed Bloomington Unit (the dike was under construction at this time) in 1996 showed good regeneration of muskgrass, Richardson's pondweed (*Potamogeton richardsonii*), and other species.

In 1997, Ducks Unlimited and the Refuge received a North American Waterfowl Conservation Act (NAWCA) grant for $468,000. This grant, along with new partnerships, allowed completion of the 1,900-acre Bloomington Unit Restoration Project. With matching funding, the total project value was $560,000. In 1998, the Refuge completed the two-mile dike and channel cleaning along Bloomington Creek. This new dike was the southern leg of a five mile dike that surrounded the 1,900-acre Bloomington Unit. In September 2000, with the 1,900-acre Bloomington Unit 98 percent dry, the

Refuge and the Idaho Department of Fish and Game conducted carp control operations in the remaining borrow areas and shallow channels.

A major improvement critical to the success of the restored Bloomington Unit was the repair and improvement of the water management system along the Refuge's boundary with the Ward Ranch. Since the Ward Ranch moved water across their property from Bloomington Creek ditches to flood irrigate their meadows, and this water eventually moved into the refuge marsh, improvements to this area were needed to prevent carp movement from flooded private meadows into the Bloomington Unit in spring 2001. This project involved replacing rusted culverts and structures, improving existing levee height, and installing prefabricated carp-screened structures over the slide gate structures in seven locations. The Refuge toured the work area three times with Dean and Philip Ward, who provided much needed advice on how and where the water moved across their property. Work on this continued through January 2001. New walkways and slide gate pullers were built and installed in March 2001. A dedication was held in June to celebrate the completion of the 1,900-acre Bloomington Unit Restoration Project.

During November and December 2002, refuge staff completed the final stages of the Bloomington Dike project by installing the Bloomington Crossing. This levee project involved installing two 64-inch pipes and stoplog structures across Bloomington Creek to allow refuge access to the east side of the Bunn Lake Unit, commonly referred to as the Dunford Uplands. This project provided the capacity to allow spring flows to pass through the structure while allowing refuge personnel to raise the level of Bloomington Creek during fall to pass water into the Bloomington Unit via Structure #4. The project was completed using materials provided by the Bloomington Dike NAWCA project and force account labor by the Refuge.

In 2003, the Rainbow Unit (historically the highest swan use unit) was maintained throughout the summer at a 3/4 full level with a 24-inch Crisafulli pump. Abnormally high August temperatures would have caused most available habitat to dry up if the pump had not been used. It is important for successful swan nesting to maintain a certain level of water throughout the summer. Other impoundments could be allowed to fluctuate more "naturally" with the existing drought conditions in 2003. The Bloomington Unit (likely to provide several potential nesting territories) was maintained through early July and then allowed to slowly recede through natural evapotranspiration. Mud Lake (where most of the swans molted through late July-August), was slowly dropped to meet irrigation demands through this period. The Refuge requested and PacifiCorp granted the opportunity to bring Mud Lake and our management units to a full pool level by the 1st of October. This provided additional shallowly flooded habitat for swan and other waterbird foraging while allowing the Refuge to maintain full pool levels through winter as a hedge against a very short irrigation season in 2004. This would allow the Refuge to maintain water levels adequate to maintain existing swan breeding territories through August 2004 if the drought persisted.

With diminished water supplies and record setting temperatures, the Refuge installed a new culvert on the 242-acre Salt Meadow Unit on July 9, 2003. The culvert allowed refuge personnel to use our 20 cfs capacity Crisafulli pump to transfer water from the Dingle Unit to the Salt Meadow Unit in order to maintain remnant submergent vegetation. Overall, the pump was operated for 10 days providing over one foot (200 ac/ft) of additional water into the rapidly drying unit.

In 2004, refuge staff worked on the Rainbow Complex Restoration Project which was funded through a $53,000 Intermountain West Joint Venture (IWJV) small grant. The project entailed construction of one new water control structure and replacement of five existing structures with carp control hardware. Over the summer of 2004, refuge staff completed construction of the new structure and replacement of two existing 36-inch structures to facilitate independent water management capabilities within the three-unit, 2,114-acre Rainbow Complex. The final stage, replacement of three existing structures, was completed during summer 2005; however, the 2004 construction elements greatly enhanced water distribution capabilities in the 234-acre Salt Meadow and 434-acre Rainbow Unit Sub-impoundment during a narrow October flooding window. All units were in exceptional condition going into 2005.

During summer 2004, the Refuge applied for and received $250,000 through the Fisheries Restoration and Irrigation Mitigation Act (FRIMA) program to complete the 14,800-foot St. Charles Creek Fish Passageway project on the proposed, 510-acre St. Charles Creek Unit. When completed, the passageway would provide unimpeded spawning access for Bear Lake Bonneville cutthroat trout from Bear Lake to spawning redds located in the upper St. Charles Creek. Persistent drought in the Bear Lake Valley and associated record low water levels in Bear Lake had nearly eliminated natural spawning of Bear Lake Bonneville cutthroat trout for the preceding seven years. As such, the project was placed on a fast track to complete within one year.

Survey and design were conducted during September/October, and approximately 7,800 feet of levee construction was bid and the contract was awarded to Western Watersheds in November 2004. Permitting was completed through December, and initial ground breaking was slated for the first part of January. Refuge staff worked feverishly to meet this aggressive schedule and actually exceeded construction expectations through the winter. Analogous to the east meets west continental railroad design, the Refuge worked from opposite ends with a hired contractor and met in the middle on April 1st, 2005. While the schedule did not produce a fully operational product until September, it was recognized that the passageway was made functional for the 2005 spawning season (U.S. Fish and Wildlife Service 2005).

Prescribed Fire

A prescribed burning program was begun on the Refuge in 1992 with a 200-acre burn completed in the Salt Meadow Unit on April 20. Ninety percent of litter and vegetation was consumed in the fire. Migratory bird use of the area in June and July was high, especially white-faced ibis foraging in the growing bulrush and *Juncus* wetlands.

Emergent bulrush transects from the 1992 Salt Meadow burn unit were monitored again in 1993. Residual bulrush is an important nesting material for redheads and other divers at the Refuge. Regrowth of burned bulrush was tracked as it regained more attractive nesting densities in subsequent years. This provided information about how long it takes for bulrush burns to fully recover in terms providing habitat for diving ducks, and if these selective burns are meeting the burn objective of stimulating growth and increasing future bulrush densities.

On April 21, 1993, a prescribed fire was planned for 430 acres in the northeast corner of the Rainbow Unit. The actual acreage burned was about 340. From 1994-1998, no prescribed fires were undertaken. In the spring of 1999 four prescribed burns were conducted by the Malheur NWR fire staff; NE Rainbow (163 acres), Bloomington 1 and 2 (432 acres), Dunford 2 (95 acres). In 2000, a crew of seven completed prescribed burns from March 8-12. Two hundred acres in the South Dingle Unit, 200 acres in the West Rainbow Unit, and 300 acres in the northern portion of the Mud Lake Unit were completed for a total of 700 acres burned. Despite the cold weather and frequent snow squalls the burns went well, burning 80 percent of the bulrush within the fire perimeters and creating some very good open ponds and channels when re-flooded later in March. The 4th burn (South Big Creek) was not done due to a lack of time to properly prepare the control lines near power lines.

On March 14, 2001, a prescribed burn of 500 acres was completed in the southern portion of the Bloomington Unit. On March 15, a 310-acre prescribed burn on the northeast portion of the Mud Lake Unit was completed. The prescribed burn was implemented by the Malheur NWR fire staff and local US Forest Service fire personnel. On May 11, 2002, a 20-acre grassland prescribed burn was conducted in the triangle north of the maintenance shop. A prescribed fire intended for spring 2003, an approximately 1,000-acre marsh burn in the St. Charles Creek area of the Bunn Lake Unit, was aborted because of weather conditions.

One prescribed burn was conducted during 2004, a 400-acre marsh burn in the Dingle Unit. The resource objectives were to create a 70 percent burn mosaic on the Dingle Unit, primarily to set back vegetative succession and create additional openings within this ephemeral water management unit. In April 2005 the 2,140-acre N St. Charles prescribed burn was completed in bulrush west of Bunn Lake. In April 2007 the 567-acre Dunford Unit was burned; the unit was a combination of wet meadow and bulrush. In October 2009 the South Dingle Unit (403 acres) was burned in same area as in 2000. In nine years the bulrush had re-grown to the same densities seen in 2000.

Haying and Grazing

Upon Refuge establishment in 1968, haying and grazing were initially retained because these uses were traditional on the lands now designated as a National Wildlife Refuge as well as the surrounding private lands. At the time the Service used haying and grazing, along with other techniques, as habitat management tools. In 1966, at a public meeting regarding possible establishment of the Refuge, John D. Findley, Associate Regional Director of the Service, made an introductory statement that included the following: “Important to the waterfowl management program will be a continuation of the haying and grazing uses which now occur in the Dingle Swamp area. These uses when properly regulated are compatible with the waterfowl management program. Grazing and haying are management tools needed to maintain openings in cover for improving nesting conditions and to allow an economic return to be realized from forage produced on the area (USDOI 1966).”

In 1968, five special use permits for haying, grazing, or haying and grazing were issued to expire April 1, 1969, extending the use of the land as practiced in the past to complete the season’s work. Future permits would be established in accordance with refuge policies within a grazing and haying program.

Both haying and grazing of refuge lands was used to open up dense bulrush stands and to provide a succulent green browse for waterfowl use. The type of vegetation cut for hay was mostly wet meadow plants such as spike and wire rushes, sedges, and even hardstem bulrush. Management felt that if it were not for haying, these units would eventually become solid, impenetrable stands of hardstem bulrush or cattail. This could be demonstrated by looking at the old hay stackyards that had grown up to solid stands of emergents. The haying program also provided areas of green browse for waterfowl and many miles of edge habitat between cover and open water.

Managers retained grazing in eight refuge units because they felt that certain areas of the Refuge were too difficult to hay and still required some manipulation of wet meadow grasses and emergents for good waterfowl use. Cattle were helpful in opening the dense stands of emergents that extended right up to the refuge boundary fence in several areas. During fall/winter storms, bedding by cattle in bulrush patches formed openings which in turn formed spring potholes for migrant and breeding waterfowl. In units with drier upland grasses and sagebrush, grazing was limited or prohibited.

The grazing program was intended to accomplish the same end as the haying program—to keep the areas open and not overgrown with emergents. However, during the 1970s and 1980s, refuge staff recognized some interference of grazing with wildlife production and damage to habitat (USFWS 1994a). In many cases the same unit was being hayed and grazed and managers felt that this might have been detrimental to the vegetation. These concerns were addressed by reducing grazing permits and changing the amount and timing of grazing.

On October 22, 1992, The National Audubon Society; the Wilderness Society; Defenders of Wildlife; Black Hills Audubon Society; and Alan D. Riley filed a complaint for declaratory judgment and injunctive relief against Manuel Lujan, Jr., Secretary of the Interior; John F. Turner, Director, U.S. Fish and Wildlife Service; and U.S. Fish and Wildlife Service. The complaint challenged the actions of the Service in authorizing and allowing secondary uses of the National Wildlife Refuge System, such as grazing, military air exercises, motorboating, and watersports, without ensuring that such uses are compatible with the purposes of the National Wildlife Refuges on which they occur (NAS 1992). The Service agreed to a settlement of the “compatibility lawsuit on October 21, 1993. The settlement agreement required that the Service “review all secondary uses on all national wildlife refuges to ensure that they are compatible with the major purposes for which the respective units were established” (USFWS 1994a).

In 1993, the Refuge reexamined grazing as a habitat management tool to determine if it met the criteria for a compatible refuge use. Managers concluded that it was not compatible, and grazing permits were phased out with 1994 being the last year of issuance. Problems documented from the existing grazing program were: increased nutrient loading in wetlands, reduction of residual nesting cover that reduced nest success, and direct mortality to nesting sandhill cranes from impacts with grazing allotment fences (USFWS 1996).

Haying was considered to be compatible with refuge purposes and permits continued to be issued. Permits are issued as Special Use Permits with either a negotiated or bid rate per ton of hay harvested, or as Cooperative Land Management Agreements (CLMA). CLMAs stipulate that the cooperator plants grains and/or legumes for wildlife in exchange for harvesting refuge hay. Cooperators also fallow fields in rotation, conduct weed control, repair water control structures, and perform various other duties as negotiated. From 1968 to 2011, the Refuge issued from 12 to 20 hay permits annually, and 994 to 2,054 tons of hay were harvested on 2,117 to 2,896 acres annually. Management currently issues two CLMAs that allow haying on up to 779 acres annually in exchange for planting 91 acres of grain or legumes annually.

Since about 2003, managers had begun to retire hay units that permit holders no longer wanted to hay, especially if these units were notably wet and difficult to dewater to allow haying. As the planning team began examining soils, vegetation, and wetland data for development of this CCP, it became clear that the Refuge was haying almost all of its wet meadow habitat, as well as some shallow emergent habitat. Short stature vegetation provided by haying occurs all over the Bear Lake Valley, whereas wet meadow habitat is in shorter supply. It makes sense to try to provide more natural wet meadow adjacent to short stature vegetation, dense nesting cover, and open pools (see Chapter 2, Management Direction).

Farming

In 1969, about 80 acres of uplands along the west boundary of the Refuge were cleared of brush and grass and cultivated for planting the following spring to wheat and barley. Depredations on local cereal crops by sandhill cranes and waterfowl were becoming a problem and it was hoped that this first grain field would help alleviate the situation. In 1970, these 80 acres of barley planted produced a fair crop of green browse and seed. Green browse was little used, but when seed began to ripen, sandhill cranes spent a great deal of time in the field. As many as 100 cranes were observed there at one time, and throughout August and September crane use averaged 40 to 50 birds per day. After cranes departed on their fall migration in the first week of October, increased use of the field by Canada geese and ducks was noted.

Barley and/or wheat have been planted every year since the Refuge was established. The Annual Narrative for 1976 notes that two main refuge objectives were being met by the farming program. First, the farming program provided a needed food source for brooding Canada geese. Second was the high priority objective of alleviating depredation to the crops of neighboring land owners.

In 1984 and 1985, waterfowl and cranes consumed 100 percent of the lure crops. Therefore, it was decided to increase the crop acreage in 1986. From 1988 to 1994, the farming program entailed a dry farm rest rotation with small acreages of barley and alfalfa grown for migratory bird use through the migration and nesting periods. Mallard, Canada goose, and sandhill crane use on these areas was high, with close to 100 percent use by November of each year. Summer fallowing was used as part of the rotation to build up soils and combat noxious weeds. No chemical fertilizers were used. Areas of the farm fields were planted to alfalfa for goose/crane browse and to fix nitrogen in the soils for later rotation to barley a few years later. In 1990 a subsoiler for deep cultivation was obtained and repaired. It was used extensively in that year to improve soil moisture retention in the spring. Managers planned to use the subsoiler on a three-year rotation.

In 1995 farming was done with shared equipment from Grays Lake NWR, 60 miles to the north. Summer fallowing was used as part of the rotation to build up soils and combat noxious weeds (primarily Russian knapweed, Canada thistle, and whitetop) in problem areas. Legumes were used to fix nitrogen, build soil tilth, and provide annual browse for Canada geese and sandhill cranes. Around 60 acres of barley was raised each year as a food crop for refuge waterfowl and cranes. During the spring, a revised Cropland Management Plan was developed for the Refuge along Regional guidelines. This afforded the opportunity to reexamine the farming program and improve the existing biological farming effort. All five farm units were scrutinized and most were redivided into three, more equally proportioned subunits and set up for rotation using barley, a legume crop, and summer fallow.

In 1998, barley planting was reduced in some units due to the presence of fairly abundant barley from the previous year. At that time the Refuge had 170 acres of croplands used as part of the farming rotation. The rotation helped minimize the use of herbicides for controlling weeds; the grain units were sprayed once in June for weed control. In addition, no chemical fertilizers were used.

The farming program continues today, except that cooperators do the work instead of refuge staff under CLMAs (see above). Currently cooperators farm approximately 91 acres annually, producing mostly winter wheat along with rotations of legumes. Cooperators are also beginning to reintroduce barley rotation since the seed bank from previous plantings is now depleted.

Depredation Reduction

From 1970 to 1985, refuge staff assisted local landowners to alleviate depredations by wildlife, mostly cranes and geese, on private grain fields. Refuge personnel, in cooperation with State conservation officers, distributed scaring devices, including cracker shells and rockets, to farmers who complained of migratory bird depredations. Heavy sandhill crane use and moderate goose and duck use of the refuge grain field contributed to depredation relief activities. In 1971 and 1972, several truckloads of barley were dumped at suitable locations in Bear Lake Refuge to attract birds. Again, rockets, cracker shells, and other devices were distributed to farmers that complained in writing of migratory bird depredations. It was felt that this effort was moderately successful in preventing depredations.

Many staff hours were spent to place and service propane powered exploders, as well as traveling from field to field shooting SCRAM rockets and teleslot in an effort to move the birds. When moved, they usually flew to another farmer’s field so the whole process would start over again. This consistent harassment by refuge personnel and the farmers usually started about mid-July and continued until the grain was harvested in September.

From 1978 to 1985, from eight to 11 farmers each year would lodge formal complaints about depredations. In 1986, the migratory bird depredation program was turned over to the U.S. Department of Agriculture-APHIS (Animal and Plant Health Inspection Service); however, the Refuge continues to provide “lure” crops to alleviate depredations, as noted in the “Farming” section above.

Goose nesting platforms

Idaho Department of Fish and Game had already placed several goose-nesting platforms in the marsh prior to 1968 when the land was still under the jurisdiction of the BLM. From 1968 to 1974, the Refuge continued to maintain and add goose-nesting platforms, and at one point had close to 100. Although maintenance and preparation for nesting season were very labor intensive activities, the Refuge continued to do so at least through 1991. With the rebound of goose populations, the Refuge decided not to continue maintaining the platforms and has been allowing them to disintegrate into the marsh over time.

Protecting Nesting Areas

From 1987 to 1996, electric fences were erected on the Rainbow Dike to reduce predation on waterfowl nests. In 1988, the Refuge also excavated water barriers to prevent predators, primarily skunk, from accessing two nesting areas: one at the northwest end of the Rainbow Dike, and the other on the inside of the east dike of the Salt Meadow Unit. Between 1,500 and 2,000 cubic yards of material was removed and used to rebuild and enlarge two nesting islands in the Rainbow Unit. The Annual Narratives contain no reports of erecting electric fence from 1997 to present.

Preventing bird strikes on power lines

In 1988, UP&L (which merged with PacifiCorp in 1989) agreed to modify power lines and poles to prevent bird strikes and electrocutions. On April 17, 1995, an immature peregrine struck a power line along Paris Dike. This incident, as well as a pending trumpeter swan release the following April, presented an opportunity to get 6,000 feet of problem power line outfitted with avian diverters. Installation of avian diverters on the power lines was completed by PacifiCorp in July of 1996.

Wildlife Surveys

From 1968-1987, waterfowl day use estimates were prepared for the Refuge, and from 1968-2000 waterfowl production (ducks, geese, and swans) was also estimated. From 1968-2004, estimates of waterbird and marshbird populations were made, usually based on guesswork, but sometimes augmented by ground or aerial surveys. Species surveyed and the level of survey effort varied from year to year. Data from these surveys have been used to assess populations and their response to management actions.

In 2005, the Southeast Idaho National Wildlife Refuge Complex began cooperating with Idaho Department of Fish and Game's Idaho Bird Inventory and Survey (IBIS) Program (Moulton and Sallabanks 2006). Secretive Marsh Bird Playback Surveys for five Idaho target species (sora rail, Virginia rail, American bittern, pied-billed grebe, and Wilson's snipe) were conducted from 2005 to 2010. Colonial waterbird colony counts were conducted by IBIS at Bear Lake NWR and Oxford Slough in 2005 and 2008, and Bear Lake NWR only in 2006 and 2009. For detail on survey results, see Section 4.4.1 below.

Oxford Slough WPA

The 1,878-acre Oxford Slough WPA (elevation 4,750 feet) was acquired by the Service in 1985, and is the only waterfowl production area in Region 1. This WPA is located 10 miles north of Preston, ID, next to the small town of Oxford, ID. The extensive Oxford Slough (711 acres of deep wetlands with bulrush and other emergent plants) dominates the unit. Oxford Slough also has a diversity of wet meadows and drier alkali uplands (988 acres), with farm units (179 acres) on its north end. The first mention of Oxford Slough WPA in the Annual Narratives is in 1990. At that time, the unit was managed from the SE Idaho Complex office. Bear Lake NWR staff provided support and they made four trips to the slough in 1990. From at least the year 2000-2007, the Oxford Slough WPA has been managed from Bear Lake NWR. From 2007 to present, the Oxford Slough WPA has been managed jointly by staff in the Complex office and Bear Lake NWR.

Water Management

Oxford Slough receives its water from runoff from surrounding fields and hills, and irrigation canal flows during the summer through fall/winter period. Late summer water is usually a problem in this unit, with much of the WPA drying up by October in normal to dry years. This was the case in 2000, a year with adequate spring and early summer water. Water levels dropped quickly during the dry summer, leaving little water available for migratory birds by September. Late fall irrigation return flows began refilling the unit in November, offering good habitat for late season mallard use.

Below average precipitation and above average temperatures in 2002 resulted in completely dry wetlands by late August, leaving no water available for migratory birds in September. Late fall irrigation return flows began refilling the unit in early November, offering good habitat for late season mallard use until the unit completely froze in early December.

During 2003, below average precipitation and above average temperatures resulted in completely dry wetlands by early August, leaving no water available for migratory birds in September. While this situation provided extremely poor habitat conditions for late nesting and fall migratory waterbirds, the Refuge took advantage of the situation by initiating a channel cleaning project to divert water away from agricultural drains and to spread limited water throughout the slough. Prior to this project, water entered at the northeast corner of the slough, seasonally spread throughout the marsh, but then was limited to the eastern portion of the slough adjacent to the drains as water receded during summer. It was hoped that the channel cleaning project would allow even distribution throughout the slough, ultimately increasing water retention in critical summer months when fledgling water birds were reaching flight stage.

During September and October of 2003, Heavy Equipment Operator Alexander and Maintenance Worker Kelsey shifted operations to the Oxford Slough WPA to begin a channel cleaning and island creation project. Through examination of aerial images of the slough, it was discovered that three separate drains had been dredged on WPA lands prior to Service acquisition in 1985. These drains tended to move water rapidly through the slough for downstream irrigation use. In this extended period of drought, this drainage resulted in adverse consequences to spring produced waterbirds because the slough tended to dry before they reached flight stage.

To complete the project, the historic channel of the slough was identified and a course plotted using ArcGIS. Through use of the excavator and a handheld GPS, this course was followed in the field to open the historic channel to divert water away from the drains. The entire project was completed force account with fuel comprising the only project cost. As of December, the project appeared to be successful as the new channel was flooded while the drains remained dry.

Qualitative observation in 2004 suggested that the 2003 channel cleaning operation was fully successful. Water retention during July and August, when fledgling water birds were reaching flight stage, was increased. Water appeared to have remained in the unit well into September; the first year water was available for the entire breeding season over the last three years. Additionally, water reflooded the Slough beginning in early October, providing at least a minimal amount of migration habitat for fall migratory birds. Channel cleaning, combined with the first marsh burn in the last 20 years (see “Prescribed Fire” below), improved conditions on the WPA for migration and breeding pair use.

Also during 2004, the 1,200-foot Oxford Slough Safety Levee was replaced using MMS funds. The levee had blown out during a mid-1990s flood leaving only the Union Pacific railroad base to access the southern and eastern portions of Oxford Slough WPA. Because of safety concerns associated with active railroad access only, the levee was rehabilitated and outfitted with a 48" water control structure to allow spring water to flow through the system. The finished levee provides access to accomplish future habitat restoration activities (e.g., prescribed burns and invasive species control) on the WPA’s eastern boundary as well as providing water management capabilities.

Farming

The 1998 Annual Narrative reported that 179 acres of farm units on Oxford Slough WPA were being farmed under a Cooperative Farming Agreement (CFA), which provided 47 acres of cut and uncut barley, 52 acres of mowed alfalfa, and 80 acres of dense nesting cover (DNC). Approximately 180 acres of wet meadow areas were hayed as well. The farming agreement was set up with a local farmer, Mr. Stanton Yearsley, who had been part of this unit’s management since Oxford Slough WPA was acquired in 1985. The five-year agreement ran through December 31, 2000. Under the CFA, Mr. Yearsley was also responsible for water management, any water assessment fees, and noxious weed control as prescribed by refuge policy.

As of 2003, the 168 acres of farm units on Oxford Slough WPA were being farmed under a Cooperative Land Management Agreement (CLMA), which provided 43.2 acres of cut and uncut barley, 24.2 acres of mowed alfalfa, and 89 acres of dense nesting cover (11.7 acres were summer fallowed in 2003). Approximately 180 acres of wet meadow areas were hayed as well. The CLMA was set up with the same farmer who held the previous CFA (Mr. Yearsley). Under the CLMA Mr. Yearsley was also responsible for water management, any water assessment fees, and noxious weed control as prescribed by refuge policy. The CLMA for 2004 was the same as in 2003 with the addition of mowing strips within barley fields, which yielded dramatic bird use increases. Mr. Lynn Garner has held the CLMA from 2007 to the present. He plants winter wheat, fallows fields, repairs fences, controls weeds, and manages refuge water rights in exchange for harvesting hay and winter wheat.

Prescribed Fire

A 55-acre upland burn was set off on April 9, 2003, with the intention of restoring native grass vigor while decreasing annual weed coverage. Pre-burn data were collected to document vegetation response. The objectives of the burn were met, but below average precipitation following the burn resulted in poor regrowth of native grasses. It was anticipated that snowpack during winter 2003/2004 would be adequate to allow for extensive regrowth of native grasses the following spring.

A 67-acre prescribed burn in the Oxford Slough marsh was conducted on April 7, 2004. The marsh burn was intended to completely remove nearly 20 years of residual hardstem bulrush in perennial water portions of the Slough, and that resource objective was met.

Wildlife Surveys

In 2000, a duck nesting survey and a duck brood count was conducted (see Section 4.4.1 below). In 2005, the Southeast Idaho National Wildlife Refuge Complex began cooperating with Idaho Department of Fish and Game's Idaho Bird Inventory and Survey (IBIS) Program (Moulton and Sallabanks 2006). Colonial waterbird colony counts were conducted by IBIS at Oxford Slough in 2005 and 2008. For detail on survey results, see Section 4.4.1 below.

Thomas Fork Unit

In 1988, the Service proposed that the 926 acres of wetlands on the 1,015-acre DeWitt-Feller property be turned over to the Refuge System. Idaho Farm Bill Coordinator Peggy Guillory, Ecological Services, Boise, persistently resubmitted fee title transfer proposals, after initial rejections, through the State office to FmHA in Washington, D.C. In June 1990, Bear Lake NWR signed an interim management agreement with the Farmers Home Administration (FmHA) pending the sale of the DeWitt-Feller property and recording of the conservation easement on the property, with the Service as manager. Finally, after many years of effort, the FmHA approved the fee title transfer of the entire 1,015-acre DeWitt-Feller property to the FWS in November of 1995, when it was named the Thomas Fork Unit.

The Refuge began management planning for 1996. During the fall, the Regional Land Surveyor made a field reconnaissance of the property in preparation for a spring boundary line survey. Prior to the fee title transfer, the Refuge did another Level I Contaminant Survey. Planning was also underway for fencing, posting boundary signs, noxious weed control, farming, and water management efforts. At that time, the objectives for this tract were preserving the 2-mile riparian corridor along Thomas Fork Creek, management of the wetlands for migratory waterfowl, improving the habitat for late summer/fall sandhill crane staging, and protecting that portion of the property where the Oregon Trail crossed the Thomas Fork.

In 1996, 4 miles of the east boundary fencing was completed by a contractor as well as old fence removed and boundary signs posted. Water crossings were also repaired with new culverts and gravel, the east water control structure was replaced with a larger stoplog type with pipe, metal gates were installed at access points, the existing trail/road through the interior of the unit was improved with gravel, and an old farm field was rehabilitated into summer fallow.

During the summer of 1996, a land exchange for 18 acres of valuable riparian habitat along the Thomas Fork was worked out with then neighbor Rolf Esche. As part of the exchange Mr. Esche received an 18-acre farm field that the Service owned adjacent to his land. As part of the agreement, the property has a permanent Conservation Easement along the stream bank protecting the riparian zone in the southern portion of the Thomas Fork. The additional riparian habitat includes willow and stream bank with adjacent seasonal oxbow wetlands. The exchange was finalized in 1997.

In 1997 the 5.3-mile boundary fence was finally completed, and more work was done to improve water delivery and infrastructure. The center structure wooden deck was replaced with concrete deck, allowing larger and wider machinery to cross. New railings, walkways, and slide gates were installed as well. Rock was hauled in to protect key areas of eroding stream bank along the Thomas Fork's main channel.

A study of Bonneville cutthroat trout movement on the Thomas Fork Creek system conducted from July 1999 to April 2001 found that three diversion structures appeared to be hindering reproductive success (Colyer et al. 2005). In 2006, the Service partnered with the Ducks Unlimited, Trout Unlimited, US Forest Service, the Bear Lake Regional Commission, and a private landowner in the Thomas Fork system to create fish friendly diversion structures with ladders to allow for Bonneville cutthroat trout passage.

Sagebrush Habitat Restoration

The Thomas Fork Unit contains approximately 80 acres of mixed sagebrush upland and meadow grass habitat along its western boundary. This portion of the unit was subject to heavy livestock grazing prior to Service acquisition in 1995. While livestock grazing was discontinued upon acquisition, most of the extant vegetation consists of old-growth sagebrush with very little native understory vegetation. To supplement regeneration of this important community, the Refuge worked with the SE Idaho Complex fire crew to plant 250 big sagebrush seedlings during spring 2003, and an additional 400 seedlings in fall 2003. It was hoped that these supplemental plantings would eventually provide an enhanced seed bank so that the community could regenerate at an accelerated pace. Due to limited staff, assessments of the success of these plantings have not been conducted. Habitat assessments are included in inventory and monitoring objectives in this CCP (Chapter 2).

Farming

Currently, the Thomas Fork has about 44 acres of croplands used as part of the farming rotation. In June 1996, the old farm units were rehabilitated and barley was planted for migratory bird use via force account. Use of these new food crop areas was high in the fall, with good carryover barley for the spring of 1997. In 1997, 22 acres of barley and 10.5 acres of winter wheat were planted as food crops for waterfowl and cranes. The Thomas Fork Unit had an additional 22 acres of barley planted in the west grain field and 10.5 acres of winter wheat planted in the east unit. In 1998, the Refuge planted 5 acres of barley. Barley planting in some units was reduced due to the presence of fairly abundant carry over barley crops from the previous year.

In response to continued drought, the Refuge attempted to incorporate winter wheat into the rotation during 2003. The rationale was to have a crop ready to take advantage of snowmelt, instead of depending on summer precipitation as is the case with spring planted barley. The response was better than anticipated with over 700 sandhill cranes using Thomas Fork Unit wheat fields during fall 2004. Under the current CLMA, about 44 acres of crops for wildlife in exchange for approximately 337 acres of refuge hay. The cooperator also manages water levels, maintains the water control infrastructure, and sprays for weeds when needed.

Haying

Haying, planting grain, and fallowing fields in rotation were all done by refuge staff until special use permits were issued in 1998. Two to three permits were issued to local landowners each year. In 2007 the permits were phased out, and haying continued under a Cooperative Land Management Agreement (CLMA) with a local landowner. From 1996 through 2011, between 49 and 340 tons of hay were harvested on 337 acres of the Thomas Fork Unit.

4.1.4 Changes in Wildlife Populations after Refuge Establishment

Birds

Continental passerine, waterfowl, and waterbird populations have changed considerably since 1965. Refuge populations have fluctuated widely through time. In some cases species abundance has declined, due to habitat changes and other causes. The loss of many habitats, including breeding wetlands, increases the importance of remaining areas like Bear Lake NWR.

Trumpeter swans, Canada geese, and many species of breeding waterfowl have either increased or remained roughly stable on Bear Lake NWR since its establishment, due to more intensive habitat and population management. Data are provided in section 4.4.1 below. There are few data to quantify population size. Early reports on wildlife were primarily extrapolations based on limited field observations. Assumptions upon which these extrapolations were based could not always be verified. To be fair, this was the standard procedure for that time, and all that was generally possible to do given other refuge management priorities, limited staff and funding, and generally less robust standards for biological data. Therefore these figures do not provide “reliable knowledge” (Romesburg 1981, 1991) with which to make comparisons with newer data. More recent studies provide more robust data on populations of waterfowl and colonial nesting birds on the Refuge, but substantial gaps remain (see section 4.4.1).

Mammals

The annual muskrat harvest from the Bear Lake marshes was estimated at 75,000 animals in the “early 1900s.” Estimates of muskrat populations between 1968 and 1984 ranged from 2,000 to 9,500, with most estimates around 3,000-4,000. There are no reliable estimates of muskrat populations on any of the units at present, but clearly muskrat populations have declined from peak historic and probably early refuge levels. Beaver numbers have always been estimated at <20, and usually <15 animals. Muskrats and beaver have important roles as potential “ecosystem engineers” on these refuge units.

The elk population in this general area has increased dramatically from early historical records. Accounts of trappers in the mid-1800s suggest that elk were common, though buffalo and bighorn sheep were more numerous. Unregulated harvest in the late 1800s and early 1900s maintained or reduced populations to relatively low levels. By 1952, elk were believed to be numerous enough to warrant the first hunting season. Elk populations are now very high in this area (Compton 2008a), and they use the Thomas Fork Unit extensively during certain seasons.

Mule deer populations have declined from 1992-2002, not only in southeast Idaho but across the western states (Idaho Department of Fish and Game 2010), while elk, moose, and pronghorn herds have been stable, or increased since the same time period. Idaho's mule deer population has fluctuated widely at least since the early 1800s, and likely previous to that time. Early accounts from that period indicated that deer were less numerous than buffalo, bighorn sheep, and elk. Deer declined through the early 1900s, probably due to unregulated harvest. By 1920 deer were quite rare. From 1920 to the early 1970s, deer numbers increased dramatically, interrupted briefly by significant winter mortality. Following a significant decline in numbers beginning in 1972, numbers again increased until the late 1980s. More conservative management has led to fluctuating but more-or-less stable mule deer numbers in this area (Compton 2008b). Mule deer winter in varying numbers (< 10 to >200) on Merkley Mountain, Bear Lake NWR, and have occasionally been seen in the marsh (Carl Mitchell, Refuge Complex Biologist, personal observations). There are no data for mule deer use on Thomas Fork or Oxford Slough.

Prior to the 1950s, there were few moose (*Alces alces*) in this region. With continued growth of the population, portions of the region continue to be colonized by moose, and populations apparently are increasing (Toweill 2008). Moose occur commonly on Bear Lake, and occasionally on Thomas Fork and Oxford Slough units.

There is a small herd of about 50-60 pronghorn (T. Boudreau, pers. comm.) that uses the Wyoming-Idaho boundary area, including Thomas Fork Unit. On one occasion in 2010, the Complex Biologist saw 150 pronghorn on the Thomas Fork Unit. A lone pronghorn is seen year after year in a field with horses in the town of Dingle near the Refuge.

Coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), skunks (*Mephitis mephitis*), raccoons (*Procyon lotor*), river otter, mink, and weasels (*Mustela* spp.) occur, but reliable population estimates are not available. Occasionally populations are mentioned as "high" or "low", but these are subjective assessments at best. Red fox were first observed on the Bear Lake NWR in 1970. Mountain lion (*Felis concolor*) and black bear have both been observed on Bear Lake Refuge, but their occurrence is very rare.

Fish

Native fishes, especially Bear River populations of Bonneville cutthroat trout, have declined from historic populations, mostly due to declines in water quality, and alterations to historic hydrology of the Bear River system (Teuscher and Capurso 2007). There are few data on other fishes on Bear Lake NWR, Thomas Fork, or Oxford Slough.

4.2 Selection of Priority Resources of Concern

4.2.1 Selection Process

Early in the planning process, the planning team identified 29 priority species (resources of concern) for the Refuge, as recommended under the Service's *Policy on Habitat Management Plans* (620 FW 1). In this policy, resources of concern (ROCs) are defined as:

> *"all plant and/or animal species, species groups, or communities specifically identified in refuge purpose(s), System mission, or international, national, regional, State, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect 'migrating waterfowl and shorebirds.' Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts (620 FW 1.4G)."*

The Service's Draft *Identifying Resources of Concern and Management Priorities for a Refuge: A Handbook* (USFWS 2009) states that "Habitats or plant communities are resources of concern when they are specifically identified in refuge purposes, when they support species or species groups identified in refuge purposes, when they support NWRS resources of concern, and/or when they are important in the maintenance or restoration of biological integrity, diversity, and environmental health." Therefore, resources of concern for a refuge may be a species or species group, or the habitat/plant community that supports a priority species/species group. (Resources of concern are called *conservation targets* in conservation planning methodologies used by other agencies and NGOs).

These priority resources of concern (ROCs) frame the development of goals and objectives for wildlife and habitat. Resources of concern may be species, species groups, or features that the Refuge would actively manage to conserve and restore over the life of the CCP; or species that are indicators of habitat quality for a larger suite of species (see "Other Benefitting Species," Table 4.1). Negative features of the landscape, such as invasive plants, may demand a large part of the refuge management effort, but are not designated as resources of concern. The main criteria for selection of the resources of concern included:

- consideration of the Refuge's establishing purposes and the Refuge System mission;
- species that may be used as an indicator of the health of one of the main natural habitat types found at the Refuge;
- recommended as a conservation priority in the Refuge's draft Habitat Management Plan (Bundy 2007); and
- Federally or State listed, candidate for listing, or species of concern.

Other criteria that were considered in the selection of the resources of concern included:

- Species groups and/or refuge features of special management concern;
- Species contributing to the biological diversity, integrity and environmental health of the ecosystem; and
- Species where it is feasible to estimate population size (needed for future monitoring and adaptive management).

Table 4.1 lists the priority resources of concern for Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit. Additional tables that support this chapter are located in Appendix E and include a Comprehensive List of Resources of Concern (both species and habitat types), and Biological

Integrity, Diversity, Environmental Health tables that describe habitat types, key ecological processes, and limiting factors. In Section 4.3, we consider the condition and trends of the habitat types that support these focal wildlife species. In Section 4.4, we consider condition and trends of populations of key species and species groups on the Bear Lake NWR, Oxford Slough WPA, and Thomas Fork Unit.

Table 4.1. Priority Resources of Concern for Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit.

Focal Resources	Habitat Type	Other Benefitting Species
Western/Clark's grebe	Open Water	American white pelican
Double-crested cormorant		California gull, Forster's tern, black tern, American white pelican, western/Clark's grebe
Black tern		California gull, Forster's tern, American white pelican, western/Clark's grebe, barn and cliff swallows
White-faced ibis	Permanent to Semi-Permanent wetlands: Dense Marsh with Tall Emergent Plants	Franklin's gull, Forster's tern, marsh wren, sora rail
Black tern		Franklin's gull, Forster's tern, red-winged and yellow-headed blackbird, marsh wren, sora rail, muskrat, mink
Canada goose (B. canadensis moffitti)		Canvasback, redhead, mallard, marsh wren, red-winged and yellow-headed blackbirds, muskrat, mink
American bittern		Sora rail, red-winged blackbird
Yellow-headed blackbird		Red-winged blackbird, marsh wren
Muskrat	Permanent to Semi-Permanent Wetlands: Hemi-Marsh (Open Water/Dense Marsh)	Mink
Trumpeter swan		Canada goose (on muskrat houses or floating platforms), canvasback, redhead, lesser scaup
Canvasback		American coot, mallard, muskrat, mink, western grebe, American wigeon, cinnamon teal, gadwall, northern shoveler
Redhead		American coot, mallard, muskrat, mink, western grebe, American wigeon, cinnamon teal, gadwall, northern shoveler
Greater sandhill crane (*G. canadensis tabida*)	Shallow marsh: seasonal wetlands	Virginia rail, sora rail, yellow-headed and red-winged blackbirds, American bittern
Northern leopard frog		Red-headed blackbird, muskrat
American bittern		Sora rail, red-winged blackbird
Mallard		Canada goose, northern pintail, American wigeon, canvasback, redhead, cinnamon and green-winged teal
Wilson's phalarope	Wet Meadow (Temporary Wetlands)	Canada goose, mallard, northern shoveler, American avocet
Greater sandhill crane		Canada goose, long-billed curlew (foraging)
Canada goose		Long-billed curlew, marbled godwit, American coot, mallard, gadwall, American wigeon

Focal Resources	**Habitat Type**	**Other Benefitting Species**
Marbled godwit		Long-billed dowitcher, Wilson’s phalarope
Purple meadow-rue *(Thalictrum dasycarpum)*		
Long-billed dowitcher		Marbled godwit, Wilson’s phalarope
Long-billed curlew		Willet, yellow-legs
White-faced ibis		Snowy egret, Franklin’s gull, Virginia rail, greater yellow-legs (migration)
Red glasswort (*Salicornia rubra*)	Alkaline Meadow and Alkali Upland Meadow (Seasonal and Temporary wetland and Upland)	Wilson's phalarope, black-necked stilt, willet
American avocet		Wilson's phalarope, black-necked stilt, willet
Long-billed curlew	Meadow Grass (Uplands)	Greater sandhill crane, vesper sparrow, killdeer, Swainson’s hawk, short-eared owl
American wigeon		Mallard, long-billed curlew, lesser scaup, short-eared owl, Swainson’s hawk
Mallard		American wigeon, greater sandhill crane, short-eared owl, Swainson’s hawk
Canada goose		Horned lark, bobolink
Grasshopper sparrow		Lesser scaup (nesting), short eared owl (nesting)
Greater sage-grouse	Sagebrush steppe (uplands)	Sharp-tailed grouse, sage sparrow, ferruginous hawk, merlin, Swainson’s hawk, golden eagle, prairie falcon, Brewer’s sparrow, Merriam’s shrew, Idaho pocket gopher, Wyoming ground squirrel, burrowing owl
Loggerhead shrike		Sage sparrow, Brewer’s sparrow, sage grouse, golden eagle, Wyoming ground squirrel
Northern pintail		White-crowned sparrow, lazuli bunting
Bonneville cutthroat trout	Riparian	Mink, muskrat, beaver, mallard, yellow-rumped and orange-crowned warblers, yellowthroats, *Empidonax* flycatchers
Swainson’s hawk		Great horned owl, yellow-rumped warbler
Bear Lake springsnail (*Pyrgulopsis pilsbryana*)		
Greater sandhill crane	Agriculture	Canada goose, mallard, red-winged and Brewer’s blackbirds, Swainson’s hawk
Canada goose		Sandhill crane, mallard, red-winged and Brewer’s blackbirds

4.2.2 Analysis of Priority Resources of Concern

Wildlife and habitat goals and objectives were designed directly around the habitat requirements of species designated as priority resources of concern. In developing objectives, the team followed the process outlined in the Service's Draft *Identifying Resources of Concern and Management Priorities for a Refuge: A Handbook* (USFWS 2009).

In developing its listing of Priority Resources of Concern, the team selected not only species identified in refuge purposes and international, national, regional, State, or ecosystem conservation plans, but also species that captured the key ecological attributes of habitats required by larger suites of species. A key ecological attribute of an ROC is defined as:

> *"a characteristic of the resource's biology, ecology, or physical environment that is so critical to the resource's persistence, in the face of both natural and human-caused disturbance, that its alteration beyond some critical range of variation will lead to the degradation or loss of the resource within decades or less"* (Unnasch et al. 2009).

The team analyzed the key ecological attributes of habitats that are necessary to meet the life history requirements of ROCs, and are therefore critical to sustain the long-term viability of the ROC and other benefitting species (see Appendix E). Key ecological attributes include habitat patch size; adjacency to or contiguity with other habitats; vegetation structure, species composition, age class, and seral stage; frequency and duration of flooding; and frequency and intensity of fire. These key ecological attributes provide measurable indicators that strongly correlate with the ability of a habitat to support a given species. For most attributes, the team developed "desired" conditions that were based partly on scientific literature review and partly on team professional judgment. These desired conditions for specific attributes were used to help design measurable habitat-based objectives, as presented in Chapter 2. Not all key ecological attributes or indicators were deemed ultimately feasible or necessary to design an objective around. In addition, while the key ecological attribute identifies a desired condition for most indicators, other factors, such as feasibility and the ability to reasonably influence or measure certain indicators, played a role in determining the ultimate parameters chosen for each objective. Thus the key ecological attributes should be viewed as a step in the planning process, but the ultimate design of objectives was subject to further discussion and consideration. Appendix E serves as a supporting appendix to Chapter 2.

The team analyzed limiting factors for the habitats that support the ROCs. A limiting factor is a threat to, or an impairment or degradation of, the natural processes responsible for creating and maintaining plant and animal communities (see Appendix E). In developing objectives and strategies, the team gave priority to mitigating or abating limiting factors that presented high risk to ROCs. In many cases limiting factors occur on a regional or landscape scale and are beyond the control of individual refuges. Therefore objectives and strategies may seek to mimic, rather than restore, natural processes. For example pumps and water control structures may be used to control water levels in wetlands in areas where natural hydrology has been altered. The structure of plant communities used by ROCs can be created, rather than restoring native species composition. For example, haying may be used to maintain a desirable vegetation structure, when restoring native grassland communities may be impractical.

4.3 Habitat Types

A baseline inventory of Bear Lake NWR habitats was completed by Utah State University during summer 2000 (USU 2001). The effort resulted in characterization of 33 plant communities at Bear Lake NWR, and 19 communities at the Thomas Fork Unit, based on 1998 aerial imagery. For ease of interpretation, these communities were incorporated into a common set of wetland and upland habitat types, applicable to all areas evaluated, and corresponding to wetland habitat types as characterized in “Classification of Wetlands and Deepwater Habitats in the Conterminous United States” (Cowardin et al. 1979). Primary types occurring on Fish and Wildlife Service Lands include: Palustrine Emergent Marsh (PEM; persistent and non-persistent), Palustrine Forested Marsh (PFO; riparian), and associated adjacent uplands. Combined, this classification contains seven wetland habitats, three upland habitats, and agricultural habitat; these eight habitats were used for further evaluation in this analysis. Database elements of the USU GIS effort were incorporated into a spreadsheet analysis to determine baseline acreages within each habitat type. Map 4 (Chapter 2) shows current distribution of habitat types on Bear Lake NWR.

4.3.1 Wetlands and Deepwater Habitats

Overview

Palustrine Emergent Marsh is a nationally decreasing wetland habitat type, characterized by a mix of wetland plant associations subject to perennial and ephemeral (permanent to seasonal) water availability. In combination, the two primary components, *perennial emergent hemi-marsh* and *ephemeral wet meadow*, provide for the seasonal needs of all wetland-dependent resources of concern, and currently cover approximately 92 percent of the Bear Lake NWR habitat base, and 65 percent and 74 percent for the Thomas Fork Unit and Oxford Slough WPA, respectively. A detailed description of each habitat type is included in the following sections.

1. Perennial Emergent Hemi-Marsh can be defined as a roughly equal mix of emergent and open water/submergent habitat, and is critical to fulfilling the life history strategies of numerous wetland-dependent wildlife species (Weller and Spatcher 1965). While the term is somewhat antiquated and rarely used today, a clear understanding of the general concept is essential to effective perennial emergent marsh management. The general premise is that overwater nesting waterbirds require habitat to fulfill two primary life history requirements during the breeding season; nesting and brood rearing. Nesting habitat (comprised of deep and shallow emergent vegetation) provides plant material necessary to construct floating or elevated nest structures, while brood rearing habitat (comprised of open water and submergent vegetation) provides the forage base for fledgling waterbirds. Maximum nesting densities are realized where the deep emergent marsh component retains a complex edge, relative to the open water component, and there is a 50:50 mix of these two components within any given management unit. Ideally, this optimal relationship would be realized through a large number of smaller open pools (1-25 acres) within emergent vegetation; however, at present, most refuge hemi-marsh habitat is comprised of a few large pools (>100 acres) ringed by emergent vegetation. Habitat types within the hemi-marsh system include

(a) open water,
(b) submergent wetlands,
(c) deep emergent wetlands, and
(d) shallow emergent wetlands.

a) Open Water Habitat is defined as permanently flooded habitat >12 inches in depth which is devoid of any aquatic vegetation. Due to presence of carp and turbid Bear River inflow, open water habitat can be further subdivided into High and Low clarity categories. High clarity open water habitat occurs where the wetland bottom (substrate) can be easily observed (NTU readings <10), while Low clarity open water habitat occurs where the wetland bottom (substrate) cannot be easily observed (NTU readings >50). Open water habitat currently covers approximately 22 percent of all refuge lands and >25 percent of Bear Lake NWR. High clarity open water habitat is only present in impounded wetland units on Bear Lake NWR, Thomas Fork Unit, and Oxford Slough WPA. Low clarity open water habitat is currently found on Mud Lake and impounded units which have not recently received carp control. The desired condition is to convert approximately 50 percent of baseline open water habitat to submergent habitat. This goal cannot be achieved until mechanisms to control sediment deposition and carp movement in Mud Lake are developed. The more realistic desired condition is to promote 100 percent coverage in high clarity open water habitat in impounded wetland units, at the Thomas Fork Unit, and at Oxford Slough WPA, while accepting <50 percent coverage in Mud Lake.

b) Submergent Habitat can be defined as permanently flooded habitat >6" but <36" in depth which is comprised primarily of aquatic submergent vegetation species such as pondweed, coontail, or water milfoil. Submergent habitat provides the desirable open water condition in palustrine emergent marsh wetlands, but is presently the most limiting component. Covering only 2.1 percent of all refuge lands, it is a primary goal to increase the extent of this habitat type. Submergent habitat can be further subdivided into early and late successional. Late successional submergent habitat consists primarily of leafy vegetation such as water milfoil, coontail, and mare’s tail. At present, <60 percent of refuge submergent habitat comprises early successional seed producing species such as pondweeds and muskgrass (*Chara*), while >40 percent of refuge submergent habitat is comprised of late successional leafy browse species. The desired condition is to convert approximately 50 percent of baseline open water habitat to submergent habitat, while maintaining a minimum of 5 percent of all refuge area comprised of this habitat type. Within successional stages, it would be desirable to maintain between 60-80 percent of submergent habitat comprised of early successional seed producing vegetation, while maintaining 20-40 percent of submergent habitat in a late successional stage dominated by leafy browse vegetation.

c) Deep Emergent Habitat can be defined as semi-permanently flooded habitat comprised primarily of hardstem bulrush, but also containing cattail. Similar to submergent habitats, deep emergent habitat can be further subdivided into three successional stages: early successional (deep emergent habitat comprised of <30 percent residual vegetation coverage from previous year's growth), mid successional (deep emergent habitat comprised of 30-90 percent residual vegetation coverage), and late successional (deep emergent habitat comprised of >90 percent residual vegetation coverage). Different levels of residual vegetation are desirable to different resources of concern based on seasonal life history requirements.

Early successional deep emergent habitat is a direct result of prescribed fire and typically lasts <2 years following a burn. No refuge units fall under this category at present. Mid successional deep emergent habitat falling within 30-90 percent residual cover is a typical mid-successional response and currently covers approximately 50 percent of refuge deep emergent habitat (those burned between 3-7 years prior). Late successional deep emergent habitat has greater than 90 percent residual cover and typically occurs >7 years following disturbance (mechanical or prescribed fire). The remaining 50 percent of refuge deep emergent habitat falls under this category at present. The desired condition is to maintain between 10 percent and 20 percent of refuge deep emergent habitat in an early successional seral stage (<30 percent residual cover), between 60 percent and 80 percent in a mid-successional stage (30-90 percent residual cover), and between 10 percent and 20 percent of refuge deep emergent habitat in a late successional stage (>90 percent residual cover).

d) Shallow Emergent Habitat is defined as semi-permanently to ephemerally flooded habitat comprised primarily of hardstem bulrush, but also containing shallowly flooded cattail and alkali bulrush, typically flooded to a depth of 3 to 24 inches. The primary difference between deep and shallow emergent habitat is water permanence. Shallow emergent habitats are occasionally dewatered during summer months, while deep emergent habitats are permanently wet. Shallow emergent habitat can be further subdivided by water quality with two different types found on refuge at present; alkaline (shallow emergent habitat comprised primarily of alkali bulrush and established in water typically >1,000 ppm TDS) and fresh water (semi-permanent to seasonally flooded habitat comprised primarily of hardstem bulrush in water typically <1,000 TDS). Significant stands of alkali dominant (e.g., alkali bulrush) shallow emergent marsh currently exist only in the Rainbow Complex (Bear Lake NWR) and Oxford Slough WPA. Approximately 90 percent of the shallow emergent community is currently dominated by hardstem bulrush which covers approximately 30 percent of all refuge units. With the exception of the lack of numerous small open water and/or submergent habitat pools intermixed within this habitat type, the current condition is desirable.

2. Ephemeral Marsh is the palustrine emergent marsh component that is subject to an ephemeral hydrologic regime. Water depths range from moist soil during late summer to as much as two feet during spring. It is this seasonal fluctuation that produces and then concentrates food reserves for most wetland-dependent wildlife species. The diversity and complexity of plant species within ephemeral marsh habitats provides ideal substrate for invertebrates, which constitute 90 percent of most waterbird diets during summer months. With fall flooding during migration, the seeds produced by annual plants additionally provide forage for migratory waterbirds. Ephemeral marsh is comprised of two habitat types including (a) wet meadow and (b) alkaline meadow, either of which can be treated as moist-soil habitat with the appropriate water management strategy.

a) Wet Meadow is defined as ephemeral to semi-permanently flooded marsh dominated by low stature, flood tolerant, annual, and perennial plants. Typical species include spikerush, Baltic rush, and flood tolerant grasses such as foxtail barley, saltgrass, and rabbitfoot grass. Wet meadow habitats can be further subdivided by successional stage with either early successional or late successional communities found on all refuge units. Early successional status wet meadow includes habitat where less than 20 percent of the community contains dense residual cover. Approximately 80 percent of wet meadow habitat is maintained in early successional status through the Refuge’s haying program. Late successional status wet meadow is defined as habitat where greater than 90 percent of the community contains dense residual cover and/or greater than 20 percent of the community is forb dominant. Less than 20 percent of wet meadow habitat is maintained in late successional status. The desired condition would be to reduce the coverage of early successional wet meadow habitat to less than 60 percent. A high amount of this habitat type occurs on private lands adjacent to all refuge units. Conversely, it would be desirable to increase the coverage of late successional wet meadow habitat to a minimum of 20 percent to 40 percent coverage. Virtually no late successional wet meadow habitat occurs on private lands adjacent to all refuge units.

b) Alkaline Meadow is defined as ephemeral to semi-permanently flooded alkali marsh (>1,000 ppm TDS) dominated by low stature, flood tolerant, annual and perennial plants. Evaporation during hot summer months leads to accumulations of salts in certain wetlands at Bear Lake NWR and

Oxford Slough WPA. Several plants and plant communities have adapted to the high salt concentrations and occur exclusively in, or are often associated with, saline depressions. Typical species include glasswort (pickleweed), red goosefoot, oakleaf goosefoot, and inland saltgrass. Alkaline meadow habitats can be further subdivided by successional stage with either early successional or late successional communities found on all refuge units. Residual cover is typically very low in alkaline meadow communities, thus, successional stage is rated based on diversity of the established plant community. Early successional status alkaline meadow is comprised of a heterogeneous plant community where more than one halophytic plant species shares dominance within the community. Early successional alkali meadow communities are dominant where water quality input is >1,000 ppm TDS and where water management has fluctuated over time. Approximately 60 percent of all refuge alkali meadow is currently in early successional status. Late successional status alkali meadow includes a relatively homogenous plant community where red glasswort (*Salicornia rubra*) is dominant within the community. Late successional alkali meadow communities are dominant where water quality input is >1,000 ppm TDS or where water management has favored natural evaporative drawdowns over time. In both cases, the current distribution is desirable.

Regional Distribution, Conditions, and Trends of Wetlands

In Idaho an estimated 386,000 acres of wetland habitat (56 percent) were lost from 1780 to 1980 (Dahl 1990). Many remaining wetlands have been degraded by actions such as hydrologic alteration and impacts to vegetation and soils. Wetlands, including deepwater habitat, cover approximately 238,000 acres of southeastern Idaho (Bear Lake County and the majority of Bonneville, Caribou, and Franklin counties), or approximately 7 percent of the 3.4 million acres of land area. Lacustrine systems, which include mostly deepwater habitat, make up nearly 1/3 of this percentage. Excluding deepwater habitat, wetlands represent approximately 5 percent of the total land area in southeastern Idaho, and palustrine emergent wetlands make up 80 percent of these wetlands (National Wetlands Inventory in Jankovsky-Jones 1997). Bear Lake County has more wetlands proportionately than the other counties in southeastern Idaho (15 percent of land area) of which approximately 38 percent is deepwater habitat, and 54 percent is emergent wetland. Approximately 52,943 acres of southeast Idaho’s wetland and deepwater habitat are currently protected, representing approximately 22 percent of the region’s wetland and deepwater habitat. The majority (89 percent) of the protected wetlands are within four National Wildlife Refuges or Refuge units (Bear Lake NWR, Grays Lake NWR, the Oxford Slough WPA, and the Thomas Fork Unit). More than 80 percent of the protected wetlands are in the palustrine emergent class.

Jankovsky-Jones (1997) identified the causes of wetland losses and functional shifts in southeast Idaho. Wetland losses occur when functions are eliminated and an area no longer meets the definition of a wetland. In southeastern Idaho, agriculture, mining, and urbanization account for wetland losses. Most of the permanent losses of wetlands in SE Idaho are due to drainage and land clearing for agriculture and mining. Road construction and home building account for minor losses in the area.

Most wetlands in southeast Idaho have been impacted by human influences, resulting in a shift of wetland functions. **Impairments** are functional shifts that reduce wetland functions and include degradation and fragmentation. Degradation, the loss of one or more wetland functions, is indicated by shifts in species composition and may result in lowered water quality due to sediment input or increased water temperatures. Fragmentation occurs when functions are lost due to barriers restricting water or gene flow. Fragmentation of wetland habitat has occurred throughout SE Idaho as a result of water development, agriculture, road building, and development. The natural hydrographs of all major rivers in southeastern Idaho have been altered by reservoirs and diversions. **Type changes** occur when a wetland is converted from one type to another (e.g., emergent to open water), while functional shifts improving wetland functions are considered **enhancements**. At Bear Lake NWR, enhancement projects have focused on improvement of channel conditions, maintenance of water levels for waterfowl, and control of exotic species.

Shifts in species composition occur when native species such as shrubs and trees are removed and when exotic species invade or are introduced. Poor water quality often results due to loss of thermal cover, loss of filtering functions, and decreased bank or shore stability. The 1992 National Resource Inventory indicated that 25 percent and 21 percent of non-Federal wetlands in southeastern Idaho were being used for pasture and rangeland respectively (SCS 1992). Pasture development has included ditching, reseeding or interseeding with non-native pasture grasses, and removal of native trees and shrubs. Use of wetlands for rangeland affects species composition through the suppression of native woody species, introduction of exotic species, and compaction of soils. Introduction of exotic animal species (e.g., carp) can also reduce wetland functions.

Bear Lake NWR

Threats to wetland habitat on the Bear Lake NWR include: Sedimentation and reduced germination of wetland plants due to altered hydrologic regimes; unnatural herbivory and disturbance by carp, leading to excessive turbidity and reduced germination; excessive natural herbivory (waterbirds); disturbance and trampling from administrative or recreational boating and/or hunting; and invasive species introductions (Eurasian milfoil).

The natural hydrologic regime has been altered within Bear Lake NWR through development of the Bear River irrigation system. Where the Bear River was functionally isolated from the Bear Lake system in the recent geologic past, flows are now almost entirely diverted into the Refuge prior to irrigation storage in Bear Lake, or release for irrigation use through the Bear Lake outlet canal. These have resulted in numerous changes to habitat structure and function, described in detail in section 4.1.2 above, and Appendix E.

The 1968 agreement between PacifiCorp and the Service stipulated that the water level in Mud Lake (a portion of Bear Lake NWR) would be maintained at an elevation of 5,920.50 feet, plus or minus a half foot, subject “to all prior commitments, including particularly the terms of the Bear River Compact and provided, nevertheless, that the maintenance of said level is dependent upon the availability of water and acts and occurrences over which the Power Company has no control.”

Silt-laden Bear River waters now enter the Refuge, creating turbidity that inhibits plant germination; foraging carp uproot the plants that do survive. This combination creates a relatively sterile wetland ecosystem, resulting in limited productivity of aquatic vegetation and waterfowl. Not only does the silt create turbidity, but most of it settles into the Mud Lake area of the Refuge, making it shallower over time. Nitrogen and phosphorus also enter the Refuge and could create additional water quality issues (see Chapter 3).

In southeastern Idaho, carp have been associated with declines in waterfowl production and loss of native fish habitat in wetlands. Carp were introduced in Idaho to the Bear River system in 1882. By the late 1890s the impact of carp to native species and habitat became apparent. Carp are bottom feeders whose activity reduces water quality by increasing turbidity, uprooting submerged aquatic vegetation, and decreasing invertebrate populations (Simpson and Wallace 1978). The presence of carp in wetland ecosystems leads to a higher proportion of open water habitat than would occur under natural processes. Carp control can lead to other impacts to wildlife and habitat, for example, improperly sustained low hydroperiod in carp-controlled units create significant sediment or peat accumulation, encroachment and expansion of bulrush/cattail, or annual winter freezing to marsh substrate, and lead to reduced over-winter muskrat survival. Low muskrat populations, in turn, lead to dense monocultures of bulrush and cattail. Isolation and management of carp populations is ongoing at Bear Lake National Wildlife Refuge (see Section 4.6.2).

Wetland condition has generally improved since refuge establishment, due to construction of numerous impoundments, canals, and with water control structures. This has allowed managers to manipulate water flows and partition and manage discrete water bodies for specific goals and objectives, based on hydrology, soils, vegetation, and other ecological factors (see Chapter 2, Management Direction, and Chapter 3, Bear Lake NWR Water Management and Infrastructure). However, proper water management is difficult in this complex system, and requires considerable skill in monitoring and interpreting conditions at any given place or time. The Bear Lake National Wildlife Refuge Habitat Management Plan (Bundy 2007) provides an excellent summary of wetland ecology and management objectives for each habitat type and management unit.

Oxford Slough WPA

As noted in Chapter 3, Hydrology, due to land use changes and increasing demands on limited water resources, the historic palustrine emergent marsh complex at Oxford Slough WPA has been reduced to a fraction of its former size and becomes desiccated much more rapidly than the historic hydrologic regime would have allowed. In many years the Oxford Slough system is completely desiccated by mid to late summer, when fledgling birds depend on the wetlands (Bundy 2007). Although improvements to water management infrastructure (described in Section 4.1.3 above) have improved the WPA's ability to hold water through the nesting season, it is prudent to evaluate the need for agricultural and meadow hay water rights, which the WPA retains through the Oxford Creek Irrigation District, and evaluate mechanisms to develop these rights for wetland storage/wildlife purposes.

The 227-acre **West Meadows** area presently contains the only fresh water, wet meadow habitat on the WPA. As such, conditions are conducive to establishing seasonally flooded meadow grasses as well as the typical, wet meadow complement of species. At present, a majority of this habitat is hayed annually, leaving little habitat for wildlife use (Bundy 2007).

Due to water shortages within Oxford Slough, ephemeral wetland habitat along the eastern edge of the slough is subject to periodic annual desiccation. Referred to as the **East Alkali area** (376 acres), this habitat is critical to migratory and breeding shorebird species and serves as primary foraging and secondary nesting habitat for waterfowl species. Without a mechanism to retain water in Oxford Slough, this habitat serves little value for the aforementioned species, and without a mechanism to seasonally flood this habitat, vegetation production is low and does not generally meet wildlife habitat requirements (Bundy 2007).

Key Species Supported

Birds

<u>Bear Lake NWR</u>

Wetlands at Bear Lake NWR host a wide variety of birds, including 30 species of waterbirds (e.g., loons, grebes, bitterns, terns, gulls, ibis, cranes), and 28 species of waterfowl (swans, geese, and ducks). Bear Lake NWR hosts significant numbers and species diversity of colonial and other waterbirds. The most notable species include sandhill cranes, white-faced ibis, Franklin's gulls, California gulls, pied-billed grebes, eared grebes, western grebes, Clark's grebes, white pelicans, double-crested cormorants, great blue herons, black-crowned night-herons, snowy egrets, cattle egrets, Forster's terns, Caspian terns, black terns, American bitterns, American coots, sora rails, Virginia rails, and Wilson's snipe.

The most abundant waterfowl using the Refuge during spring and fall migration include Great Basin Canada geese, mallard, green-winged teal, canvasback, redhead, and ruddy ducks. Gadwall, northern pintail, cinnamon teal, and lesser scaup also occur in lower numbers. Some snow geese, trumpeter swans, and tundra swans migrate through the Refuge. Swans, geese, and ducks molt in large numbers on Mud Lake. The most common nesting waterfowl include mallard, canvasback, redhead, and ruddy duck. Trumpeter swans, lesser scaup, northern shoveler, cinnamon teal, green-winged teal, northern pintail, gadwall, and American wigeon also nest in lesser numbers.

<u>Oxford Slough WPA</u>

A wide variety of migratory birds use Oxford Slough WPA, including abundant nesting ducks, Canada geese, and sandhill cranes. The center of Oxford Slough is dominated by a large colony of white-faced ibis, snowy egrets, black-crowned night-herons, and Franklin's gulls.

<u>Thomas Fork Unit</u>

Birds seen on the Thomas Fork Unit include: Canada Geese, mallard, gadwall, canvasback, redhead, green-winged and cinnamon teal, white-faced ibis, American coot, sandhill crane, northern harrier, Swainson's, red-tailed, and rough-legged hawks, black tern, black-crowned night heron, great blue heron, Virginia and sora rails, belted kingfisher, western wood-pewee, willow flycatcher, several swallow spp., marsh wren, mountain bluebird, yellow-rumped warbler, savannah sparrow, red-winged, Brewer's, and yellow-headed blackbirds, and American goldfinch.

Mammals, Reptiles, and Amphibians

Mammals that occur in refuge wetlands include moose, beaver, muskrat, river otter, and mink. Predators such as coyote, red fox, raccoon, striped skunk, and long-tailed weasel forage opportunistically in wetlands. Reptiles and amphibians known to occur in wetland habitat are western terrestrial and common garter snakes, western chorus frogs, and northern leopard frogs (Annual Narrative 1971). Others undoubtedly occur, but there are no formal inventories.

Fish

Native fish known (or likely) to be present on the Bear Lake NWR and the Thomas Fork Unit include Bonneville cutthroat trout (*Oncorhynchus clarkii utah*), Utah sucker (*Catostomous ardens*), Paiute sculpin (*Cottus beldingii*), mottled sculpin (*Cottus bairdii*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), longnose dace (*Rhinichthys cataractae*) and leatherside chub (*Snyderichthys copei*) (American Fisheries Society, Idaho Chapter 2011). More data are needed on native fish abundance and distribution. There is no known fishery on the Oxford Slough WPA.

Invertebrates

In August 1990, Mr. Peter Hovingh inventoried areas of the valley, including both carp-infested and carp-free areas of Bear Lake NWR, for mollusks, leeches, and amphibians (see Section 4.6.1 below). He found the following freshwater snails on the Refuge: *Physa*, *Helisoma*, *Lymnaea stagnalis*, *Lymnaea* sp., and *Oxyloma*. Leopard frogs were also found in carp-free zones. The leech *Erpobdella* *punctata* was found in the refuge ponds (Refuge Annual Narrative 1990:48). Other than this study, there are no known checklists of any invertebrate species on Bear Lake NWR units. As these species have important ecological roles, these data are badly needed to ensure that any habitat management takes species life histories into account.

Refuge Management Activities

Considering overall wetland loss throughout the Bear River drainage and Great Basin in general, it is no longer desirable to maintain the historic natural processes of widespread flood/drought. Rather, it is imperative to retain functional wetland remnants at optimal levels. Where appropriate, these areas can be maintained through mimicking natural seasonal periodicity (e.g., Thomas Fork Unit, Bear Lake NWR); however, artificial water management strategies can also be used to simulate natural environmental process (Bear Lake NWR) while water rights can be used to supplement seasonal shortfalls (Oxford Slough WPA).

Bear Lake NWR

<u>Water Management</u>

Water management is used to simulate natural environmental fluctuations. Using rotation among management units and complexes, it is possible to simulate three scenarios (flood, normal cycle, and drought) within the same refuge and year, while seasonally maintaining roughly the same wetland acreage annually. The general management philosophy is to maintain hydrologic regimes such that an approximately equal proportion of refuge habitat is managed under high water, normal, and low water conditions using complex-specific habitat tolerance thresholds and subsequent management prescriptions to determine which units would be so managed in any given year. The history of water management on the Refuge to date is included in Section 4.1.3 above. A detailed description of current water management on Bear Lake NWR, by management unit, is included in Chapter 3, “Bear Lake NWR Water Management and Infrastructure,” pages 21-28. Current and proposed future wetland management is provided in the habitat objectives for Palustrine Emergent Marsh, Palustrine Forested habitat, and associated habitat types (Chapter 2, Management Direction).

<u>Prescribed Fire</u>

Prescribed fire has been used on the Refuge since 1992, primarily to set back vegetative succession and create openings in dense emergent vegetation. The history of prescribed fire use on the Refuge to date is included in Section 4.1.3 above. Fire models and history are discussed in Chapter 3.

<u>Haying</u>

From 1968 to present, haying has been used on the Refuge to open up dense bulrush stands, create “edge” habitat between cover and open water, and to provide succulent green browse for waterfowl use. Currently, about 2,900 acres of upland meadow, wet meadow, and shallow emergent wetlands are hayed annually. This includes most of the Refuge’s wet meadow habitat. Currently haying is conducted under both permits and two Cooperative Land Management Agreements (CLMAs) that allow haying in exchange for planting grain or legumes (see Section 4.1.3 above for history of haying on the Refuge). Cooperators also fallow fields in rotation, conduct weed control, repair water control structures, and perform various other duties as negotiated. Since about 2003, managers had begun to retire hay units that permit holders no longer wanted to hay. The management direction of this CCP

(Chapter 2) proposes continuing this gradual retirement of hay units to achieve a 60 percent reduction in haying by 2027, combined with an increase in wet meadow habitat.

Oxford Slough WPA

Oxford Slough receives its water from runoff from surrounding fields and hills, and irrigation canal flows during the summer through fall/winter period. Late summer water is usually a problem in this unit, with much of the WPA drying up by October in normal to dry years. Late fall irrigation return flows begin refilling the unit in November, offering good habitat for late season mallard use.

Ideally, water at Oxford Slough WPA is managed to retain spring flows and maximize water retention during July and August, when fledgling water birds are reaching flight stage. When possible, Oxford Slough is reflooded beginning in early October to provide habitat for fall migratory birds. In 2003, the marsh was burned for the first time in 20 years to open up stands of dense emergent vegetation, and the historic channel of the slough was cleaned to divert water away from three drains that had been dredged prior to Service acquisition in 1985. In drought years these drains were causing the slough to dry out before young birds reached flight stage. In 2004 the Oxford Slough Safety Levee was replaced and a 48" water control structure was installed to improve water management capabilities (see section 4.1.3 above for history of management of Oxford Slough WPA). Despite these improvements, the Service currently has little control over water management of the Oxford Slough WPA. We are currently investigating methods to ensure water availability in the future. Possible solutions include establishing a well to supplement summer and early fall flows, establishing retention levees to make better use of the limited water supply, and evaluating the present farming program to determine if existing farming/water management strategies are facilitating the primary purpose of Oxford Slough WPA (waterfowl production). Any changes to WPA water rights must be initiated by the Oxford Creek water district, thus, present objectives are to develop stronger relationships with the district and surrounding landowners. About 300 acres are hayed and 80 acres of crops grown on the WPA annually. Prescribed fire has been conducted twice since the WPA was acquired, in 2003 and 2004.

Thomas Fork Unit

The Thomas Fork Unit is used by greater sandhill crane pairs in spring, and provides nesting habitat for cranes, Canada geese, and several species of ducks. The Thomas Fork Unit is on the tail end of the Raymond Valley and water irrigation of meadows naturally collects on this unit via sloughs and ditches before entering the Bear River. The Thomas Fork Creek backs up from the Bear River during high water (April-June), filling side wetlands and sloughs along the unit’s west side. The center water control structure staff gauge is considered to be full at 15.60-15.80 feet. Usually the challenge with the Thomas Fork Unit is too much water at the wrong time of year (i.e., nesting season) when the Bear River immediately south of the Thomas Fork Unit floods and backs up into the unit’s wetlands. In years of high water flows, nest flooding can be a problem. In years with low snowpack (e.g., 2000-2004), this does not occur, and the challenge then is managing water with very low levels.

The Service is the majority water shareholder in the Thomas Fork Irrigation Company at 32 percent of the 1,565 shares in the company. Each 500 shares (or 500 miner’s inches) is worth a 10 cfs (50 miners inches per 1 cfs) flow to the Refuge and combined with the other water rights, would irrigate 979 acres of the Thomas Fork Unit's 1,015-acre total. The additional water right is for 3.6 cfs, so total Thomas Fork Unit water rights are for 13.6 cfs.

Currently, approximately 330 acres of the Thomas Fork Unit are hayed annually. Haying provides crane and waterfowl pair habitat that is undisturbed by grazing that occurs on adjacent lands. In addition, approximately 44 acres of crops are grown on the Thomas Fork Unit. Hay and grain units are managed in a dry land rotation that minimizes the use of herbicides. Units that are not planted, and problem weed areas, are fallowed twice during the summer. No chemical fertilizers are used. Prescribed fire has not been used on the Thomas Fork Unit to date.

4.3.2 Riparian and Instream Habitat

Overview

These habitats are limited to 49 acres on Bear Lake NWR, 41 acres on Thomas Fork Unit, and 2 acres on Oxford Slough WPA. The Bear Lake riparian habitat is in two patches, one on the east side of the Bear Lake Canal and another patch on the south of the Alder Unit. The first patch comprises solely peachleaf willow (*Salix amygdaloides*) and sandbar (also called coyote) willow (*Salix exigua*), and the second consists of quaking aspen (*Populus tremuloides*), peachleaf willow, and sandbar willow. The Thomas Fork of the Bear River meanders through the Thomas Fork Unit for three miles. A preliminary assessment of the Thomas Fork Unit by Jankovsky-Jones (1997) found thick beds of *Potamogeton* in the Thomas Fork channel, and remnant stands of mostly *Salix exigua* and some *S. boothii* bordering the Thomas Fork creek. The Oxford Slough riparian area lies along the deepest parts of the main slough channel.

Palustrine Forested Wetlands: Also referred to as riparian habitat, palustrine forested habitat (PFO) is a nationally decreasing habitat type found in small but important acreages at all three refuge units. While rivaling the diversity found in wet meadow habitats, it is the willow overstory above the mix of wet meadow plants that make palustrine forested habitats critically important for a variety of migratory and breeding landbird species. Willow communities support both terrestrial and semi-aquatic insects that are an important forage base for both fish and passerine birds. Willow communities are also important in maintaining water quality for fish by stabilizing banks and shading water. Additionally, stream courses such as St. Charles Creek (Bear Lake NWR) and Thomas Fork Creek provide critical spawning access for the State threatened Bonneville cutthroat trout (BCT). Both of these spawning tributaries have been identified as critical to the long-term survival of BCT.

Riparian Habitat is defined as natural stream bank and artificial water course habitat predominately comprises native willow species with a wet meadow understory, typically subject to an ephemeral, spring flooding regime (>0"-12" in depth) (Bundy 2007). This habitat type can be further subdivided based on the prevalence of native species within the plant community. Communities where willow or other woody native species occupy >90 percent of the total canopy coverage occupy less than 60 percent of all refuge riparian habitats (Bundy 2007). Approximately 40 percent of refuge riparian habitat either does not contain an adequate native willow component or greater than 10 percent non-native/invasive species component (Bundy 2007). The desired condition would be to maintain 90 percent of riparian habitat in the native dominant category; however, this plan would accept 10 percent coverage by riparian communities where <90 percent of the canopy coverage is native dominant.

Regional Distribution, Conditions, and Trends of Riparian Habitat

Riparian habitats are threatened by altered and insufficient flows to sustain native vegetation due to legal and illegal diversions, increased demands on surface and groundwater by exurban development and agriculture, vegetation removal, altered channel morphology and reduced water quality caused by improper livestock grazing; beaver removal; over-browsing by moose and beaver (an unlikely threat given current population levels); and fire.

Several creeks flow into Bear Lake NWR but do not originate there, and significant portions of the watershed lie outside the Refuge. Off-refuge upstream activities have major impacts on water quality and quantity. Restoring riparian habitats would require cooperative efforts between the Service, USFS, Trout Unlimited, NRCS, and landowners throughout the Bear River Watershed.

During very high water years, the Bear River can flood, backing up Thomas Fork Creek and flooding the eastern meadows of this unit. The Thomas Fork is an Idaho Department of Environmental Quality 303(d) stream due to sediment and nutrient loading likely caused by water diversions, degraded riparian vegetation, and irrigation and grazing practices.

There have been no assessments of riparian vegetation on Bear Lake NWR or the Thomas Fork Unit. Quantitative assessment of condition and regeneration is required. Many of the willows on Thomas Fork Unit appear to be dead or dying. Furthermore, this appears to be human-caused, since upstream from the boundary fence the willow community appears to be healthy and thriving. At this writing we are uncertain as to the cause of the willow condition on the Thomas Fork Unit.

Key Species Supported

Willow overstory and a diverse mix of wet meadow related plant understory make palustrine forested habitats critically important for a variety of migratory and breeding landbird species. Species that nest in riparian habitat include great blue herons, black-crowned night herons, snowy egrets, great horned owls, Swainson’s hawk, numerous warblers, and other passerines. Riparian areas also provide important brood-rearing habitat for greater sage-grouse and sharp-tailed grouse. Riparian areas have also been shown to be important foraging areas for Townsend’s big-eared bat (Fellers and Pierson 2002).

The primary native fish of conservation interest on Bear Lake NWR and Thomas Fork Unit is the Bonneville cutthroat trout. Bonneville cutthroat trout are considered a Game Fish by the State of Idaho and a Sensitive Species by the USDA Forest Service (USFS) and U.S. Bureau of Land Management (BLM) (Teuscher and Capurso 2007). Several non-governmental organizations have petitioned to list BCT under the Endangered Species Act (ESA). There have been four petitions for listing since 1979 (Teuscher and Capurso 2007).

Bonneville cutthroat trout (BCT) have greatly diminished range in southern Idaho, and efforts have been made, in cooperation with ID Department of Fish and Game and Trout Unlimited, to restore and conserve habitat at Bear Lake NWR and Thomas Fork. On Service lands, BCT only occur in St. Charles Creek on Bear River NWR, and in the Thomas Fork of the Bear River (Teuscher and Capurso 2007). They have been extirpated in Bloomington Creek. Thus management of these waters for BCT is critical.

Stream courses such as St. Charles Creek (Bear Lake NWR) and Thomas Fork Creek provide critical spawning access for the State threatened Bonneville cutthroat trout (BCT). Cutthroat trout pass through St. Charles Creek which provides a critical corridor between Bear Lake winter and upper headwater spawning habitats. St. Charles Creek has been identified by IDFG as “the most important natural spawning location for Bear Lake [Bonneville] cutthroat trout,” but cutthroat spawning numbers have declined from the thousands of fish observed in the creek in the 1950s, 60s and 70s to fewer than 100 fish in 2003 (Western Native Trout Initiative 2010). Recently, projects to improve fish passage on St. Charles Creek have been completed (see section 4.4.2 below).

Leatherside chub probably occur in the Thomas Fork Creek in low numbers, but have not been documented as yet. Other aquatic species include two endemic mollusks, the Green River pebblesnail, and the Bear River spring snail.

Refuge Management Activities

Bear Lake NWR, Oxford Slough WPA

Monitoring of riparian condition and control of invasive plants is the only management currently occurring on riparian habitat on Bear Lake NWR and the Oxford Slough WPA.

Thomas Fork Unit

Thomas Fork Creek streamflow patterns are essentially the same as occurred historically until the irrigation season begins around the 1st of May. This allows for the natural hydrologic periodicity to function from roughly September 30 until May 1st when irrigators begin flooding agricultural fields. The Refuge maintains approximately 500 shares in the Thomas Fork irrigation company which allows the Refuge to artificially maintain both wetland levels and instream flow during critical late spring/early summer months necessary to support spawning by Bear River, Bonneville cutthroat trout, as well as nesting and brood-rearing by a wide variety of nesting and migratory wetland- and riparian-dependent wildlife species.

During the summer of 1996, a land exchange for 18 acres of valuable riparian habitat along the Thomas Fork was worked out with then neighbor Rolf Esche. As part of the exchange Mr. Esche received an old 18-acre farm field that the Service owns adjacent to his land. As part of the agreement, the property has a permanent Conservation Easement along the stream bank protecting the riparian zone in the southern portion of the Thomas Fork. The additional riparian habitat is important willow and stream bank with adjacent seasonal oxbow wetlands. The exchange was finalized in 1997.

4.3.3 Upland Meadows

Overview

Upland meadows differ from wet meadows based on the seasonal periodicity of hydration. Upland habitats can be seasonally flooded for as many as 30, but usually for less than 10 days in the spring. On the refuge units, two types of upland meadows occur: alkali upland meadows, and meadow grass uplands. Similar to the relationship between wet and alkali meadows, alkali and meadow grass upland distribution vary by soil pH and conductivity as influenced by site-specific evaporation rates.

Alkali Upland Meadows are an uncommon habitat (314 acres on Bear Lake NWR, 2 acres on the Thomas Fork Unit, and 127 acres on the Oxford Slough WPA) located in isolated shallow pans; probably flooded in spring. Upland meadows often have a salt crust in summer, and are sparsely vegetated with patches of bare soil. Alkali upland meadows provide a vital nesting area for sensitive species such as American avocet and long-billed curlew. Without the close juxtaposition of alkali uplands to alkali wet meadows, these species would no longer frequent refuge habitat because these habitats in combination provide the components necessary to fulfill their life history strategies. On the Oxford Slough WPA, Jankovsky-Jones (1997) found that drier hummocks were dominated by the *Sarcobatus vermiculatus*/*Distichlis spicata* var. *stricta* community type with non-native *Bromus tectorum* locally dominant.

Meadow grasslands are comprised of native grass species such as Great Basin wildrye and tall wheatgrass. Typically, meadow grass species are taller in stature and have considerably more structural complexity than alkali uplands. Therefore, meadow grasslands are used by a wider range of wildlife species. Similar to the juxtaposition of alkali uplands with alkali meadows, meadow grass in close proximity to wet meadow is also vitally important to a different complement of wildlife species, including upland nesting waterfowl and shorebird species such as Wilson's phalarope. About 570 acres of meadow grass currently occurs on Bear Lake NWR, 231 acres on the Thomas Fork Unit, and 119 acres on the Oxford Slough WPA.

Jankovsky-Jones (1997) found relatively high quality native wet meadow and grassland habitat on the Thomas Fork Unit, noting that the site is largely covered by a mosaic of native grass communities that cover nearly 4 square miles. She found that much of the site was composed of relatively high quality native vegetation. Extensive stands of *Deschampsia cespitosa* occur on alluvial terraces on the eastern half of the site.

Regional Distribution, Conditions, and Trends of Upland Meadows

Threats to alkali upland meadows include extreme drought or flood conditions; groundwater depletion; grazing; development; conversion to agriculture; and invasive species. Threats to meadow grasslands include conversion to croplands, invasive species, fire, grazing, haying, disturbance, and development. In southeastern Idaho, both wet meadows and upland meadows are extensively used for haying and grazing (Jankovsky-Jones 1997). On the Oxford Slough WPA, nonnative species (*Bromus tectorum*, *Agropyron repens*, *Tragopogon pratensis*, *Alopecurus pratensis* (in large patches), *Cirsium arvense*, and *Phleum pretense*) compete with native vegetation. Native species predominate in upland meadows on the Thomas Fork Unit; however, non-native and invasive plants are present and currently pose the greatest threat.

Key Species Supported

Alkali upland meadow provides foraging and breeding habitat for American avocet, and foraging habitat for snowy egret. Meadow grass provides nesting habitat for short-eared owls and mallard, nesting and foraging habitat for long-billed curlew, grasshopper sparrow, and Canada goose, and foraging habitat for American widgeon, California gull, burrowing owl, Swainson's hawk, ferruginous hawk, merlin, and Franklin's gull. It also supports Wyoming ground squirrel, Uinta ground squirrel, and Idaho pocket gopher.

Refuge Management Activities

Bear Lake NWR, Thomas Fork Unit

Haying and control of invasive plants are the only management activities currently occurring in upland meadow habitat on Bear Lake NWR. Monitoring of habitat condition and control of invasive plants is the only management currently occurring in upland meadow habitat on the Thomas Fork Unit.

Oxford Slough WPA

As Region 1's only Waterfowl Production Area, the extent and quality of upland habitat for upland nesting waterfowl at Oxford Slough is critical. To that end, the Refuge has restored approximately 53 percent of historic agricultural fields by planting native upland grasses to produce nesting cover. Additionally, prescribed fire has been used sparingly to return native meadow grass communities to early successional status (<90 percent residual cover and <10 percent forb cover) which should create optimal conditions for wildlife nesting.

4.3.4 Shrub Habitats

Overview

Shrub is defined as upland comprised of either early successional (rubber rabbitbrush), late successional alkali (big greasewood), late successional climax (big sagebrush) shrub species with the dominant overstory canopy covering at least 50 percent of the community. Shrub habitats typically contain a native grass understory comprised of either meadow grass or alkali upland species. Refuge units contain approximately 2.2 percent shrub habitat by areal coverage: 352 acres on Bear Lake NWR, 87 acres on Oxford Slough WPA, and 80 acres of mixed sagebrush upland and meadow grass on the Thomas Fork Unit (approximately 24 acres of which are sagebrush). Oxford Slough shrub habitats are more greasewood dominant, while Bear Lake NWR and the Thomas Fork Unit have a higher proportion of big sagebrush. Sagebrush, rabbitbrush, greasewood, and various wheatgrass species occur on the east side of Bear Lake NWR near Merkley Mountain.

Jankovsky-Jones (1997) found that the highest terraces on the Thomas Fork Unit were dominated by "an odd mixture" of sagebrush species (*Artemisia arbuscula*, *A. cana*, *A. tripartita*, and a small amount of *A. tridentata*) occurring on the relatively fine textured alluvium. She noted that "these small areas do not fit existing vegetation classifications. Another odd cover type, also small in area, is dominated by *Atriplex nuttallii* and *Sporobolus airoides*."

Regional Distribution, Conditions, and Trends of Sagebrush and Greasewood Habitats

Regionally, threats to sagebrush and other shrub habitats include conversion to agriculture, improper grazing practices, invasive species, increased severity of fire (exacerbated in part by invasive species such as cheatgrass), and (in the Bear Lake area) residential and resort development. Widespread population and habitat declines have been projected for numerous sagebrush associated species (Knick and Rotenberry 1999, Knick et al. 2003, Wisdom et al. 2000). A growing sense of urgency over the outlook for sagebrush-dependent wildlife has spawned numerous assessments and planning exercises at various scales (e.g., Partners in Flight Conservation Plans, Wisdom et al. 2000, Wisdom et al. 2003a and 2003b, NDOW 2004). As a result, hundreds of species associated with sagebrush habitats, including 28 species of birds, have been identified as being of conservation concern (Wisdom et al. 2002, Rich et al. 2005).

While extensive areas of sagebrush habitat are adjacent to Bear Lake NWR, the quality of refuge shrub habitat is superior that of adjacent shrub habitat on private land. The 80 acres of mixed sagebrush upland and meadow grass habitat along the western boundary of the Thomas Fork Unit were subject to heavy livestock grazing prior to Service acquisition in 1995. While livestock grazing was discontinued upon acquisition, most of the extant vegetation consists of old-growth sagebrush with reduced sagebrush canopy coverage and very little native understory vegetation.

Key Species Supported

Shrub habitat complements wetland habitat by providing habitat critical to fulfilling the seasonal life history requirements of upland nesting, wetland-dependent wildlife species such as northern pintail, long-billed curlew, and Swainson's hawk. It also serves as the primary habitat type used by specialists such as greater sage-grouse. Shrub habitat on refuge lands has been identified as a potential reintroduction site for sage-grouse. Other birds strongly linked to sagebrush habitat for both breeding and foraging include Brewer's sparrow, ferruginous hawk, loggerhead shrike, sharp-tailed grouse, merlin, and burrowing owl.

Shrub habitats provide winter cover for big game species such as elk and mule deer. Pronghorn, carnivores (coyote, red fox, raccoon, badger, striped skunk, long-tailed weasel), and rodents (porcupine, meadow vole, deer mouse) also use sagebrush and associated upland habitats on the Refuge. The small mammal community is not well-documented but may include Merriam's shrew, Wyoming ground squirrel, Uinta ground squirrel, and Idaho pocket gopher. Reptiles known to occur in sagebrush/greasewood habitats include the Great Basin rattlesnake, Great Basin gopher snake, kingsnake, and an unidentified "iguanid" lizard (Bear Lake NWR Annual Narrative report 1971).

Refuge Management Activities

Bear Lake NWR

While shrub habitat adjacent to the Refuge may be used by upland nesting, wetland-dependent wildlife species, it is also acknowledged that associated land use practices often diminish or negate the value for nesting wildlife. As such, refuge upland habitats are managed to eliminate the negative impacts from livestock grazing and haying, and additionally, are managed consistent with a natural periodicity of ecological distubance through artificial active management techniques (e.g., prescribed fire). Upland habitats that become overly dense and decadent (late succession is defined as habitat with >90 percent residual coverage and/or >10 percent forb coverage) lose their value to nesting wildlife, but can be restored to early successional status using a variety of active management treatments such as prescribed fire, invasive species control, and seeding or planting of native sagebrush.

Oxford Slough WPA

Other than prescribed fire and invasive species control, no active management of this habitat type occurs on the Oxford Slough WPA.

Thomas Fork Unit

To supplement regeneration of this important community, the Refuge worked with the SE Idaho Complex fire crew to plant 250 big sagebrush seedlings during spring 2003, and an additional 400 seedlings in fall 2003. It is hoped that these supplemental plantings will eventually provide an enhanced seed bank so that the community can regenerate at an accelerated level. These habitats must be reassessed and the results used to develop long-term restoration procedures.

4.3.5 Agriculture (Crop Fields)

Overview

In all the Refuge currently manages up to 214 acres of agricultural land on all units of the Refuge, including 91 acres on Bear Lake NWR, 44 acres on the Thomas Fork Unit, and 79 acres on the Oxford Slough WPA. Of the total acreage about two-thirds is in crops and one-third fallowed in any given year. Although they comprise a small percentage of refuge lands, agricultural habitats (crop fields) can serve a critical function for migratory waterfowl and landbirds, and breeding Canada geese. Agriculture includes the following types:

- Small Grain (wheat or spring barley)
- Summer Fallow
- Legumes (Annual Clover)
- Legumes (Alfalfa)

At a point where carbohydrates are required for migration, species such as Canada geese, greater sandhill cranes, and dabbling ducks can find abundant grain to fulfill this life history requirement. Additional benefits are provided for spring/summer grazing by geese and cranes as new growth shoots become available. Considering recent off refuge conversions from small grain to alfalfa and meadow hay production, refuge agricultural crops provide a necessary supplement for wildlife, as well as a depredation benefit to those local farmers still growing small grain crops. All crops are managed through CLMAs.

Regional Distribution, Conditions, and Trends of Agricultural Lands

Threats to agricultural habitats in the Bear Lake area (both on and off refuge) include lack of funding, shortened growing season, low precipitation, weeds, non-refuge crop depredation, increased demand for hay leading to off refuge conversions from small grain to alfalfa and meadow hay production. As of 2008, alfalfa and wild meadow hay (meadow hay generally cut for first crop hay, and then grazed after it has the opportunity to re-establish itself), accounted for the majority of crops grown on private land in the Bear Lake subbasin. Approximately 66,000 acres of private lands were in grain crops vs. 72,000 acres of private grass, pasture, and hay (IDDEQ 2008).

Key Species Supported

Agricultural habitats (crop fields) comprise a small percentage of refuge lands but serve a critical function for fall migratory waterfowl and landbirds. At a point where carbohydrates are required for migration, species such as Canada geese, greater sandhill cranes, and dabbling ducks can find abundant grain to fulfill this life history requirement. Additional benefits are provided for spring/summer grazing by geese and cranes as new growth shoots become available. Agricultural lands are also used by raptors (Swainson’s hawk and short-eared owl) for foraging.

Refuge Management Activities

Bear Lake NWR

From 1988 to present, a rotation of barley, alfalfa, and summer fallowing has been used. As of 2011, the Refuge had 91 acres of croplands in rotation, divided approximately equally between barley, alfalfa, and summer fallow. Barley is grown as a food crop for fall-migrating sandhill cranes and waterfowl. Legumes are used to fix nitrogen, build soil tilth, and provide browse for Canada geese and sandhill cranes. No chemical fertilizers are used. Summer fallowing is used as part of the rotation to build up soils and combat noxious weeds (primarily Russian knapweed, Canada thistle, and white top) in problem areas. Currently, all farming is done via CLMAs.

Oxford Slough WPA

Since 1995, between 170 and 180 acres on the north end of the Oxford Slough WPA have been farmed under a Cooperative Farming Agreement (CFA) with a local farmer, which has been renewed approximately every five years. Under this agreement the farmer is responsible for water management, any water assessment fees, and noxious weed control as prescribed by refuge policy. Under this agreement, 40-50 acres of cut and uncut barley and/or winter wheat, 25-50 acres of mowed alfalfa, and 80-90 acres of dense nesting cover have been provided.

Thomas Fork Unit

The Thomas Fork Unit lies on the migration route of the Rocky Mountain greater sandhill crane population. Upward of 2,000 cranes have been seen using this area on spring migration in March/April, and during the fall migration in September/October. About 30 acres of grain (barley and/or winter wheat) is grown annually on the Thomas Fork Unit to provide food for fall-migrating waterfowl and cranes. Crane depredation is a concern in this area of the State, and the importance of the Thomas Fork Unit in alleviating depredation along this portion of the flyway has been recognized by the State and the USFWS (Subcommittee on Rocky Mountain Greater Sandhill Cranes 2007).

4.4 Major Species Groups

4.4.1 Waterfowl and Colonial Nesting Waterbirds

Waterfowl

Thousands of waterfowl use the Refuge during spring, summer and fall. Peak spring estimates run from 3,500 to 10,000 waterfowl, and fall estimates from 3,500 to 13,000 waterfowl present. The most abundant species include Great Basin Canada geese, mallard, green-winged teal, canvasback, redhead, and ruddy ducks. Gadwall, northern pintail, cinnamon teal, and lesser scaup also occur in lower numbers. Some snow geese, trumpeter swans, and tundra swans migrate through the Refuge. Swans, geese, and ducks molt in large numbers on Mud Lake. Waterfowl day use estimates from 1968-1987 are shown in Table 4.2 below.

Great Basin Canada geese are the only resident goose on the Refuge. Geese arrive in March and depart in November, depending on weather and ice conditions. Arrival and departure trends for migratory waterfowl are not closely monitored and are vary annually by species, regional and local weather patterns, and other climatic conditions. Typically the first permanent open water occurs in April, and freeze-up occurs in November. In exceptionally mild winters (e.g., 1971-1972) a few Canada geese would overwinter on the Refuge.

Several species of ducks nest on the Refuge. The most common nesting species include mallard, canvasback, redhead, and ruddy duck. Trumpeter swans, lesser scaup, northern shoveler, cinnamon teal, green-winged teal, northern pintail, gadwall, and American wigeon also nest in lesser numbers. Waterfowl production estimates are shown in Table 4.3 below.

Colonial Waterbirds

Bear Lake NWR, Thomas Fork Unit, and Oxford Slough all host significant numbers and species diversity of colonial and other waterbirds. The most notable species include sandhill cranes, white-faced ibis, Franklin's gulls, California gulls, pied-billed grebes, eared grebes, western grebes, Clark's grebes, white pelicans, double-crested cormorants, great blue herons, black-crowned night-herons, snowy egrets, cattle egrets, Forster's terns, Caspian terns, black terns, American bitterns, American coots, sora rails, Virginia rails, and Wilson's snipe. As of 2008, an estimated 12,700 pairs of white-faced ibis, and 29,000 Franklin's gulls, nested in colonies at Bear Lake NWR, and 4,600 pairs of white faced ibis, and 2,400 pairs of Franklin's gulls, nested at Oxford Slough WPA (see Tables 4.4-4.6 below). The presence of diverse and abundant waterbirds makes these refuge units critical for their conservation.

Condition, Trends, and Threats to Waterfowl and Colonial Nesting Waterbirds

Waterfowl

Goose and duck surveys have been conducted by refuge personnel since the 1970s. As of the mid 1970s, census of waterfowl populations on the Refuge was being done almost entirely by use of aircraft (1977 refuge annual narrative report, page 12). Generally, two spring flights were conducted to determine the breeding bird populations and production, followed by one mid-summer flight and three fall flights. The fall flights, conducted in cooperation with IDFG, are usually made during the first week of September, October, and November. Regular refuge patrols contribute information to update the waterfowl census data. Data from these surveys have been used to assess populations and their response to management actions. Duck numbers counted fluctuate widely due to continental, regional, and local environmental, biological and management effects. Thus density estimates of various species or their annual production may not be the best metric to monitor management success.

Peak numbers of waterfowl occur during fall and spring migration. Canada geese in the Bear Lake NWR and southern Idaho region have shown a significant change in numbers and distribution (Knetter 2009), but little attention has been given to monitoring specific life history parameters because the population is well above objective. Spring aerial surveys of goose pairs between 2004 and 2008 counted goose pairs varying between 177 and 690 (Knetter 2009). Until 1987, Waterfowl Use Days were used as a measure of habitat use on National Wildlife Refuges. Data show a slight upward trend in waterfowl use of the Refuge between 1968 and 1987.

Table 4.2. Waterfowl Use Day Estimates for Bear Lake NWR, Idaho from 1968-1987.

Year	Swan Use Days	Goose Use Days	Duck Use Days
1968	742	242,760	1,059,877
1969	63	251,251	918,855
1970	1,043	331,890	1,312,245
1971	0	131,740	519,500
1972	92	91,742	628,956
1973	30	123,050	724,317
1974	600	250,170	881,520
1975	1,189	398,355	974,369

Year	Swan Use Days	Goose Use Days	Duck Use Days
1976	275	365,580	1,431,710
1977	190	702,750	1,374,090
1978	180	390,600	773,820
1979	30	398,355	974,369
1980	30	220,830	766,170
1981	210	380,580	1,092,960
1982	90	411,450	1,291,650
1983	60	398,580	1,059,390
1984	5,280	456,090	1,153,470
1985	180	378,210	1,052,430
1986	1,320	351,100	1,351,140
1987	60	433,300	1,314,500

Source: Annual Narrative Reports, refuge files.

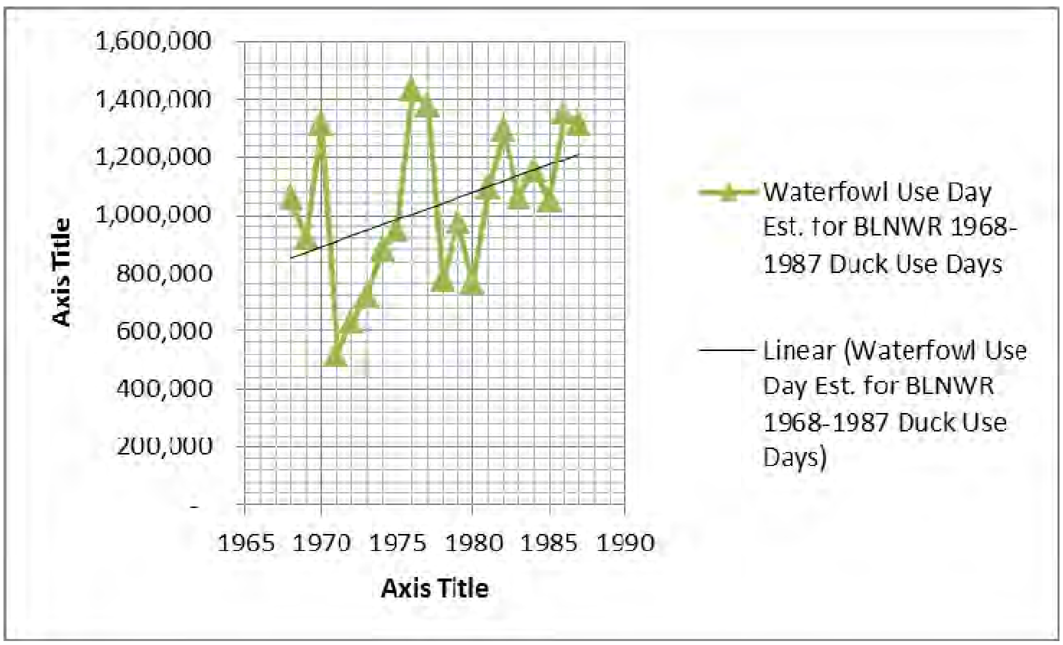


Figure 4.1. Duck use at Bear Lake NWR, 1968-1987.

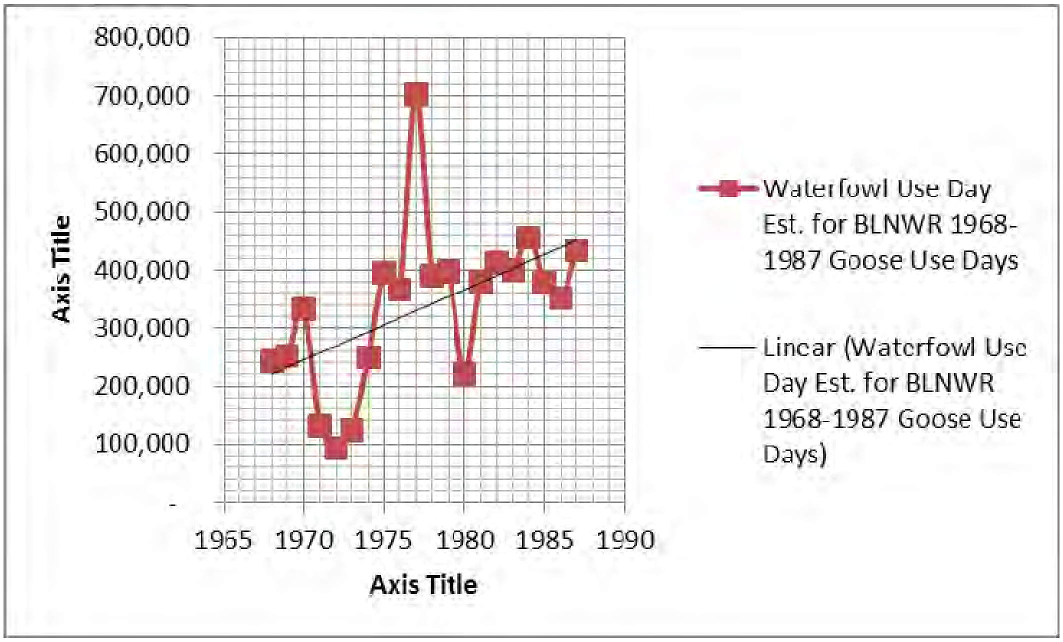


Figure 4.2. Goose use at Bear Lake NWR, 1968-1987.

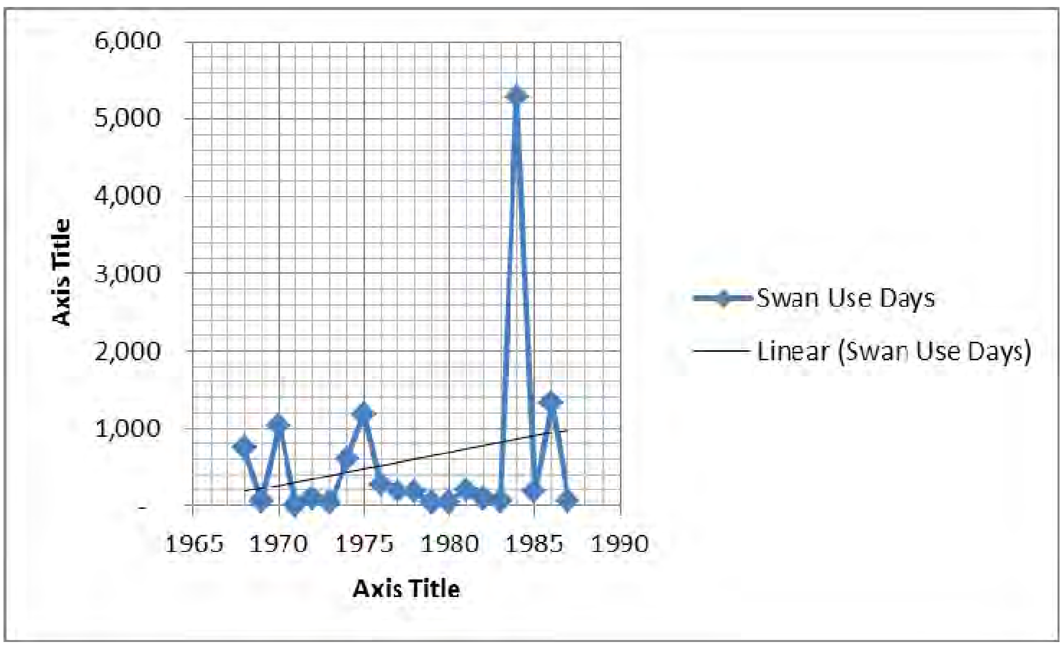


Figure 4.3. Swan use at Bear Lake NWR, 1968-1987.

Waterfowl Production

According to recent waterfowl surveys and Annual Narrative Report data (1968-2000), annual waterfowl productivity is, and has always been, highly variable at Bear Lake NWR. Annual productivity is based largely on water conditions on the Refuge and in the immediate vicinity. In wet years wetlands are exceedingly abundant adjacent to the Refuge, and the finite population of breeding waterfowl scatters to exploit these habitats. In dry years breeding waterfowl concentrate on the Refuge. Nest success also varies (7-75 percent depending on study and unit), as does brood survival. Inclement weather at high elevations, in addition to predation and lack of water and forage abundance in dry years, often drastically reduces cygnet, gosling and duckling survival. Some variation is also due to survey effort and technique, and observer experience (Carl Mitchell, Refuge Complex Biologist, pers. comm.). Most ground based survey techniques used show high levels of variation in sample data (Mitchell, pers. com.). Overall production of all major waterfowl groups (dabbling ducks, diving ducks, and Canada geese) shows a positive trend between 1968 and 2000.

Table 4.3. Annual waterfowl production estimates at Bear Lake NWR, Idaho, 1968-2000.

Year	Canada Goose	Dabbling Ducks	Diving Ducks	Total Ducks
1968	704			1,537
1969	840			1,652
1970	1,420			1,910
1971	900			920
1972	500-750			1,180
1973	750			1,780
1974	910			-----
1975	1,480			3,130
1976	2,500			7,855
1977	2,150			4,744
1978	1,000			------
1979	1,300	3,165	820	3,985
1980	770	1,820	1,080	2,900
1981	1,480	1,790	1,035	2,825
1982	2,200	4,520	1,650	6,170
1983	1,550	3,285	1,430	4,715
1984	2,000	2,775	2,300	5,075
1985	1,550	880	2,815	3,695 (aerial count)
1985	------	2,715	2,715	5,430 (ground count)
1986	1,500	3,065	3,245	6,310
1987	1,710	2,905	2,294	5,200
1988	2,100	3,135	1,765	4,900
1989	2,000	2,380	2,673	5,053
1990	1,742	3,531	3,674	7,205
1991	2,280	4,073	3,437	7,510
1992	2,200	3,213	3,370	6,583
1993	1,590	3,092	3,161	6,353
1994	2,142	3,696	4,247	7,943
1995	1,645			5,663
1996	------			6,000

Year	Canada Goose	Dabbling Ducks	Diving Ducks	Total Ducks
1997	890			2,200
1998	1,814			9,094
1999	------			------
2000	1,704			6,839

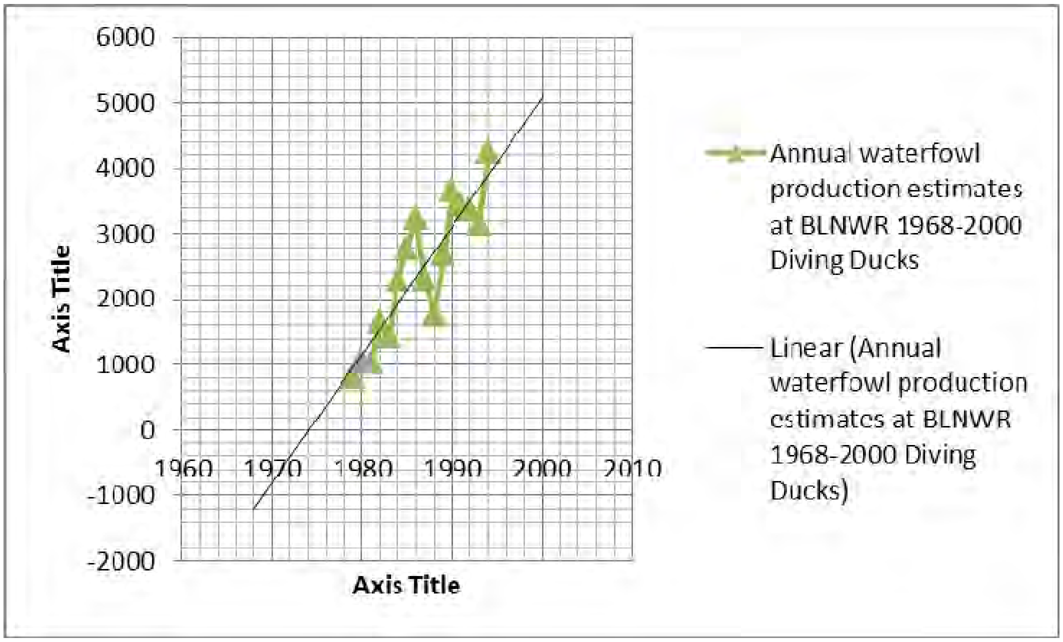


Figure 4.4. Diving duck production at Bear Lake NWR, 1968-2000.

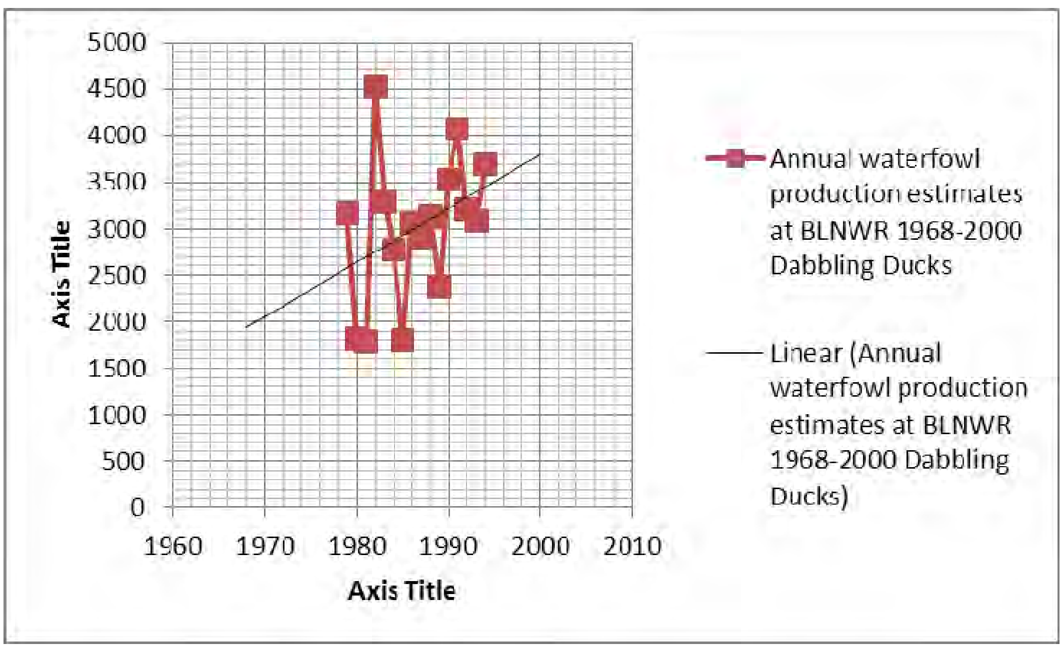


Figure 4.5. Dabbling duck production at Bear Lake NWR, 1968-2000.

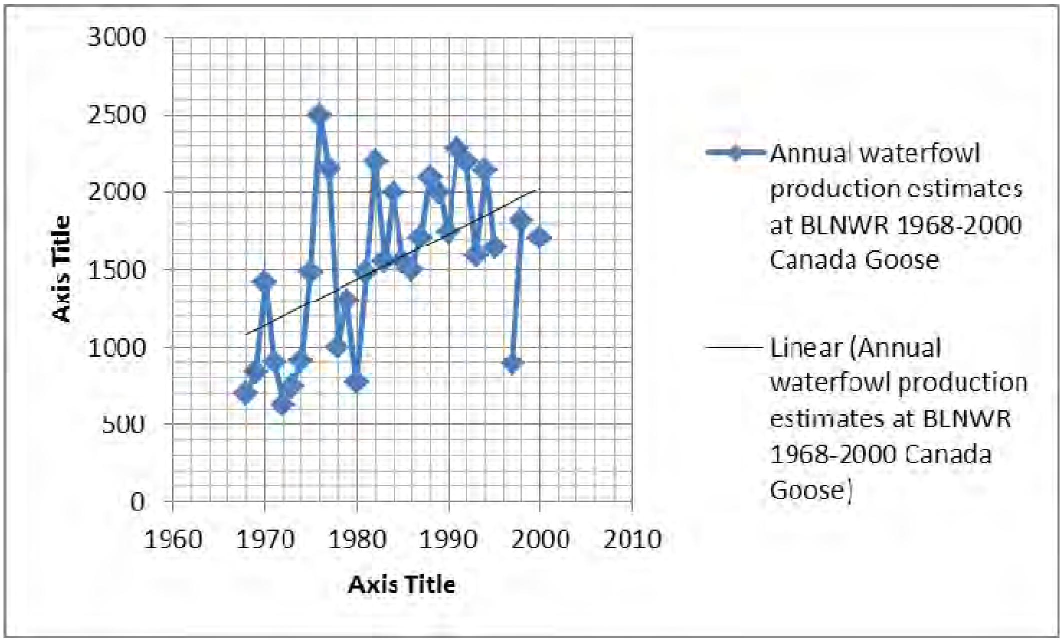


Figure 4.6. Canada goose production at Bear Lake NWR, 1968-2000.

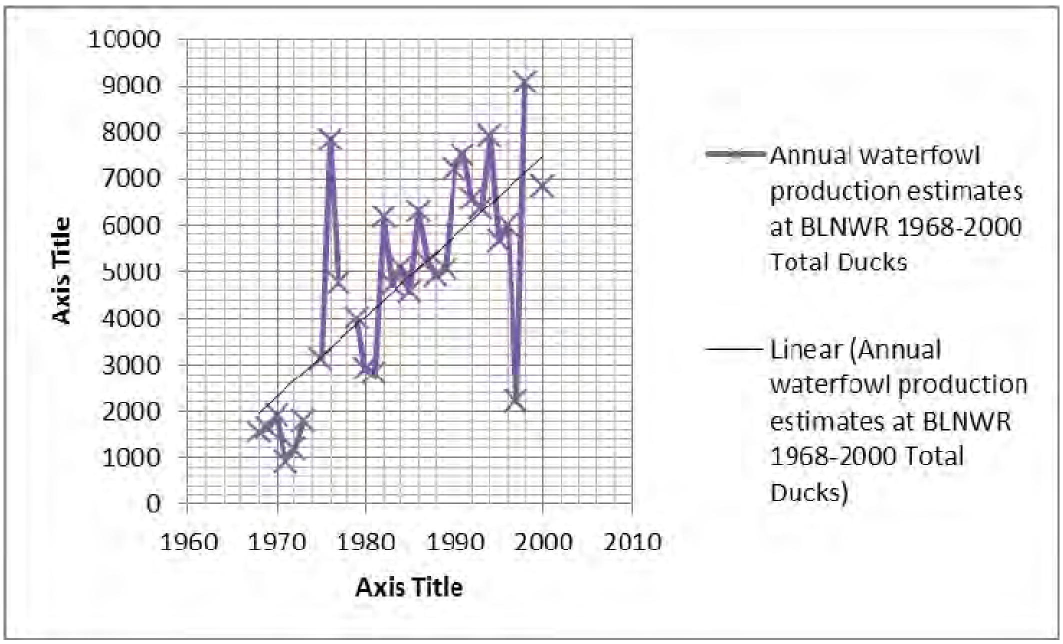


Figure 4.7. Total waterfowl production at Bear Lake NWR, 1968-2000.

Nest and Brood Surveys

In 2000, a duck nesting survey using an ATV chain drag was conducted at Oxford Slough from April 24 through June 9 on the 80 acres of Dense Nesting Cover (DNC). All nest coordinates were captured with a GPS for location and mapping. A total of 59 nests were located and monitored. Predation rates were low and nest densities were high making for some excellent Mayfield success figures as follows: mallard (26 nests) 48 percent, gadwall (10 nests) 38 percent, cinnamon teal (9 nests) 51 percent, northern shoveler (6 nests) 73 percent and northern pintail (6 nests) 100 percent Mayfield success. Overall success was 53.1 percent Mayfield. Since Oxford Slough frequently suffers from lack of sufficient late season water, mortality of young ducks can be high at times. (Note: the Mayfield method of estimating nesting success removes potential sources of bias often associated with other estimates of this parameter.)

A duck brood count was also conducted on Oxford Slough in July 2000 counting 54 duck broods. Duck production was estimated at around 2,100 birds (1,500 duck pairs, 35 percent average Mayfield success over all habitats and an average of four type III [fully feathered, but flightless] ducklings per brood). Scent station routes indicated that predator numbers were low. An estimated eight crane pairs were using the slough. About 100 cranes used the Oxford grain fields through the spring and fall periods in 2000.

Marshbird and Waterbird Surveys

Early marshbird or waterbird surveys were crude estimates usually based on guesswork, but sometimes augmented by ground or aerial surveys. Therefore, undue reliance on the actual numbers reported in Bear Lake NWR Annual Narrative reports is not warranted. Effort on individual species also varied with staff and other duties, so not all species were mentioned, let alone surveyed, each year.

In 2005, the Southeast Idaho National Wildlife Refuge Complex began cooperating with Idaho Department of Fish and Game’s Idaho Bird Inventory and Survey (IBIS) Program (Moulton and Sallabanks 2006). All data are taken from Moulton and Sallabanks 2006 and Moulton 2007; 2008; 2009; 2010).

Colonial Waterbird Colony Counts

Many of the waterbird species at Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA nest colonially. These species include white pelican, great blue heron, black-crowned night-heron, snowy egret, California gulls, Franklin’s gulls, white-faced ibis, double-crested cormorants, and eared grebes. Colonial birds are surveyed in a variety of ways. Details on methods used are given in Moulton and Sallabanks (2006) and Moulton (2007, 2008, 2009, and 2010), and are not repeated here.

Colony counts on islands are successful at estimating colony size. Colony counts in marsh habitats are innately difficult, and the transect method used in 2005 was not an effective way to estimate colony size. This method gave a good indication of the numbers of birds along the transect but it did not give an index of density that could be extrapolated to the entire colony. Transects likely sampled the densest portions of the colony. Extrapolations from these transects would likely overestimate colony size. An alternative is to select a straight line transect through the colony but traversing a straight line transect is extremely difficult. In addition to sampling problems, delineating colony boundaries also was problematic, as navigation around the colonies was extremely difficult. Ideally, colony boundaries should be delineated from the air. However, this may not be financially possible for most years (Moulton and Sallabanks 2006).

Colonial waterbird colony counts followed recommendations from the IMWWCP. In 2006 IBIS focused colonial waterbird efforts on island colonies, due to the inherent difficulty of conducting colony counts in marsh habitats. Surveys of heron rookeries were limited in both 2004 and 2005, due to time constraints and weather issues.

Table 4.4. Colonial waterbird colony counts at Bear Lake NWR, 2005

California gull	99 nests	100% colony surveyed
Caspian tern	21	100% colony surveyed
Double-crested cormorant	64	100% colony surveyed
White-faced ibis	339	Unknown
Black-crowned night heron	63	Unknown
Snowy egret	28	Unknown
Forster’s tern	10	Unknown

Table 4.5. Colonial waterbird colony counts at Oxford Slough WPA, 2005

California gull	0	
Caspian tern	0	
Double-crested cormorant	0	
White-faced ibis	244	Unknown
Black-crowned night-heron	18	Unknown
Cattle egret	3	100% colony surveyed
Snowy egret	5	Unknown
Great blue heron	1	100% colony surveyed
Forster’s tern	3	100% colony surveyed
Black tern	6	100% colony surveyed

Table 4.6. Colonial waterbird colony counts for Bear Lake NWR, 2006.

California gull	368	100% colony surveyed
Ring-billed gull	367	100% colony surveyed
Double-crested cormorant	84	100% colony surveyed

Table 4.7. Changes in colony counts at Bear Lake NWR, 2005 to 2006.

California gull	99	368	272%
Ring-billed gull	0	367	N/A
Caspian tern	21	0	−100%
Double-crested cormorant	64	84	31%

In 2008, IBIS surveyed colonial waterbirds only at Bear Lake and Oxford Slough. There was no detected change in Caspian tern nesting. Double-crested cormorants totaled 56, down 33 percent. During flight line evening counts at Bear Lake NWR, IBIS personnel counted 1,446 and 7,640 white-faced ibis and 4,880 and 4,860 Franklin’s gulls. At Oxford Slough WPA they counted 3,690 and 1,096 white-faced ibis on morning surveys, and 1,760 and 962 white-faced ibis and two and nine Franklin’s gulls.

Colonial waterbird colony nest estimates at Bear Lake for 2008 are summarized as follows. The colony was estimated at 391,842 square meters (4,217,752 square feet). Of this, 15,700 square meters (168,993 square feet) (4 percent) was surveyed. White-faced ibis nests totaled 0.032 nests/m^2, for an estimated nest total of 12,729. Franklin's gull nests totaled 0.075 nests/m^2, for an estimated nest total of 29,326.

At Oxford Slough WPA 5,024 square meters (54,077 square feet) (10 percent) of a 50,766-square-meter (546,440-square-foot) colony was surveyed. They counted 0.091 white-faced ibis nests/m^2, for an estimated total of 4,608 nests. Franklin's gulls nests totaled 0.047 nests/m^2, for an estimated total of 2,409 nests.

In 2009 colonial waterbird colony counts at Bear Lake NWR totaled: Double-crested cormorant, 58 nests; California gull, 339 nests; ring-billed gull, 112 nests; great blue herons, 15 nests.

Secretive Marsh Bird Playback Surveys

Secretive marsh bird playback surveys for five Idaho target species (sora rail, Virginia rail, American bittern, pied-billed grebe, and Wilson's snipe) were conducted from 2005 to 2010. In 2005, these surveys detected all the target species at 94 points (46 points in morning surveys, 48 points in evening surveys), with a mean of 2.54 birds/point/survey detected on morning surveys, and 4.63 birds/point/survey detected on evening surveys. American coots were abundant at all locations, and were difficult to track individually during surveys. Since coots are generally detected quite well during monthly aquatic bird surveys, they were dropped from these surveys, and Wilson's snipe added. Wilson's snipe is another secretive marsh bird species that is not readily detected visually during aquatic bird surveys.

During 2006 secretive marsh bird playback surveys, IBIS crews detected all five target species on 132 points (66 points in morning surveys, 66 points in evening surveys) on six surveys, with a mean of 2.76 birds/point/survey on morning surveys, and 3.29 birds/point/survey on evening surveys. All secondary species (American coot, brown-headed cowbird, common yellowthroat, eared grebe, marsh wren, red-winged blackbird, willow flycatcher, yellow-breasted chat, yellow-headed blackbird, and yellow warbler) were also detected. The 2007 marsh bird playback surveys were again successful in detecting all target species. All secondary species except yellow breasted chat were also detected. Similar to the aquatic bird surveys, these surveys represented the completion of a 3-year inventory period.

Surveys in 2008 surveys detected the target species on 132 points (66 a.m., 66 p.m.), with a mean of 2.84 birds/point/survey during morning surveys, and 3.05 birds/point/survey during evening surveys. In 2009, surveys for 17 points on three surveys detected all target species with a mean of 4.66 birds/point/survey. Most secondary species (American coots, Clark's grebe, western grebe, Forster's tern, long-billed curlew, marsh wren, and yellow-headed blackbird) were also detected. In 2010, surveys for 14 points on three surveys detected all target species with a mean of 3.99 birds/point/survey. Secondary species detected were American coot, Forster's tern, long-billed curlew, marsh wren, western grebe, and yellow-headed blackbird.

Passerine Surveys

In 1992, bird surveys were conducted on the DeWitt-Feller property, which later became the Thomas Fork Unit. In 1996 refuge biologist Bill Pyle, along with a volunteer, set up a 10 point passerine transect and started collecting neotropical bird data on the Thomas Fork Unit riparian areas. The most frequently seen neotropical birds were willow flycatcher, eastern kingbird, yellow warbler, black-headed grosbeak, and Bullock's oriole.

Trumpeter Swan Reintroductions (1996-2005)

In 1996, 20-25 wing-clipped subadult trumpeter swans were released on Bear Lake NWR as part of an effort to increase their breeding range to former nesting areas. Project Leader Reiswig, and Biologists Dr. Rod Drewien and Ruth Shea coordinated with the various state resource agencies and the flyway council to get approval for the transfer of swans to Bear Lake. During December 1995, biologists captured some of these swans (74) using night lighting techniques on the Snake River at Harriman State Park. These swans were then transported to the Oregon State Wildlife Management Area at Summer Lake to spend the winter. The birds would be recaptured and transferred to the Refuge the following spring. Local interest in this project was high, as were expectations of establishing nesting pairs of trumpeters at Bear Lake.

Twenty-five wing-clipped trumpeter swans were re-introduced to the Bear Lake Refuge marsh in late April, 1996. On April 22, 1996 refuge staff drove to Summer Lake Wildlife Management Area to recapture the 25 wing-clipped trumpeters. Because of bad weather and low numbers of available swans they took the first 25 trumpeters captured, neck collared the swans that needed collars, and returned to Bear Lake, arriving there at 0300 hrs the next morning. The sex ratio of the captured swans was 15 males and 10 females, and the age ratio was 14 after hatching year (adults to sub-adults) to 11 juvenile (second year and hatching year) swans. The trumpeters were released at 0800 hrs into the Rainbow Unit where there were good aquatic plant foods. The local media and TV station was on hand to cover the event and within a few days CNN and the *USA Today* newspaper mentioned the release. The Rainbow Unit was closed to the public at this time of year so disturbance to the swans was kept to a minimum. After two weeks, 22 of the swans could be accounted for. One dead swan was located May 17. The cause of death was unknown. By late July, most of the trumpeters could fly again and groups of swans were seen moving around the Refuge exploring the other marsh units. Well over 90 percent of the swan observations between the time they regained flight and marsh freezeup in late November were on the Refuge. After freezeup the trumpeters that remained in the valley were forced off the Refuge to adjacent open creek channels or left the area entirely. During the winter several Bear Lake swans could be seen on the open east end of Alexander Reservoir by Soda Springs. Some swans spent the winter on the south end of Bear Lake along Big Creek. Three trumpeters ended up in the vicinity of Kern NWR, CA. Four Bear Lake trumpeters were seen by Swan Biologist Ruth Shea in the Yellowstone-Jackson Hole region, evidently re-pairing with old separated mates on their traditional wintering areas.

In 1997, a few trumpeters were observed during the early spring months passing through the area. Since about 1994, a pair of uncollared swans and sometimes a single swan had been hanging out at the Refuge through the spring and sometimes through the summer months. Refuge staff observed very few of the green neck-collared swans in spring 1997, but the usual unmarked pair (with leg bands) was back. In 1997 a pair of apparent sub-adult trumpeter swans nested on the Refuge for the first time. However, they did not hatch their four eggs.

The uncollared pair of trumpeter swans returned again in spring 1998 and nested in the Rainbow Unit hatching one leucistic (white phase) cygnet, around June 10. (This phase is fairly rare; typically cygnets are gray and turn white when they attain adult plumage.) Refuge staff believed this to be the first trumpeter swan produced in the Bear Lake Valley in 100 years or so. Data from 1999 are not available.

In 2000, a pair (probably the same pair) again nested successfully at Bear Lake, raising two cygnets on their territory (Pond #4, Rainbow Unit). The previous year's sibling hung out nearby in Pond #3, Rainbow Unit. The trumpeter swan pair was on the nest by late April and two cygnets were spotted in Pond #4 June 16, with an estimated hatch date of June 8-10. These cygnets grew rapidly through the summer and fledged in good shape. The pair returned to their territory in April 2002 and successfully hatched and raised two cygnets; one gray phase and one white phase (leucistic).

On July 24, 2000, two yearling cygnets propagated by Bill Long were released into the Rainbow Unit. These sub-adults (green neck collar 5EO, female, leg band 619-24848; and collar 5E1, male, leg band 619-24849) originally came from Golden Pond, Harriman State Park. These swans hung around the Refuge until freeze up in November. The male 5E1 appeared smaller than normal and weak in late October and it is doubtful that this swan made it through the winter.

In response to rapidly drying conditions on nearby Grays Lake NWR, it was decided to transplant two Grays Lake produced cygnets to Bear Lake NWR. These birds were released on August 22, 2002 by Grays Lake NWR biologist Carl Mitchell, in Rainbow Unit pool #4, which was the established territory of a successful pair at Bear Lake NWR. The hope was that the Bear Lake pair would accept and adopt the Grays Lake cygnets and in turn, successfully fledge all four cygnets.

Eleven swans were released on May 10, 2003. All received leg bands and various types of neck collars. A monitoring effort initiated by the Idaho Department of Fish and Game, used a variety of radio-transmitters affixed to the neck collars to determine behavioral impacts associated with the transmitters versus the distance at which birds could be relocated. Of the 11 birds, three received neck collars without transmitters, four received 4-inch whip antenna models, two received 2-inch whip antennae, and two received a recessed "whipless" design. Among the eight receiving transmitters, four were confirmed mortalities and one was relocated to a captive rearing facility to heal from wounds sustained from the 4-inch whip design. The three receiving neck collars only were observed on Bear Lake NWR until freeze up in early November.

Eleven swans were released on July 14, 2004, and all received leg bands as well as yellow and black lightweight neck collars. All 11 2003 release birds, part of the IDFG radio telemetry study, disappeared from the Refuge during 2004. At least six were confirmed mortalities while the remaining fate of five was unknown. Among the 11 released during 2004, all were observed on or adjacent to the Refuge until late October, with six observed through the winter at the south end of Bear Lake. It was hoped that the birds would return to the Refuge during spring 2005. No swans were released on the Refuge after 2005, and no collared swans have been observed on the Refuge since October 2007.

Threats to Waterfowl and Waterbirds

Southern Idaho, including units of Bear Lake NWR, provides important habitat for migrating and breeding waterfowl using the Pacific Flyway, and to colonial waterbirds. Threats associated with breeding and migration areas in Canada and Alaska are treated in detail in other documents. Threats to waterfowl and their associated habitats in this region include:

- Loss, degradation, or fragmentation of wetland and grassland habitat.
- Development of grasslands or conversion to less suitable or unsuitable agricultural habitats.
- Additional regional demands on surface and groundwater.
- Wildlife diseases (especially Highly Pathenogenic Avian Influenza H5N1 and West Nile Virus).
- Invasive and noxious weeds, which compete with or exclude desirable grasses and forbs used by waterfowl and compromise ecological integrity and function.

Threats to waterbirds and their associated habitats in this region include:

- Invasive carp, which degrade wetland habitats for breeding and foraging waterbirds (but which also provide some forage for piscivorous species).
- Conflicts, real or imagined, between desirable sport fisheries and piscivorous birds.
- Loss, degradation, or fragmentation of wetland and grassland habitat (see section 4.4).
- Development of grasslands or conversion to less suitable or unsuitable agricultural habitats.
- Human disturbance to key foraging and roosting areas.
- Wildlife diseases.
- Invasive and noxious weeds, which compete with or exclude desirable plant communities used by waterbirds, and which compromise ecological integrity and function of their breeding and foraging habitats.

4.4.2 Bonneville Cutthroat Trout

Bear Lake NWR

St. Charles Creek is the largest Bear Lake tributary, and one of a few tributaries to Bear Lake that provide spawning and rearing habitat for adfluvial Bonneville cutthroat trout (BCT). A significant portion of the creek lies in the southwest corner of the Refuge. (The two remaining major tributaries of Bear Lake are Bloomington Creek, which flows into the Bunn Lake Unit of the Refuge, and Paris Creek, which flow into the Bear River outlet canal. Bonneville cutthroat trout populations in those creeks appear to be very low or non-existent.)

There are few natural spawning runs to support the population, and because of the limited production from Saint Charles Creek, persistence of the Bear Lake cutthroat trout populations is dependent on hatchery supplementation. The Utah Division of Wildlife Resources stocks 200,000 to 300,000 Bonneville cutthroat trout in Bear Lake annually. Managers increase trout stocking when the lake is at full storage capacity. Those fish are collected at the egg stage from spawners that migrate from Bear Lake into Swan Creek, Utah. In good years, the run of adult Bear Lake cutthroat trout into Swan Creek is 300 to 500 adults. Utah also maintains a broodstock in one of their hatcheries to supplement stocking if the egg take at Swan Creek is insufficient to meet the minimum stocking goal of 200,000. In 2004, Idaho and Utah agreed to develop an interagency management plan for Bear Lake's fishery management program (Teuscher and Capurso 2007).

Despite excellent potential, production of adfluvial cutthroat trout from Saint Charles Creek has been limited due to unscreened irrigation diversions and migration barriers near the confluence with Bear Lake. Adfluvial BCT must navigate several irrigation diversions as they move upstream to spawn, and downstream migrating fish often get entrained into irrigation diversion screens. Saint Charles Creek's confluence becomes impassible to adult cutthroat trout at lake elevations below 5,912 feet. During 2003 and 2004, peak lake elevations were below 5,907 feet. As a result, juvenile production in the stream was very poor. Fish survey work showed that Saint Charles Creek's fish community was dominated by resident rainbow trout, brook trout, and rainbow trout x cutthroat trout hybrids, with Bonneville cutthroat trout constituting less than 20 percent of the fish community (Teuscher and Capurso 2007).

A 2003 graduate study regarding trout movement in St. Charles Creek suggested that spawning trout were being lost to the Bear Lake/St. Charles Creek system. Of 16 radio tagged fish entering the Refuge via the fish ladder located just west of the Lifton pump station, 14 ended up either distributed throughout the marsh, or worse, downstream in the Bear River with no possibility of reentering the Bear Lake system. Two fish attempted to spawn on Spring Creek; however, it is unknown whether these fish survived or if their fry were able to successfully return to the lake. Most of the fish were hatchery-reared and have no particular allegiance to the St. Charles Creek or Spring Creek systems. They appeared to move to the heaviest flows, either from the Rainbow inlet canal or the Bear Lake outlet canal, where flows in excess of 1,000 cfs are common. Among the 16 tagged fish, 14 were hatchery raised and two were native based on adipose fin clipping records. Only two attempted to spawn in the St. Charles Creek system (Burnett 2003).

In 2005 a fish passage structure was constructed on St. Charles Creek to facilitate passage of spawning BCT. To minimize the effects of both the St. Charles Creek and Thomas Fork projects (below), refuge manager Bundy worked closely with the St. Charles Creek Working group, USFS, Trout Unlimited, and private landowners to help find creative solutions to these problems. The Refuge created a new wetland unit around St. Charles Creek in 2005-2006 to ensure that any trout entering the Refuge have only one way to go. By creating a levee around the creek, trout are forced into the St. Charles Creek system to spawn and returning fry would only be able to return to the lake.

In 2008 Trout Unlimited and project partners installed a fish ladder funded by NFHAP through the Western Native Trout Initiative at the lowest irrigation diversion on St. Charles Creek so that migrating Bonneville cutthroat trout could reach upstream spawning and rearing areas. A new project, which was scheduled for completion in 2011, includes installation of a rotary drum fish screen at a diversion upstream from the previously installed fish ladder, and stabilization of adjacent stream banks through sloping, armoring with rock, and willow planting. This would improve fish passage past the diversion structure for both upstream and downstream migrating fish. The overall plan is to systematically work upstream and remove barriers and entrainment risks to restore a natural spawning run. It was expected that this project would be completed in 2011 following runoff in St. Charles Creek.

Thomas Fork Unit

The following is an excerpt from Teuscher and Capurso (2007):

"The Thomas Fork of the Bear River is considered a stronghold for Bonneville cutthroat trout. Three tributaries of the Thomas Fork (Preuss, Giraffe, and Dry Creeks) were established as long-term monitoring streams for Bonneville cutthroat trout. To enhance those tributary populations, a conservation agreement was initiated in October 1994. The multi-agency agreement outlined cattle management requirements of the Caribou Cattlemen Association, enforcement of those actions by the USFS, and Bonneville cutthroat trout population monitoring by IDFG. This agreement has recently been discontinued, but construction of structural improvements such as fences to decreased cattle impacts to the streams have continued. The Thomas Fork River supports resident stream populations and a run of fluvial BCT from the Bear River."

From July 1999 to April 2001, Colyer et al. conducted a study on Bonneville cutthroat trout movement on the Thomas Fork Creek system where the Thomas Fork Unit is located. In this case, three diversion structures appear to be hindering reproductive success. Irrigation water is typically first delivered from April 15-May 1st, which coincides with the time when trout are attempting to enter the creek to spawn. The water rights are such that no instream flow remains and any trout that do make it through the diversion are subject to being trapped as the diversion structures are closed (Colyer et al. 2005). In 2006, the Refuge partnered with the USFS, Idaho Division of Fish and Game, Trout Unlimited, the Bear Lake Regional Commission, and a private landowner in the Thomas Fork system to create fish friendly diversion structures with ladders to allow for Bonneville cutthroat trout passage.

Threats to Bonneville Cutthroat Trout

Threats to Bonneville cutthroat trout in the Bear River watershed include:

- Habitat loss, fragmentation, or degradation (including water quality and quantity) through presence of streamside grazing, invasive carp, increasing exurban development, low precipitation and low, warm, poorly oxygenated streamflows, and inadequate or improper management of refuge wetland units that function for fish passage;
- Climate change (increased risk of drought and wildfire) (Williams et al. 2009, Haak et al. 2010);
- Unscreened irrigation diversions (Kershner 1995);
- Inbreeding with non-native rainbow or brook trout (Teuscher and Capurso 2007); and
- Uncontrolled angler harvest (Teuscher and Capurso 2007).

Williams et al. (2009) assessed the extirpation risk to local populations of native cutthroat trout based on the combined stressors of habitat fragmentation and climate change. They first analyzed the current distribution of Bonneville cutthroat trout, Colorado River cutthroat trout, and westslope cutthroat trout to determine the likelihood of population persistence (under current conditions) based on relationships drawn from the literature between persistence and fish abundance, habitat connectivity and patch size for several trout species. They then analyzed climate change-driven environmental effects and combined these results with the results of the persistence analysis to provide a spatially explicit characterization of local extinction risk in the context of climate change. They characterized the thermal limits for each subspecies based on the relationship between each subspecies' historical distribution and air temperature. An upper thermal limit of 24° C was applied to Bonneville cutthroat trout. Temperatures at or above these limits were considered "unsuitable." Marginal habitat range for westslope cutthroat trout was defined as 22.1-24.0 ° C. They applied a 3° C temperature increase to 1970-2000 mean July air temperatures. This increase has been projected as the most likely scenario for the western United States within this century (CIG 2004).

They concluded that in most areas of the Bear River Basin, especially those streams around Bear Lake and streams draining the Uinta Mountains, risk is low for winter flooding and increased summer temperature. Drought risk and wildfire risk, however, is high for most of this area. For example, 24 of 37 conservation populations (65 percent) in the Bear River drainage rate as having a high risk for wildfire, but 32 populations (86 percent) are rated as having a low risk for increasing summer temperature.

4.5 Threatened, Endangered, and Sensitive Species

One goal of the Refuge System is “To conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.” In the policy clarifying the mission of the Refuge System, it is stated “We protect and manage candidate and proposed species to enhance their status and help preclude the need for listing.” In accordance with this policy, the CCP planning team considered species with Federal or State status, and other special status species, in the planning process.

At present there are no known threatened or endangered species occurring on Bear Lake NWR, Thomas Fork Unit, or Oxford Slough WPA. The Canada lynx is the only listed threatened species in the project area occurring in Bear Lake and Franklin Counties; however, it occurs in high elevation habitat (subalpine forest) and therefore would be unlikely to occur on the refuge units (USFWS ECOS website).

Candidate species include the yellow-billed cuckoo in Bannock and Franklin Counties (the species does not occur in Bear Lake County), and the greater sage-grouse in Bear Lake and Bannock Counties. The wolverine is a candidate species that occurs in Bear Lake County, but in this southern portion of the species’ range its distribution is restricted to high elevations (USFWS ECOS website). Therefore, it would be unlikely to occur on refuge units. In cooperation with the State Ecological Services office, every effort will be made to remain current on any changes in status (e.g., sage grouse listing), and necessary monitoring and management will be implemented.

The greater sage-grouse, northern leopard frog, Bear Lake springsnail (*Pyrgulopsis pilsbryana*) and red glasswort (*Salicornia rubra*) have a S2 State conservation status (imperiled; at high risk because of restricted range, few populations, rapidly declining numbers, or other factors that make it vulnerable to extirpation in the State of Idaho). Red glasswort is also listed as a Type 4 Species of Concern by BLM (BLM 2003). It is site specific to the alkali meadow (ephemeral wetland) habitat type. This plant’s sensitive status merits inclusion as a refuge focal species and its relative abundance and contribution to wetland diversity provides a suitable adaptive management threshold for alkali meadows.

Bonneville cutthroat trout has a S3 State conservation status (vulnerable, at moderate risk). The breeding populations of a number of bird species that breed on Bear Lake NWR, Oxford Slough, and the Thomas Fork Unit are included in the list of Idaho Species of Greatest Conservation Need. Species with S1 status breeding populations include: trumpeter swan, common loon, great egret, Forster’s tern, and black tern, while species with S2 status breeding populations include: red-necked grebe, western grebe, Clark’s grebe, snowy egret, cattle egret, black-crowned night-heron, white-faced ibis, Franklin’s gull, California gull, and Caspian tern (IDFG 2005b).

4.6 Exotic, Invasive, and Nuisance Species

One of the most striking features of the Refuge is the extent to which invasive plants and animals have taken hold. Invasive plant species displace native vegetation, altering the composition and structure of vegetation communities, affecting food webs, and modifying ecosystem processes resulting in considerable impacts to native wildlife (Olson 1999). The term invasive species refers to a subset of introduced or non-indigenous species that are rapidly expanding outside their native range. A species is regarded as invasive if it:

1. Has been introduced by human action to a location where it did not previously occur naturally;
2. Becomes capable of establishing a breeding population in the new location without firther intervention by humans; and
3. Spreads widely throughout the new location.

Introduced species can become invasive for many reasons including:

1. the insects, fungi, mammals or other fauna that kept the species in check within its native landscape do not exist in the region to which the species was introduced.
2. the species is allelopathic (exudes chemicals which inhibit growth). Some species release chemicals which directly inhibit the growth of other plants, while others may release chemicals that negatively impact mycorrhizal fungi.
3. the invasive species has a competitive advantage such as earlier leaf-out, asexual reproduction, deeper root system, etc. (Wildflower Association of Michigan 2007).

Chemical, biological, or mechanical control of existing invasive species provides a competitive advantage for new growth of native species, which ultimately promotes healthy ecosystems through restoration of native plant communities. Early detection of new invasive species or new stands of existing invasive species greatly increases the efficacy of control measures (Bundy 2007).

4.6.1 Exotic and Invasive Species

Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit host a variety of exotic and invasive plants and animals. In some cases these species are well established and complete eradication is unlikely.

Exotic Plants in Upland Habitats

The spread of invasive plant species in upland habitats was facilitated by the rapid increase in land clearing and grazing that followed Euro-American settlement. By 1848 there was a small herd of oxen, cattle, and horses at Smith’s trading post. Herds expanded rapidly in the 1860s. Cattle were grazed on what are now refuge lands for more than 150 years. Grazing by domestic livestock has very different effects on plant communities than grazing by wild bison, or other native ungulates. It is often a major factor in habitat change, because many native grasses and forbs are not adapted to prolonged, season-long, heavy grazing pressure and soil disturbance and/or compaction. This gives exotic grasses and forbs a competitive advantage over native species.

Exotic pasture and forage grasses were also intentionally introduced. Today, most grasses on the Refuge are introduced “tame” pasture grasses, for example perennial ryegrass, timothy, foxtails, bluegrasses, orchardgrass, and fescues. These grasses can however, provide some benefits to some native wildlife. Short grazed or mowed pasture grasses are extensively browsed by Canada geese and are also used by foraging sandhill cranes and other waterbirds.

Exotic Plants in Riparian and Wetland Systems

Bear Lake NWR

Nine known invasive plant species have been found on Bear Lake NWR: Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), hoary cress (whitetop) (*Lepidium draba* ssp. *draba*), Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), black henbane (*Hyoscyamus niger*), perennial pepperweed (*Lepidum latifolium*), common reed (*Phragmites australis*), and saltcedar (*Tamarix* spp). Phragmites is not currently listed as a noxious weed in Idaho, but is listed in Utah. Map 11 below shows the distribution of Canada thistle, hoary cress, Russian knapweed, spotted knapweed, and black henbane across 771 acres of refuge habitat as of 2007. While distributions are fairly accurate at present, this does not mean that new communities have not become established since these maps were prepared. As an objective, approximately 40 acres of known infested habitat should be treated annually (as refuge resources allow) while expansion of existing stands and identification of new species should remain a high priority (see Chapter 2, Management Direction).

In addition to these invasive species, exotic grasses have been intentionally introduced to the area, and in some areas have become dominant species. Although reed canarygrass (*Phalaris arundinacea* L.), a circumboreal perennial grass species, is native to North America and the Pacific Northwest (Merigliano and Lesica 1998), a more aggressive European cultivar or hybrid has been widely used as a forage grass species. Seed for this cultivar has been commercially available since the late 1920s (Always 1931). Reed canarygrass, probably a non-native cultivar, was planted on the Refuge in the 1960s as a forage grass, and for dike stabilization (Bear Lake NWR, Annual Narrative Reports, 1965-1967). Once established, however, this aggressive non-native cultivar either displaces native plant species or prevents them from reestablishing on disturbed areas (Maurer et al. 2003, Kilbride and Paveglio 2000, Harrison et al. 1996, Emers 1990, Taylor 1990). Seasonal wetlands and wet meadow areas become a monotypic stand of this species. There are 100 species of native plants that should occur in habitats susceptible to invasion by reed canarygrass.

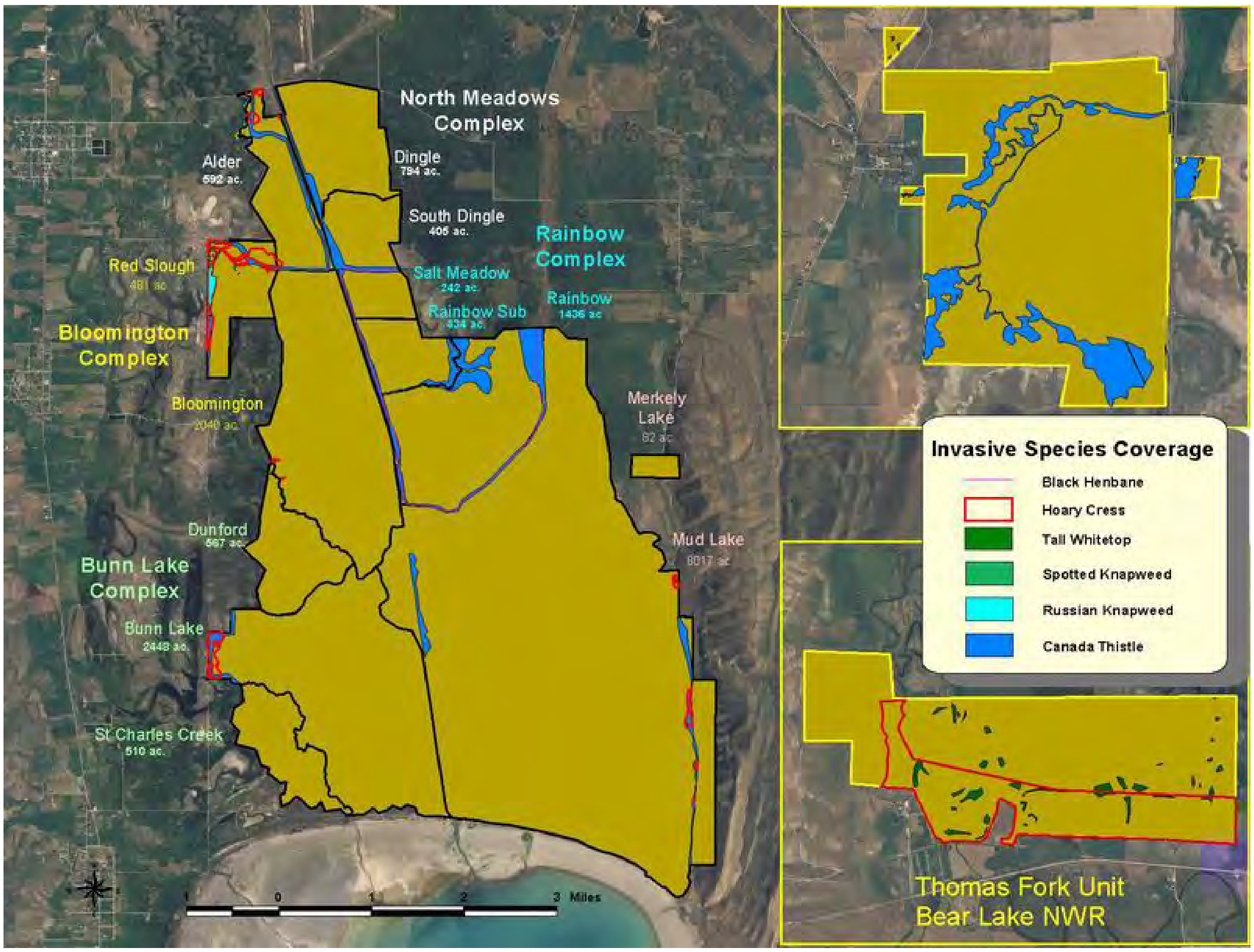
Reed canarygrass dominated wetlands have fewer food resources, as a result of simplified structure, coarser less digestible detritus, and the density of accumulated plant material. For early spring migrants such as the mallard, northern pintail, and American wigeon, food resources and their availability are limited by a thick thatch layer covering the soil surface. This thatch layer limits wildlife access to important foraging strata and shades the soil surface maintaining cooler temperatures which delays emergence of invertebrates. These shallow flooded areas are also important pairing habitat for many species of dabbling ducks especially the cinnamon and blue-winged teal. Other waterbirds affected by invasion of reed canarygrass include several species of shorebirds: lesser and greater yellow-legs, long-billed dowitchers, Wilson’s snipe, and western, least, and Baird’s sandpipers; and marshbirds such as the sora and Virginia rail.

Thomas Fork Unit

White top, or hoary cress (*Cardaria draba*), was the primary weed infesting the Thomas Fork Unit since at least the 1990s when Bear Lake NWR took over management. In 1996, perennial pepperweed (*Lepidium latifolium*) had just recently moved into the eastern portion of Bear Lake County by traveling down the Bear River from Wyoming. Besides white top and perennial pepperweed, black henbane (*Hyoscyamus niger*), Russian knapweed (*Rhaponticum repens*), and various thistles (*Cirsium* spp) are also a concern.

Oxford Slough WPA

Weed distribution on Oxford Slough is poorly understood at present, except that most of the intermittent hydrologic zone is currently infested with varying concentrations of Canada thistle, and the uplands with dyer's woad (*Isatis tinctoria*).



Map 11. Distribution of Invasive Plants at Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA.
From Bundy 2007.

Introduced Birds

Exotic birds present at Bear Lake NWR, the Thomas Fork Unit and Oxford Slough WPA include European starlings (*Sturnus vulgaris*), house sparrows (*Passer domesticus*), Eurasian collared-dove (*Streptopelia decaocto*), rock dove (*Columba livia*), chukar partridge (*Alectoris chukar*), ring-necked pheasants (*Phasianus colchicus*), and occasional feral waterfowl (*Anas* spp.) (Mitchell 2010). Though not native to North America, pheasants and chukars are valued game birds. Collared-doves are a relatively recent immigrant to Idaho, with the first sighting near Pocatello in 2003, but have been rapidly expanding since then. Their impacts on native species is unknown. A recent study by Cornell University showed that native dove species were actually more common in areas where collared-doves were also present. However the results of this study may not be applicable to this region. Starlings and house sparrows compete with native cavity nesting birds (mountain bluebirds, *Sialia currucoides*; tree swallows, *Tachycineta bicolor*; house wrens, *Troglodytes aedon*; and kestrels, *Falco sparverius*) for limited nest sites. Feral waterfowl may carry disease from captive flocks into wild ecosystems. All of these species could conceivably compete with native species for insect and seed forage, and all provide prey for native predators (e.g., merlins, *Falco columbarius*; peregrine falcons, *Falco peregrinus*). Control of non-native birds has not been conducted on the Bear Lake NWR, Oxford Slough WPA, and Thomas Fork Unit.

Introduced Mammals

There are no known exotic mammals on Bear Lake NWR, although feral dogs, feral cats, and possibly house mice probably do occur, at least sporadically. None are known to be permanently present to any significant extent, although if house mice do occur they likely do so in large numbers at selected sites. Dogs and cats are potentially serious predators of native wildlife, although cats and house mice, if they occur, also may provide food for native predators, including red fox, coyote, great horned owls, and other medium-sized raptors.

There are no known exotic or invasive amphibians or reptiles present on Bear Lake NWR.

Exotic Animals in Riparian and Wetland Systems

Introduced Invertebrates

New Zealand mudsnail (*Potamopyrgus antipodarum*), zebra mussel (*Dreissena polymorpha*), and the quagga mussel (*Dreissena bugensis*) are a problem in Idaho waters, but have not yet been found on the Refuge. Likely invasion would occur from hunters' equipment (e.g., uncleaned boats, boat trailers, decoys, or boots).

Introduced Fish

Common carp were introduced to Bear Lake and Oneida Counties by the U.S. Fish Commission in 1882. Thus, they have been established in the Bear River and its wetlands long before the Refuge was established. Although young carp provide forage for piscivorous birds, e.g., white pelican, osprey, bald eagles, and mammals (mink), adult carp have significant long-term negative effects on wetlands by increasing turbidity, eliminating suitable habitat for native fish, birds, and other wildlife, and directly consuming submerged aquatic plants, thus harming the diverse native wildlife that depend on those aquatic plants or a clear water column. Rainbow and non-native brook trout from St. Charles Creek may occasionally stray into refuge waters, but are not present in significant numbers.

4.6.2 Control Efforts

In accordance with Service policy 569 FW 1 (Integrated Pest Management), wildlife and plant pests on units of the Refuge System can be controlled to ensure balanced wildlife and fish populations in support of refuge-specific wildlife and habitat management objectives. An Integrated Pest Management (IPM) approach is used, which includes a variety of tools: prevention of new introductions or the spread of established pests to areas not infested, mechanical or physical control methods, cultural methods, biological controls, pesticides, and habitat restoration/maintenance. The current IPM program for the Refuge is included as Appendix F. Control efforts are planned annually and Pesticide Use Proposals (PUPs) are submitted to regional and/or national IPM coordinators for approval. Chemical, biological, or mechanical control of existing invasive species provides a competitive advantage for new growth of native species, which ultimately promotes healthy ecosystems through restoration of native plant communities. Early detection of new invasive species or new stands of existing invasive species greatly increases the efficacy of control measures (Bundy 2007).

Carp Control

When the Refuge was established in 1968, managers immediately knew that the combination of widely fluctuating water levels and abundant carp was severely impacting the growth of submerged aquatic plants used by waterfowl, even in permanent pools. In 1972, Idaho State University students built carp exclosures on the Refuge as part of an ecology study. This graphically demonstrated that alkali bulrush (an important waterfowl food) was being destroyed by carp outside of the exclosures. In 1973 a 15-acre carp exclosure was built along the east side of the Refuge. By the spring of 1974, alkali and three-square bulrush was growing vigorously in the exclosure. While managers recognized that carp control would improve habitat, little could be done in the early years due to lack of resources. Managers acknowledged that the Refuge would remain deficient in wildlife food supplies until impoundments could be constructed, making carp control feasible.

Slowly managers began to construct impoundments on the Refuge by building up dikes and levees along naturally higher areas and controlling water flows with stop logs and screw gates. Still, by 1978 the only place where the Refuge could control water levels was on the newly constructed Salt Meadow Unit. Here, a dike enclosed approximately 280 acres, of which 240 acres was water and emergent vegetation. The effects of carp exclusion were immediately apparent. Inside the impoundment, turbidity was negligible and invertebrate life was much more abundant. At times, several hundred ducks were present in this impoundment while almost no ducks were present in the carp-infested waters on the other side of the dike.

In 1980, construction of the Rainbow and Alder dikes was begun. The Alder dike was completed within the year, and the Rainbow dike, due to its size and complexity, was completed in 1987. The refuge manager attempted to completely dewater the 1,800-acre Rainbow Unit during the fall of 1981 to remove carp, but was unsuccessful because construction activity delayed the effort. The water level was low enough during the winter to result in a partial winterkill of 3,000-5,000 carp throughout the unit. With the partial winterkill the water quality improved considerably compared to previous years.

In 1983, the Rainbow Unit was drawn down to apply rotenone for carp control. After the nesting season was completed and the water began to recede, water was allowed to flow out of the unit. Between September 6 and October 7, Crisafulli pumps were used to reduce the volume to about 50 acre feet (the unit holds about 3,500 acre feet of water when full). Rotenone was then applied on five segments in five different days. Water quality improved rapidly following carp control. The blocked off portion of the old Rainbow Canal, borrow areas, and former mud bottom and mud flat areas, developed extensive stands of submergent vegetation, and the unit got excellent use by redhead pairs and broods where few, if any, were observed in previous years.

The Rainbow Dike, which was begun in 1980, was finally completed in 1987. Water control structures and fish barriers were installed to keep carp out of the new Rainbow Unit. In 1988, rotenone was applied to remove carp from both the Rainbow and Dingle Units. This removal effort was extremely successful.

In 1990, drought conditions made a complete drawdown of the refuge marsh (primarily the Mud Lake and West Canal units) feasible. In all, almost 14,000 acres of semipermanent and permanent marsh that otherwise rarely dried out, were drawn down. (The West Canal Unit was later subdivided into the Bloomington, Bunn, St. Charles, and Dunford Units.) While the objective was primarily to allow the marsh to go through a much needed drying cycle, another important benefit was removing carp from large areas of the marsh. This was accomplished by drying up areas, flushing fish downstream, and freezing out fish in shallow pools held low over the winter.

In the summer of 1995, small schools of larger age class carp were observed in the borrow areas of the Rainbow Unit, and water quality was also beginning to deteriorate. In fall 1996, the Rainbow Unit was again drawn down for carp control. The water control structures remained open until mid-January 1997, and then closed to prepare for snow melt in the spring. The Alder and Dingle Units were also drawn down for carp control in 1996.

The Rainbow Unit drawdown for carp removal was very effective, and only a couple of small groups of carp were seen within the Rainbow Unit the following summer. Production of aquatic plants (sago pondweed and muskgrass) was excellent. The carp exclosures placed within the proposed Bloomington Unit (the dike was under construction at this time) in 1996 showed good regeneration of muskgrass, Richardson's pondweed (*Potamogeton richardsonii*), and other species.

In September 2000, the Refuge and the Idaho Department of Fish and Game conducted carp control on the 1,900-acre Bloomington Unit as part of a restoration project. Water was released from this unit over a period of two weeks. Fifty gallons of rotenone was then applied in the remaining 3.2 miles of borrow areas and shallow channels using a small airboat. An estimated 4,500 carp were killed. The water management system along the boundary with the Ward Ranch was repaired and improved in 2001. This was crucial to prevent carp movement from flooded private meadows into the Bloomington Unit. This project involved replacing deteriorating culverts and structures, raising the existing levee height, and installing prefabricated carp-screened structures over the slide gate structures in seven locations.

The Rainbow Complex Restoration Project, begun in 1994 and completed in 2005, entailed construction of one new water control structure and replacement of five existing structures with carp control hardware. These improvements allowed independent water management and carp control within the three-unit, 2,114-acre Rainbow Complex.

Noxious Weed Control

Control efforts, including water level management, hand pulling, and herbicide application began early after establishment of Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit. Refuge annual narrative reports document increasing numbers of exotic species, increased acreage and distribution of exotics, increased man-hours devoted to exotic plant control, and more use of chemicals and other control techniques over time. Due to personnel and budget constraints, efforts to control exotic plants have been intermittent and not demonstrably successful.

Bear Lake NWR

The Refuge uses IPM techniques to control noxious weeds, including crop rotation, rotary mowing, and summer fallowing to reduce the need for herbicide use. However, herbicides are used to control hoary cress (whitetop), perennial pepperweed (tall whitetop), black henbane, Russian knapweed, spotted knapweed, and the larger Canada thistle patches. Refuge barley fields are sprayed once, usually in June, for weed control. Weed spraying begins in May into June with black henbane and hoary cress.

Oxford Slough WPA

Control of dyer's woad and various thistle species occurs at OS. A combination of prescribed fire, hand pulling, herbicide, biological controls, deep disking, fallowing, and haying has been used.

Thomas Fork Unit

Weed control was an important management activity before the Service acquired the Thomas Fork Unit, and remains an important task. A combination of fallowing, deep disking, spraying, and releasing of biological controls has been used to manage weedy species. The unit is subject to sporadic infestations of hoary cress; the Refuge has conducted control of this species as time and funding allow. When tall white top or perennial pepperweed (*Lepidium latifolium*) was discovered on the Refuge in 1996, the county weed board was informed of the serious nature of this persistent and rapidly spreading tall weed. A total of 206 acres of the Thomas Fork Unit's 1,015 acres were treated with 102.5 gallons of herbicide.

Over the past several years, distribution of perennial pepperweed on the Thomas Fork Unit has been dramatically reduced through establishment of "weed days" in partnership with the Highlands Cooperative Weed Management Area (CWMA). Established in 2001, the Highlands CWMA has made a commitment to control of perennial pepperweed on the Bear River system by annually holding a work day on and adjacent to the Thomas Fork Unit. In 2000, the Highlands CWMA group donated herbicide supplies to the Refuge to combat encroaching perennial pepperweed along the Bear River and at the Thomas Fork Unit. Almost every year since then, the Highlands CWMA has donated some supplies to the Refuge, not supplying all of the Refuge's needs, but certainly making a contribution.

Biological Control

Between 1990 and 2004, the Refuge also used biological control agents (insects) to treat infestations of Canada and musk thistle (*Carduus nutans*) at Bear Lake NWR. Biological control agents were also released at Oxford Slough WPA in 1991 and at the Thomas Fork Unit in 1999 and 2000. Releases of biological control agents at Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit between 1990 and 2004 are shown in Table 4.8 below. Impacts on Canada thistle by these insects have been minimal to date; however, there has been some reduction in musk thistle seed head production from past biological control releases.

Table 4.8. Releases of Biological Control Agents at Bear Lake NWR, Oxford Slough WPA, and Thomas Fork Unit

Date	Biological Control Agent	# Released	Release Location/Notes
5/23/90	stem mining weevil (*Ceutorhynchus litura*)		Marsh interior
6/20/90	seed head weevil (*Rhinocyllus conicus*)		
1991	stem gall fly (*Urophora cardui*)	200	
1991	stem mining weevil	400	
1992	stem gall fly		
1992	leaf feeding beetle (*Larinus planus*)		
6/4/93	stem gall fly	1,000	4 sites (low survival)
7/8/93	seed head weevil	300	2 sites
6/22/94	stem gall fly	500	
7/94	seed head weevil	300	3 sites
1995	seed head weevil		
1996	leaf defoliator beetle (*Cassida rubiginosa*)	300	Only release in 1996 due to budget restrictions
7/30/97	leaf defoliator beetle	300	Thistle patches near Paris Dike
1998	leaf defoliator beetle	210	
1998	seed head weevil	210	
	"similar to 2000"		
6/21/00	leaf defoliator beetle	500	
7/13/00	leaf defoliator beetle	500	
8/15/00	stem mining weevil leaf feeding beetle	300 200	
8/23/00	stem mining weevil	300	
2002	stem mining weevil	500	
2003	stem mining weevil		
2004	stem mining weevil		
Oxford Slough WPA			
1991	stem gall fly stem mining weevil	100 200	
Thomas Fork Unit			
1999, 2000	seed head weevil		On musk thistle north and west of the west barley fields
1999, 2000	stem mining weevil		
1999, 2000	leaf feeding beetle		

4.6.3 Control of Nuisance Species

Refuges may control native species when necessary to protect refuge resources or infrastructure, restore habitat, or meet wildlife and habitat management objectives. Animal species damaging/destroying Federal property and/or detrimental to the management program of a refuge may be controlled as described in 50 CFR 31.14 (Official Animal Control Operations)**.** Based upon 7 RM 14.7E, a pest control proposal is required, in some cases, to initiate a control program on refuge lands. However, a pest control proposal is not required for the routine protection of refuge buildings, structures (e.g., dikes, levees, water control structures), and facilities that do not involve the use of prohibited chemicals; or for the use of routine habitat management techniques, selective trapping, on-refuge transfer, and physical and mechanical protection such as barriers and fences (including electric fences). Examples of control of native animal species include: control of beaver and muskrat that damage refuge dikes or other infrastructure; and control of predators that cause unacceptable levels of mortality to priority species. Control of such species is addressed in the Refuge's IPM Plan (Appendix F.) On Bear Lake NWR, nuisance species can include mink, beaver, muskrat, raccoon, and weasel, but their status depends on population size and behavior.

Predator Control

Bear Lake NWR

From 1988 to 1995, removal of several predator species (mostly skunk and raccoon) using both live and lethal trapping, and shooting, occurred in order to increase the nest success of migratory birds. The number of animals removed was relatively small (60 animals total between 1988 and 1995), and no animals have been removed since 1995. Electric fencing and water barriers have also been used to reduce impacts of predators on nesting migratory birds (see section 4.1.3, above).

4.7 Wildlife and Habitat Research, Inventory, and Monitoring

A number of research and monitoring projects have been conducted at the Refuge since it was established. Many are collaborative efforts between the Refuge and other Service programs, other agencies, nongovernment organizations (NGOs), and universities.

4.7.1 Bird Banding

The first documented bird banding on Bear Lake NWR occurred in September 1974, when waterfowl was trapped using a cannon net on the salt flats southeast of the water control structure. Thirty-five mallards and 130 pintail were banded. In June 1975, 270 Canada geese were banded along Bear Lake Canal by use of a drive trap. In 1977, 227 Canada geese were trapped on the Bear Lake Canal and banded. No bird banding was done from 1978 through 1986. Banding resumed in 1987 with 191 geese banded after being driven down the Outlet Canal to the Airport field. One hundred thirty nine of these geese were transported to northern Idaho for release on the Coeur d'Alene River near Harrison, ID.

Preseason Waterfowl Banding

In 1991, the Service and IDFG initiated banding for local mallards and pintails to gather data on survival rates, improve population estimates, and set hunting regulations. These preseason banding efforts ran from late July through late August. In 1991, 526 ducks, including 355 mallards and 150 redheads, were banded. In 1992, 715 ducks were banded. 556 ducks were banded in 1993, 919 in 1994, 605 in 1995, 247 in 1996, and 161 mallards in 1998. No banding was done in 1997 due to high water. No further banding of ducks or geese was conducted after 1998.

Trumpeter Swan Reintroduction and Monitoring

Reintroduction of trumpeter swans on the Refuge was conducted between 1996 and 2007. For a detailed history of the swan reintroduction program, see section 4.4.1 above. Swans released in 1996 were neck-collared prior to release and monitored thereafter. During the following winter, biologists at other refuges and wildlife management areas, as far away as Kern NWR in southern California, observed collared swans from Bear Lake.

Eleven swans released in May 2003 received leg bands and various types of neck collars. A monitoring effort initiated by the Idaho Department of Fish and Game, used a variety of radio-transmitters affixed to the neck collars to determine behavioral impacts associated with the transmitters versus distance birds could be relocated. All 11 2003 release birds disappeared from the Refuge during 2004. At least six were confirmed mortalities while the remaining fate of five was unknown. Eleven swans released in July 2004 received leg bands and lightweight neck collars. No swans have been released on the Refuge since 2005.

4.7.2 Aquatic Waterbird Surveys

In 2006 and 2007, IDFG conducted Aquatic Waterbird Surveys, as recommended by the Intermountain West Waterbird Conservation Plan (Ivey and Herzinger 2006). These consisted of actual counts from specific sites, in order to document species occurrence, relative density, and diversity through time. This two-year inventory period provided a useful baseline of aquatic bird use at these sites.

Aquatic Waterbird Surveys were conducted in May, June and July. In 2006, waterfowl species totaled 14, 11, and 13, for those months, respectively. Shorebird species totaled 4, 5, 4, respectively, and waterbird species totaled 17, 19, and 15. In 2007, Aquatic Bird Surveys detected 15, nine, and 13 waterfowl species in May, June and July, respectively. Shorebird species totaled four, six, and seven, and other waterbirds 16, 20, and 12 species, respectively.

Secretive Marsh Bird Playback Surveys

Secretive Marsh Bird Playback Surveys for five Idaho target species (sora rail, Virginia rail, American bittern, pied-billed grebe, and Wilson’s snipe) were conducted in 2005-2010 using procedures outlined by Conway (2005). American coot was included in 2005 but this species was dropped as it was relatively abundant and easily counted in aquatic bird surveys. Wilson’s snipe was substituted for coot in subsequent surveys as it is secretive and not easily counted in aquatic bird surveys. The Idaho target species were detected in all surveys. Results are summarized in section 4.4.1 above.

4.7.3 Other Research Projects

Research is encouraged at the Refuge. Professors and students, graduate and undergraduate, from the University of Idaho, Idaho State University, and Utah State University have conducted research at the Refuge. Research projects are vetted by refuge managers and biologists to ensure that the studies are relevant, well thought out, and that information gathered is useful to refuge management needs or otherwise justifiable.

Before the lands of the Dingle Marsh were withdrawn to create the Refuge, a thesis project was conducted in 1954 by Henry Reeves titled “Muskrat and Waterfowl Production and Harvest on Dingle Swamp, Bear Lake County, Idaho.” Reeves was a graduate student at Utah State Agricultural College in Logan, Utah.

In 1969, Doctorate student Rod Drewien, of the University of Idaho at Moscow, was selected to conduct research into the ecology of the greater sandhill crane in southeast Idaho (Annual Narrative, page 13). This studied continued through 1974 and Drewien published his dissertation “Status and Distribution of Greater Sandhill Cranes in the Rocky Mountains” in the Journal of Wildlife Management (Drewien and Bizeau 1974). A second paper, “The Breeding Biology of the Greater Sandhill Crane” also resulted from his studies on the Refuge.

In 1971, the study of potential waterfowl food plants adaptable to conditions at the Refuge, which was begun in cooperation with USDA SCS, Plant Materials Center at Aberdeen, Idaho, continued through 1975. The researchers planned to expand the project in 1976.

In 1973, William Mullins continued a project titled “Seasonal Movements, Chemical Residue and Summer Food Habits of the Greater Sandhill Crane.” This was completed in 1975.

In 1979, Bryce Nielson at the USU Fishery Research Laboratory on Bear Lake set gill nets at two locations on the Refuge. He netted at the south end of the Outlet Canal next to Camp Lifton and at the north end of the Outlet Canal next to the control structure. As was expected, carp were very abundant with large numbers of Utah suckers, Utah chubs, and yellow perch also present. The perch were six inches and smaller, and Nielson felt that the population was stunted with the six-inch fish being breeders. One green sunfish and one Bonneville whitefish were also caught.

Also in 1979, gizzards were collected from mallards and pintails shot by hunters on the Refuge. Only 94 gizzards were collected and sent to the IDFG laboratory in Boise for analysis. Two percent of the sampled birds had ingested lead shot.

In 1981, a Special Use Permit was issued to Doctors John Kadlec and Vince Lamarra and their graduate students to study the nutrient dynamics of the refuge marsh. This study was part of a larger study of the water quality of Bear Lake and its tributaries, including the Bear River. In 1983, Ph.D. candidate Rex Herron, USU, continued fieldwork on the Refuge for his study, “Phosphorus Dynamics in Dingle Marsh, Idaho, BLNWR.” This research was an offshoot of the water quality study that has been conducted on the Refuge for the previous two years to determine the sources and extent of the eutrophication of Bear Lake. In 1985, Herron completed his program and provided a copy of his dissertation to the Refuge.

Also in 1985, a research team headed by Dr. Ted Bjornn, Idaho Cooperative Fishery Research Unit, began a study titled “Evaluation of Proposed Use of BLNWR as a Sediment and Nutrient Trap for Inflows to Bear Lake.” The team studied water flows and pathways, sediment movement and deposition, nutrient dynamics, invertebrate populations, waterfowl and other migratory bird use and abundance, fish populations, and mapped plant communities. A second field season was scheduled for 1986. The investigators intended to use the data collected in the study to develop proposals, alternatives, and costs of using the Refuge as a nutrient and sediment trap. Results of the study were published in 1998 (Bjornn and Idaho Cooperative Fish and Wildlife Research Unit 1998). The proposal to use the Refuge as a nutrient/sediment trap never moved forward, probably because of the cost involved and impacts of increasing sediment on refuge habitats.

During late August of 1990, Mr. Peter Hovingh, a local expert on invertebrate fauna, inventoried areas of the valley including portions of the Refuge for mollusks, leeches, and amphibians. The Refuge requested that as part of his inventory, he make a comparison between carp infested and carp free zones. An excerpt from his work follows:

> "The second part of the survey – to determine the status of mollusk in carp-infested and carp-free areas of the Refuge revealed that only *Physa* gastropods were found in the carp-infested waters (although in some locations *Lymnaea* and *Oxyloma* were found associated with the wet areas of the bulrushes but not in the actual body of the waters). The carp-free zones contained both *Helisoma* (not so abundant) and *Lymnaea stagnalis* as well as *Lymnaea* sp., *Physa*, and *Oxyloma*. Leopard frogs were also associated with the carp-free zones and not with the carp-infested zones. The leech *Erpobdella punctata* was the only leech found in the Refuge ponds whereas *Erpobdella dubia* was associated with the streams and springs of the Bear Lake drainage. *Erpobdella punctata* seems to tolerate increased salinity and eutrophic conditions, although both leeches are found in lakes, streams, and springs."
>
> "The lack of an abundant molluscan fauna in the carp-infested waters could be due to the substrate instability and the cloudiness of the waters. In desert springs which contain an abundance of carp, molluscan fauna are well represented. These desert springs generally have an abundance of aquatic flora and clear waters."

During the summer of 1991 a turbidity monitoring program was begun to provide the Refuge with baseline turbidity, conductivity, and other marsh water quality information on Bear River water as it moves through the marsh enroute to Bear Lake or downstream via the Outlet Canal. Turbidity and conductivity measurements were taken in June and in August at 30 locations around the marsh. These samples included control and non-control areas for carp. The highest turbidity was measured at peak in-flows down the Rainbow Canal in June. These measurements ranged from 55-60 Formazin Turbidity Units (FTU). Across the Rainbow Dike in the relatively carp-free Rainbow Unit, FTU levels dropped to 20. Turbidity and conductivity measurements were again taken in 1992. Annual Narratives from 1993 to 2000 had nothing to report on the research front.

In 2002, the contaminants branch of the Boise and Pocatello Fish and Wildlife Offices (USFWS) initiated a three year study to ascertain contaminants levels of concern in refuge sediments and biotic components of Bear Lake NWR marsh habitats. Of primary concern was the selenium levels associated with past phosphate mining operations in the Bear Lake Plateau located on the eastern boundary of Mud Lake. Sediment samples collected during the initial phase (2003) have been analyzed and the results suggest that several contaminants are elevated in sediments associated with inflow points on the east and west sides of Mud Lake. The Rainbow inlet canal, source of all Bear River water entering Mud Lake, tends to be highest in most nutrients and contaminants sampled while Mud Lake sediments tend to retain the lowest concentrations. The final report titled

"Evaluation of Contaminant Concentrations in Water, Sediment, and Biota at Bear Lake National Wildlife Refuge from Historical Phosphate Mining and Agricultural Return Flows" was completed in 2004 by Burch, Arena, and Thomas.

Jeffery S. Horsburgh, David K. Stevens, and Nancy O. Mesner, professors at Utah State University (USU) in Logan, Utah, undertook a study titled "Continuous Water Quality Monitoring of Mud Lake to Support Evaluation of Effects of Bear River Water Diverted into Bear Lake." Their students, in particular Cody Allen for his Masters' Thesis, began collecting data on the Refuge in 2007. They installed continuous monitoring equipment at four sites around the periphery of Mud Lake to monitor the water quality of its major inflows and outflows.

The project was geared toward answering the following major science questions:

1. What is the nutrient and sediment budget for Mud Lake?
2. How does management of Mud Lake affect flow pathways and residence times within the system?
3. Does the management of Mud Lake have a significant impact on sediment loading into Bear Lake and conversely from Bear Lake and Mud Lake to the Bear River as water is released for agricultural purposes from Bear lake?
4. What are other exogenous factors that potentially affect these processes?

In 2006 this project received a Water Initiative Research Initiation Award from USU. Project: Utah State University Water Initiative, State of Idaho Department of Environmental Quality, Continuous Water Quality Monitoring of Mud Lake to Support Evaluation of Effects of Bear River Water Diverted into Bear Lake, J. S. Horsburgh, D. K. Stevens, N. O. Mesner, 2006-2009. Cody Allen's thesis defense was scheduled to be completed by 2011.

Wayne Wurtsbaugh, a professor in the Watershed Sciences Department at USU, Logan, conducted a study with his students. They conducted fieldwork on the Refuge in 2008, and produced a report dated February 17, 2009 titled "Comparative Limnological Analysis of Cutler Reservoir and Dingle Marsh with Respect to Eutrophication." Dr. Wurtsbaugh and his students returned to collect more data in 2009 and produced another report submitted to the Refuge in March 2010 titled "Limnological Analyses of Cutler Reservoir and Dingle Marsh with Respect to Eutrophication."

David K. Stevens, professor at Utah State University in the Utah Water Research Laboratory, and his student, Hussein Batt, have been collecting data on the Refuge since 2008. Their study is titled "Management of Sediment Load to Enhance Water Quality and Promote Wildlife in Mud Lake." Data collection was completed in 2010. Mr. Batt's dissertation defense was scheduled for the summer of 2012.

Karin Kettenring, a professor in the Watershed Sciences Department at USU Logan, and her student, Amanda Sweetman, collected data in 2009 at the Refuge for a study titled "The relative importance of geographic and environment variation in the intraspecific composition of *Schoenoplectus maritimus* across spatial scales." Ms. Sweetman also collected data at the Bear River Migratory Bird Refuge in Brigham City, Utah. Her thesis defense occurred in December 2011 and the results of her study were schedules to be available in 2012.

Chapter 5
Human Environment

Cinnamon teal/George Gentry, USFWS

Chapter 5. Human Environment

5.1 Cultural Resources

This section presents a brief outline of the rich history and cultural heritage of Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA. Archaeological and other cultural resources are important components of our nation's heritage. The Service is committed to protecting valuable evidence of plant, animal, and human interactions with each other and the landscape over time. These may include previously recorded or yet undocumented historic, cultural, archaeological, and paleontological resources as well as traditional cultural properties and the historic built environment. Protection of cultural resources is legally mandated under numerous Federal laws and regulations. Foremost among these are the National Historic Preservation Act (NHPA) as amended, the Antiquities Act, the Historic Sites Act, the Archaeological Resources Protection Act (ARPA) as amended, and the Native American Graves Protection and Repatriation Act (NAGPRA). The Service's Native American Policy (USFWS 1994c) articulates the general principles guiding the Service's relationships with Tribal governments in the conservation of fish and wildlife resources. Additionally, the Refuge seeks to maintain a working relationship and consult on a regular basis with the Tribes that are or were traditionally tied to lands and waters within the Refuge.

Since cultural resources encompass many elements and time periods, the following simple temporal divisions were used to distinguish and categorize this brief review of the following resources.

- Pre-recorded History
- Pre-Contact Native American Traditions
- Post-Contact Traditions (Native American, British and United States)
- Recent U.S. Settlement and Economic Development Period
- Historic and Prehistoric Sites on the Refuge

5.1.1 Pre-recorded History

Archaeological studies have documented the human use of the eastern Snake River Plain by hunting and gathering peoples for at least 13,500 years (USDOE 2009). Southeastern Idaho is in the Snake and Salmon River culture area of the northern Great Basin (Butler 1986). Butler divides the prehistory of the region into three broad periods: (1) PaleoIndian (ca. 12,000 to 7,800 years ago); (2) Archaic (ca. 7,800 to 300 years ago); and (3) Protohistoric (ca. 300 years ago to historic). These periods were marked by major changes in weapon systems and in the types of projectile points that were used by different cultures, and by different settlement and subsistence patterns, indicating the early human presence in this region.

Large lanceolate and stemmed lanceolate projectile points typify the PaleoIndian Period in which hunters sought big game such as mammoth and bison. During the Archaic Period, large spear points were almost entirely replaced by smaller notched and stemmed forms, which may have been more effective in exploiting newly evolved species that survived the Pleistocene-Holocene transition. In the Early Archaic Period (ca. 7,800 to 4,500 years ago), there is no evidence of a substantial shift in subsistence practices, but the Middle Archaic (ca. 4,500 to 1,300 years ago) is marked by an increase in the frequency of bifurcate stemmed (Pinto and Gatecliff series), large corner-notched (Elko series), and lanceolate (Humboldt series) points; earth oven features are also commonly associated with sites of this period.

The introduction of the bow and arrow, as indicated by small side-notched and corner-notched projectile points, and ceramics marks the beginning of the Late Archaic Period (1,300-300 years ago) in the eastern Plateau. Archaeologically, the Late Archaic Period is recognized by a general decrease in projectile point size and increase in small side- and trinotched arrow points, or Desert Side-Notched points, from approximately 700 to 300 years ago when stone-tipped arrows began to be replaced by firearms of Euro-American manufacture. At least two cultural groups, the Fremont and the Shoshonean, are represented by these remains. Although ceramics are often thought of as a marker of sedentary horticulturalists, current evidence indicates that the northern Fremont were mobile hunter-gatherers. Shoshonean occupation is marked by brown-ware ceramics, desert sidenotched points, and Cottonwood triangular points.

The Protohistoric Period (ca. 300 years ago to historic) began with the first appearance of Euro-American trade goods in archaeological assemblages that still reflect a reliance on traditional practices of hunting and gathering. One of the most conspicuous influences on cultural change was the horse, which made new hunting techniques possible and increased the potential range of hunting forays. At the same time, the demands of horse herds for water and forage limited potential settlement locations. The Shoshonean horse cultures of the Protohistoric Period in this region were the predecessors of the historic Shoshone and Bannock (BLM 2009).

Bear Lake Valley. The prehistoric record of Bear Lake Valley is not well documented, and few archaeological sites have been recorded. The southeastern corner of Idaho is topographically linked more to the Great Basin than it is the Snake River Plain. The area is on the margin of two rather well documented cultural traditions: the Desert Culture to the south with its roots in the Great Basin; and the Plains Big-Game Hunters to the north and east associated with the Snake River Plains (Butler 1978). Additional archaeological investigations will be required to determine the predominant cultural influences on the Bear Lake Valley region of southeastern Idaho.

The closest excavated archaeological site with any time-depth is the Weston Canyon Rockshelter, about 40-50 kilometers (25-31 miles) west of Bear Lake, with evidence of hunting dating from as early as 6000 years ago. D'Azevedo (1986) wrote, "It is reasonable to expect that Bear Lake Valley has been used by prehistoric peoples at least since ~6000 BP." However, the nature and extent of that prehistoric occupation is still poorly understood.

According to Harvey and Burnside, the two sites found during a 1995 refuge survey and the few previously recorded sites near the Refuge, "are not inconsistent with either of the two Archaic cultural traditions, and indicate the full time hunting and gathering of both animal and plant foods … The single complete projectile point found on the Refuge, an Elko corner-notched point, broadly identifies a Middle Archaic occupation sometime between ~6000-1500 years BP."

5.1.2 Pre-Contact Native American Traditions

Shoshone are suspected to have occupied southeastern Idaho as early as the fifteenth century (D'Azevedo 1986). At the time of major white settlement of the Great Basin and the Snake River areas in the 1840s, there were seven distinct Shoshone groups:

1. The Eastern Shoshone, occupying the region from the Wind River Mountains to Fort Bridger and astride the Oregon Trail;
2. The Goshute Shoshone, in the valleys and mountains west and southwest of Great Salt Lake;
3. The numerous Western Shoshone in northern and western Nevada; and

4. Four remaining groups in southeast Idaho and northeastern Utah that are usually listed under the general name of the "Northern Shoshone" (Madsen 1980, 2010): The Fort Hall Shoshone of about 1,000 people, who lived together with a band of about 800 Northern Paiute known as the Bannock at the confluence of the Portneuf and Snake rivers, but ranged widely into Idaho, Wyoming, and Montana; the Lemhi, numbering some 1,800 people, who ranged from the Beaverhead country in southwestern Montana westward to the Salmon River area, which was their main homeland; in western Idaho, along the Boise and Bruneau rivers, a third section of about 600 Shoshone followed a life centered around salmon as their basic food; finally, the fourth and final division of 1,500 people, the Northwestern Shoshone, resided in the valleys of northern Utah—especially Weber Valley and Cache Valley—and along the eastern and northern shores of Great Salt Lake. This group also ranged into the southeastern corner of Idaho (the northern Cache Valley and Bear Lake Valley).

The Northern Shoshone are distinguished from the Western Shoshone mainly in having had many horses in late aboriginal times, and from the Eastern Shoshone in having had an economy based more on salmon fishing than on bison hunting. Today, most Northern Shoshone groups are included among the Shoshone-Bannock Tribes of the Fort Hall Reservation, Idaho (Murphy and Murphy 1986), but some Northwestern Shoshone are members of a separate recognized tribe, the Northwestern Band of the Shoshone Nation (Parry 2010).

Historically, the Bear Lake Valley was within territory visited by both the Northern and Eastern Shoshone. Prior to the settlement of the Bear Lake Valley in the 1860s, the Shoshone and possibly the Bannock Indians used the valley for grazing horses and hunting. Buffalo herds used the valley's lush meadows and took refuge in the old Dingle Swamp's bulrush stands in winter. Buffalo bones and skulls have been found from time to time in the marsh and along eroded canal banks (USFWS 2001a).

Although the Fort Hall Shoshone and Bannock and the Northwestern Shoshone visited the Bear Lake area, their winter camps were in other more sheltered areas in the Fort Hall bottoms, Bannock Creek, and the Cache Valley. The Northwestern Shoshone had winter villages in the northern Cache Valley and therefore would have been most likely to hunt and gather in the vicinity of Oxford Slough. Both the Fort Hall Shoshone and the Northwestern Shoshone had friendly relations with the Eastern Shoshone and joined them for buffalo hunts in Wyoming and Montana, which may have taken them through the Thomas Fork area. Bear Lake was seasonally visited by both the Northern and Eastern Shoshone and at least on occasion by neighboring tribes (Crow and Blackfoot), but due to its severe winters it was not permanently inhabited.

Round Valley, at the south end of Bear Lake, was a site for summer gatherings of various Shoshone bands. Used primarily during spring and summer periods, Round Valley was a prime hunting and fishing area for the Shoshone, Bannock, Ute, Sioux, and Blackfoot Indian tribes (Parson 1996 in Palacios et al. 2007a). It was customary for these Native Americans to spend many weeks on the shores of Bear Lake trading furs, ponies, and fish with other tribes and then eventually with Euro-Americans, who held fur trading rendezvous there in 1826 and 1827. The site was of sufficient significance to the Shoshone that in 1863, Chief Washakie of the Eastern Shoshone negotiated with Mormon leader Charles Rich to prohibit settlement there (see section 5.1.4 below).

Fort Hall Shoshone and Bannock. Two linguistic groups, the Shoshone and the Northern Paiute-speaking Bannock, seem to have occupied the Fort Hall region since prehistoric times. They called themselves Bohogue ("people of sagebrush butte," referring to the butte northeast of Fort Hall). The

Bannock, a horse-owning group living in close association with the Shoshone, called themselves Bana'kwiit (Steward 1938). In contrast to the unmounted “foot Shoshone” who lived immediately below them on the Snake River, the Fort Hall Shoshone and Bannock acquired horses relatively early (about 1700). Their cultures were strongly stamped with Plains traits and had a comparatively high degree of political solidarity at an early period.

Subsistence activities. In winter most of the Bannock and Shoshone camped in the vicinity of Fort Hall, where the lush bottomlands of the Snake River provided ample forage for their horses. In spring, groups of related families set out in search of various foods. Whether they went east for bison, south toward the Bear River for berries and for hunting, or west for salmon, camas, and trading depended upon individual circumstances and whether or not they had horses. Usually families set out first to Camas Prairie or to the Boise, Payette, and even Weiser Rivers to the west. Since Fort Hall is some distance above the limit of salmon in the Snake River, an important reason for these trips was to procure salmon, either directly from the river or by trade from the lower Snake River Shoshone. At Camas Prairie they usually scattered out to gather roots and seeds. They visited the Nez Perce and local Yahandiika Shoshone to dance and barter. They traded buffalo skins to the Yahandiika for seeds, roots, dried crickets, and salmon, and to the Nez Perce for horses. A few families remained in this region all summer, but most of them turned east in late summer to seek buffalo. However, some families remained in the vicinity of Fort Hall during the summer, or went to Bear Lake for roots, berries, mountain sheep, and other game. In the fall some families went south to the Grouse Creek region for pinyon nuts (Steward 1938).

Formerly bison ranged along the Snake River plains, not far from Fort Hall, and in the Bear River Valley. After bison were extirpated from Idaho (by 1840), large parties of Indians went to Montana and Wyoming to hunt them, starting about when the leaves were turning in the fall. Even in 1811, however, Hunt’s party saw Shoshone, who were probably from Idaho, hunting bison somewhere near the headwaters of the Green River (Irving 1961:385-387). Fear of the Blackfeet as well as the greater efficiency of communal hunting compelled the main body of Fort Hall Shoshone and Bannock to travel as a unit, often joining Lemhi, Nez Perce, Flathead, and Wyoming (Eastern) Shoshone. On their way east they usually procured chokecherries and various seeds, roots, and berries in the mountains. Most people returned to Fort Hall late in the fall, transporting the dried buffalo meat and hides on their horses.

Northwestern Shoshone. Madsen (1980, 2010) identified three major groups of Northwestern Shoshone at the time the first Mormon pioneers began settling northern Utah: Chief Little Soldier’s misnamed ‘Weber Ute’ group of about 400, who occupied Weber Valley down to its entry into the Great Salt Lake; Chief Pocatello’s band (‘Bannock Creek Shoshone’) of about 400 people, who ranged from Grouse Creek in northwestern Utah eastward along the northern shore of Great Salt Lake to the Bear River; and Chief Bear Hunter’s band (‘Cache Valley Shoshone’) of about 450 people, who resided in Cache Valley and along the lower reaches of the Bear River.

Cache Valley Shoshone. The Shoshone were noted for a “wide range of political organization and grouping” and a “looseness and diffusity of the social institutions” (Murphy and Murphy 1986). Not surprisingly, authors differ in their identification of various Shoshone bands, which were variously named for their core territories, the foods they ate, or in more recent times, their leaders. Madsen (1980) describes Bear Hunter’s band as Northwestern Shoshone, and noted that Mormon settlers regarded Bear Hunter as the principal leader of the Northwestern Shoshone, holding equal status with Washakie when the Eastern (Wind River) and Northwestern groups met in their annual get-together each summer in Round Valley, on the south end of Bear Lake, near present-day Laketown, Utah.

Steward (1938) describes them as “Cache Valley Shoshone” or Pangwidiika (“Fish Eaters”). Thomas et al. (1986) describe the Cache Valley Shoshone or Pangwiduka as “A band of the Western Shoshone … historically located in the Cache Valley, at the extreme NE corner of Western Shoshone Territory.” While these authors refer to Cache Valley Shoshone as Pangwiduka, today the Northwestern Shoshone identify with the traditional name Kammadeka or “jackrabbit eaters.” This discussion follows both Madsen and descendants of the Cache Valley Shoshone, who refer to themselves as Northwestern Shoshone. From the available evidence, this band had the closest ties to the Bear Lake valley in historic times.

The Idaho State Historical Society (1970) and Madsen (1980, p. 26) also mention a “Bear Lake” band of Northwestern Shoshone, separate from the “Cache Valley” band. The Bear Lake band ranged “from McCammon, Idaho to Bear Lake, or Logan River in Utah, to the continental divide. They were known as the Pengwideka (“Fisheaters”) under a chieftain Werasuape (“Bear Spirit”), a close friend of Washakie” (Idaho Historical Society 1970). Given that “Wirasuap” was another name of Bear Hunter (Christiansen 2007), the “Bear Lake” and “Cache Valley” Shoshone are probably one and the same, and various subgroups travelled between the northern Cache Valley and the Bear Lake Valley. Powell and Ingalls (1874, p. 11 in Steward 1938) listed two Cache Valley bands. One, numbering 124 persons, was under San'-pits. The other, numbering 158, was under Sai'-gwits. They mention a third group, numbering 17 persons, at Bear Lake under Tav-i-wun-shear. This small band settled on the Wind River reservation (Madsen 1980).

The Northwestern Shoshone lived in small and fluid family groups, hunting and gathering scarce resources throughout the spring, summer, and fall. During the winter, the small groups gathered together into larger camps in areas that provided cover, timber, and food sources to supplement the foodstuffs they had gathered and stored. Often they wintered near hot springs at Battle Creek near Franklin, Idaho or at Promontory Point or Crystal Springs in Utah, erecting brush or tipi homes. The Northwestern Band moved between bands of Northern Shoshone inhabiting the Snake River drainage, and the Western Shoshone of western Utah and eastern Nevada, and used the resources of both areas. They fished Bear Lake and the Bear, Weber, and Snake rivers, using spears, gill nets, and basket traps. They snared and shot waterfowl and small mammals, but also conducted communal drives for pronghorn and deer. Of all the plant foods, pinyon nuts were the most important. The band usually went to Grouse Creek, in northwestern Utah, to gather the nuts in the fall. After about 1840, at least some groups of Northwestern Shoshone had sufficient horses to hunt bison with the Eastern Shoshone in Wyoming.

<u>Bannock Creek Shoshone</u>. Murphy and Murphy (1986) noted that “very temporary band associations grew up during hostilities with the Whites on the Oregon Trial in the 1860s … One of the more important of these bands was formed under the leadership of Pocatello, a Bannock Creek Shoshone.” Pocatello, according to his daughter Jeanette, never used that name, but called himself Tondzaosha (Buffalo Robe) (Idaho State Historical Society 1984).

Steward (1938) reported that “Though close to Fort Hall, the Kamudiika [Bannock Creek Shoshone] seem to have been independent of the Bohogue [Ft. Hall Shoshone] … They had only occasionally banded with the Bohogue before moving to the Fort Hall Reservation in 1869.” Although Pocatello’s band maintained a separate identity from the Fort Hall Shoshone and Bannock, they gradually merged after moving onto the Fort Hall reservation. Most other Northwestern Shoshone, including the Cache Creek Shoshone, maintained a separate identity and residence, and today refer to Pocatello’s band as part of the Fort Hall Shoshone (Parry 2010).

Like other Shoshone bands, the Bannock Creek Shoshone were known by a number of different names. The Fort Hall Shoshone and Bannock referred to them as Hukundiika, "eaters of porcupine grass seed," when they occupied lands around Bannock Creek and Promontory Caves, but also called them "pinyon pine nut eaters" as distinguished from their own economy as limber pine nut eaters (Idaho State Historical Society 1984). However one of Steward's informants, a Promontory Shoshone, called his own people the Hukundiika and referred to the Bannock Creek Shoshone as Kamudiika (jack-rabbit eaters) (Steward 1938). Murphy and Murphy (1986) followed Steward in referring to the Bannock Creek Shoshone as "Kammedeka." However, this name is used today by Northwestern Shoshone that settled off the Fort Hall reservation (see Cache River Shoshone, above).

<u>Territory</u>. Prior to the 1860s, the Bannock Creek Shoshone were a dispersed population, and were largely unmounted until after 1850 (Murphy and Murphy 1986). Steward (1938) reported that they formerly occupied scattered winter encampments on Bannock Creek near the Snake River and on the Portneuf River between the present town of Pocatello and McCammon. The Kamudiika did not remain together as a single band during the summer, but scattered in small groups to gather foods, some going to Bear Lake, some to the Malad River in Utah, and some down the Snake River beyond Twin Falls, perhaps to Camas Prairie.

Apparently there were several independent villages in this district in aboriginal days, but when the people acquired horses and Euro-Americans entered the country, they began to consolidate under Pocatello, whose authority was extended over people at Goose Creek to the west and probably at Grouse Creek. Murphy and Murphy (1986) note that the Bannock Creek Shoshone had "frequent contact" with the Western Shoshone of the Grouse Creek district of Utah, where both groups gathered pinyon nuts, and that "in this area it is difficult to draw a line between distinct Western and Northern Shoshone types of economy and settlement pattern." Indeed, Pocatello was born in Grouse Creek territory, but moved to the Bannock Creek Shoshone's main village of Biagamugep (near present-day Kelton, Utah) where he became chief (Steward 1938). Starting about 1860, Pocatello's band began to commit depredations on the wagon trains. It was probably not until this time that his influence extended over the whole district of the Kamudiika and their neighbors to the west (Steward 1938).

Sven Liljeblad (Idaho State Historical Society 1984) reported that Pocatello's band ranged from Upper Humboldt and Upper Goose Creek valleys past City of Rocks and Raft River to Promontory Caves, and Bannock Creek. Pocatello's band also spent time with some Northwestern bands as well as Cache Valley Shoshone and Washakie's Eastern Shoshone bands. Pocatello's band joined Washakie's band for joint buffalo hunts on Green River, and at times had winter camps on Green River with Washakie. Pocatello's band also fished at Salmon Falls. Although they ranged over extensive Northern and Eastern Shoshone lands, Pocatello's "tough boys did not tolerate other [Indian] people or let them into Raft river" which was his central exclusive territory (ibid.).

5.1.3 Post-Contact Traditions

The Fur Trade Era. The fur trade had a profound impact on the traditional way of life for the Shoshone and Bannock peoples of Idaho and northern Utah. It had a major impact on wildlife resources—the fur trade eliminated bison from more marginal ranges in Idaho by about 1840 and reduced populations of other game animals as well. The fur trade, along with the introduction of horses and firearms, increased economic competition (and at times conflicts) between tribes. The alliance between the Shoshone and American and British fur traders is interpreted by some as a political necessity due to increasing pressures from increasingly powerful Plains tribes living to the east (Lohse 1993).

The first permanent fur trading establishment was Fort Henry, built by the Missouri Fur Company on the North Fork of the Snake River in the fall of 1810. In the fall of 1811, the Wilson Price Hunt Expedition or “Overland Astorians” encountered a Shoshone camp near the confluence of the Portneuf and Snake Rivers or near the present-day “bottoms” on the Fort Hall Indian Reservation. This same expedition reached Astoria, and then returned back along the route they had pioneered. In fact, the route discovered and explored by the Overland and Returning Astorians was to become the Oregon Trail. The Astorians had established a link for the Upper Snake and Salmon River country to the Columbia River drainage and the Pacific Northwest that was never broken. Canadian and British companies began to establish posts on the Columbia River system that were to dominate trade in this region for the next half-century (Lohse 1993).

The first Euro-Americans known to have visited the refuge area (the Thomas Fork Unit) were Robert Stuart’s party of Astorians, which started from Astoria in June 1812 and reached St. Louis on April 30, 1813—a journey of nearly 3,800 miles. Stuart discovered the Bear River on September 9, 1812. They called it Miller’s River for Joseph Miller, a member of their party who thought he had hunted farther upstream the preceding fall. After meeting a trading party of Crow on the Bear River (near present-day Dingle in Idaho) they turned north on Thomas Fork Creek and into Salt Creek Canyon, Wyoming. Therefore, Stuart saw the outlet of Bear Lake, but if he or his men noticed the lake, he did not mention it. Eddins (2002) argues that Stuart’s discovery of the South Pass in Wyoming in November 1812—a practical wagon route to the Oregon Country—contributed more to American expansion than did the government-sponsored Lewis and Clark Expedition.

In June 1816, Donald Mackenzie was assigned to head the newly created North West Company’s interior department of the Columbia. In 1818-1819 Mackenzie brought a large brigade across the Blue Mountains, down the Snake River on to the Bear River, and to the headwaters of the Snake. It was during this expedition, in 1819, that he became the first Euro-American known to have viewed Bear Lake. He named it “Black Bears Lake” (Morgan 1964). In 1821 the North West Company joined with the Hudson’s Bay Company, and Mackenzie left the Snake River country for Canada.

In 1822, two American fur companies sent expeditions from St. Louis to join the Rocky Mountain fur trade. William H. Ashley of the Rocky Mountain Fur Company sent out a large group of mountain men. One of his parties crossed South Pass in the summer of 1824 and reached Bear Lake that fall. John H. Weber led this group, and is credited with being the first American to view Bear Lake. Bear Lake was called “Weaver’s Lake” by trapper Jim Beckwourth, suggesting Weber’s discovery of the lake. Weber continued on to establish a winter camp on the Cub River in Cache Valley. This campsite, located just north of what then was the Mexican boundary, now is in Idaho close to the town of Franklin (Fromm n.d.). It was a member of Weber’s party, Jim Bridger, who made the famous bullboat journey down the Bear River from Cache Valley to discover, at least for him and his party, the Great Salt Lake.

The arrival of American fur brigades in the Snake River country prompted the Hudson’s Bay Company to appoint Peter Skene Ogden to head the HBC Snake brigades, and direct its agents to extract furs from the region as quickly as possible. The Columbia River and Snake River drainages would become a buffer against Russian and American expansion (Lohse 1993).

From 1824 to 1828, the Cache Valley and Bear Lake served as a major base for the Rocky Mountain fur trade. The 1826 rendezvous was held in Cache Valley. There, on July 18, 1826, William H. Ashley sold out to a new firm of Jedediah Smith, David E. Jackson, and William H. Sublette. Ashley agreed to bring supplies to the next rendezvous at Bear Lake. When he came to Bear Lake with supplies for the trappers' rendezvous, in June 1827, Ashley brought along a small wheeled cannon for protection. In doing so, he proved that the route of what was to become the Oregon Trail—at least as far as the Bear River Valley—was suitable for wagons. He almost needed his cannon at Bear Lake. A band of 120 Blackfeet got into a fight with the Shoshone at Bear Lake, and six of the mountain men came to the aid of their Shoshone allies. Three Shoshone were killed in the fight; three more Shoshone and one American were injured. The rendezvous returned to Bear Lake in 1828. A Blackfoot band showed up again, attacking Robert Campbell's party at the north end of the lake. Campbell obtained help from the rendezvous at the south end of the lake, and the Blackfeet were driven off after a sharp four hour fight. After this second Bear Lake rendezvous, fur hunting shifted to other areas (Fromm n.d.).

Peter Skene Ogden brought his Hudson's Bay Company Snake expedition back to Bear River in February 1829, without seeing any beaver. The Cache Valley was also trapped out. An 1831 rendezvous (one of two or three for that year, because of failure of the supply train to arrive on time) assembled in Cache Valley. But systematic trapping of the Snake country had depleted the fur resources of the northwest, and several years of steady pressure had cut down the trade along Bear River also. The Rocky Mountain Fur Company dissolved in 1834, and the American Fur Company was left in control of the St. Louis based trade.

In 1834, Nathaniel Wyeth established Fort Hall on the south bank of the Snake River above the mouth of the Portneuf to dispose of goods rejected at the 1834 rendezvous. As the fur trade was unprofitable, Wyeth thought he might trade with the Indians and recover some of his expenses (Lohse 1993). Shortly after the fort was established, it was visited by a large band of Shoshone and Bannock numbering at least 250 lodges. The "Fort Hall Bottoms" had long been an important site for the Shoshone and Bannock (see Section 5.1.2 above). Placing the fort in the bottoms simply amplified the importance of the area, and intensified Anglo-American and Shoshone-Bannock interaction in years to come (Lohse 1993).

American Exploration

<u>The Bonneville Expedition</u> (May 1, 1832-August 22, 1835). The first official exploration of southern Idaho was undertaken by Captain Benjamin L.E. Bonneville in the early 1830s. Granted a leave of absence from the military to enter the fur trade, Bonneville was carrying out instructions from the War Department to explore the Far West. Some historians believe that Bonneville was actually a spy for the cause of national expansion, assessing the British strength and operations in the Oregon country, contacting native tribes, and evaluating the region's natural resources (National Park Service 1999; Goetzmann 1966). Bonneville produced two maps of his journeys, and for their time, they ranked among the most important. In addition, his descriptions of the Snake River country, recorded in his journals and published by Washington Irving, offered some of the first portraits of the region.

On May 1, 1832, Captain Bonneville, along with 110 men and 20 ox and mule wagons loaded with provisions, ammunition, and trade goods, left Fort Osage on the Missouri River for the Columbia River. On the 6th of November 1833, Bonneville encamped "at the outlet of a lake about 30 miles long, and from two to three miles in width, completely imbedded in low ranges of mountains, and connected with Bear River by an impassable swamp. It is called the Little Lake, to distinguish it from the great one of salt water …" (Irving 1861). Bonneville's "Little Lake" was Bear Lake.

Over the winter and summer of 1833-1834, the main party of Bonneville's expedition remained with the Bannock Indians at a camp on the Portneuf, while Bonneville and three other men explored the Snake and Columbia Rivers. On March 4, 1834, Bonneville reached the Columbia River at Fort

Wallawalla. Here he hoped to collect information and establish trading connections; but, upon requesting some needed supplies, the superintendent of the British Hudson's Bay Company informed him that he could do nothing officially to facilitate or encourage rival traders among the Indians of that region. Thwarted, Bonneville returned to his caches on the Portneuf, which he reached after much suffering, on May 18, 1834. He pursued his way up the Bear River, and on the 13th of June, 1834 arrived "at the Little Snake Lake; where he encamped for four or five days … Having finished his survey of the lake, Captain Bonneville proceeded on his journey, until on the banks of the Bear River, some distance higher up, he came upon the party which he had detached a year before, to circumambulate the Great Salt Lake, and ascertain its extent, and the nature of its shores. [This party was headed by mountain man Joe Walker, who discovered the only practical overland route to California, which would become critically important in later years.] [Walker's party] had been encamped here about 20 days; and were greatly rejoiced at meeting once more with their comrades, from whom they had been so long separated." (Irving, Adventures of Captain Bonneville, 384.)]

<u>The Fremont Expeditions</u>. After Bonneville, the next major exploration of the area was made by John C. Fremont. From 1842 to 1846, Fremont led three expeditions of the Oregon Trail. His first expedition, in 1842-44, took him from St. Louis to Soda Springs and then down the Bear River through Cache Valley to the Great Salt Lake. Despite some errors, Fremont's explorations proved enormously successful. Expedition cartographer Charles Preuss's maps far outshone anything previously available. Fremont's descriptions, publicized by Jessie Benton, became invaluable to travelers on the Oregon and California Trails. His 1842-1844 expedition was particularly influential. Sections of Fremont's report found their way into Joseph E. Ware's *The Emigrant Guide to California*, and lectures at the Royal Geographical Society in London summarized his work (Alexander 2010).

Fremont's expedition also chronicled changes that had come to the region. By 1840, both the fur trade and the buffalo were all but gone from the Shoshone and Bannock country. Charles Preuss observed in 1843 that "the white people have ruined the country of the Snake Indians [Shoshone] and therefore should treat them well. Almost all the natives are now obliged to live on roots, game can scarcely be seen any more" (Gudde and Gudde 1958:86).

5.1.4 Recent Settlement and Economic Development Period

The Oregon Trail brings emigrants through the Thomas Fork and Bear Lake Valley. As the fur trade ended, Americans turned to the West as a source of new land and opportunity. In 1846 Britain and the United States settled on the 49th parallel as the line dividing British and American possessions in the Pacific Northwest. Initially, Idaho was only an obstacle to be crossed enroute to Oregon or California, using routes pioneered by the fur traders and mapped by explorers like Bonneville and Fremont. The Oregon Trail received U.S. government recognition with Charles C. Fremont's survey of 1842-43, which demonstrated that the Columbia River drainage provided the only practicable route across the Rocky Mountains to the Pacific Ocean.

Immigrants began using the Oregon Trail in large numbers in 1842, when Dr. Elijah White led an expedition of over 100 people to Oregon's Willamette Valley. In 1843, a thousand emigrants crossed the trail in Applegate's wagon train. A dramatic increase in immigrant use of the trail occurred started in 1848 and 1849. Many were headed for the gold fields in California, many to Oregon. This was the period of greatest impact on the Indian societies of the region. Permanent settlements in Idaho would be relatively rare for several decades yet, but the combined effects of fur trading activities and contact with migrating settlers were dramatic (Lohse 1993). With their large droves of stock, the emigrant trains caused major hardships for the Shoshone and Bannock living along the trails.

In 1837, the Hudson's Bay Company had bought Fort Hall. It became a primary stopover and supply point for "Forty Niners" enroute to California, and immigrants on the Oregon Trail. The HBC closed Fort Hall in 1856, with the onset of hostilities in the Yakima country that closed Fort Walla Walla and threatened lines of supply to the Snake country (Lohse 1993).

The Oregon Trail crossed the Thomas Fork of Bear River (through the Refuge's Thomas Fork Unit). Utah State University historian F. Ross Peterson located the crossing "pretty close to where Thomas' Fork enters the Bear River … there's kind of a natural back up there and the channel is pretty deep" where the Highway 30 now crosses a deep channel. "[It] wasn't originally a clean embankment going down … it isn't that wide. It's at best 20 to 30 feet … they hit it at a time of year when it was after the run-off but it still was a very difficult crossing because a lot of them talk about it" (Idaho Public Television 2010).

In 1851, Thomas Bodwell built a toll bridge over the Thomas Fork, by means of which, according to his biographer, "he hoped to reap an income from the immigrants who were then going westward. Travel that year, however, proved exceptionally light, and after conducting the business for about a year, he gave it up. A better fortune awaited his successors, for the following year they made about $15,000 on the toll of immigrants" (Gregory 1911). After fording the Thomas Fork, emigrants headed west, crossing the Sheep Creek range and descended into the Bear Lake Valley. This was another difficult crossing; the harrowing descent of "Big Hill" was often mentioned by travelers, but it was still better than the alternative—dragging wagons through the swampy Bear River bottomlands. Shortly after leaving Big Hill, travelers passed by the small "post" operated by Thomas Long "Peg Leg" Smith, an old veteran of the fur trade era. Peterson places the site "right by the little town now called Dingle in between Ward burro [sic] and Dingle … It's not very far after they came off Big Hill" (Idaho Public Television 2010). Smith operated the post at what was variously called "Peg Leg Island," "Big Timber," or "Cottonwood" (after the huge cottonwood trees that once abounded in the area) from 1842 to 1857. Later the site was called "Oakey's Grove," and tradition has it that it was given its current name, "Dingle," by Brigham Young during a visit to the valley (Ream and Nate n.d.).

From Smith's post, the emigrants followed the foothills, skirting the valley floor. They paused to rest and recruit their stock at Clover Creek (so named for its stands of wild clover), later named Montpelier Creek, north of the present-day Refuge. Peterson places the site "right near main street [in Montpelier] up against the hill before they cross the creek. Right below the Montpelier Hill" (Idaho Public Television 2010). From there, they travelled on to Soda Springs, Fort Hall and the Oregon country.

Settlement of northern Cache Valley. Mormon settlers arrived at the Great Salt Lake in 1847. News of the Latter-day Saints' wagon train reached Great Basin area tribes in advance of their arrival into the Salt Lake Valley. The reports characterized the LDS as friendly and as a result, the Mormon pioneers and their leaders were initially welcomed into the Shoshone country. On July 31, 1847, Northwestern Shoshone tribal leaders, including Chiefs Sagwitch and Bear Hunter, met with LDS leader Brigham Young in Salt Lake City to advance their territorial claims (Parry 2010). A policy of "feed rather than fight" with local tribes was decreed by Brigham Young in the earliest days of settlement and continued to be semi-official doctrine through the 1850s and 1860s (ibid.). However, the Mormon settlement of northern Utah and southeast Idaho had serious consequences for the Northwestern Shoshone.

By 1856, Mormon colonization extended to Cache Valley, when a drought plagued Utah and Brigham Young sent a group over the mountains with their cattle to take advantage of Cache Valley's water and fertile ground (Preston, Idaho Chamber of Commerce 2007). Settlement of southeastern Idaho, including the Bear Lake Valley and the northern Cache Valley, began in the 1860s. Historian Kristen Rogers wrote that "Fifteen years after the Mormon settlers arrived in Utah [ca. 1862], their livestock had so overgrazed the native grasses and seeds that the Indians were starving, noted Jacob Hamblin, one of those settlers" (Rogers 2010).

The discovery of gold in Montana in 1862 increased freight and stock traffic through the Cache Valley, the homeland of the Northwestern Shoshone. This further increased tension brought about by an increasing scarcity of the resources the Shoshone had traditionally relied upon. The situation came to a head late in 1862, when a group of Shoshone killed two miners and took their horses and belongings into the area occupied by Pocatello's band. According to Northwestern Shoshone oral tradition, the raiders were part of Pocatello's band (Parry 2010), but Chief Bear Hunter's band of Northwestern Shoshone was blamed. These murders, combined with a series of other incidents, were the catalyst for action. Chief Justice John F. Kinney of Utah Territory issued a warrant for the arrest of Chiefs Bear Hunter, Sagwitch, and Sanpitch (Madsen 1986).

On the morning of 29 January 1863, Colonel Patrick Edward Connor and about 200 California Volunteers from Camp Douglas in Salt Lake City assaulted the winter camp of Bear Hunter's group of 450 men, women, and children on Beaver Creek (later called Battle Creek) at its confluence with the Bear River, some 12 miles west of the Mormon village of Franklin in Cache Valley (just north of the Utah-Idaho border)]. As a result of the four-hour carnage that ensued, 23 soldiers lost their lives and at an estimated 350 Shoshone were slaughtered by the troops, including at least 90 women and children in what is now called the Bear River Massacre. It was the largest massacre of Indian people in U.S. history, but received little attention due to the Civil War raging in the East. Bear Hunter was killed, and the remnants of his band under Chief Sagwitch regrouped and drifted south into Utah, joining other Northwestern Shoshone that had camped near Brigham City.

In early January, Pocatello's band had been visiting Bear Hunter's band for the Warm Dance celebration. Pocatello and part of his people learned of the approaching troops and reportedly fled a day before Connor arrived. Although they escaped the massacre, soldiers continued to pursue Pocatello (Reeve 1995). Not long after the Bear River Massacre, Washakie and the Eastern Shoshone signed the 1863 Fort Bridger Treaty. Soon after the signing Pocatello sent word that he wished for peace. On July 30, 1863, Colonel Connor and Superintendent Doty met with Chief Pocatello and eight other Northwestern Band chiefs and signed the 1863 Treaty of Box Elder at Brigham City, bringing peace to this Shoshone region. Pocatello signed the treaty first as the most prominent leader. The 1868 Fort Bridger Treaty with the Eastern Shoshone and Bannock established the Fort Hall reserve for the Fort Hall Shoshone and Bannock. In 1873, a government commission recommended that the "Sanpits, Seigwitz and Pocatilla bands" be placed on a reservation on the Raft River, but later recommended that they all move to Fort Hall (Madsen 1980).

Sagwitch's people wanted to remain in their homeland, and appealed to Mormon leader Brigham Young for help. Young sent a man named George W. Hill to their aid. About this time, Chief Sagwitch had dreamed of a red-haired man who would come to show them the way. Hill had red hair, had learned the Shoshone language, and respected their ways. A settlement was established near Corinne, Utah where, under Hill's direction, the Indians planted crops. All that was required to receive assistance was baptism into the Mormon faith. In 1875, news of the missionary farm reached Pocatello. He had consented to the move to Fort Hall, but saw his people suffer when promised supplies did not arrive. Now the chief saw a solution to his people's hunger. In May 1875 Pocatello and his band traveled to Utah and requested baptism. By August 1875, Hill had baptized 574 Northwestern Shoshones (Madsen 1980). Many of these were members of Pocatello's band. The influx of Indians did not sit well with Corinne residents, however, and townsfolk soon agitated for their removal. Federal troops responded and forced the return of the converts to Fort Hall (Reeve 1995). After his return to the Fort Hall Reservation in 1876, Pocatello and some of his people settled into Bannock Creek, which was part of their homeland (Madsen 1986). Today their descendants are part of the Fort Hall Shoshone-Bannock Tribe.

Some Northwestern Shoshone families also moved to Fort Hall, while others settled in nearby Elwood (Wadley 2007). But many stayed, and the LDS church helped them establish a new settlement between the Malad and Bear Rivers, east of what is now the city of Tremonton, Utah. In 1876, using rights guaranteed under the Homestead Act, 14 Shoshone families applied for homestead patents. But in the process, these Shoshone abandoned their tribal allegiances and rights to government annuities.

In 1880 the colony was moved to the southern end of the Malad Valley, about 20 miles south of Malad, Idaho, and about four miles south of Portage, Utah. For the next 80 years, the new settlement, Washakie, was home to the Northwestern Band of Shoshone. Several Indian agents visited the Shoshone settlements over the years, and finally recommended that the LDS Church be allowed to manage the settlement without much help or hindrance from the Office of Indian Affairs. During World War II most of them moved away, and in 1960 representatives of the LDS Church, mistakenly believing that Washakie had been abandoned, decided to sell the land and burnt down many of the houses. In 1984, the church gave the band 184 acres of land near Washakie, which enabled it to get aid and recognition from the government. The Northwestern Band of Shoshone received Federal recognition and adopted a constitution and created a seven-member governing board in 1987. In 2002, there were 431 enrolled members of the Northwestern Shoshone in Idaho and Utah. The tribe owns 187 acres of land near Washakie, as well as some additional private lands. The Northwestern Shoshone have offices in Pocatello, Idaho, and Brigham City, Utah (University of Utah and Utah Deptartment of Community and Culture 2010).

Tribal affiliations with lands now part of the Refuge are shown in Table 5.1.

Table 5.1. Tribal Affiliations with Lands Now Part of Bear Lake NWR and Oxford Slough WPA

Tribe	Treaties
Fort Hall Shoshone-Bannock Tribe: Lands for Western Shoshone and Bannock allocated in the **Fort Hall Reservation**, Idaho. Fort Hall Reservation established by Treaty of Fort Bridger (1868).	Treaty with the Eastern Shoshone (Sosoni) Tribe, 1863; Treaty with the Eastern Band of Shoshone and Bannocks, 1868 at Fort Bridger; Act to Ratify an Agreement, 1874; Act to Ratify an Agreement, 1889; Act to Ratify an Agreement, 1882; Act to Ratify an Agreement, 1888; Act to Ratify an Agreement, 1889; Act to Ratify an Agreement, 1900.
Northwestern Band of Shoshone Tribe: Recognized 1980. Self-governance form of government; constitution approved August 1987.	Treaty of Box Elder, June 30, 1863; Act to Ratify an Agreement with the Eastern Shoshone. September 26, 1872, ratified in December 15, 1874; Act to ratify an Agreement with the Shoshone, Bannocks, and Sheepeaters of the Fort Hall Reservation, May 14, 1880, ratified February 23,1889; Act to Ratify an Agreement with the Shoshone Bannock Tribes at Fort Hall, July 18, 1881, ratified on July 3, 1882.

Settlement of the Bear Lake Valley. The first settlers in the area were members of the Church of Jesus Christ of Latter-day Saints who settled the Bear Lake area in the 1860s. In 1863, Mormon settlers established Paris, Utah, the first settlement in Bear Lake Valley. They thought they were settling within the Utah Territory, but instead were on Shoshone land. Charles C. Rich and Chief Washakie of the Eastern Shoshone reached a cooperative, peaceful agreement that the settlers would be allowed in all parts of the valley except “Round Valley,” the traditional Shoshone gathering site at the southern end of the lake. In the spring of 1864, an additional 700 Mormon settlers established the towns of Bloomington, Fish Haven, Liberty, Montpelier, Ovid, and St. Charles.

Tullidge (1889) reported: “Irrigation, by reason of the dry atmosphere and very light rainfall, has to be resorted to in order to carry on farming successfully … Water was found in abundance for irrigating purposes and the now populous towns of Paris, Bloomington, St. Charles, Liberty and Montpelier were laid out and built up, Bishops were immediately appointed to preside over each place … Fields were fenced, water ditches laid out and dug, bridges built and roads constructed.” Among the early canals constructed were the Dingle Irrigation, Ream-Grimmett (now Ream-Crockett), Peg Leg, and Black Otter (Ream and Nate n.d.).

Early conditions were difficult. A resident of Dingle, Idaho, just north of the Refuge, recalled, “In the early days frosts came a little early so that wheat was not a good crop. Most of it got frozen and the bread made from frosted wheat was black and sticky. Oats and barley made better crops … The three deadly enemies of good crops were the squirrels, the grasshoppers, and the frost” (Ream and Nate n.d.). Tullidge (1889) reported: “Although these valleys (Cache and Bear Lake) lie contiguous and parallel to each other, they are separated by a belt of lofty and rugged mountains about 20 miles wide, over which the settlers of Bear Lake Valley had to make their annual visits in order to obtain breadstuffs for themselves and families to subsist upon.” At first, the only communication between the two valleys was via the Shoshone Indian Trail, which ran 25 miles from Franklin, through the Cub River Canyon, to Bear Lake. In 1864, mail was carried to Bear Lake on snowshoes.

The Bear Lake Valley had another valuable resource: grazing lands. “On the north of Bear Lake is a tract of low land called Bear Swamp extending several miles northward, upon which grass grows luxuriantly, which furnishes abundant fodder for the horses and cattle during the long, cold winters” (Tullidge 1889). The lower foothills supported stands of “splendid grass” for summer grazing. In the 1880s, these “beautiful ranges for pasture and the wild hay meadows” began to attract ranchers to the valley (Ream and Nate n.d.). On the current Montpelier and Soda Springs Districts cattle and horses had been grazing since the 1860s when settlers brought them in. Transient sheep herds also used the area, and were overrunning the territory by 1883 (USDA Forest Service 2003). Around 1905 an influx of sheep occurred and they dominated the use of the range prior to the establishment of the Caribou National Forest (ibid). One resident of the Bear Lake Valley recalled, “There used to be thousands of head of cattle pastured on the hills and mountains east and south of town [Dingle]. Rangeland was very good until sheep came. Together they over-ran and over-grazed the area” (Ream and Nate n.d.).

Bancroft and Victor (1890) reported that “The valley of Bear Lake, called Mormon Valley, a fertile plain 15 miles wide and 25 miles long, had a population, in 1885, of 4,000. By irrigating, large crops of wheat, oats, and barley, the finest potatoes in abundance, and the largest hay crop in the territory were raised, while herds of cattle and sheep covered the hillsides … The manufacture of cheese was introduced, the product in 1883 being 200,000 pounds.” (p. 549). A new era of homesteading began when dry farming methods were introduced about 1890, allowing wheat to be raised successfully on the uplands. By 1914 most of the range land in the Bear Lake Valley had been homesteaded (Ream and Nate n.d.).

Starting in the early 1900s, Bear Lake became an important recreation area. Lakota Bear, purchased around 1913, became the first successful resort with log cabins and a heated pool. About the same time the Ideal Beach Amusement Company began operation with cabins, concessions, dance pavilion, first class restaurant, and canoe rentals. Through the 1950s and 1960s the Rich County, Utah area felt an increased demand for recreational pursuits. The west shore of Bear Lake became interspersed with private cabins, motels, and the new Blue Water Beach. The Bear Lake Marina, north of Garden City, was constructed in 1965-66. In the 1970s the area around Bear Lake experienced a recreational boom. Five new enterprises appeared along the lake, including the Sweetwater Resort. As recreational activity steadily increased, State and Federal agencies began taking an interest in the region. Rendezvous Beach was designated a State park in the summer of 1978, complementing the Bear Lake marina (Palacios et al. 2007a). Five parks on the east side of the lake were obtained through a number of transactions from 1962 through 1987 (Utah Division of Parks and Recreation 2005).

Settlement of Oxford and the northern Cache Valley. A few years before the Bear Lake Valley was settled, the Cache Valley in southern Idaho was being settled. Franklin—Idaho's first town—was settled in 1860. In July 1864, a company of explorers was sent to Idaho by President Brigham Young to locate suitable places for settlements. The same year Noah Brimhall and John Boice built the first homes in Oxford.

Among Oxford's early settlers were Major Jefferson Hunt of the Mormon Battalion, Noah Brimhall, Philip Cardon, T. C. D. Howell (also of the Battalion) V. J. Cooper, Jesse Walker, Hyrum Henderson, A. N. Clements, Lyman Hawkins and Reuben Barzee (Tullidge 1889). Here they found a setting of real beauty, "… at the foot of Oxford Mountain, and overlooking the green meadows below …" (Hawley 1920). These "green meadows" were good grazing lands, probably similar to what settlers described in nearby Preston, Idaho, with "an abundance of wild grasses such as the sand, blue and wheat grasses" (Hovey 1923-1925). A large marsh covered a portion of the valley floor. Even as late as 1916, the "big marsh" near Oxford was "one of the few areas in this part of the valley which is not yet much utilized" (Lee et al. 1916).

The discovery of gold in Montana in 1862 was an economic windfall for the farmers of the Cache Valley, and the people of Franklin did a considerable trade, exporting butter, eggs, and grain to the mining district. This also, however, brought increased conflicts with the Indians along the wagon roads. Because of Indian raids, people who had settled north and south of Oxford were advised to move into Oxford in the fall of 1865. They built and lived in a fort of log houses during the winter of 1865-66. Indian trouble increased and so these pioneers left their homes and moved to Franklin in the summer of 1865. All summer the men went back to Oxford and took care of their crops. In the fall they moved their families back. Indian difficulties were over by the spring of 1867 so people moved out of the fort into their city lots (Hart 1982). One woman who decided to try farming in the "new place," Oxford, in the 1870s found it to be "less than fifty families and all houses but one log and dirt-roofed" (Jensen 2001). By 1876, the town of Oxford consisted of "log cabins, brush fences, a few cottonwood shade trees and a great deal of wild sage brush."

The coming of the Utah & Northern Railroad in 1879 transformed Oxford to what was described in 1889 as "a small but very pretty town, with a mixed population of Mormon and Gentile. It can boast of fine residences, large barns, thrifty orchards; it is unexcelled for its shade and ornamental trees, is well watered by the mountain streams and is surrounded by vast meadows" (Tullidge 1889). Oxford aspired to replace Malad City as county seat of Oneida County. However, as Malad City was far from the railroad, more than half of the county-officers resided and had offices in Oxford, on the narrow gauge railway. Oxford obtained the public land office in 1879 (Link and Phoenix 1996). A newspaper, the *Idaho Enterprise*, was printed here from 1879 to 1883 (French 1914).

Oscar Sonnenkalb, who lived in Oxford from 1881 to 1889, reported: “there were several saloons, grocery stores, also a newspaper edited by Colonel Straight who, with the famous imagination of the western promoter, predicted a wonderful growth of our village into a second Chicago with the Oxford slough representing Michigan Lake” (Harstad, editor, 1972, in Link and Phoenix 1994).

Railroads also stimulated economic investments in the West by eastern and foreign capitalists. Many of these investments were made in livestock and during the 1870s and 1880s the number of cattle increased dramatically in Idaho and neighboring Utah. The ranges of Idaho were considered fully stocked by 1875 (USDA Forest Service 2003). In the early 1880s, Henry Harkness grazed “mammoth herds of blooded cattle and sheep” on his 1,600 acre ranch near Oxford (French 1914, vol. 3). The term “blooded” refers to imported, purebred stock. Beginning in 1870, shorthorn cattle from Canada were imported to help improve the Utah cattle stock. During the 1880s Hereford cattle were imported and other breeds followed (Powell 2010).

By the early 1880s cattle trailing numbers dropped off as forage declined and railroads provided better and quicker access. Disastrous winters in the 1880s killed so much stock in southern Idaho that the local cattle industry never quite recovered. In the winter of 1886-87, some ranchers in Utah lost half or more of their herds; figures for southern Idaho are probably similar. The late 1880s experienced decrease in rangeland productivity fueled partially by drought but mainly by the huge numbers of grazing animals (Spaeth et al. 1996). Sheep were moved into the grazing areas once dominated by cattle and flocks expanded rapidly. In what is now the Westside District of the Caribou National Forest, Basque herders brought in huge numbers of sheep, which peaked between 1895 and 1905. Early estimates suggest more than 600,000 head of sheep in Oneida County trailed back and forth from the summer mountain ranges to the desert winter ranges (Valora 1996). By 1907, Idaho ranked third in the nation in amount of wool produced and fourth in size of flocks (Link and Phoenix 1994).

As had been the case in the Bear Lake Valley, sheep were blamed for degrading range conditions in the northern Cache Valley. “Large sheep men, who wintered their sheep in Utah and Nevada and summered them near Soda Springs, trailed back and forth through the valley until much of the valley grass was killed” (Wakley n.d.). The range began to depreciate between 1905 and 1910 (USFS 2003).

Besides stock raising, wheat farming was the major industry of the northern Cache Valley. By 1890, Bancroft wrote that “Round Valley, which is the upper end of Cache Valley, is the wheat granary of southern Idaho and northern Utah” (Bancroft and Victor 1890). About 1890, farmers in the valley learned that wheat could be grown by the dry farm method. The advent of dryland farming, along with the introduction of new wheat varieties, proved to be the turning point for the northern Cache Valley. Yields rose from 10 bushels per acre, to 20-30 bushels. Home seekers came in from other states, and it wasn’t long before all available land was taken. Grain elevators were built in every town on the railroad. In a short time there were seven elevators and three grist flourmills in the valley (Wakley n.d.).

For many years, Oxford was the main trading center of the northern Cache Valley. But by the early 20th century, due to the fact of the railroad building away from it and other towns like Pocatello and Preston going up on either side, Oxford lost its commercial importance, and became a “quiet little village in the hills” (Hawley 1920), which it remains to this day. Lee et al. (1916) reported that the “Mormon village” of Oxford had a population of 591.

Establishment of Oxford Slough WPA. The northern Cache Valley was considered as a location for National Wildlife Refuge as early as 1956 (USFWS 1965). The 4,693-acre Coulam Slough NWR near Oxford, ID was proposed in conjunction with the Bear River project. The Refuge proposal was scrapped due to a low probability of being able to acquire sufficient water to provide waterfowl habitat (USFWS 1965). The 1,878 acre Oxford Slough WPA was purchased in fee title from the Federal Land Bank, on May 16, 1985. Lands were purchased using Federal Duck Stamp Funds, allocated by the Migratory Bird Hunting and Conservation Stamp Act. The MBCC stated that "Acquisitions of this type in the southeast Idaho area seek to improve and preserve important wetlands for waterfowl production, including redhead ducks."

Settlement of Thomas Fork. Thomas Fork was first settled by Cub Johnson and others (Tullidge 1889). An 1884 survey (T14S R46E, Boise Meridian) showed three houses on the west side of the Thomas Fork, on section 9, just north of the ford; and one house on the east side, on section 4. A wagon road is shown heading west from the ford; a branch heads north along the Thomas Fork. To the south, the Oregon Short Line railroad crosses the Bear River, closely following a wagon road. As of 1889, Thomas' Fork had a population of 300, "mostly ranchers" (Tullidge 1889).

Establishment of Thomas Fork Unit. The Thomas Fork Unit was transferred in fee title, to the U.S. Fish and Wildlife Service from the Farm Home Administration (FmHA) on September 28, 1995. This 1,015 acre tract was acquired "… for conservation purposes …" under the Consolidated Farm and Rural Development Act (7 U.S.C. 2002). Objectives for this tract included restoring and protecting the Thomas Fork Creek riparian zone for Bonneville cutthroat trout, managing wet meadows and deeper wetlands for waterfowl feeding and nesting and greater sandhill cranes, and preserving cultural resources.

5.1.5 Prehistoric and Historic Sites

As Federal property, stewardship of prehistoric and historic sites on the Refuge is mandated and guided by Sections 106 and 110 of the National Historic Preservation Act (NHPA) as well as other relevant Federal cultural resource laws. Although the Refuge has not had a complete cultural survey, there have been limited systematic archaeological surveys in response to specific ground-disturbing projects. Approximately 30 acres of the Refuge have been surveyed since 1980, representing 15 Section 106 or Section 110 related projects.

Prehistoric Background. D'Azevedo (1986) reported that "Few archaeological sites have been recorded in the Bear Lake Valley. Several sites were recorded during the 1960s prior to construction projects, of which, only two are prehistoric sites on or near the Refuge. These are sites 10BL14 [not on the Refuge] and 10BL2 [have not found anything in files about this site]. Both sites are only briefly recorded and characterized as small lithic scatters, with potsherds, and fire cracked stone."

In their 1995 survey report, by Harvey and Burnside concluded that the two sites found in their survey (10BL79 and 10BL80), and the few previously recorded sites near the Refuge, were not inconsistent with either of the two Archaic (Desert and Plains big-game hunting) cultural traditions. The presence of ground stone indicated plant/seed processing, possibly including cattail, tule, juncus, and camas. Projectile points and all stages of reduction flakes reflected tool manufacture, and strongly indicated hunting activities. The single complete projectile point, an Elko corner-notched point, broadly identified a Middle Archaic occupation sometime between ~6000-1500 years BP.

Known Prehistoric Sites. Archaeological evidence of Native American use is limited to just a few sites recorded around the edge of the current Bear Lake footprint (Table 5.2). The archaeological sites are described as lithic scatters or camps, no burials or large scale village sites have been recorded.

Based on results of a small number of archaeological investigations conducted in the Bear Lake NWR, the Oxford Slough WPA, and the Thomas Fork Unit it appears likely that, at a minimum, the area was used for seasonal hunting trips that would have included hunting big game, fishing, and trapping waterfowl. Within the refuge boundaries the marshy conditions and potential for high-water events may have buried cultural remains or limited the use of much of the landscape.

The number of surveys or acres surveyed on the three units is very limited. The small amount of data does not provide a statistically sound sample size to devise a research strategy or predictive model for the presence of prehistoric sites on refuge lands. Only three sites (10BL79 and 80 on Bear Lake NWR and 41-17885 on Oxford Slough WPA) have been formally recorded and none of them have been evaluated to the National Register of Historic Places. The prehistory of the Bear Lake area is not well understood, having been categorically lumped together within poorly defined cultural boundaries, based on aspects of its physical geography. The use of the area by Shoshone and Bannock people is well-documented during the ethnographic period. Recorded sites are summarized in Table 5.2.

Table 5.2. Recorded Prehistoric Resources

Site #	Elev.	Date Rec.	Site Type	Materials	Condition (Integrity)	NRHP Eligibility	Surveyed By
Bear Lake NWR							
10-BL-2		1968	Camp site	Lithic scatter, ground stone, pottery	Poor	Unevaluated	T. Semilis
10BL14 *Not on Refuge*		1968	Camp at Hot Springs	Lithic scatter, ground stone, fire cracked rock.	Poor	Unevaluated	T. Semilis
10BL16 *Not on Refuge*		1968	Camp site	Lithic scatter, ground stone, buffalo bone.	Poor	Unevaluated	T. Semilis
10-BL-79	5,925	1995	Small lithic scatter	Lithic scatter, ground stone, large mammal bone.	Good	Unevaluated	Harvey and Burnside
10-BL-80	5,927	1995	Small lithic scatter	Lithic scatter, ground stone, large mammal bone.	Good	Unevaluated	Harvey and Burnside
Oxford Slough WPA							
10FR30 *Not on Refuge*		1993	Flakes	Two obsidian flakes	Poor	Ineligible	James Cullum
Thomas Fork Unit – No recorded prehistoric sites.							

Known Historic Sites. Eight cultural resources are related to the water control and manipulation that occurred at the northern end of Bear Lake in the 1910s. The Bear Lake Outlet Canal, Bear Lake Outlet Bridge, and Ream-Crockett Canal have been evaluated and determined to be eligible to the NRPA under criterion A. The Bear Lake Outlet Water Control Structure was evaluated in 1995 and found to be ineligible. The remaining water control structures, canals, bridges, or pumping stations have not been recorded and no determination of eligibility has been submitted for SHPO review and concurrence. Two historic homestead sites are noted within the Refuge. The William Rich Cabin was recorded in 1972, but by 1968 when the Bear Lake NWR was established it had deteriorated substantially and was determined in consultation with the SHPO to be ineligible (Figure 5.1).

Table 5.3. Historic Resources

Site #	Date Recorded	Site Name	Site Type/ Features/Materials	Condition (Integrity)	NRHP Eligibility	Evaluated By
Bear Lake NWR						
Love Tester's Cabin	1972	William Rich Cabin	Log Cabin	Good in 1972; poor in 1985	Ineligible, 1985	Hoffman, 1972; Refuge Staff, 1985
07-17896	2002	William H. Smith Homestead	Homestead cabin and barn, dates to ca. 1920s.	Removed (may not have been on Refuge land)	Eligible, A	Gray, 2002
07-005183	2002	Bear Lake Outlet Canal Bridge	1911 construction of the outlet canal.	Good	Eligible, A	Gray, 2002
07-017895	2002	Bear Lake Outlet Canal	1911 construction of the outlet canal.	Good	Eligible, A	Gray, 2002
07-017882	1995	Bear Lake Outlet Control Structure		Poor	Ineligible, 1995	Maureen Wilson
(10BL129)	2002	Ream Crockett Canal	1887 – ditch was to be 20 ft wide and 4 ft deep. Canal ends in Dingle Swamp. Currently canal is 70 ft wide.	Good	Eligible, criterion A (concurrence?)	SWCA Environmental Consultants
Dingle Canal				Unevaluated		
Rainbow Canal		Constructed in 1917-1918		Unevaluated		
Stewart Dam		Constructed in 1916 by Utah Power & Light (UP&L)		Unevaluated		
Camp Lifton pumping station		Constructed in 1917-1918		Unevaluated		
07-000780 Not on Refuge	2002	Beckwourth Battleground	1828 Battle site.	Unknown	Unevaluated	
Oxford Slough WPA						
41-17885	1992	Cabin, barn, house, farmstead		Poor	Ineligible, DOE 1992	Dale Lish, FmHA
Thomas Fork Unit – No recorded historic resources.						

Figure 5.1. Rich Cabin (Bear Lake NWR).

5.1.6 Surveys

Previous Archaeological Research. Archaeological fieldwork on the Bear Lake NWR and Thomas Fork Unit have focused on compliance with Section 106 of the National Historic Preservation Act (NHPA) for a variety of undertakings including installing a boundary fence (Thomas Fork Unit), gravel borrow pits, levee/dike construction or maintenance, bridge repairs, powerline installation, mine reclamation, and the maintenance building? construction. Idaho Transportation Department and the Federal Energy Regulatory Commission (FERC) have investigated projects near the refuge parcels. Table 5.4 provides a summary of projects that have occurred on the Refuge. Reports generated by the surveys are cited, when applicable, in the References section of this document. Hard copies of the reports are on file at the office of the Region 1/Region 8 Cultural Resources Team Sherwood, Oregon.

Table 5.4. Cultural Resource Surveys on the Bear Lake NWR, Oxford Slough WPA, and Thomas Fork Unit (by year)

Surveyor/ Report Author	Report #	Date	Type	Acres Surveyed	Notes/Findings within Survey Area
Bear Lake NWR					
Gallaher	2003/44	2002	Survey	207	Bear Lake Fiber Optic Line.
Thompson	2005/602	2005	Survey	50	Howard Creek and Targhee Creek Bridge Construction, Targhee NF
Harding and Shelton	2001/1026	2001	Survey	4	50 cell tower locations
Harvey and Burnside	1996/854	1995	Survey	275	Investigations at Bear Lake NWR; Negative Results
Plew	1989/5467	1987	Survey	0	Survey of State Lands in Bear Lake and Franklin Counties.
Butler	1989/1019	1986	Survey	57	Dike Improvement and Fencing Project.
Burnside	2007/183	2005	Survey	8	Dunford Levee Project
Gray	2003/544	2002	Survey	10	Bear Lake Outlet Bridge Project.
Jacklin	1989/3091	1981	Survey	0	Reconnaissance of a Proposed Underground Power Line on the NE Corner of Bear Lake.
Hauck	1994/909	1994	Survey	2	Evaluation of a Proposed Channel Corridor on the North Shore of Bear Lake in the Lifton Locality.
Burnside	2004		Survey	1	Hot Springs Mine Reclamation Project.
Burnside	2000		Survey	13	Bear Lake NWR Visitor Center and Shop Construction project.
Butler	1979		Survey	0	Inventory of the Proposed Dike Improvements and Borrow Sources, Bear Lake NWR
Butler	1980		Survey	0	Inventory of Proposed Fence Lines, Crop Fields and Dike and Road Improvements, Bear Lake NWR; three isolated flakes
Butler	1984		Survey	0	Inventory of Five Potential Gravel Borrow Sources in Bear Lake County.
Oxford Slough WPA					
Plew	1994/4	1994	Survey	300	FmHA Seth Coburn Property Inventory
Bassett and Rings	1989/641	1989	Work Plan	3,750	Work Plan for Cult. Res. Mitigation of the AT&T Comm, Fiber optic cable.
Cates	1997/40	1996	Survey	1	James Roberts NRCS
Gaston	1993/14	1992	Survey	122	Winder-Banida, Idaho DOT
Thomas Fork Unit					
Harvey	1996		Survey	130	Thomas Fork Unit Boundary Fence.

5.2 Refuge Facilities

5.2.1 Entrance and Access Points

Bear Lake NWR. The administrative office for Bear Lake National Wildlife Refuge is in Montpelier, Idaho and can be accessed by Route 30. The main entrance to Bear Lake NWR is four miles west of Montpelier on Route 89 and south onto Airport Road, approximately halfway between Montpelier and Ovid. The refuge boundary is first encountered five miles south on Airport Road where visitors can access refuge facilities (auto tour route, Canoe Trail, three boat ramps, five parking areas, accessible walking trail, information kiosks and two accessible photography/hunting blinds). On the east side of the Refuge, off of Dingle Road, there is an access point for launching boats during the waterfowl hunting season. Another boat launch is available on the northeast corner of the Rainbow Unit. This area is accessed through private property, so prior permission from the landowner must be obtained by those desiring entry.

Thomas Fork Unit. The Thomas Fork Unit is situated at approximately 20 miles east of Montpelier, Idaho, along Route 30, near Border, Wyoming. The Unit's eastern boundary is the Wyoming State line. Thomas Fork Unit is surrounded by private property and is closed to the public. Staff can access the Unit through an easement over private property on the eastern border in Wyoming. Staff can also access the unit through adjacent private property on the southern border with permission from the landowner.

Oxford Slough WPA. As are most Waterfowl Production Areas (WPA), Oxford Slough Waterfowl Production Area is open to the public for hunting, fishing, trapping, and wildlife observation. There is only one public entrance, along the northern boundary of the unit on Oxford Road. The entrance was renovated in 2002 and includes a graveled parking area and a primitive boat landing.

5.2.2 Boundary Fences and Markers

Bear Lake NWR. The Refuge encompasses 18,068 acres. Its boundary is marked with Service boundary signs. Generally, the Refuge's perimeter borders sloughs, creeks, and marshes. It is the Service's intent to accurately post the Refuge's boundary; however, in certain locations the boundary may be posted slightly off of the actual property line on high ground or dikes to avoid the potential loss of a sign due to flooding and bank erosion. Periodically, boundary signage is checked to replace damaged and missing signs. Boundary fences are installed around most of the Refuge (50 miles. Fence is not erected in places where the Refuge's perimeter borders large water bodies and steep mountainsides, but boundary signs are in place and maintained. Fencing around the Refuge is subject to additional maintenance and repair when it abuts private lands where cattle are grazed.

Thomas Fork Unit. The entire Thomas Fork Unit is fenced (7.5 miles of fencing) and boundary signs are posted. Some fencing goes across the Thomas Fork Creek and through wet, marshy areas and extra maintenance is required for these stretches of fence. Fencing around the unit boundary is subject to additional seasonal repair due to cattle grazing on adjacent properties.

Oxford Slough WPA. Oxford Slough WPA is fenced (9 miles of fencing) and signed on all sides except at the entrance. As at the Refuge and Thomas Fork Unit, fences pass through wetlands and adjoin private lands where cattle are grazed, which requires added fence maintenance and repair.

5.2.3 Roads and Parking Areas

Bear Lake NWR. The main entrance to the Refuge is via graveled County and refuge roads. The auto tour loop is 2.4 miles. Along the auto tour route are three pull-outs where cars can park while the occupants observe wildlife. A parking area large enough for three buses is located by the public comfort station, which contains vault toilets. Just south of the maintenance building complex is a mowed parking area for boats and trailers launching at the old Paris Dike boat ramp. Continuing down the main entrance road about 1.17 miles is a parking area for the Rainbow Sub-Impoundment hunting/photography blind and a kiosk with hunting information. The blind is about 420 feet from the kiosk. A little farther south is a parking area next to another informational kiosk, a bench, an interpretive panel, and the boat ramp for the Canoe Trail as well as access to a foot trail. The Hoageson spur of the foot trail can also be accessed from a road at the southeast corner of the auto-tour route with additional parking adjacent to the trail loop. From the Canoe Trail ramp off of the main entrance road and just before encountering the gate across the Rainbow Dike are two boat ramps, one accessing the Rainbow Unit and the other, the Outlet Canal. Parking for these ramps is along either side of the widened dike road. On the east side of the Refuge, off of Merkley Lake Road, is an entrance and parking area for hunters to launch boats during the hunting season. These roads and parking areas are open to the public year-round or as seasonal winter conditions dictate.

Thomas Fork Unit. A 1.25 mile road traverses the Thomas Fork Unit from the eastern boundary right of way easement on the Feller property in Wyoming and heading west then northwest into the interior of the unit. The road was graveled soon after the unit was acquired. The road provides access to the three water control structures on the unit.

Oxford Slough WPA. The entrance to this unit is on the county-owned graveled Oxford Road, which is about 1.8 miles west of Highway 91. The graveled entrance road is 0.24 miles long and leads to a 354 square foot graveled parking area. A 1,667 square foot parking area on the western edge of the unit is used seasonally for equipment storage.

5.2.4 Trails

Bear Lake NWR. A two mile walking path can be accessed from the main entrance road to the Rainbow Dike. This trail leads to several interpretive panels and resting benches, a spur trail to the Rainbow Unit hunting/photography blind, and a foot bridge over the Canoe Trail to the Hoageson portion of the walking trail with additional interpretive panels and resting benches. The Hoageson spur of the trail can also be accessed from a road at the southeast corner of the auto tour route with additional parking adjacent to the trail loop. Walking along the auto tour route and along the Rainbow Dike is allowed as well.

Neither the Thomas Fork Unit nor Oxford Slough WPA has foot trails available.

5.2.5 Administrative Facilities

Bear Lake NWR. The refuge administrative office is a leased space in the U.S. Forest Service suite of offices housed in the National California-Oregon Trail Center in the City of Montpelier, about 8.5 miles from the Refuge. The office space was leased in June of 2011. Employee parking is located in the back of the building and visitor parking is conveniently located in the front of the Trail Center.

On the Refuge is a newly constructed maintenance compound containing a shop built in 2005 with two large vehicle or heavy equipment bays and one drive-through equipment bay. This building is used for most repairs on equipment and vehicles. The maintenance compound also contains an equipment storage building, a Hazmat building, a propane tank for heating, and an above ground fuel tank. A storage yard is located near the maintenance compound on the west side of the Outlet Canal, and can be accessed via the Paris Dike.

The Refuge is considering the funding and development of a combination administrative office and visitor contact station with a multi-purpose room for environmental education and other activities to be located on or near the Refuge (see Chapter 2, Management Direction).

Neither the Thomas Fork Unit, nor Oxford Slough WPA has administrative facilities; they are managed from the Refuge in Montpelier, Idaho and/or the Southeast Idaho NWR Complex Office in Chubbuck, Idaho.

5.2.6 Easements and Rights-of-Way

Bear Lake NWR. The Refuge currently has an agreement with PacifiCorp (UP&L) for access to the Refuge's main entrance road on the east side of the Outlet Canal and for the Alder Dike Road leading to the Alder Unit on the west side of the Outlet Canal. The agreement stipulates that the Refuge will maintain the dike/road along this portion of PacifiCorp's property in exchange for access to the Refuge. PacifiCorp is tasked with maintaining the Outlet Canal. PacifiCorp also has right-of-ways where their power lines cross the Refuge, namely on the Paris-Bloomington Dike road and north of North Beach Road, which is the southern boundary of the Refuge. Both these power lines run east to west. A power line also runs north to south along the entrance road of the Refuge up to the Maintenance Shop Compound and on the southeastern edge of the Refuge along Merkley Lake Road.

Thomas Fork Unit. At the Thomas Fork Unit, the Refuge has a perpetual right of way on the Feller property in Border, WY, for access to the east boundary of the unit. The right-of-way is 20 feet wide and 1,225 feet long. This right-of-way was acquired with the purchase of the unit in 1995.

The Refuge also holds a conservation easement on the adjacent Peterson property (formerly the Esche property) 20 to 80 feet wide running along the Thomas Fork. This easement was negotiated with an exchange of about 18 acres of land between Mr. Esche and the Refuge.

Oxford Slough WPA. No right-of-way or easements exist at Oxford Slough WPA.

5.2.7 Dikes, Irrigation, and Water Control Structures

Bear Lake NWR. The refuge staff has access to many dike roads for control of water levels and maintenance of water control structures. All of the dike roads are wide enough to accommodate heavy equipment required for maintenance and repairs.

Alder Unit. The Alder Unit is diked along the east and south perimeters. The east dike passes through the PacifiCorp easement. The Alder Unit receives its water from the Paris Creek, where the Refuge owns water shares. Three stoplog water control structures, the Paris Creek diversion, and north and south Alder help manage water in the unit.

Dingle Unit. For the 794-acre North Dingle Unit, the Refuge has water rights in the Black Otter Irrigation Company and receives irrigation tailwater via the Keetch drain controlled by a screwgate.

The Keetch drain passes underneath the Paris-Dingle county road. The Pugmire culvert, using stoplogs, drains the North Dingle Unit to the Outlet Canal as it passes under the entrance road. The 405-acre South Dingle Unit culvert and screwgate, in the southwest corner of the unit, drains water to the Outlet Canal north of the Paris Dike via a screwgate. Bob's Crossing (about midway between the North and South Dingle Units) has a culvert with stop logs. This controls water between the two units.

Salt Meadow Unit. The 242-acre Salt Meadow Unit (the first impoundment constructed on the Refuge) has a screw gate and flat fish screen at the northwest corner of the unit where water is exchanged with the Outlet Canal. In the northeast corner of the unit is a culvert which exchanges water with the South Dingle Unit during extreme high water events, and allows water to be pumped between the units.

Rainbow Unit. The Rainbow Sub-impoundment is 434 acres. Its dike, which is also the walking trail, has a screw gate and rotary fish screen from the Outlet Canal. There is a screw gate and rotary fish screen between the Rainbow Sub-Impoundment and the Rainbow units, and between the Salt Meadow and the Rainbow Sub-Impoundment units. The northeast portion of this unit has several culverts associated with the Hoageson Road (#1, 2, and 3) and the Hoageson inlet. There are three additional water control devices along the eastern border of the unit: Hoageson West, Hoageson Out #1, and Hoageson Out #2. One culvert passes underneath the Hoageson portion of the walking trail. The Rainbow Dike goes around the west, south, and east boundaries of the 1,437-acre Rainbow Unit. It has four water control structures: RB 1, 2, 3, and 4. All structures have screwgates; one and four have rotary fish screens; two and three have flat fish screens. Water comes into or out of the Outlet Canal for RB 1; and from the Rainbow Inlet Canal for RB 2-4.

Bloomington Unit. The 2,040-acre Bloomington Unit has extensive dikes. The Paris Dike Road separates the Bloomington and Alder units and runs all the way to Power Line Road. The eastern leg of the Bloomington Dike (running north-south) has three water control structures with screwgates and rotary fish screens. Water is exchanged with the Outlet Canal. As the Bloomington dike jogs west and heads north again, another water control structure with a screwgate (Bloomington #4) is located just north of Bloomington Crossing. A stoplog/flat screen structure, Bloomington #5, occurs adjacent to the old Ward cabin on the western edge of this unit. Bloomington Crossing has two culverts with stop logs to provide flooding of hay units and to regulate the flow of Bloomington Creek south into the Bunn Lake Unit. From the Bloomington Crossing, the western dike is called the Dunford Dike. The Dunford Unit is 568 acres and is still under construction. Currently it has one culvert. The dike ends at Power Line Road.

Red Slough Unit. The 481-acre Red Slough Unit is west of the Bloomington Unit. This unit receives groundwater discharge from adjacent farmlands, as well as delivery of limited water rights in the Dry Lake Canal Company. The Madsen levee and two water control structures manage water for this unit.

Bunn Lake Unit. The Bunn Lake Unit is 2,448 acres. From the Bloomington Crossing the Bloomington Dike heads south and becomes the Bunn Lake Dike, which connects to North Beach Road (the southern boundary of the Refuge). The Bunn Lake Dike has three structures each with two culverts, and two rotary fish screens; one structure has stop logs and the other two have screwgates.

St. Charles Unit. The 510-acre St. Charles Unit is in the southwest corner of the Refuge. It extends from North Beach Road to Power Line Road. The St. Charles Dike borders St. Charles Creek and has two water control structures each with two culverts, two rotary fish screens, and two sheet metal "stoplogs." Across North Beach Road is a fish ladder to facilitate migration of Bonneville Cutthroat trout from Bear Lake proper and through the Refuge via the St. Charles Creek for spawning.

Merkley Lake Unit. The 82-acre Merkley Lake Unit primarily receives its water in the form of geothermal discharge from the adjacent Hot Springs mountain range. This unit is hydrologically disconnected from the rest of the Refuge.

Mud Lake Unit. The 8,017-acre Mud Lake Unit serves as a storage basin (along with Bear Lake proper) for irrigation use in the lower Bear River Watershed. The Refuge maintains an agreement with PacifiCorp (the primary water rights holder), through which target elevations are set, at the Refuge's request, to meet wildlife requirements. PacifiCorp controls and manages five major water control structures that affect the Refuge: Stewart Dam, Rainbow Dam, the Lifton Pump Station, the Causeway, and the Paris Dike. The Stewart and Rainbow Dams divert the Bear River into the Mud Lake Unit of the Refuge through the Rainbow Inlet Canal, the Causeway funnels water from the Refuge into Bear Lake proper, the Lifton Pump Station moves water from the lake back into the Refuge via the Outlet Canal, and the Paris Dike is the last mechanism (associated directly with the Refuge) to regulate flows to downstream irrigators.

Thomas Fork. The Thomas Fork Unit's water control structures consist of the Center Structure, controlled with stoplogs, and Irrigation #1 and #2, culverts with water flow controlled by removable metal dams.

Oxford Slough WPA. Oxford Slough WPA has a reservoir (North Pond) with a culvert, screwgate, and 300-foot long levee located in a triangular plot of land at the northwest corner of the unit. A 3,520-foot pipeline with risers is part of the irrigation system. There is a water control structure at Pool #1 in the north part of the unit; a structure at the 700-foot Safety Levee in the northeast unit; and two more culverts at West Marsh #1 and West Marsh #2. The last control structure is located midway along the western border of the unit and is called West Meadows and has a 200-foot levee.

5.3 Public Use Overview

5.3.1 Open and Closed Areas

Open Areas. The Bear Lake NWR auto tour route is open to vehicle and foot traffic year round. The entrance road is open to vehicle traffic all the way to the Rainbow Dike gate. These roads may be impassable at time due to harsh winter conditions. The entrance road is plowed in the winter to provide access for refuge and PacifiCorp staff. To provide snow-shoeing and cross-country skiing opportunities, the auto tour route is not plowed in the winter.

Oxford Slough WPA is open year-round, but may be impassable in winter. The County's Oxford Road, which leads to the unit, is not maintained in the winter.

Seasonally Open Areas. The two accessible photography/hunting blinds at Bear Lake NWR are open March 15-September 20. Hiking is permitted July 1-January 20 on all roads open to vehicle traffic. The accessible walking trail is open March 15-September 20. The Canoe Trail (nonmotorized craft only) is open July 1-September 20. Motorized and nonmotorized boats are allowed September 20-January 15 in the Salt Meadow, the Rainbow Sub-Impoundment, and the Rainbow Units, as well as the Merkley Lake Unit, and the Mud Lake Unit as far south as the buoys. Pedestrian access is also allowed in this area September 20-January 15. However since most of this area is deep marsh and open water, few visitors venture off the roads, trails, and dikes.

Oxford Slough WPA has no seasonal restrictions, but may be impassible in winter.

Closed Areas. All areas west of the Outlet Canal at Bear Lake NWR are closed to public access. This includes the Alder, Bloomington, Red Slough, Bunn, Dunford, and St. Charles Units. The Dingle Unit (north and south) is also closed year round, as is the southern portion of the Mud Lake Unit.

The Thomas Fork Unit is closed to the public.

5.3.2 Annual Recreation Visitors

Bear Lake NWR. Visitor numbers have been estimated over the years from a variety of sources: brochure counts, traffic counters at the entrance road and the auto tour route, number of cars parked during hunting season, etc. From 1981 to 2004, the estimated number of visitors to the Refuge ranged from 890 to 5,245. From 2000 to 2009, managers began including visitors that used off-refuge sites adjacent to the Refuge in visitor estimates. The North Beach State Park abuts the southern boundary of the Refuge and is clearly visible. Merkley Lake Road goes through or borders much of the southeast boundary of the Refuge. Unofficial turn-outs along that road afford the visitor spectacular views of the Refuge. Managers began estimating about 4,000 off-refuge visitors along North Beach Road and 1,000 visitors along Merkley Lake Road. Total visitor numbers for 2000 to 2009 range from 8,430 to 12,000. In 2010, total visitation was estimated to be 12,360 (Table 5.5). Visitors are a blend of both local residents and out-of-towners. Visitors from outside of the area usually visit the Refuge as a destination during the summer. As the Bear Lake Valley becomes more popular and populated, visitor numbers are expected to continue their trend and steadily increase.

Table 5.5. Number of Bear Lake NWR Recreation Visitors (2010)

Activity	Rank	Residents	Non-Residents	Total
Non-Consumptive				
Auto Tour	1	1,620	6,480	8,100
Photography	2	500	2,000	2,500
Pedestrian	3	196	784	980
Other Recreation (snowshoeing, cross-country skiing)	4	60	240	300
Interpretation	6	30	120	150
Boat Trail/Launch Visits	7	24	96	120
Environmental Education	9	6	20	26
Bicycle Visits	11	1	4	5
Hunting				
Waterfowl	5	53	212	265
Upland Game	8	48	12	60
Fishing				
Fresh water	10	16	4	20
Total Visitation		**2,250**	**9,840**	**12,360**

Oxford Slough WPA. As with most WPAs, public access is allowed for hunting, fishing, trapping, and wildlife observation. There is no staff on-site at Oxford Slough WPA, and as such there is currently no mechanism to estimate the number of visitors. Visitor statistics are sporadic and based on the manager’s educated estimate. The approximate number of visitors annually to Oxford Slough is 150.

5.3.3 Annual Recreation Visits

Recreational visits differ from overall annual visitors. A visitor is a member of the public coming to the Refuge to participate in an activity. In most instances, a visitor may engage in multiple activities. For example, one visitor may watch birds along the auto tour route, talk a walk on the Rainbow Trail, and take pictures from the photography blind. In this example, the visitor actually visited three distinct locations. The activities of the visitor are considered visits. One visitor can register multiple visits in one trip and the annual sum of visits is always more than the number of visitors. Visits are measured by a variety of direct and indirect methods. Vehicular visits are measured by a counter installed at the entrance road. Hunting visits are measured by the number of vehicles parked where hunting areas are accessed. Scheduled tours and other special event visits are directly counted by staff conducting these activities. Other visit numbers may be estimated by staff via informal observations of the frequency of an activity. Also, the types of data and the methods to capture that data have changed over time so that information collected in the 1970s may not translate well into databases used currently. The majority of visitation (98 percent) occurs at the Refuge while minimal visitation occurs at Oxford Slough WPA.

Bear Lake NWR. At the Refuge, the office is not located on the Refuge, so management is not present to make the types of observations that typically occur when staff has an on-refuge presence. From 1990 to 1998 total visits (for all activities, presumably including hunting and fishing) to the Refuge ranged from 2,776 to 4,204 and averaged 3,411 visits. From 1999 through 2004, the total number of visitors was tallied (also presumably including hunting, fishing, etc.) with a high of 5,245, a low of 3,914, and an average of 4,280 visitors. It is unclear whether managers were counting visits or visitors, but the numbers from 1990 through 2004 are fairly consistent, so probably one or the other was being counted throughout this time period rather than a change from counting visits to counting visitors. Managers estimated that 90 percent of visits (or visitors) were engaging in non-consumptive wildlife recreation such as observation and photography. Peak visitation occurs in the summer months from July through September.

Oxford Slough WPA. Refuge records indicate that in 1999 and 2000 the total visits per year was 440. Records for 2005-2009 indicate total visits at 220 per year.

5.3.4 Recreation and Entrance Fee Program

The Refuge does not charge entrance fees or other recreation fees.

5.3.5 Accessibility of Recreation Sites and Programs for People with Disabilities

Bear Lake NWR. The Refuge has two accessible photography/hunting blinds. In addition to the blinds, the Refuge has Architectural Barriers Act (ABA)–compliant restrooms and an accessible walking trail with several interpretive panels and resting benches placed along the route.

Oxford Slough WPA. The facilities at this unit are minimal and very basic. No ABA-compliant facilities have been developed at this time.

5.3.6 Law Enforcement

Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit receive law enforcement coverage from a full-time officer stationed at the Southeast Idaho NWR Complex office in Chubbuck. This officer is also assigned to the Minidoka, Grays Lake, and Camas NWRs as well as special assignments at other refuges in the region. Refuge Law Enforcement Officers enforce special refuge regulations via periodic patrols of refuge lands, protect resources, and maintain public safety. The most common law enforcement issues encountered are trespass into closed areas, hunting violations (bag limit violations and poaching), hunting or fishing without the proper licenses, vandalism (defacing signs), and littering.

5.4 Wildlife-dependent Recreation

5.4.1 Waterfowl Hunting

The Ntional Wildlife Refuge System Improvement Act was passed by Congress in 1997 and identified hunting as a wildlife-dependent, priority public use for the National Wildlife Refuge System. At Bear Lake NWR and Oxford Slough WPA the waterfowl hunting program is operated in a manner that is consistent and compatible with the units' purposes and goals, and provides a quality experience for the hunter. This program contributes to the continuation of America's traditions and heritage in wildlife conservation and outdoor recreation.

The Thomas Fork Unit is closed to the public and has never been opened to hunting.

Bear Lake NWR. The Refuge has several boat ramps: one at the Paris Dike; the Rainbow Dike has three boat ramps—two on the west dike with access to the Rainbow Unit and the Outlet Canal, and one on the east dike with access to the Rainbow Inlet Canal; and an undeveloped ramp at the Merkley Lake Road hunting area. Primary access for hunting is by boat along the canals, but walk-in access can occur from the Rainbow Dike. The Refuge also has two accessible hunting blinds and an information kiosk devoted to current hunting information. Hunting facilities additionally include parking areas at boat ramps, restrooms along the main access road, and a trail spur from the Rainbow Dike.

Oxford Slough WPA. Oxford Slough has an undeveloped boat ramp at the terminus of the parking area.

Hunt Program History

Bear Lake NWR. Upon refuge establishment in 1968, hunting was allowed on the entire refuge as had occurred in the past, adhering largely to the rules and regulations set forth by the State of Idaho, but sometimes having additional refuge-specific regulations. Currently the Idaho State Department of Fish and Game sets the opening for waterfowl hunting as the first weekend in October, with a youth hunt on the weekend prior. Officially the hunting day spans sunup to sundown and the season runs through mid to late January, however Bear Lake NWR generally freezes up and the birds leave by the end of November. The first official public waterfowl hunting program on the Refuge was conducted in 1969, after refuge boundaries were established by surveys and the hunting areas delineated. An estimated 352 hunters harvested about 465 birds during the season for an average of 1.3 birds per hunter. Approximately 55 percent of the birds taken were mallards or Canada geese. Estimated crippling losses were high, about one bird lost for every two retrieved. The dense emergent vegetation covering much of the area makes very good escape cover for a wounded bird and only a few hunters used dogs to retrieve their birds. Since the first hunt in 1969, a waterfowl hunt has occurred on the Refuge every year.

Beginning in 1994, refuge managers noticed an increase in nonresidents hunting refuge waterfowl. To this day, the majority of refuge waterfowl hunters at the Refuge come from the Cache Valley-Logan area in Utah. In some years, drawdown of the waters in the Refuge for construction of dikes or management of carp has impacted the hunting experience. Those management activities may reduce the quality of the hunt over the short term, but should improve the habitat quality resulting in more use by waterfowl and a better hunting experience overall. In 2004, accessible hunting blinds were constructed on the Refuge with hunters using one or both blinds during 15 days of the season.

Oxford Slough WPA. When OS was purchased in 1985, it was opened to all types of hunting and trapping as per the regulations governing WPAs. As well, the Service complies with Idaho State and other Federal regulations.

Number of Hunters and Harvest Statistics

Bear Lake NWR. The Refuge kept records for the hunting program from 1969 to 2003. From 1969 to 1978 and 1995 to 1996, the number of hunters was recorded. From 1969 to 1972, the number of waterfowl harvested and the average number of birds harvested per hunter were also recorded. From 1973 to 2003, hunter visits, activity hours, waterfowl harvested per visit, and average number of birds harvested per visit were recorded. Not all parameters were recorded in every year. From 1969 to 2003 the number of hunters ranged from 100 to 540, with the average being 273 hunters per season (Figure 5.2). From 2005-2010 total waterfowl hunter visitors are estimated at 185.

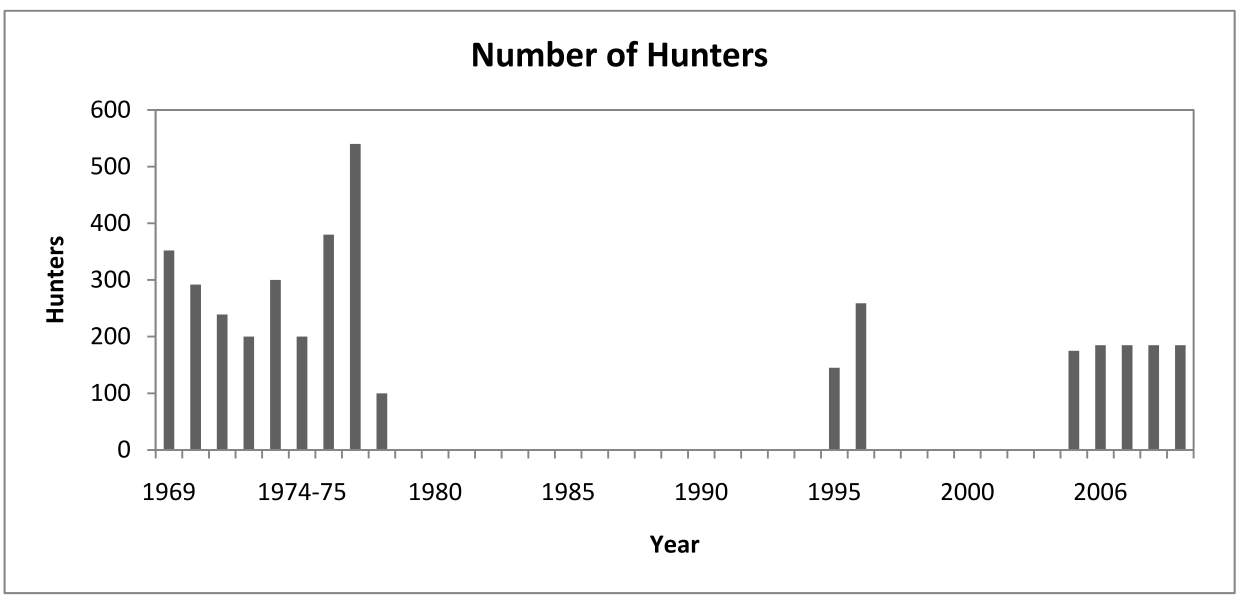


Figure 5.2. Annual number of hunters using the Bear Lake Refuge, 1969-2009.

The number of hunter visits is always greater than the number of hunters. During this time period, the number of hunter visits ranged from 90 to 654 with an average of 229 visits. This number is actually less than the average number of hunters (273), and is an artifact of having incomplete records. Hunters often make more than one visit to the Refuge during the hunting season. Figure 5.3 shows the number of hunt visits to the Refuge, and Figure 5.4 shows the number of birds per hunter ranged from 1.3 to 5.5 with an average of 2.9 birds per hunter. The graph shows particularly high visitation during the mid-1970s. Currently, the number of annual hunter visits is increasing, from 150 visits in 2002 to 300 visits in 2004.

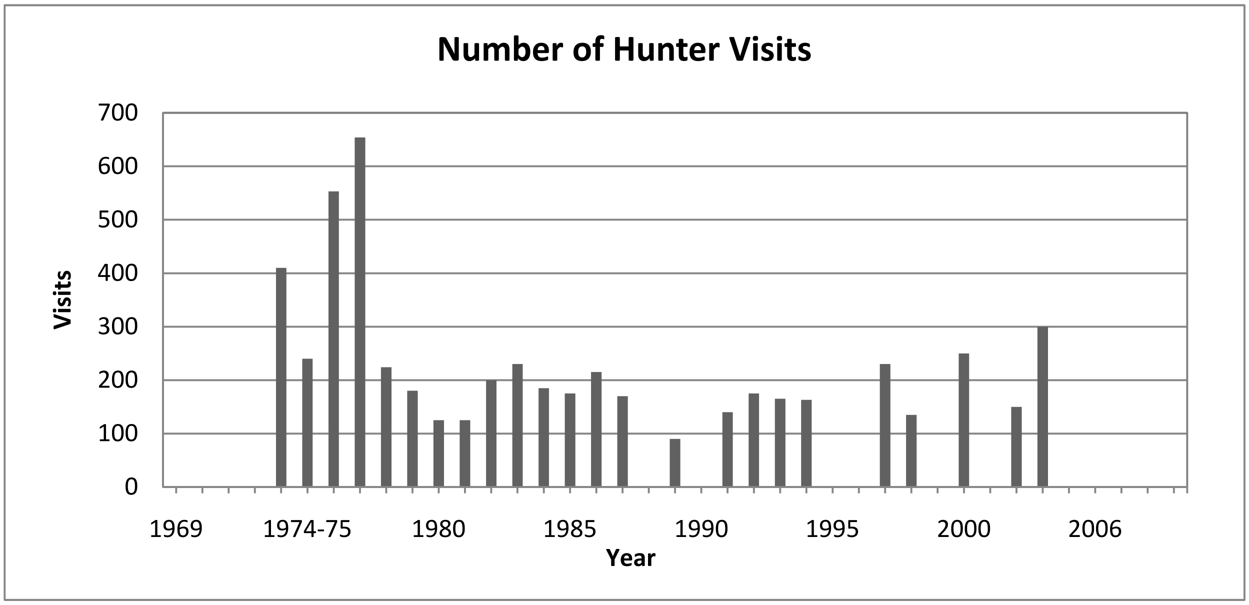


Figure 5.3. Annual number of hunter visits to Bear Lake Refuge, 1969-2009.
Note: There were no records available for 1990, 1999, 2001, and 2004.

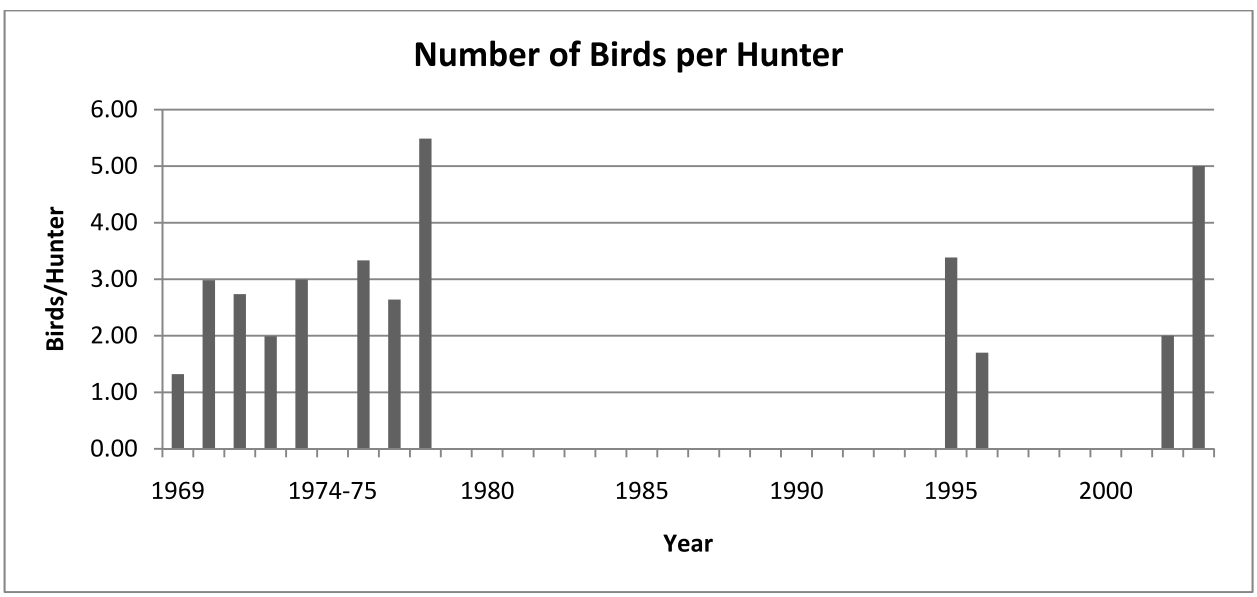


Figure 5.4. Annual harvest of birds per hunter at Bear Lake NWR, 1969-2009.

Mallard ducks and Canada geese comprise the greatest proportion of the refuge harvest. From 1969-2009, the number of ducks harvested ranged from 167 to 1,000 with an average of 435. The number of Canada geese harvested ranged from 10 to 173 with an average of 62. The total number of waterfowl harvested (ducks and Canada geese) from ranged from 198 to 1,426 with the average being 570, with the highest number of birds harvested in the mid-1970s. In the late 1970s the harvest declined precipitously, and then rose modestly to about 550 birds annually in the mid 1980s. After another decline in the mid-1980s, harvests rose to about 450-500 birds annually. In 2004, the harvest rose to 1,000 birds; however, no data have been collected since that time, making it impossible to determine a trend. Figure 5.5 shows the annual harvest of birds at the Refuge gathered from multiple reports and narratives.

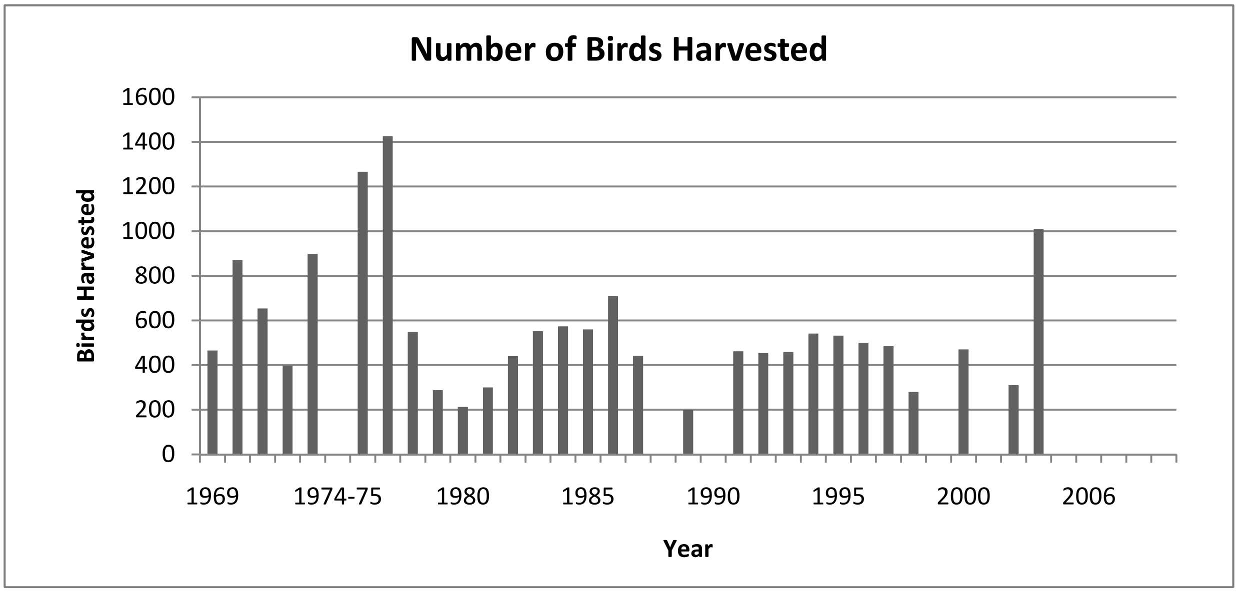


Figure 5.5. Annual number of birds harvested at Bear Lake Refuge, 1969-2009.

The refuge waterfowl hunt program harvests a variety of bird species. A majority of the ducks harvested from the Refuge are dabbling ducks, including mallard, northern shoveler, northern pintail, green-winged teal, and gadwall. Select diving ducks are harvested on the Refuge, including ring-necked, lesser scaup, and redhead. Canada goose is also a commonly harvested species. From 1969-2009, mallard comprised roughly 30 percent of the birds harvested, and Canada goose comprised roughly 25 percent of birds harvested. Starting in 1972, green-winged teal comprised 17 percent of birds harvested. Data are inconsistent for other species. In 1989, the top species harvested were mallard, Canada goose, green-winged teal, northern pintail, and ring-necked ducks. In 1993, the top species were mallard, green-winged teal, and northern shoveler. In 1994, gadwall, lesser scaup, and redhead were harvested in addition to other common species, and in 1995 the top species were mallard, green-winged teal, gadwall, and northern shoveler. Figure 5.6 shows the composition of ducks and geese harvested on the Refuge during this time period. In 1972, coots accounted for about five percent of birds harvested; however, data for coots harvested in additional years are inconsistent and thus not included in the figure below.

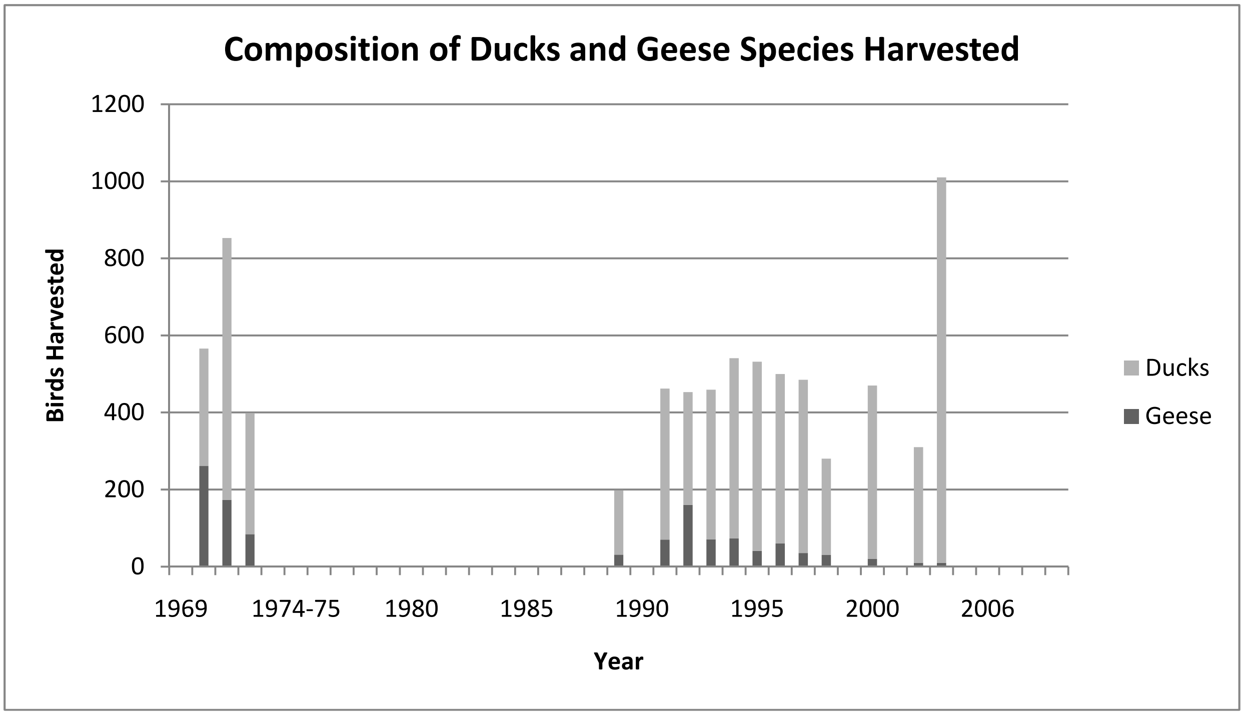


Figure 5.6. Composition of ducks and geese harvested at the Refuge, 1969-2009.

Oxford Slough WPA. Refuge records indicate that in 1999 and 2000, visits for waterfowl hunting were estimated at 120 per year. Records for 2005-2009 indicate visits at 80 per year for waterfowl hunting.

Current Hunt Program

Bear Lake NWR. Hunting of ducks, geese, coots, and mergansers is allowed on 7,000 acres of the Refuge, seven days per week, from sunrise to sunset, during the State waterfowl hunting season. Because of the high elevation at the Refuge, most hunting occurs in early October before temperatures drop. Freezing of the marsh usually occurs by the middle of November, so quality hunting usually ends early, even though the Idaho waterfowl hunting season remains open into January. The Refuge allows a youth hunt according to Idaho State regulations, which is usually the weekend prior to the regular hunting season opener. Waterfowl seasons run concurrently with many big game seasons, which creates lesser interest and participation from hunters in waterfowl hunting on the Refuge. Overall hunter use of the Refuge is light. The Refuge offers hunters a quality waterfowl hunting experience with little competition, especially on opening weekend when other hunting locales are far more crowded.

Hunting is in accordance with Idaho, Federal, and any special refuge regulations. Approved non-toxic shot is required for hunting all species. Temporary blinds of natural vegetation may be constructed, but such blinds are available for general use on a first-come, first served basis. Construction of permanent blinds is prohibited. The Refuge’s two accessible hunting blinds are available to disabled sportsmen on a first come, first served basis one-half hour before sunrise to one half hour after sunrise. After this time, they are available to the general hunting public. These blinds are open for use September 20-January 20 per State hunting regulations. Reservations are not required.

Oxford Slough WPA. The Oxford Slough WPA is administered by Bear Lake NWR to preserve small natural wetlands and their associated uplands. Waterfowl Production Areas (WPAs) are public lands purchased by the Federal government for the purpose of increasing the production of migratory birds, especially waterfowl. WPAs are wetlands or grasslands critical to waterfowl and other wildlife, acquired pursuant to the Migratory Bird Hunting and Conservation Stamp Act or other statutory authority. Federal Duck Stamp revenues are the primary funding source for the purchase of these lands. Every dollar spent for the purchase of a Federal Duck Stamp goes directly toward the acquisition of waterfowl habitat. Waterfowl production areas are administered by National Wildlife Refuges (NWR) or Wetland Management Districts (WMD). Unlike National Wildlife Refuges, Waterfowl Production Areas are subject to all of the provisions of the Migratory Bird Conservation Act except the inviolate sanctuary provisions (16 U.S.C. 718(c)). All Waterfowl Production Areas are open to public hunting, provided that all forms of hunting or entry on all or any part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations.

Although waterfowl hunting occurs on Oxford Slough WPA in accordance with Idaho State and Federal hunting regulations, no formal hunting or trapping program has been developed. Refuge staff maintains an entrance, parking lot, fencing, and boundary signs on the unit to facilitate visitor use, but the unit is unstaffed.

5.4.2 Upland Game Hunting

Bear Lake NWR. Hunting of snipe, gray partridge, sage grouse, and cottontails is allowed on approximately 300 acres of upland in the southeastern portion of the Refuge along Merkley Lake Road, seven days a week during the Idaho State seasons. All other species of wildlife are protected and may not be hunted. Hunting is in accordance with Idaho, Federal, and any special refuge regulations.

Interest in and demand for upland game hunting has never been high. Refuge data indicate that in 1973 hunting for chukar and Hungarian (gray) partridge was poor and participation by upland game bird hunters was understandably low. Only three hunters were observed taking part in this opportunity on the Refuge. Since the Refuge does not have much upland habitat for game birds, opportunities to hunt upland game are low when compared to off-refuge sites. The same holds true today and the Refuge has never hosted many upland game bird hunters.

In 1979 the refuge hunting area was opened for the first time to the hunting of cottontail rabbits. Light hunting pressure began after the first snowfall in November. Approximately 40 hunters visited the Refuge by the end of December. Currently, demand for refuge upland game and small game hunting remains low.

Oxford Slough WPA. As noted above, Waterfowl Production Areas are subject to all of the provisions of the Migratory Bird Conservation Act except the inviolate sanctuary provisions (16 U.S.C. 718(c)). All Waterfowl Production Areas are open to public hunting, provided that all forms of hunting or entry on all or any part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations.

Trapping on Waterfowl Production areas is covered under 50 CFR § 31.16, Trapping program:

"Except as hereafter noted, persons trapping animals on wildlife refuge areas where trapping has been authorized shall secure and comply with the provisions of a Federal permit issued for that purpose. This permit shall specify the terms and conditions of trapping activity and the rates of charge or division of pelts, hides, and carcasses. Lands acquired as 'waterfowl production areas' shall be open to public trapping without Federal permit provided that trapping on all or part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions affecting land, water, vegetation, or wildlife populations. Each person trapping on any wildlife refuge area shall possess the required State license or permit and shall comply with the provisions of State laws and regulations." [36 FR 17998, Sept. 8, 1971]

Although hunting for upland game, and trapping, occurs on Oxford Slough WPA in accordance with Idaho State and Federal hunting regulations, no formal hunting or trapping program has been developed. Refuge staff maintains an entrance, parking lot, fencing, and boundary signs on the unit to facilitate visitor use, but the unit is unstaffed. Over the years, several hunters have taken advantage of the pheasant season opener at Oxford Slough WPA. Refuge records indicate that in 1999 and 2000, visits for upland game hunting were estimated at 30 per year, as well as 90 for trapping. Records for 2005-2009 indicate visits at 50 per year for upland game hunting.

5.4.3 Fishing

Bank fishing has occurred at the Refuge since the Refuge's establishment, along the Bear Lake Outlet Canal and at the Lifton Pump Station. Although there is a sizable fishery of Bonneville cutthroat trout within the Thomas Fork Unit, the Unit is closed to the public. There has never been a fishery at Oxford Slough WPA.

Fishing Program History

Bear Lake NWR. In 1969, managers noted that Utah suckers (*Catostomus arden*) and Utah chub (*Gila atraria*) were abundant in the canals and creek channels. Local residents angled occasionally in the Outlet Canal in spring for trout and yellow perch, which were plentiful. Rainbow trout were also frequently caught on the Refuge, and cutthroat and Mackinaw (lake) trout (*Salvelinus namaycush*) were occasionally caught. Bluegill were seen infrequently. Bear Lake proper contained cutthroat trout, rainbow trout, lake trout, Bonneville cisco, Bonneville whitefish, Utah sucker, carp, Utah chub, and yellow perch (McConnell et al. 1957), so these species could have been caught on the Refuge, although most likely rarely. The first Annual Narrative in 1968 remarked that common carp were found in great enough numbers to be a nuisance and a very definite problem.

In 1970, the public fishing area just north of the Bear Lake Outlet Canal Structure was heavily used during spring by fishermen before and after the ice disappeared; most fish caught were yellow perch or carp. In 1972, Annual Narratives noted that fishermen at the Outlet Canal started catching trout, Mackinaw, and cutthroat trout in the spring and fall. Other fish caught on the Refuge included yellow perch, chub, and suckers.

Number of Visits

Bear Lake NWR. Refuge records from 1970 through 1987 for fishing measured activity hours, which ranged from a low of 128 in 1980 to a high of 1,036 in 1974-75. Visits were estimated in 1981 and 1982 at 105 and 85, respectively. In 1989, fishing visits were estimated at 130; this dropped to 60-80 visits per year from 1992 to 1995. In 1996, fishing visits were estimated at 30-40. From 2005 to present, fishing visits are estimated at 20 per year.

Current Fishing Program

Bear Lake NWR. The areas of Bear Lake NWR currently open to bank fishing are on the Outlet Canal north of the Paris Dike and just north of the Lifton Pumping Station.

Archery fishing for carp is permitted on a portion of the Refuge, but few archers have taken advantage of the sport, probably because of the abundance of shallow carp waters near the valley's population centers during the early spring months. Some ice fishing for perch occurs in late winter at the Outlet Control Structure. The Refuge is not known for its game fisheries; higher quality fishing opportunities are available in nearby streams and at Bear Lake proper. Most fishing on the Refuge is for carp; however, large Bonneville cutthroat trout do move from Bear Lake, via the Lifton pump station, the Causeway, and the fish ladder into the Outlet Canal and marsh.

5.4.4 Wildlife Observation and Photography

Bear Lake NWR. As early as 1976, refuge managers noted that there was a demand for a self-guided canoe route from visitors who wanted to view wildlife from a different vantage point. Several special use permits were issued for members of the public to take canoe trips through the Refuge, and in 2005 a canoe trail was created through the marsh for access. No motorized craft are allowed on the Canoe Trail. The Canoe Trail is open to the public from July 1 to September 20. In recent years, users have included groups like Boy Scouts using four to six canoes on weekends during the summer. Peak use appears to be July and August.

The Refuge's auto tour route consists of a 2.4-mile road around the 200-acre Salt Meadow Unit constructed in 1978. In 1995, wetland enhancement projects completed along this route improved waterfowl and shorebird viewing. In recent years, turnouts have been added along the route to improve traffic flow. Over 90 percent of refuge visitors come for wildlife observation, and this route is the main way visitors view Bear Lake's wildlife. Trips to the Refuge during mid-May by residents of the Bear Lake Valley are a common activity when the gosling hatch is at its peak. Most recently, the Salt Meadow Unit has had a breeding pair of trumpeter swans. In 2010, an interpretive panel was installed by the Youth Conservation Corps (YCC) Crew on one of the car turnouts describing the swans.

The Rainbow Unit ADA Accessible Trail Project includes two accessible photography/hunting blinds, and four bench/rest areas to enhance the visitors' enjoyment of wildlife and is open from March 15-September 20. Hiking is permitted on all roads open to vehicle travel from July 1-January 20 in areas of the Refuge marked on the map as seasonally open.

Thomas Fork Unit. Because the Thomas Fork Unit is a landlocked parcel, there is no public access. Travelers along Highways 30 and 89 may stop to observe wildlife from the road, although there are currently no welcome or orientation signs to notify the public that this is a Service-owned site, or encourage wildlife observation and photography.

Oxford Slough WPA. To date, no facilities designed specifically for wildlife viewing and photography have been developed at Oxford Slough WPA.

Number of Visits

Bear Lake NWR. Soon after refuge establishment, managers noted the high volume of recreation visitors to Bear Lake State Park situated immediately south of, and visible from, the Refuge. They also noted that at least some of these visitors were incidentally observing wildlife on the Refuge. Visitors to Bear Lake North Beach State Park were estimated at 45,000 in 1970, 75,000 in 1972, and 133,000 in 2007.

In 1973-74, managers estimated recreation activity hours at 2,201. This included wildlife observation, photography, and "wildlife-wildlands" appreciation. In 1981, a traffic counter was installed on the Refuge's entrance road and tallied 890 visits for wildlife observation, most of them along the Salt Meadow Unit's auto tour route. In 1987, visits to the Refuge were estimated at 1,742 people, in 1988 at 2,014, and in 1989 at 2,071. Managers noted casual visitation from users of Bear Lake North Beach State Park throughout these years at about 7,000 people, or 10 percent of the total number of visitors to the State Park. Also in 1989, managers noted a few mountain bikers and cross-country skiers, and canoes. From 2000 on, managers estimated an additional 4,000 visitors viewing the Refuge (1,000 from the east county road area [Merkley Lake Road], and 3,000 from the Bear Lake North Beach State Park). Total wildlife observation visits for 2006-2010 equal 800 pedestrian visits and 8,100 auto-tour visits, and photography visits equal 2,500.

Thomas Fork Unit. Because the Thomas Fork Unit is a landlocked parcel, there is no public access. Since no staff is stationed at this unit, it is unknown if or how many people might enjoy wildlife observation or photography here. People may observe wildlife from the road, but this use has not been quantified.

Oxford Slough WPA. Refuge records indicate that in 1999 and 2000, 200 visits were for wildlife observation. Records for 2005-2009 indicate 80 visits for wildlife observation and 10 for wildlife photography.

5.4.5 Environmental Education and Interpretation

Bear Lake NWR. In the first decade of the Refuge's establishment, public demand for interpretive trails, visitor centers, and environmental study areas was low. Preliminary contacts with local teachers and school officials had not yielded increased interest in environmental education and interpretation. In 1978, managers began providing slide show programs and refuge tours to Scout and school groups. This off-refuge focus continued through 1985. In 1986, local elementary and middle schools started participating in field visits to the Refuge to study water quality, nesting requirements of various bird species, owl pellets, wildlife habitats, learned bird and plant identification, and the history and importance of the marsh. The Refuge worked with the teachers to provide environmental education materials, information about the refuge purposes, wildlife, and habitats, and Project WILD activities, a widely used wildlife-focused conservation education program for students in kindergarten through high school. The Refuge also participated in a number of supporting projects with local schools to aid in outdoor classroom design and construction, preparation of migratory bird display collections, and forums to provide teachers with instruction on how to teach wildlife and habitat principles. Environmental Field Days continued until 2004 when funding shortfalls within the Bear Lake County School District precluded tours of the Refuge. Currently, environmental education services are provided opportunistically or when requested by schools or groups.

In 1989, planning started on developing an informational and interpretive display for Idaho's Bear Lake State Park kiosk at North Beach with installation occurring in 1995. An interpretive kiosk was developed and installed at the beginning of the auto tour route on the Salt Meadow Unit in 1996.

Until 2004, the only refuge foot trails available for use were cabled off dike roads that the public was allowed to hike after June 30. At that time, no official interpretive trail existed, and managers felt that a planned designated walking route was needed to give visitors more opportunities to view waterbirds. In 2003, the Refuge initiated construction of a 2,000-foot Americans with Disabilities Act (ADA) interpretive trail called the Rainbow Unit ADA Accessible Wildlife Observation Trail Project through receipt of a $15,000 Challenge Cost Share (CCS) grant and partner contributions. Based on additional analysis, the trail increased to a 10,000 foot trail and included a bridge crossing the Canoe Trail, and three parking areas capable of supporting school buses. Monies were set aside from the trail fund to develop interpretive signs for eight points along the trail and three interpretive kiosks for 2005. The Refuge also developed a 7,300-foot Canoe Trail in conjunction with the Rainbow Unit ADA Trail Project. The official opening of the trail was on July 1, 2005, with the season of use extending from July 1-September 20.

The Rainbow Unit ADA Accessible Trail Project also included two accessible photo/hunting blinds and four bench/rest areas. The blinds would serve a dual function for wildlife photography (March 15-September 20) and waterfowl hunting (September 21-January 20). Staff from Camas and Grays Lake NWRs helped to develop levee approaches to the new blinds during spring. In 2010, the YCC Crew helped install the interpretive panels at strategic places along the Rainbow Trail, particularly at the resting benches and at the Rainbow Unit blind.

Oxford Slough WPA. Refuge records do not indicate any history or current programming for environmental education or interpretation at this unit.

Number of Visits

Bear Lake NWR. For 2006-2010, environmental education participants are estimated at 40 per year. From 2005-2006 interpretation participants were estimated at 1,000; from 2007-2009 this number dropped to zero. This drop may be explained by changes in how participation in activities were counted. In recent years, participation in interpretation has been limited by the Refuge's small staff. In 2010 the Refuge had 150 interpretation participants and 10 in 2011. The number of environmental education participants in 2010 was 26 and 92 participants in 2011.

Oxford Slough WPA. Refuge records do not indicate any visits for environmental education or interpretation at this unit.

5.4.6 Cultural Resources Interpretation

Bear Lake NWR. The Refuge does not have a cultural resources interpretation program at this time. However, cultural resources on the Refuge include: archaeological sites (both prehistoric and historic and their associated documentation), buildings and structures, landscapes, objects, and historic documents. These items form tangible links with the past. The Service is responsible for, and committed to, protecting and managing these irreplaceable resources in a spirit of stewardship for future generations to understand and enjoy.

The Refuge has old cabins acquired when the unit was established. These cabins were the homes of the early settlers to the area and included farmers, ranchers, and trappers. These cabins have been evaluated by the State Historic Preservation Office and found not to be historically significant.

Bison bones have been found at various locations on the Refuge, and sometimes in large numbers. These bones are generally revealed when water levels are drawn down for various management purposes. Cultural resource surveys are required whenever the Refuge undertakes a project that will disturb the ground, like building new impoundments. In the course of these surveys, stone flakes and fire-cracked rocks have been found attesting to the use of the area by Native Americans.

Thomas Fork Unit. The Thomas Fork Unit was once part of the Oregon Trail and pioneers traversed it in search of a crossing over the Thomas Fork and Bear River. No artifacts or wagon wheel ruts have been found on the unit to date. The area was heavily cultivated and grazed, which may have obliterated evidence of the Trail. Wheel ruts are found outside the western border of the unit heading toward Sheep Creek. No cultural resource interpretation developed by the Service occurs on-site. Idaho State erected a historic landmark sign at a pull-out along Highway 30 near the Wyoming border. The sign describes the importance of the area to pioneers along the Oregon-California trail.

Oxford Slough WPA. Like the Refuge, Oxford Slough WPA has old cabins acquired when established. It also has a gravestone from the 1800s in a field in the northwest corner of the unit. After the WPA was established, the Service erected a new fence around the grave out of respect and to protect it from harm. No cultural resource interpretation currently occurs at this site.

5.5 Non-wildlife-dependent Recreation

Bear Lake NWR. Horseback riding is allowed only on certain roads and trails, but this activity occurs rarely, if at all. Bicycling is also allowed, and the Refuge may get five or so bicyclists per year. Pets are allowed on the Refuge while on leash or under the control of the owner. Cross-country skiing and snowshoeing are allowed in the same areas and dates as those for hiking, but would of course occur during the long winter months. Total other recreation (snowshoeing and cross-country skiing) participants are estimated at 340 from 2005-2009, and at 300 for 2010. In 2010, the Refuge recorded 120 visitors to the Canoe Trail with four to six canoes and one to two people per canoe per visit.

Thomas Fork Unit. Thomas Fork Unit is closed to the public.

Oxford Slough WPA. It is unknown if any non-wildlife-dependent use occurs on the WPA.

5.6 Illegal Uses

Few illegal uses have been documented for the Bear Lake Refuge. Among those few, the most common violations relate to hunting: shooting from the road, no license or duck stamp, unplugged shotguns, and hunting in closed areas. The Refuge might have one or two violations per season, but not necessarily every year. Because the Refuge has only one Law Enforcement Officer whose bailiwick covers the entire Southeast Idaho NWRC, violations may go unreported. On occasion the Law Enforcement Zone Officer for the Service and an Idaho Department of Fish and Game Conservation Officer may patrol the area during hunting season. Cattle trespass occurs every year and is generally quickly resolved by a call to the livestock owner and a fence repair. Sometimes snowmobilers clip fencing and trespass on the Refuge as evidenced by the tracks they leave.

Vandalism in the form of shooting boundary and entrance signs occurs. Littering occurs regularly, but no trash dumping occurs. Driving under the influence occurs rarely. Break in and theft of tools at the equipment shed on the Refuge occurred in 2004. The local police responded, investigated, apprehended the suspects, and recovered most of the stolen goods. No illegal uses have been documented for Oxford Slough or the Thomas Fork Unit. However, without staff presence there is the possibility that hunting violations and/or cattle trespass do occur, although no vandalism has occurred to fences or signs.

5.7 Area Outdoor Recreational Opportunities and Trends

The area surrounding Bear Lake NWR and Oxford Slough WPA consists of small rural towns and cities. Immediately to the south are burgeoning urban populations in Logan and Brigham City, Utah. The Bear Lake area has steadily become a popular summer recreation area. Summer homes continue to be developed around the lake and summer residents as well as tourists flock to the area to enjoy water sports such as jet skiing, power boating, and water skiing. Most summer homes and condominiums are being built in the Garden City, UT, area of the lake, but Fish Haven in Idaho is also continuing to grow with many residents migrating south in the winter.

Bear Lake proper is bisected by the Idaho-Utah border. Much of the area around the lake is managed by the Idaho and Utah State Parks and Recreation Departments and their campgrounds are very popular. Idaho State Parks manages the North Beach State Park just south of the Refuge. Many people passing through the area stop to visit the Refuge.

5.7.1 Nearby Recreational Opportunities

Bear Lake NWR, located in rural southeastern Idaho's Bear Lake County, is surrounded by mountains, and is located just north of and adjacent to Bear Lake—often called the "Caribbean of the Rockies" for its turquoise-blue water—and Bear Lake State Park, a major recreation area for residents of Idaho, Utah, and Wyoming. Oxford Slough WPA is in Franklin and Bannock counties on the edge of Oxford in southeast Idaho. The Refuge and Oxford Slough WPA are located less than two hours south of Pocatello, Idaho, and less than three hours north of Salt Lake City, Utah, making the Refuge a reasonable opportunity for recreational day visits from Idaho and Utah residents. Bear Lake NWR

There are many opportunities for residents and visitors in southeastern Idaho to enjoy outdoor recreation, including wildlife-dependent recreation. Nearly 50 percent of Bear Lake County is public land, while around 36 percent of Bannock and Franklin counties are public land (IDPR 2006). In Bear Lake County, about 230,000 acres (37 percent) of county is National Forest land. The Refuge and units are located near the Caribou-Targhee National Forest, where visitors can enjoy hiking, camping, snowmobiling and ATVing, mountain biking, horseback riding, cross-country skiing, big game and upland game hunting, and fishing (IDPR 2006).

Adjacent to the Bear Lake NWR, Bear Lake State Park offers opportunities for water-based sports, beach activities, hiking, camping, and winter activities. Bear Lake proper hosts a trophy cutthroat trout fishery, where the Idaho State record cutthroat of 19 lbs. was caught and lake trout (mackinaw) may grow to 30 lbs. There are also four endemic fish species in Bear Lake: the Bonneville cisco, the Bonneville whitefish, the Bear Lake whitefish, and the Bear Lake sculpin. The January-February spawning run on Bear Lake for Bonneville cisco draws fishing enthusiast who dip nets to capture the small swift fish. In 2007, Idaho State Parks counted almost 166,400 day use visitors to Bear Lake State Park, about 4 percent of the total day use visitation at Idaho State parks. Utah State Parks provided park visitation numbers from 1990-2005 in its 2005 Bear Lake Resource Management Plan. Bear Lake State Park's annual visitation has been trending upward since 1990, despite dips in visitation in 1994 and 1997. Visitation increased 94 percent from 160,205 visitors in 1990 to 310,175 in 2002. Most visits to Bear Lake State Park occur between July and September (80 percent of the total visitation). The number of visits to the Park drops off sharply due to cooler weather October through April. Visits begin to increase in May and June as the weather improves, but increase dramatically in the peak month of July.

5.7.2 Outdoor Recreation Rates and Trends

The Idaho Department of Parks and Recreation (IDPR) produces the Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan (SCORTP), under the direction of the Idaho SCORTP Task Force. The Task Force is comprised of representatives from public and private organizations statewide with interest in outdoor recreation. The plan, which is required by the National Park Service (NPS) in order to maintain eligibility for participation in the Federal Land and Water Conservation Fund (LWCF) program, is produced every five years. The plan includes a statewide assessment of outdoor recreation supply and demand, public involvement and a wetlands component. For the latest (2006-2010) SCORTP, the IDPR surveyed Idahoans statewide to determine their participation in a wide range of recreational activities, and to get a sense of the public's priorities on issues related to outdoor recreation. In addition, staff reviewed other statewide studies related to outdoor recreation conducted during the past five years.

Current Participation Rates. The most recent Idaho SCORTP (IDPR 2006) and associated recreation survey identified a number of major categories (activity areas) of outdoor recreation, subdivided into recreational activities. Survey results were organized statewide as well as regionally, with Bear Lake, Bannock, and Franklin counties included in the Region 5 study area for SCORTP. Walking was the most popular outdoor recreation activity in Idaho and in Region 5, with 78.3 percent of adult Idahoans and 80.5 percent of Region 5 adult residents walking for exercise or pleasure. Idahoans also participate in wildlife-dependent recreational activities, including hunting, fishing, wildlife observation, and photography. Idahoans and residents in Region 5 participate in these activities about the same amount, although Region 5 had slightly higher participation in wildlife watching, including outdoor photography (52.7 percent for Region 5 versus 47.5 percent for Idaho) and watching wildlife other than birds or fish (66 percent for Region 5 versus 63 percent for Idaho). Compared to national participation rates, Idahoans participate in waterfowl hunting nearly six times as often. Non-consumptive wildlife activities, such as viewing animals, were also higher than the national average. Table 5.6 shows participation for activities that are currently allowed on the Refuge reported statewide and in Region 5.

Table 5.6. Participation Rates for Selected Outdoor Recreational Activities in Idaho and Region 5

Recreation Activity	Rank	Idaho Adult Residents Participation	Idaho Region 5 Adult Residents Participation
Nature Activities			
Observe wildlife other than birds, fish	2	63.0%	66.0%
Viewing fish		36.9%	34.2%
Bird watching		46.5%	46.8%
Outdoor photography	5	47.5%	52.1%
Fishing			
Fishing on a river from bank or shore	4	57.7%	56.2%
Hunting			
Waterfowl hunting		12.9%	11.8%
Upland or small game hunting		26.5%	25.5%
Walking/Hiking			
Walking for exercise or pleasure	1	80.5%	78.4%
Hiking	3	59.5%	63.3%
Cross-country skiing		16.6%	17.3%
Snowshoeing		16.5%	16.7%
Horseback riding		16.2%	18.9%

Table includes those recreational activities which are currently allowed on the Refuge.
Source: Idaho participation rates from 2004 Outdoor Recreation Needs Assessment, reported in Idaho SCORTP (IDPR 2006).

It must be noted that there is a major discrepancy between the estimated number of waterfowl hunters in the 2002 Idaho Recreation Survey and numbers reported by the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game (IDFG) in their hunter surveys for that year. The SCORTP estimated than more than 160,000 Idaho residents participated in waterfowl hunting in 2002, while the U.S. Fish and Wildlife Service reported sales of 25,000 Ducks Stamps in Idaho that year, and the IDFG estimated 19,000 duck hunters and 12,500 goose hunters for that year based on their telephone surveys (see below; IDFG 2009). The National Survey of Hunting and Fishing reported that the state of Idaho had 27,000 waterfowl hunters, 16 years old or older, in 2006 (the State ranks 17th in the nation in waterfowl hunting participation). This raises the question of whether 2002 recreation survey methodology resulted in a higher percentage of hunters being surveyed than are present in the general population, or whether estimated participation is higher than actual participation in multiple categories. The 2002 survey may have captured individuals who formerly hunted but no longer do so. Still, the study does provide a broad basis of comparison of participation in recreational activities.

The most recent National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHWAR) was conducted in 2006 (U. S. Department of the Interior [USDI] et al. 2007). The Survey collects information on the number of anglers, hunters, and wildlife watchers; how often they participate; and how much they spend on their activities in the United States. The 2006 Survey found that 1.0 million Idaho residents and nonresidents 16 years old and older fished, hunted, or wildlife watched in Idaho. Of the total number of participants, 350,000 fished (35 percent), 187,000 hunted (18.7 percent), and the majority at 506,000 participated in wildlife watching activities (50.6 percent), which include observing and photographing wildlife (see Table 5.7). The sum of anglers, hunters, and wildlife watchers exceeds the total number of participants in wildlife-related recreation because many individuals engaged in more than one wildlife-related activity.

Table 5.7. Participation in Wildlife-dependent Recreational Activities in Idaho, 2006

Activity	Residents and Nonresidents	Idaho Residents	Nonresidents
Wildlife watching (away from home)	**506,000**	**179,000**	**326,000**
Observe wildlife	441,000	175,000	265,000
Photograph wildlife	265,000	110,000	156,000
Freshwater Fishing	**350,000**	**206,000**	**144,000**
Rivers and streams	240,000	132,000	107,000
Ponds, lakes, and reservoirs	220,000	150,000	70,000
Hunting	**187,000**	**122,000**	**65,000**
Small game hunting	55,000	28,000	27,000
Migratory bird hunting	42,000	22,000	--

Activities are ranked by popularity by total participation, in descending order.
Source: 2006 National Survey of Fishing, Hunting, and Wildlife Associated Recreation-Idaho (USDI et al. 2007). *Sample size too small to report data reliably. --Residents/nonresidents grouped in these data sets.

Comparing national hunting and fishing estimates for 1991 to 2006 based on the FHWAR survey finds participation declining over the entire time period. In 1991 and 1996, the number of people who hunted and fished remained essentially unchanged. In 2001, the number of sportspersons fell compared to the two previous survey estimates. In 2006, the number of anglers continued to decline and the number of hunters was stable. There were differing trend lines from 1991 to 2006 for wildlife watching. The number of overall wildlife watchers decreased 17 percent from 1991 to 1996, increased 5 percent from 1996 to 2001, and increased 8 percent from 2001 to 2006. Away-from-home wildlife watching dropped from 1991 to 2001 (21 percent from 1991 to 1996 and 8 percent from 1996 to 2001) and stayed level with a statistically insignificant 5 percent increase from 2001 to 2006.

Another major recreational area is the nearby Caribou-Targhee National Forest. The National Visitor Use Monitoring (NVUM) program provides science-based estimates of the volume and characteristics of recreation visitation to the National Forest System, and the latest data collection was completed from 2005-2009 (USFS 2010b). These data are relatively new and trend information is not yet available; rather, these data provide a “snapshot” of annual National Forest visitation. From 2005-2009, the Caribou-Targhee National Forest had 1.4 million National Forest Visits, which is defined as the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. The majority of visitors participated in viewing wildlife with 50.3 percent participation, although hiking/walking was most often selected as the main priority for the forest visit. Hunting had a 13.4 percent participation rate, fishing had a 7.4 percent participation rate, and nature study had a 7.5 percent participation rate. Caribou-Targhee National Forest also received high participation rates for viewing natural features, relaxing, skiing, snowmobiling, picnicking, and developed camping.

Forecast of Future Regional Recreation Demand and Key Recreation Needs. Although the 2006 Idaho Outdoor Recreation Survey established baseline data for recreational activities in the State, trend data have not yet been developed. Bowker et al. (1999) developed projection models for the publication *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends* (1999). It is the only ongoing, comprehensive assessment of outdoor recreation trends in the country. The researchers created models based on today's behavior as sampled through the National Survey on Recreation and the Environment. The following activity participation projections in Table 5.8 from that study are for the Rocky Mountain Region (state by state projections are not available).

Although projections should be viewed with caution, it seems likely that demand for many outdoor activities generally permitted on refuges will continue to increase over the next decade. Based on the 2002 Idaho recreation survey, walking, bicycling and recreation with dogs are increasing in popularity, and this trend is expected to continue long term.

Table 5.8. Participation Projections for Selected Outdoor Recreation Activities in the Rocky Mountain Region

Activity	2010	2020
Wildlife-related activities		
Nonconsumptive uses	+20%	+30%
Hunting	+5%	+12%
Fishing	+16%	+26%
Dispersed Land Activities		
Hiking	+15%	+24%
Horseback riding	+13%	+23%
Developed Land Activities		
Walking	+18%	+28%
Biking	+17%	+26%
Picnicking	+18%	+28%
Winter Activities		
Cross-country skiing	+31%	+41%

Source: Bowker et al. 1999.

The IDPR began gathering baseline data on outdoor activities in 2002. Data used for the 2006-2010 SCORTP were gathered mostly in 2004 and 2005. Even in that short amount of time public preferences have changed in some areas. Participation in outdoor photography has increased significantly in recent years (44 percent). Of Idahoans surveyed in 2005, 70 percent participated in the activity of outdoor photography. Additionally, more than half of Idahoans are considered regular participants or enthusiasts. This increase is likely due to the emergence of digital photography, which makes picture taking easier and less expensive than in the past. The rise in popularity of digital cameras likely feeds the increase in wildlife viewing (21 percent) and bird watching (29 percent). Table 5.9 below illustrates these trends for selected activities occurring on the Refuge; only activities with at least a 10 percent increase or decrease in participation are listed.

Table 5.9. Idaho SCORTP Statewide Trends in Selected Outdoor Recreation Activities, 2005

Activity	Percent Change
Outdoor photography	+ 44%
Bird watching	+ 29%
Snowshoeing	+ 28%
Watching wildlife (other than fish)	+ 21%
Classic cross-country skiing	+ 15%

Table includes those recreational activities which are currently allowed on the Refuge.
Source: Idaho SCORTP (IDPR 2006).

Trends in Waterfowl Hunting in Idaho. The number of duck hunters in Idaho declined in the 1980s, due to declines in duck populations attributable to low nesting success, and consequently more restrictive seasons and bag limits. As duck populations recovered, hunters returned to the sport, though not in the numbers seen in the 1960s and 70s. Overall, the number of waterfowl hunters in Idaho has increased since the late 1980s. A near doubling of the length of the duck season in 1995-1996, from 59 days in 1990 to 107 days in 1996, as well as more liberal daily bag limits (from four ducks in 1994 to seven ducks from 1996 on) led to larger numbers of ducks harvested, as well as increasing numbers of participants in waterfowl hunting. Although the length of the goose season and bag limits increased only slightly in the same period (from 93 days in 1990 to 107 days in 2003, daily bag limit from three to four geese) goose harvests also rose significantly. Numbers of Duck Stamps sold in Idaho rose from approximately 17,000 in the late 1980s and early 1990s, to approximately 25,000 in the early to mid-2000s. Harvests rose from 113,000 ducks and 27,000 geese in 1988, to more than 200,000 ducks and 75,000 geese in the mid-2000s (Table 5.10, IDFG 2009).

Table 5.10. Estimated Waterfowl Harvest Numbers from USFWS's Waterfowl Hunter Survey for Idaho, 1988-2006

Year	Duck Stamps Sold	Estimated Adult Hunters	Total Geese Harvested[1]	Total Ducks Harvested[1]
1988	16,597	14,271	26,600	112,900
1989	16,894	14,073	30,500	119,600
1990	17,036	13,443	36,800	96,700
1991	17,151	14,144	39,500	117,880
1992	17,717	14,132	31,700	126,700
1993	21,761	17,972	45,600	153,200
1994	21,229	17,418	61,100	141,300
1995	21,097	18,395	46,900	203,400
1996	22,382	19,751	61,100	245,800
1997	23,697	22,241	40,700	248,600
1998	23,515	21,006	56,700	254,700
1999	26,709	20,795	28,500	228,300
2000	28,206	23,306	86,200	173,200
2001	26,173	12,000/14,900[2]	64,400	138,600
2002	24,937	14,500/9,900[2]	36,700	160,600
2003	24,878	18,200/15,400[2]	84,200	262,900
2004	24,320	17,100/13,300[2]	62,700	188,500
2005	23,724	18,500/16,000[2]	74,300	258,300
2006[3]	25,726	18,400/14,5000b	77,800	278,000

Source: IDFG 2009. [1]Adjusted for exaggeration memory bias and juvenile hunter density. [2]The first number is estimated number of duck hunters and the second number is estimated number of goose hunters. [3]Preliminary estimate July 2007.

5.8 Social/Economic Environment

5.8.1 Population, Housing, and Income

Bear Lake NWR including the Thomas Fork Unit are located in the southeast corner of Idaho in Bear Lake County. The Refuge is situated along the coastline of Bear Lake proper and just south of the city of Montpelier. Montpelier is the largest city in the county with a population of 2,867 (Bear Lake Chamber of Commerce 2010). Oxford Slough Wildlife Production Area (WPA) is wholly located within Bannock and Franklin counties in southeast Idaho.

Table 5.11 shows the population and area economy for Bear Lake Refuge and Oxford Slough WPA. The local study area includes a five-county area within Idaho and Utah. Bannock, Bear Lake, and Franklin counties, which entirely encompass the Refuge and WPA, are included along with two other counties (Cache and Rich counties in Utah). Since 80 percent of recreational visitors to the Refuge are non-residents, the inclusion of additional neighboring counties is justified. Many shop in Logan, UT (70 miles away), Pocatello, ID (90 miles away), and Garden City, UT, on the shores of Bear Lake proper. Therefore, Bear Lake, Bannock, and Franklin counties in Idaho and Cache and Rich counties in Utah comprise the local study area for estimating the economic effects of the recreational use of the Refuge and WPA. To a lesser extent, there are also economic effects to the States of Idaho and Utah and the United States.

Bear Lake County, Idaho was largely discovered by people seeking recreation during the early 1990s. Throughout that decade, development of affordable recreational homes near Bear Lake, also known as the “Caribbean of the Rockies” for its spectacularly blue water, sparked nearly half of the county’s population growth. During the last half of the 1990s, population fluctuated but held fairly steady. By 2002 with population at 6,164, the county started a slow but steady decline (Idaho Department of Labor 2011a). By 2009 the population was estimated at 5,774. For Bannock County, access to higher education and the intersection of major north-south and east-west interstate highways helped fuel population and economic growth. The county population rose from 75,565 in 2000 to 82,539 in 2009 as both Bannock County and southeastern Idaho were being discovered (Idaho Department of Labor 2011b). Franklin County has experienced rapid population growth in the past 10 years, becoming part of the Logan, Utah, metropolitan statistical area in the 2000 Census as a result of commuting patterns. The population grew 12.8 percent over the decade to 12,676 in 2009. Located on the Idaho-Utah border, the county became a magnet for Utah residents seeking available land, affordable housing, and a rural lifestyle (Idaho Department of Labor 2011c).

Since 2000, Cache County has grown by 21,265 people overall—a nearly 24 percent increase—while Rich County has grown by 15 percent, almost half as much as the total growth in Utah (26 percent). Both counties have benefited from the development of Bear Lake as a popular recreation area with resorts, public beaches, and summer homes.

The area population increased 16 percent from 1998 to 2008, compared with a 22 percent 26 percent increase for the States of Idaho and Utah, respectively. According to 2010 Census data, the population generally increased; from April 2000 to April 2010 Utah ranked third nationally in percentage of population growth (24 percent) and Idaho ranked fourth (21 percent), compared to 10 percent growth nationwide (U.S. Census Bureau 2010; Idaho Department of Labor 2010). Per capita income in the five-county area increased by 10 percent from1998-2008, while the United States increased by 12 percent. Per capita income was not reported in the 2010 Census.

Table 5.11. Summary of Population and Per Capita Income

County	Population			Per Capita Income	
	2010[1]	2008[2]	% Change 1998-2008	2008[2]	% Change 1998-2008
Idaho	**1,567.6**	**1,527.5**	**22%**	**$32,994**	**12%**
Bannock	83.8	81.3	9%	$28,902	10%
Bear Lake	6.0	5.8	-8%	$28,114	30%
Franklin	12.8	12.5	13%	$26,634	14%
Utah	**2,763.9**	**2,727.3**	**26%**	**$31,936**	**9%**
Cache	112.7	111.9	24%	$25,863	9%
Rich	2.3	2.1	15%	$30,116	18%
Area Total	**216.5**	**213.6**	**16%**	**$25,571**	**10%**
United States	308,745.5	304,374.8	10%	$40,116	12%

Population in thousands; per capita income in 2009 dollars.
Source: [1]U.S. Census Bureau 2010. [2] U.S. Department of Commerce 2010.

Along with population growth, population in Idaho and Utah also became more diversified from the 2000 Census to 2010 Census. Although the counties and states are still less ethnically diverse than the nation, as a whole, the population demographics diversified from 2000 to 2010, particularly with population growth of Black, Asian, Pacific Islanders, and Hispanic persons. In Bear Lake County, persons identifying themselves as Hispanic had a percentage growth of 40.3 percent, increasing the population from 2.4 percent in 2000 to 3.6 percent in 2010 (Busselberg 2011).

Bear Lake and Franklin Counties in Idaho and Rich County in Utah homeownership rates (83.1 percent, 80.8 percent, and 83.9 percent respectively) are higher than the State averages. Rich County has the lowest poverty rate. All five counties have a higher high school graduation rate compared to their respective States. Table 5.12 shows selected demographic characteristics and social statistics for Idaho and Table 5.13 shows the characteristics for Utah.

Table 5.12. Selected Demographic and Social Statistics for Idaho

Population Parameter	Bannock County	Bear L. County	Franklin County	Idaho	% Change 2000-2010 (Idaho)
White persons, percent, 2010	89.8%	96.3%	94.4%	89.1 %	18.6%
Black persons, percent, 2010	0.8%	0.1%	0.2%	0.6%	79.8%
American Indian and Alaska Native persons, percent, 2010	3.2%	0.5%	0.4%	1.4%	21.5%
Asian persons, percent, 2010	1.3%	0.4%	0.1%	1.2%	60.4%
Native Hawaiian and Other Pacific Islander, percent, 2010	0.2%	0.0%	0.1%	0.1%	77.1%
Persons of Hispanic or Latino origin, percent, 2010	6.7%	3.6%	6.6%	11.2%	73.0%
High school graduates, percent of persons age 25+, 2000	87.5%	85.5%	88.2%	84.7%	--
Homeownership rate, 2000	70.7%	83.1%	80.8%	72.4%	--

Population Parameter	Bannock County	Bear L. County	Franklin County	Idaho	% Change 2000-2010 (Idaho)
Persons below poverty level, percent, 2008	14.1%	11.7%	9.3%	12.5%	--

Source: U.S. Census Bureau 2010. Notes: -- No data provided in 2010 Census.

Table 5.13. Selected Demographic and Social Statistics for Utah

Population Parameter	Cache County	Rich County	Utah	% Change 2000-2010
White persons, percent, 2010	89.1%	97.0%	86.1%	19.4%
Black persons, percent, 2010	0.6%	0.0%	1.1%	65.9%
American Indian and Alaska Native persons, percent, 2010	0.6%	0.7%	1.2%	10.9%
Asian persons, percent, 2010	1.9%	0.3%	2.0%	49.0%
Native Hawaiian and Other Pacific Islander, percent, 2010	0.4%	0%	0.9%	62.1%
Persons of Hispanic or Latino origin, percent, 2010	10.0%	4.2%	13.0%	77.8%
High school graduates, percent of persons age 25+, 2000	90.4%	91.5%	87.7%	--
Homeownership rate, 2000	64.6%	83.9%	71.5%	--
Persons below poverty level, percent, 2008	11.8%	9.0%	9.7%	--

Source: U.S. Census Bureau 2010. Notes: -- No data provided in 2010 Census.

5.8.2 Employment and Business

In the study area, area employment increased by 25 percent but was outpaced by the Idaho state total (28 percent) and Utah state total (30 percent). The study area had a larger employment increase than the United States (15 percent). Although population has been declining in Bear Lake County, employment had a slight increase, although not as much as other counties. During the last 10 years Bear Lake County's labor market has been tight, providing jobs for most individuals who wanted to live in the county. The county's civilian labor force increased 12.5 percent since 1999, or 369 people (Idaho Department of Labor 2011a). Table 5.14 shows a summary of employment from 2008 in the study area.

Table 5.14. Summary of Employment (in thousands), 2008

County	Employment	
	2008	**% Change 1998-2008**
Idaho	**939.8**	**28%**
Bannock	48.4	21%
Bear Lake	3.3	15%
Franklin	5.9	29%
Utah	**1,702.5**	**30%**
Cache	66.0	29%
Rich	1.4	42%
Area Total	**125.1**	**25%**
United States	**181,755.1**	**15%**

Source: U.S. Department of Commerce 2010.

The largest industry sectors of the five-county area are ranked below by employment (Table 5.15). The largest employer is the State and local government. Food services and retail stores, which are both impacted by Refuge and WPA visitation, are also important contributors to the economy. Cheese manufacturing has comparatively low employment, but has the highest overall output of the area. For Bear Lake County alone, government accounted for 37 percent of the nonfarm jobs in a county where the Federal government manages 46 percent of the land. During the last decade the industry composition has changed little with government, trade, and services supplying most of the nonfarm jobs (Idaho Department of Labor 2011a). In Bannock County over the last decade, food manufacturing and construction employment increased dramatically. While all industries suffered, retail, transportation, and professional and business services lost the most jobs (Idaho Department of Labor 2011b). With a diverse, skilled labor force, Franklin County has consistently had one of the lowest unemployment rates in southeastern Idaho. Many residents commute to Logan, Utah, and some continue to work in the oil fields of neighboring Wyoming and Utah, and over the decade, most job growth occurred in services, trade and construction (Idaho Department of Labor 2011c).

Cache County was ranked 10th highest percentage of job growth from 2000 through 2009 in Utah, with 42.6 percent job growth during the period. Cache County has a diverse economy, with Utah State University conducting extensive aerospace research and the county having several medical services companies. It also has a young population, access to outdoors, and strong local government and public school job sectors.

Table 5.15. Industry Summary for the Study Area (thousands)

Industry	Employment	Output	Employment Income
Government	18.8	$1,008,622.6	$890,509.4
Food Services	6.1	$280,075.0	$83,133.1
Health and Social Services	5.3	$330,486.0	$192,536.0
Retail Stores	2.6	$134,768.6	$57,950.3
Wholesale trade	2.5	$326,917.3	$119,171.1
Employment Services	2.3	$59,201.8	$37,983.2
Construction	2.3	$294,677.8	$79,969.4
Business support services	2.0	$119,159.4	$53,423.1
Sporting Goods Manufacturing	1.9	$411,801.1	$99,421.2
Cheese Manufacturing	1.3	$1,180,283.4	$73,907.7

Source: Minnesota IMPLAN Group, Inc. 2008.

5.8.3 Refuge Impact on Local Economies

From an economic perspective, Bear Lake NWR and Oxford Slough WPA provide a variety of environmental and natural resource goods and services used by people either directly or indirectly (Caudill and Henderson 2005). The use of these goods and services may result in economic impacts to both local and state economies. The various services the Refuge provides can be grouped into five broad categories:

1. Maintenance and conservation of environmental resources, services, and ecological processes;
2. Production and protection of natural resources such as fish and wildlife;
3. Production and protection of cultural and historical sites and objects;
4. Provision of educational and research opportunities; and
5. Outdoor and wildlife-related recreation.

People who use these services benefit in the sense that their individual welfare or satisfaction level increases with the use of a particular good or service. One measure of the magnitude of the change in welfare or satisfaction associated with using a particular good or service is *economic value*. Aside from the effect on the individual, use of the good or service usually entails spending money in some fashion. These expenditures, in turn, create a variety of economic effects collectively known as *economic impacts*. For this report, the term *economic effects* encompasses both economic value and economic impacts.

Economic value is the economic trade-off people would be willing to make in order to obtain some good or service. It is the maximum amount people would be willing to pay in order to obtain a particular good or service minus the actual cost of acquisition. In economic theory this is known as net economic value or consumer surplus (see 1) Freeman and 2) Boyle et al. for a more detailed discussion). In the context of this report, estimates of the economic value of particular recreational activities are used to determine the aggregate value of recreational use of Bear Lake Refuge and Oxford Slough WPA.

Economic impacts refer to employment, employment or labor earnings, industrial or economic output and Federal, local, county and State tax revenue that occur as the result of consumer expenditures on refuge-related goods and services. For this report, two types of impacts are addressed: (1) impacts associated with annual consumer expenditures on refuge and WPA-related recreation; and (2) impacts associated with refuge budget expenditures.

A comprehensive economic profile (baseline) of the refuges and estimates of the economic effects of alternative management strategies would address all applicable economic effects associated with the use of refuge-produced goods and services. However, for those goods and services having nebulous or non-existent links to the market place, economic effects are more difficult or perhaps even impossible to estimate. Some of the major contributions of the refuges to the natural environment, such as watershed protection, maintenance, and stabilization of ecological processes, and the enhancement of biodiversity would require extensive on-site knowledge of biological, ecological, and physical processes and interrelationships even to begin to formulate economic benefit estimates. This is beyond the scope of this section.

This section focuses on a limited subset of refuge goods and services, primarily those directly linked in some fashion to the marketplace, such as recreation use and refuge budget expenditures. It should be kept in mind that the emphasis on these particular market-oriented goods and services should not be interpreted to imply that these types of goods and services are somehow more important or of greater value (economic or otherwise) than the non-market goods and services previously discussed.

The economic area for the Refuge and WPA is the five-county area including Bannock, Bear Lake, and Franklin Counties in Idaho and Cache and Rich Counties in Utah. It is assumed that visitor expenditures occur primarily within this area. Visitor recreation expenditures for 2010 are shown in Table 5.16. Total expenditures were $184,900 with non-residents accounting for $171,500 or 93 percent of total expenditures. Expenditures on non-consumptive activities accounted for 81 percent of all expenditures, followed by hunting and fishing at 18 percent and less than 1 percent respectively.

Table 5.16. Visitor Recreation Expenditures (2009 $,000)

Activity	Residents	Non-Residents	Total
Total Non-Consumptive	$9.65	$140.72	$150.37
Total Hunting	$3.5	$30.7	$34.2
Total Fishing	$0.2	$0.1	$0.3
Total Expenditures	**$13.4**	**$171.5**	**$184.9**

Input-output models were used to determine the impact of expenditures on the local area. Table 5.17 summarizes the local economic effects associated with recreation visits. Final demand totaled $156,300 with associated employment of two jobs, $46,800 in employment income and $21,800 in total tax revenue. The final demand is less than the total expenditures due to leakage outside the area economy. That is, the five-county study area does not manufacture/support all the services and products that are purchased by visitors. Therefore, some of the expenditures “leak” to other areas.

Table 5.17. Local Economic Effects Associated with Recreation Visits (2009 $,000)

	Residents	Non-Residents	Total
Final Demand	$11.3	$144.9	$156.3
Jobs	0.2	2.0	2.2
Job Income	$3.4	$43.5	$46.8
Total Tax Revenue	**$1.6**	**$20.2**	**$21.8**

In addition to impacts from recreational visitors, there are also economic effects related to the Refuge's budget which contributes to local and regional economies. Table 5.18 summarizes the economic impact of both salary and non-salary budget expenditures based on the 2010 refuge budget. Table 5.18 shows the jobs, job income, and tax revenues generated by budget expenditures. The Refuge's annual budget generates approximately $176,100 in job income and three jobs. Again, the final demand is less than budget expenditures due to leakage outside the area economy.

Table 5.18. Local Economic Effects Associated with 2010 Refuge Budget (2009 $,000)

	Total
Final Demand	$288.2
Jobs	3
Job Income	$176.1
Total Tax Revenue	**$44.2**

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Wilson's phalarope/© Bill Bouton

Appendices

Appendix A. Appropriate Use Determinations

A.1 Introduction

The Appropriate Refuge Uses Policy outlines the process that the Service uses to determine when general public uses on refuges may be considered. Priority public uses previously defined as wildlife-dependent uses (hunting, fishing, wildlife observation and photography and environmental education and interpretation) under the National Wildlife Refuge System Improvement Act of 1997 are generally exempt from appropriate use review. Other exempt uses include situations where the Service does not have adequate jurisdiction to control the activity and refuge management activities.

In essence, the appropriate use policy, 603 FW 1 (2006), provides refuge managers with a consistent procedure to first screen and then document decisions concerning a public use. When a use is determined to be appropriate, a refuge manager must then decide if the use is compatible before allowing it on a refuge. The policy also requires review of existing public uses. During the CCP process the refuge manager evaluated all existing and proposed refuge uses at Bear Lake National Wildlife Refuge using the following guidelines and criteria as outlined in the appropriate use policy:

- Do we have jurisdiction over the use?
- Does the use comply with applicable laws and regulations (Federal, State, tribal and local)?
- Is the use consistent with applicable Executive orders and Department and Service policies?
- Is the use consistent with public safety?
- Is the use consistent with goals and objectives in an approved management plan or other document?
- Has an earlier documented analysis not denied the use or is this the first the use has been proposed?
- Is the use manageable within available budget and staff?
- Will this be manageable in the future within existing resources?
- Does the use contribute to the public’s understanding and appreciation of the refuge’s natural or cultural resources, or is the use beneficial to the refuge’s natural or cultural resources?

Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality, compatible, wildlife-dependent recreation into the future?

Using this process and these criteria, and as documented on the following pages, the refuge manager determined that the following refuge use(s) are appropriate, and directed that compatibility determinations be completed for each use: research on the Bear Lake NWR, including the Thomas Fork Unit, and the Oxford Slough WPA; agriculture (farming and haying) on the Bear Lake NWR and Oxford Slough WPA; dog walking on the Bear Lake NWR; canoeing and kayaking (nonmotorized boating) on the Bear Lake; and bicycling, cross-country skiing, and snowshoeing on the Bear Lake NWR; and cross-country skiing, and snowshoeing on the Oxford Slough WPA.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Bear Lake

Use: Research

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager: [signature] Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: [signature] Date: 2/11/13

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

A.1.1 Appropriate Uses Justification, Attachment 1

Date: March 15, 2012

Refuge: Bear Lake National Wildlife Refuge (NWR), Oxford Slough WPA

Use: Conducting research on refuge lands and waters

Summary: The Refuge receives requests to conduct scientific research on refuge lands and waters. Research applicants must submit a proposal that outline: 1) study objectives; 2) justification for the study; 3) detailed methodology and schedule; 4) potential impacts on refuge wildlife and/or habitat, including disturbance (short- and long-term), injury, or mortality; 5) personnel required; 6) costs to Refuge, if any; and 7) end products (i.e., reports, publications). Research proposals will be reviewed by refuge staff, and others as appropriate prior to the issuance of a special use permit (SUP). Projects will not be open-ended, and at a minimum, will be reviewed annually.

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

a. Do we have jurisdiction over the use?

The Refuge has jurisdiction over those research projects that are sited within the Refuge's boundaries.

b. Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?

All approved research activities will comply with all applicable laws and regulations. A SUP will be issued, with stipulations and restrictions to ensure compliance with relevant laws and regulations.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

Through the review of individual projects, the Refuge will ensure that research projects are consistent with applicable policies, especially Research on Service Lands Policy (803 FW 1).

d. Is the use consistent with public safety?

Through individual project review, the Refuge will ensure that each project is consistent with public safety. If necessary, stipulations to ensure public safety will be included in the project's SUP.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

Research activities are approved in instances where they can provide meaningful data that may contribute to refuge management and public appreciation of natural resources.

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

This is the first time the use has undergone an appropriate use determination although research has occurred on the Refuge since establishment.

g. Is the use manageable within available budget and staff?

The Refuge receives 1-4 research requests per year. Only projects that are manageable within the current budget and staffing will be approved.

h. Will this be manageable in the future within existing resources?

The proposed activity at current levels will be manageable in the future with the existing resources (see above).

i. Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

The proposed use is beneficial to the Refuge's natural and cultural resources because approved research projects would inform management decisions and contribute to the understanding and appreciation of natural and/or cultural resources.

j. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?

The Refuge will ensure that the research activities will not impair existing or future wildlife-dependent recreational use of the Refuge during individual project review, prior to issuing a SUP for the project.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Oxford Slough WPA

Use: Research

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager: [signature] Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** ~~outside the~~ CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge ~~supervisor must sign concurrence~~.

Refuge Supervisor: [signature] Date: 2/11/13

A compatibility determination is required before the use may be allowed.

**FWS Form 3-2319
02/06**

A.1.2 Appropriate Uses Justification, Attachment 1

Date: June 28, 2012

Refuge: Oxford Slough Waterfowl Production Area (WPA)

Use: Conducting research on WPA lands and waters

Summary: The WPA receives requests to conduct scientific research on WPA lands and waters. Research applicants must submit a proposal that outline: 1) study objectives; 2) justification for the study; 3) detailed methodology and schedule; 4) potential impacts on WPA wildlife and/or habitat, including disturbance (short- and long-term), injury, or mortality; 5) personnel required; 6) costs to WPA, if any; and 7) end products (i.e., reports, publications). Research proposals will be reviewed by WPA staff, and others as appropriate prior to the issuance of a special use permit (SUP). Projects will not be open-ended, and at a minimum, will be reviewed annually.

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

Do we have jurisdiction over the use?

The WPA has jurisdiction over those research projects that are sited within the WPA's boundaries.

b. Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?

All approved research activities will comply with all applicable laws and regulations. A SUP will be issued, with stipulations and restrictions to ensure compliance with relevant laws and regulations.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

Through the review of individual projects, the WPA will ensure that research projects are consistent with applicable policies, especially Research on Service Lands Policy (803 FW 1).

d. Is the use consistent with public safety?

Through individual project review, the WPA will ensure that each project is consistent with public safety. If necessary, stipulations to ensure public safety will be included in the project's SUP.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

Research activities are approved in instances where they can provide meaningful data that may contribute to WPA management and public appreciation of natural resources.

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

This is the first time the use has undergone an appropriate use determination although research has occurred on the WPA since establishment.

g. Is the use manageable within available budget and staff?

The WPA receives 1-2 research requests per year. Only projects that are manageable within the current budget and staffing will be approved.

h. Will this be manageable in the future within existing resources?

The proposed activity at current levels will be manageable in the future with the existing resources (see above).

i. Does the uses contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

The proposed use is beneficial to the WPA's natural and cultural resources because approved research projects will inform management decisions and contribute to the understanding and appreciation of natural and/or cultural resources.

j. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?

The WPA will ensure that the research activities will not impair existing or future wildlife-dependent recreational use of the WPA during individual project review, prior to issuing a SUP for the project.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Bear Lake NWR and Oxford Slough WPA

Use: Agriculture (farming and haying)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager: [signature] Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: [signature] Date: 2/11/13

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

A.1.3 Appropriate Uses Justification, Attachment 1

Date: March 23, 2012

Refuge: Bear Lake National Wildlife Refuge (NWR)

Use: Agriculture (farming and haying) to provide habitat and forage for wildlife

Summary: The Refuge manages pastures, wetlands, and agricultural fields to provide a variety of foods that meet the needs of wintering and migratory waterfowl. Current refuge agricultural practices include haying and planting of crops such as cereal grains and clover. Crops grown on the Refuge (winter wheat, spring barley, and legumes) are selected primarily to provide wildlife with an easily accessible source of high-energy carbohydrates. Hayed ground can provide short cover habitat and newly sprouted browse for wildlife. The Refuge proposes to maintain crops at 154 acres and haying at 2,133 acres.

The Refuge manages crop production using a Cooperative Land Management Agreement (CLMA) involving a negotiated agreement between the Refuge and private farmers to manage lands for both parties. To benefit wildlife, the wheat or barley will be left in the field where it will be available to wildlife. The farmers' share is the haying of a described acreage of refuge land. The Refuge manages other hay fields using Special Use Permits (SUPs). The private farmer or rancher removes hay from refuge lands in exchange for a negotiated or bid price per ton of hay.

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

a. Do we have jurisdiction over the use?

Yes. All proposed activities will take place within refuge boundaries and under the supervision of refuge staff.

b. Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?

Yes.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

The proposed use will provide high energy and readily available forage and cover for wintering and migrating waterfowl and cranes within close proximity to other natural food sources and high quality resting habitat. Crops can provide wildlife with easily accessible high energy foods that are more digestible than native plants, and can reduce foraging time required to meet caloric demands (Raveling 1979, Alisauskas and Ankney 1992, Baldassare and Bolen 2006). Because it will be difficult to meet these conditions by managing natural foods alone, the production of non-genetically modified crops is consistent with the Service's Biological Integrity, Diversity and Environmental Health Policy (601 FW 3) and will help achieve the refuge purposes.

d. Is the use consistent with public safety?

The proposed use is consistent with public safety and, on Bear Lake NWR, will be sited in areas closed to the general public.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

The proposed use is consistent with the Refuge's Draft Habitat Management Plan and Comprehensive Conservation Plan.

f. Is the use manageable within available budget and staff?

The proposed use is manageable with available budget and staff. The use of cooperators and permit holders will save staff time and resources and increase the reliability of successful crop production and haying operations.

g. Will this be manageable in the future within existing resources?

Yes.

h. Does the uses contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

The proposed use is can contribute to the public's understanding and appreciation of the Refuge because hay and crop fields are situated adjacent to county roads where the public can view wildlife.

i. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?

The proposed use does not and will not impair existing or future wildlife-dependent recreational use of the Refuge. Approximately 154 acres will be used for crop production and 2,133 acres for hay; much of these areas are closed to the general public, but viewable from adjacent roads.

Literature Cited

Alisauskas, R.T. and C.D. Ankney. 1992. The cost of egg laying and its relationship to nutritional reserves in waterfowl. Pages 30-61 in: B.D.J. Batt, A.D. Afton, M.G. Anderson, C.D. Ankney, D.H. Johnson, J.A. Kadlec, and G.L. Krapu, eds. Ecology and management of breeding waterfowl. Minneapolis, MN: University of Minnesota Press.

Baldassare, G.A. and E.G. Bolen. 2006. Waterfowl ecology and management. New York, NY: John Wiley and Sons.

Raveling, D.G. 1979. The annual energy cycle of the cackling Canada goose. Pages 81-93 in: R.I. Jarvis and J.C. Bartonek, eds. Management and biology of Pacific Flyway geese. Corvallis, OR: Oregon State University.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Oxford Slough WPA

Use: Agriculture (farming and haying)

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager: [signature] Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: [signature] Date: 2/11/13

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

A.1.4 Appropriate Uses Justification, Attachment 1

Date: June 28, 2012

Refuge: Oxford Slough Waterfowl Production Area (WPA)

Use: Agriculture (farming and haying) to provide habitat and forage for wildlife

Summary: The WPA manages pastures, wetlands, and agricultural fields to provide a variety of foods that will meet the needs of wintering and migratory waterfowl. Current WPA agricultural practices include haying and planting of crops such as cereal grains and clover. Crops grown on the WPA (winter wheat, spring barley, and legumes) are selected primarily to provide wildlife with an easily accessible source of high-energy carbohydrates. Hayed ground can provide short cover habitat and newly sprouted browse for wildlife. The WPA proposes to maintain crops at 30 acres and haying at 150 acres.

The WPA manages crop production using a Cooperative Land Management Agreement (CLMA) involving a negotiated agreement between the WPA and a private farmer to manage lands for both parties. To benefit wildlife, the wheat or barley will be left in the field where it will be available to wildlife. The farmers' share is the haying of a described acreage of WPA land.

For each of the findings listed on FWS Form 3-2319, a justification has been provided below:

a. Do we have jurisdiction over the use?

Yes. All proposed activities will take place within WPA boundaries and under the supervision of WPA staff.

b. Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?

Yes.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

The proposed use will provide high energy and readily available forage and cover for wintering and migrating waterfowl and cranes within close proximity to other natural food sources and high-quality resting habitat. Crops can provide wildlife with easily accessible high energy foods that are more digestible than native plants, and can reduce foraging time required to meet caloric demands (Raveling 1979, Alisauskas and Ankney 1992, Baldassare and Bolen 2006). Because it will be difficult to meet these conditions by managing natural foods alone, the production of non-genetically modified crops is consistent with the Service's Biological Integrity, Diversity and Environmental Health Policy (601 FW 3) and will help achieve the WPA purposes.

d. Is the use consistent with public safety?

The proposed use is consistent with public safety, separated spatially and temporally from public use activities.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

The proposed use is consistent with the WPA's Draft Habitat Management Plan and Comprehensive Conservation Plan.

f. Is the use manageable within available budget and staff?

The proposed use is manageable with available budget and staff. The use of a cooperator will save staff time and resources and increase the reliability of successful crop production and haying operations.

g. Will this be manageable in the future within existing resources?

Yes.

h. Does the uses contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

The proposed use can contribute to the public's understanding and appreciation of the WPA because hay and crop fields are situated adjacent to county roads where the public can view the wildlife using these areas.

i. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?

The proposed use does not and will not impair existing or future wildlife-dependent recreational use of the WPA. Approximately 30 acres will be used for crop production and 130 acres for hay; much of these areas are viewable from adjacent roads.

Literature Cited

Alisauskas, R.T. and C.D. Ankney. 1992. The cost of egg laying and its relationship to nutritional reserves in waterfowl. Pages 30-61 in: B.D.J. Batt, A.D. Afton, M.G. Anderson, C.D. Ankney, D.H. Johnson, J.A. Kadlec, and G.L. Krapu, eds. Ecology and management of breeding waterfowl. Minneapolis, MN: University of Minnesota Press.

Baldassare, G.A. and E.G. Bolen. 2006. Waterfowl ecology and management. New York, NY: John Wiley and Sons.

Raveling, D.G. 1979. The annual energy cycle of the cackling Canada goose. Pages 81-93 in: R.I. Jarvis and J.C. Bartonek, eds. Management and biology of Pacific Flyway geese. Corvallis, OR: Oregon State University.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Bear Lake

Use: Dog Walking

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager: [signature] Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: [signature] Date: 2/11/13

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

A.1.5 Appropriate Uses Justification, Attachment 1

Date: March 14, 2012

Refuge: Bear Lake National Wildlife Refuge (NWR)

Use: Dog walking

Summary: Allowing dog walking on Bear Lake NWR has been determined to be appropriate because visitors enjoy walking with dogs while viewing wildlife.

For findings listed on FWS Form 3-2319 and if deemed necessary a justification has been provided below:

a. Do we have jurisdiction over the use?

Yes.

b. Does the use comply with applicable laws and regulations?

Yes.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

Yes.

d. Is the use consistent with public safety?

Yes, walking with dogs on the Refuge is consistent with public safety Perhaps 20 visits by people with dogs occur on Bear Lake NWR per year. Dogs must be on leash. No negative interactions with other visitors have been observed. Visitors generally take the auto tour route and do not exit their vehicles. Dog walkers use the Entrance Road and have never been observed on the auto tour route.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

Yes.

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

This is the first time the use has undergone an appropriate use determination, although the use has historically occurred infrequently.

g. Is the use manageable within available budget and staff?

Yes.

h. Will this be manageable in the future within existing resources?

Yes.

i. Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

Although dog-walking is not strictly being performed to understand or appreciate the wildlife on the Refuge, the refuge manager has observed dog-walkers watching wildlife through binoculars. In addition, dog-walkers provide an opportunity for staff to interact with the local community to explain the regulations and to share observations of wildlife within "eye-shot" of the dog-walker.

j. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1 for description), compatible, wildlife-dependent recreation into the future?

Dog-walking is restricted to areas open to the general public, and occurs infrequently; therefore it is not impairing existing wildlife-dependent recreational uses. This use should be carefully monitored to reassess appropriateness before the use increases to the point of causing conflicts with wildlife and other visitors.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Bear Lake

Use: Canoeing and kayaking

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate_____ **Appropriate** ✓

Refuge Manager: [signature] Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: [signature] Date: 2/11/13

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

A.1.6 Appropriate Uses Justification, Attachment 1

Date: March 15, 2012

Refuge: Bear Lake National Wildlife Refuge (NWR)

Use: Canoeing and Kayaking

Summary: Allowing canoeing and kayaking on Bear Lake NWR has been determined to be appropriate because of its temporal and spatial separation from nesting bird colonies.

For findings listed on FWS Form 3-2319 and if deemed necessary a justification has been provided below:

a. Do we have jurisdiction over the use?

Yes.

b. Does the use comply with applicable laws and regulations?

Yes.

c. Is the use consistent with applicable Executive orders and Department and Service policies?

Yes.

d. Is the use consistent with public safety?

The Canoe Trail on Bear Lake NWR is consistent with public safety; it is 7,300 feet long and in calm, relatively shallow water. There is ample room to park, offload, and load small craft safely.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

Yes.

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

This is the first time the use has undergone an appropriate use determination, although the use has occurred since the Canoe Trail was constructed on Bear Lake NWR in 2004.

g. Is the use manageable within available budget and staff?

Yes.

h. Will this be manageable in the future within existing resources?

Yes.

i. Does the uses contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

Generally canoeing and kayaking is performed for enjoyment of nature and exercise. The use contributes to the public's understanding and appreciation of the Refuge's natural resources by providing a perspective on wildlife and nature different from that achieved through the auto tour route or on foot.

j. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1 for description), compatible, wildlife-dependent recreation into the future?

Canoeing and kayaking can enhance the visitors' experience of the Refuge and does not impair or reduce the experience of other more traditional wildlife-dependent recreation currently or into the future.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Bear Lake

Use: Bicycling, cross-country skiing, snowshoeing

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ____ **Appropriate** ✓

Refuge Manager: ______ Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** ~~outside the CCP~~ process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: ______ Date: 2/11/13

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

A.1.7 Appropriate Uses Justification, Attachment 1

Date: March 14, 2012

Refuge: Bear Lake National Wildlife Refuge (NWR)

Use: Bicycling, Cross-country skiing, snowshoeing

Summary: Allowing bicycling, cross-country skiing, and snowshoeing on Bear Lake NWR and Oxford Slough WPA has been determined to be appropriate because of its low occurrence and temporal separation from breeding wildlife.

For findings listed on FWS Form 3-2319 and if deemed necessary a justification has been provided below:

a. Do we have jurisdiction over the use?

Yes

b. Does the use comply with applicable laws and regulations?

Yes

c. Is the use consistent with applicable Executive orders and Department and Service policies?

Yes

d. Is the use consistent with public safety?

Perhaps 5 visits by people bicycling occur on Bear Lake NWR per year. Because of this infrequent use, management has no observations or reports of conflicts with vehicle traffic, pedestrians, or wildlife. Approximately 300 visitors enjoy the Refuge in the winter months, facilitated by snowshoes and cross-country skis. These uses have not been observed on the Oxford Slough WPA.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

Yes

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

This is the first time these uses have undergone an appropriate use determination, although the uses have traditionally occurred infrequently.

g. Is the use manageable within available budget and staff?

Yes

h. Will this be manageable in the future within existing resources?

Yes

i. Does the uses contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

Generally bicycling is performed for exercise and enjoyment. However, because the Refuge has graveled (not paved) roads, bicyclers move at a slower pace. Those bicycling strictly for exercise will probably not use the Refuge for that function. It may be postulated that bicyclers coming to the Refuge are doing so for exercise, enjoyment of nature, and wildlife-watching. Because interactions with bicyclers occur so infrequently, no data are currently available to determine their actual motivations.

Snowshoeing is a leisurely activity that is conducive to stopping and watching winter wildlife. Because the Refuge is basically flat, cross-country skiing is also a leisurely activity, although faster paced than the snowshoeing. Cross-country skiing also lends itself to stopping and enjoying wildlife.

j. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1 for description), compatible, wildlife-dependent recreation into the future?

At the present time bicycling, due to its infrequency, is not impairing existing wildlife-dependent recreational uses. This use should be carefully monitored to reassess appropriateness before the use increases to the point of causing conflicts with wildlife and other visitors.

Snowshoeing and cross-country skiing is not a traditional wildlife-dependent recreation. Due to relatively low numbers of visitors partaking in these activities and the fact that they occur in winter when wildlife numbers and wildlife-dependent recreation visitors are at their lowest, these activities can be accommodated without impairing other uses.

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FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Oxford Slough WPA

Use: Cross-country skiing and snowshoeing

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	**YES**	**NO**
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___ **Appropriate** ✓

Refuge Manager: [signature] Date: 12-4-2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: [signature] Date: 2/11/13

A compatibility determination is required before the use may be allowed.

**FWS Form 3-2319
02/06**

A.1.8 Appropriate Uses Justification, Attachment 1

Date: June 28, 2012

Refuge: Oxford Slough Waterfowl Production Area (WPA)

Use: Cross-country skiing, snowshoeing

Summary: Allowing cross-country skiing and snowshoeing on Oxford Slough WPA has been determined to be appropriate because of its low occurrence and temporal separation from breeding wildlife.

For findings listed on FWS Form 3-2319 and if deemed necessary a justification has been provided below:

a. Do we have jurisdiction over the use?

Yes

b. Does the use comply with applicable laws and regulations?

Yes

c. Is the use consistent with applicable Executive orders and Department and Service policies?

Yes

d. Is the use consistent with public safety?

These uses have not been observed on the Oxford Slough WPA but safety issues are unlikely because there are no vehicular roads and trails on the WPA. Conflicts with other visitors are unlikely because of the low level of public use in general on the WPA after freezeup.

e. Is the use consistent with goals and objectives in an approved management plan or other document?

Yes

f. Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?

This is the first time these uses have undergone an appropriate use determination, although the uses have traditionally occurred infrequently.

g. Is the use manageable within available budget and staff?

Yes

h. Will this be manageable in the future within existing resources?

Yes

i. Does the uses contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?

Snowshoeing is a leisurely activity that is conducive to stopping and watching winter wildlife. Because the WPA is basically flat, cross-country skiing is also a leisurely activity, although faster paced than the snowshoeing. Cross-country skiing also lends itself to stopping and enjoying wildlife.

j. Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1 for description), compatible, wildlife-dependent recreation into the future?

Snowshoeing and cross-country skiing is not a traditional wildlife-dependent recreation. Due to relatively low numbers of visitors partaking in these activities and the fact that they occur in winter when wildlife numbers and wildlife-dependent recreation visitors are at their lowest, these activities can be accommodated without impairing other uses.

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Appendix B. Compatibility Determinations

B.1 Introduction

The compatibility determinations (CDs) developed during the comprehensive conservation planning process evaluate uses projected to occur under Alternative 3, the Preferred Alternative in the Draft CCP/EA for the Bear Lake National Wildlife Refuge and the Oxford Slough WPA (USFWS 2012), which has carried forward as the management direction for the Refuge and WPA in this CCP (Chapter 2). The evaluation of funds needed for management and implementation of each use is described in Appendix C, Implementation. Chapter 6 of the Draft CCP/EA also contained an analysis of the impacts of refuge uses to wildlife, and habitats. That document is incorporated through reference into this set of CDs.

B.2 Uses Evaluated at This Time

The following section consists of CDs for all refuge uses that are required to be evaluated at this time. According to Service policy, compatibility determinations must be completed for all uses proposed under a CCP. Existing wildlife-dependent recreational uses must also be re-evaluated and new CDs prepared during development of a CCP or every five years, whichever comes first. Uses other than wildlife-dependent recreational uses are not explicitly required to be re-evaluated in concert with preparation of a CCP, unless conditions of the use have changed or unless significant new information relative to the use and its effects have become available or the existing CDs are more than 10 years old. However, the Service planning policy recommends preparing CDs for all individual uses, specific use programs, or groups of related uses associated with the proposed action. Accordingly, the following CDs are included in this document for public review.

Refuge Use	Compatible	Next Year Due for Re-evaluation
Bear Lake NWR		
Environmental Education, Interpretation, Wildlife Observation, and Photography	yes	2027
Waterfowl Hunting	yes	2027
Upland Game Hunting	yes	2027
Sport Fishing	yes	2027
Research	yes	2022
Agricultural Practices (Farming and Haying)	yes	2022
Dog Walking	yes	2022
Canoeing and Kayaking (Nonmotorized Boating)	yes	2022
Bicycling, Cross-country Skiing, Snowshoeing	yes	2022
Oxford Slough WPA		
Environmental Education, Interpretation, Wildlife Observation, and Photography	yes	2027
Waterfowl Hunting	yes	2027
Hunting of Resident Game and Furbearers	yes	2027
Trapping of Furbearers	yes	2027

Refuge Use	Compatible	Next Year Due for Re-evaluation
Research	yes	2022
Agricultural Practices (Farming and Haying)	yes	2022
Cross-country Skiing, Snowshoeing	yes	2022

B.3 Compatibility—Legal and Historical Context

Compatibility is a tool refuge managers use to ensure that recreational and other uses do not interfere with wildlife conservation, the primary focus of refuges. Compatibility is not new to the Refuge System; the concept dates back to 1918. As policy, it has been used since 1962. The Refuge Recreation Act of 1962 directed the Secretary of the Interior to allow only those public uses of refuge lands that were "compatible with the primary purposes for which the area was established." If a general public use is determined to be appropriate, the use must then undergo a compatibility review. A compatibility review is required for all appropriate public uses, including wildlife-dependent recreational uses.

The term "compatible use" is defined as a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Refuge Manager, would not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge.

The Administration Act defines sound professional judgment as a finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to other applicable laws. Included in this finding, determination, or decision is a Refuge Manager's field experience and knowledge of the particular Refuge's resources.

Part 603 FW 2 of the Fish and Wildlife Service Manual sets forth the policy and guidelines for determining compatibility of proposed uses and provides procedures for documentation and periodic review of existing uses. In addition, the policy requires an opportunity for public review and comment on all compatibility determinations. When prepared in conjunction with a CCP, compatibility determinations are distributed for public review along with the CCP.

Under compatibility policy, uses are defined as recreational, economic/commercial, or management use of a refuge by the public or a non-Refuge System entity. Uses generally providing an economic return (even if conducted for the purposes of habitat management) are also subject to compatibility determinations. The Service does not prepare compatibility determinations for uses when the Service does not have jurisdiction. For example, the Service may have limited jurisdiction over refuge areas where property rights are vested by others; where legally binding agreements exist; or where there are treaty rights held by tribes. In addition, aircraft over-flights, emergency actions, some activities on navigable waters, and activities by other Federal agencies on "overlay Refuges" are exempt from the compatibility review process.

New compatibility policy, developed in response to the 1997 amendments to the National Wildlife Refuge System Administration Act (Administration Act), was adopted by the Service in October 2000 (http://refuges.fws.gov/policymakers/nwrpolicies.html). The policy requires that a use must be compatible with both the mission of the System and the purposes of the individual refuge. This standard helps to ensure consistency in application across the Refuge System.

The Service recognizes that compatibility determinations are complex. For this reason, refuge managers are required to consider "principles of sound fish and wildlife management" and "best available science" in making these determinations (House of Representatives Report 105-106). Evaluations of the existing uses on Bear Lake NWR, the Thomas Fork Unit, and the Oxford Slough WPA are based on the professional judgment of refuge personnel including observations of refuge uses and reviews of appropriate scientific literature.

The Refuge Manager has the authority to determine, by exercising sound professional judgment, what is a compatible use. In addition to determining if a use would materially interfere with or detract from the fulfillment of the System mission or the purposes of the Refuge, the Refuge Manager must also evaluate the direct and indirect impacts of a use on refuge resources. Further, the cumulative impacts of the use when conducted in conjunction with other existing or planned uses of the Refuge must also be considered. After evaluating the anticipated impacts of a proposed use and determining if any stipulations (terms or conditions) are needed to avoid or minimize potential adverse impacts, the Refuge Manager would determine whether or not the use is compatible. This determination is documented in writing and is available for review by the public.

A proposed use can be denied without determining compatibly under certain circumstances, such as instances in which:

1. A proposed use would conflict with other applicable laws or regulations;
2. The use would result in conflicts with the goals or objectives of an approved CCP; or
3. A use is determined to be inconsistent with public safety.

Refuges are closed to all public uses until officially opened. Regulations require that adequate funds be available for administration and protection of refuges before opening them to any public uses. However, wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are to receive enhanced consideration and cannot be rejected simply for lack of funding resources unless the Refuge has made a concerted effort to seek out funds from all potential partners. Once found compatible, wildlife-dependent recreational uses are deemed the priority public uses at a refuge. If a proposed use is found not compatible, the use must be modified to be compatible or if the use cannot be modified to be compatible, then the use may not be allowed. Economic uses that are conducted by or authorized by the Refuge also require compatibility determinations.

B.4 References

House of Representatives Report 105-106 (on NWRSIA): http://refuges.fws.gov/policyMakers/mandates/HR1420/part1.html

U.S. Fish and Wildlife Service. National Wildlife Refuge System Policies. Compatibility regulations adopted by the Service in October 2000. Available at: http://refuges.fws.gov/policymakers/nwrpolicies.html.

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B.5 Compatibility Determination for Wildlife Observation and Photography, Interpretation, and Environmental Education on Bear Lake National Wildlife Refuge

RMIS Database Uses: Wildlife Observation, Wildlife Photography, Interpretation, and Environmental Education

Refuge Name: Bear Lake National Wildlife Refuge (NWR)

Location: Bear Lake County, Idaho

Date Established: 1968

Establishing and Acquisition Authorities:

- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

- "… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species … " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "… the Secretary … may accept and use … real … property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors …" 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "… to conserve (A) fish or wildlife which are listed as endangered species or threatened species … or (B) plants … " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "… for the development, advancement, management, conservation, and protection of fish and wildlife resources … " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "… for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude … " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Non-consumptive wildlife-dependent recreation (defined here as wildlife observation, photography, environmental education and interpretation) are designated as priority public uses under the Refuge Improvement Act and can enhance the users' appreciation of the Refuge, the National Wildlife Refuge System, wildlife, their habitats, and the human environment.

Current Use: Currently, most use is self-guided and occurs on roads and trails. Due to the often harsh and long winters in the Bear Lake area, most of this use occurs during the late spring, summer, and early fall. The 2.4-mile Auto Tour Route (Salt Meadow Unit Wildlife Observation Route) is open to vehicle and foot traffic year round, although it may be impassable in winter. The accessible 1.9-mile pedestrian trail is open March 15-September 20. Hiking is permitted year round on all roads open to vehicle travel. The 7,400-foot Canoe Trail is open July 1 to September 20. Pedestrian access is allowed throughout the seasonally open area of the Refuge (7,450 acres, including the Salt Meadow, Rainbow sub-impoundment, and Rainbow units; the Mud Lake Unit north of the buoy line and east of the County Road, and the Merkley Lake Unit) from July 1 to January 20; however since most of this area is deep marsh and open water, few (if any) hikers venture off the roads, trails, and dikes. Motorized and nonmotorized boats can be used in this area from September 20-January 15, however few visitors other than hunters use the area for boating

Proposed Use: The Refuge will maintain facilities for self-guided wildlife observation and photography: the 2.4-mile Auto Tour Route, 1.9-mile seasonal pedestrian trail, two ABA-accessible photography blinds, and the 1.5-mile seasonal Canoe Trail. To promote visitor safety and limit disturbance to wildlife, we propose to eliminate free-roam pedestrian and boat access in the seasonally open area in the management direction, other than for hunting access. Pedestrian use will continue to be allowed on service roads and dikes within this area, July 1-Feb 28. Nonmotorized boating will be permitted on the Canoe Trail July 1-Sept 20. Off-trail activities will require a Special Use Permit from the Refuge.

Additional opportunities for wildlife observation, photography, environmental education, and intepretation will be provided under the management direction via the construction of two well-developed turn-out and parking areas along Merkley Lake Road (the southeast boundary of the Refuge) to increase opportunities for wildlife viewing and interpretation of the Mud Lake Unit. One of the turn-outs will have an interpretive panel; the other, interpretive panels and an observation platform and seasonal spotting scope. Additionally, the CCP will provide a boardwalk and elevated wildlife viewing platform with interpretive panels on the southeast border of the Refuge along North Beach Road. Spotting scopes will be added to the accessible walking trail and auto tour route. At least one guided wildlife-based Refuge tour per month will be provided from May-September. Guided tours will be limited to 15 visitors. Interpretive materials are also available to visitors through interpretive panels, kiosks along the Rainbow dike/road, at the Refuge Office, and from Refuge brochures. Other facilities supporting this use are parking areas, a boat launch for canoes and kayaks, and restrooms.

Need and Availability of Resources:

Category and Itemization	One-time ($000)	Annual ($000/yr)
Administration and management:	$0	$5k
Maintenance: Existing and proposed public use facilities	$0	 $50k
Monitoring: Law enforcement and biological	$0	$10k
Special equipment, facilities, or improvements: Development of pull-outs and viewpoints along roads Design and construction of elevated viewing platform, boardwalk, and interpretive panels	 $300k $50k	$0
Offsetting revenues: TOTALS	$0 $350k	$0 $65k

Once the CD is approved through the CCP process, Federal funds will be requested through the Service budget process. Other sources (monetary and non-monetary) will be sought through strengthened partnerships, grants, coordination with other agencies, and additional Refuge operations funding to support a safe, quality public use program. Increased volunteer assistance, strengthened existing partnerships, and new partnerships will be sought to support these programs in an effective, safe, and compatible manner. Refuge staff will increase volunteer recruit efforts. Volunteers, interns, and various user groups when provided appropriate training can assist the Refuge with monitoring, education and interpretation programs, and maintenance projects. With additional assistance as described above, staffing and funding is expected to be sufficient to manage these uses.

Anticipated Impacts of the Use(s):

Impacts resulting from the proposed use include both direct and indirect impacts to wildlife resources and the associated habitat. Direct impacts have an immediate effect on wildlife and generally result from the public's interaction with wildlife. Indirect impacts include actions taken by the public that would impact habitat or reduce access to habitat.

Effects to Habitat. The primary impact visitors engaged in wildlife observation and photography have on habitat is the trampling of vegetation and creation of social trails. Trail widening and creation of social trails increases the area of disturbed land (Liddle and Greig-Smith 1975, Dale and Weaver 1974, Adkison and Jackson 1996). Pedestrians can potentially cause structural damage to plants and increase soil compaction and erosion (DeLuca et al. 1998, Whittaker 1978). These impacts are unlikely to occur on the well-defined, gravel surface of Refuge trails, however, social trails associated with off-trail use remains an issue for Refuge managers as plants are trampled and wildlife is disturbed. Control of invasive plant species on the Refuge is a difficult and never-ending battle. Roads and trails often function as conduits for movement of plant species, including nonnative, invasive species (Benninger-Truax et al. 1992, Hansen and Clevenger 2005). Propagules of non-native plants can be transported into new areas on hikers' boots, clothing, and equipment (Benninger-Traux et al. 1992). Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. Invasive plants and animals will be controlled and monitored as part of the Refuge's Integrated Pest Management Plan.

Effects to Wildlife. Immediate responses by wildlife to recreational activity can range from behavioral changes including nest abandonment, altered nest placement, change in food habits, physiological changes such as elevated heart rates and increased energetic costs due to flight or flushing, or even death (Knight and Cole 1995, Belanger and Bedard 1990, Morton et al. 1989, Miller et al. 1998, Miller and Hobbs 2000, Knight and Swaddle 2007, Smith-Castro and Rodewald 2010). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

According to Knight and Cole (1991), there are three wildlife responses to human disturbance: 1) avoidance; 2) habituation; and 3) attraction. The magnitude of the avoidance response may depend on a number of factors including the type, distance, movement pattern, speed, and duration of the disturbance, as well as the time of day, time of year, weather; and the animal's access to food and cover, energy demands, and reproductive status (Knight and Cole 1991; Gabrielsen and Smith 1995, Fernandez-Juricic 2007).

Habituation is defined as a form of learning in which individuals stop responding to stimuli that carry no reinforcing consequences for the individuals that are exposed to them (Alcock 1993). A key factor for predicting how wildlife would respond to disturbance is predictability. Often, when a use is predictable—following a trail or boardwalk or at a viewing deck—wildlife habituate to and accept human presence (Oberbillig 2000). Gabrielsen and Smith (1995) suggest that most animals seem to have a greater defense response to humans moving unpredictably in the terrain (e.g., off-trail hikers) than to humans following a distinct path.

<u>Direct impacts:</u> We expect these impacts to include the presence of humans disturbing wildlife, which typically results in a temporary displacement of individuals. Some species, such as greater sandhill cranes, avoid the areas people frequent, such as the developed trails and the Auto Tour Route, while others such as raccoons and skunks seem unaffected by or even drawn to the presence of humans.

Negative impacts to wildlife have been documented when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Responses of wildlife to human activities include: departure from site, use of suboptimal habitat, altered behavior (Burger 1981, Morton et al. 1989, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day. The location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller, 1998). Klein (1989) found that migratory dabbling ducks to be the most sensitive to disturbance, and that migrant ducks were more sensitive when they first arrived, in the late fall, than later in winter. She also found gulls and sandpipers to be apparently insensitive to human disturbance, with Burger (1981) finding the same to be true for various gull species. Gutzwiller et al. (1997) found that singing behavior of some songbirds was altered by low levels of human intrusion. Pedestrian travel can impact normal behavioral activities, including feeding, reproductive, and social behavior. Studies have shown that ducks and shorebirds are sensitive to pedestrian activity (Burger 1981, 1986). Resident waterbirds that are regularly exposed to human disturbance tend to be less sensitive than migrants, especially when migrants first arrive at a site (Klein 1993). In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

Burger (1981) found that wading birds were extremely sensitive to disturbance in the northeastern United States. Disturbance during critical times in the breeding cycle may cause colony abandonment in colonial-nesting waterbirds. White-faced ibis are susceptible to colony abandonment resulting from human intrusion into colonies during the early nesting period (Ryder and Manry 1994). While gulls are relatively insensitive to disturbance while foraging away from breeding colonies, they can be extremely sensitive to human disturbance at nesting sites. Franklin's gulls are particularly sensitive to human disturbance early in the breeding cycle and again during the chick phase, and would abandon with excessive human exposure (Guay 1968). Abandonment of nests is less likely with young than eggs but may still occur with repeated disturbance (Burger and Gochfeld 1994).

Because they are relatively quiet and slow moving, canoes and kayaks cause less disturbance to wildlife than motorized boats, however because these boats can maneuver close to shorelines, the potential for disturbance exists.

To help mitigate these impacts, wildlife observation and photography, interpretation, and environmental education will be allowed only on the 2.4-mile Auto Tour Route and proposed North Bear Road boardwalk year round; on the 1.9-mile accessible walking trail from March 15-Sept 20; on the Canoe Trail July 1-Sept 20; and on roads and dikes only in the 7,450-acre seasonally open area, July 1-February 28.

Cumulative and indirect/secondary impacts: People can be vectors for invasive plants by moving seeds or other propagules from one area to another. Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. The threat of invasive plant establishment will always be an issue requiring annual monitoring and treatment when necessary. Refuge staff will work at eradicating invasive plants and educating the visiting public. Providing and maintaining access points to the Refuge indirectly impacts wildlife by creating barriers to movement, through vegetation removal and management, and abrupt edge creation that may lead to increased predation (Ratti and Reese 1988). Trail edges may concentrate prey species and may be used by predators as travel corridors. Other indirect impacts may include the deposition of litter and erosion caused by the damage to vegetation from trampling.

Despite the potential for the above effects to result from public visitation, the physical impacts, disturbance to wildlife and habitat, and disturbances on the Refuge are expected to be intermittent, minor, and short-term, and in the context of the amount of the Refuge closed to public use (sanctuary) allowing these uses on the Refuge are not expected to diminish the value of the Refuge for its stated purposes.

Summary and Application to Bear Lake NWR. Since Bear Lake provides important breeding habitat for migratory waterfowl and waterbirds, the primary concern on Bear Lake NWR will be disturbance to wildlife (especially colonial nesting birds) during the breeding season, which coincides with the peak season for public use on the Refuge. Most wildlife observation and photography takes place on the Auto Tour Road, the Refuge entrance road, and the 1.9-mile pedestrian trail, as well as county roads at the periphery of the Refuge. In the seasonally open area of the Refuge (7,450 acres), access for wildlife observation and photography, interpretation, and environmental education will be restricted to pedestrian use of service roads and dikes from July 1 to February 28. The Canoe Trail is open to public use July 1-Sept 20. These facilities are all located at least 250 feet from nesting colonies of white-faced ibis, Franklins' gulls, and other colonial nesting birds. Most birds have fledged before the Canoe Trail is open for public use. In addition, confining pedestrian and vehicle access to designated roads and trails allows wildlife to habituate to the presence of humans.

Disturbance caused by nonmotorized boats using the Canoe Trail will be limited by the small area (1.5-mile trail) and limited time (July 1-Sept 20) in which this use occurs.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination: (check one below)

___Use is Not Compatible

_X_Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Activities associated with this proposed use are restricted to those portions of the Refuge that are open to the general public during daylight hours.
- Adherence to seasonal use restrictions to reduce disturbance to nesting waterfowl and other wildlife.
- Camping, overnight use, and fires are prohibited.
- Littering is prohibited.
- Collection of plants and animals is prohibited unless a Special Use Permit is obtained from the Refuge (except wildlife captured while engaged in fishing and hunting).
- The Refuge will provide signs and brochures. These materials will clearly state pertinent Refuge-specific regulations. Verbal instructions from Refuge staff will promote appropriate use of trails and blinds to minimize wildlife and habitat disturbance.
- The Refuge will periodically monitor and evaluate sites and programs to determine if objectives are being met and the resource is not being degraded.

Justification:

Wildlife Photography, Observation, Interpretation, and Environmental Education are listed as priority wildlife-dependent uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Service's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and to ensure that they receive enhanced attention during planning and management. Facilitating these uses on the Refuge will increase visitor knowledge and appreciation of fish and wildlife resources. This enhanced understanding will foster increased public stewardship of natural resources and support for the Service's management actions in achieving the refuge purposes and the mission of the National Wildlife Refuge System.

There is more than an adequate amount of undisturbed habitat available to the majority of waterfowl, waterbirds, and other wildlife for escape and cover, such that their abundance and use of the Refuge will not be measurably lessened from allowing wildlife observation and photography, interpretation, and environmental education to occur. There is no evidence that these uses at current participation levels materially interfere with the purposes of the refuge. Stipulations will help reduce or eliminate any unwanted impacts of these uses. The relatively limited number of individual animals expected to be adversely affected due to these uses will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing wildlife observation and photography, interpretation, and environmental education will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the Refuge was established.

Mandatory 10- or 15-Year Re-evaluation Date: (provide month and year for "allowed" uses only)

_X_ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

___Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

___Categorical Exclusion without Environmental Action Statement

___Categorical Exclusion and Environmental Action Statement

_X_ Environmental Assessment and Finding of No Significant Impact

___Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 1, Wildlife Observation, Photography, Environmental Education, and Interpretation at Bear Lake NWR:

Prepared by: Adele King (Signature) 12-4-2012 (Date)

Refuge Manager/ Project Leader Approval: Lisa Casselman (Signature) 12/6/12 (Date)

Concurrence

Refuge Supervisor: (Signature) 2/11/13 (Date)

Acting Regional Chief, National Wildlife Refuge System (for HI, ID, OR, PI, and WA): (Signature) 2/11/13 (Date)

B.6 Compatibility Determination for Waterfowl Hunting on Bear Lake National Wildlife Refuge

RMIS Database Uses: Waterfowl Hunting

Refuge Name: Bear Lake National Wildlife Refuge (NWR)

Location: Bear Lake County, Idaho

Date Established: Bear Lake NWR: 1968

Establishing and Acquisition Authorities:

- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

- "… for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "… suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species … " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "… the Secretary … may accept and use … real … property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors … " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species … or (B) plants … " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "... for the development, advancement, management, conservation, and protection of fish and wildlife resources … " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude … " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd et seq.).

Description of Use(s):

The U.S. Fish and Wildlife Service (Service) proposes to continue to allow hunting of waterfowl (ducks, geese, mergansers, and coots) and common snipe on Bear Lake NWR in accordance with State and Federal regulations. Waterfowl and migratory bird hunting in the United States is guided by an established regulatory process that involves numerous sources of waterfowl population and harvest data. Harvest data are reported by hunters to the State and season and bag limits are adjusted accordingly to ensure that overall populations of game species remain healthy into the future.

The Refuge has provided a public waterfowl hunting area since it was established in 1968. Hunting of ducks, geese, coots, mergansers, and snipe is allowed on approximately 7,450 acres of the Refuge, on the following units: Salt Meadow, Rainbow sub-impoundment, Rainbow, Mud Lake north of the buoy line and east of the County Road, and Merkley Lake. Waterfowl hunting is permitted seven days per week, from sunrise to sunset, during the State waterfowl hunting season. No Refuge-specific permits or hunter check-in procedures are required.

The State waterfowl season typically starts the first of October and runs through the end of January. The Refuge allows a youth hunt according to Idaho State regulations, which is usually the weekend prior to the regular hunting season opener. Shooting hours correspond to State regulations (½ hour before sunrise until sunset). Non-toxic shot is required, and hunters may not possess lead shot in the field. Because they reduce the loss of waterfowl to the hunter's bag and hence can reduce the overall impact to the resource, dogs used in support of hunting are allowed on the Refuge.

Because of the high elevation at the refuge, most waterfowl hunting occurs in early October before temperatures drop. Freezing of the marsh usually occurs by the middle of November, so quality hunting usually ends early, even though the Idaho waterfowl hunting season remains open into January. Waterfowl hunting visits are estimated at 185 visits annually.

Primary access for hunting is by boat along the canals. Hunters may use motorized or nonmotorized boats to access hunting areas from September 20 to January 15. Air thrust boats are prohibited. Boats can be launched at the following five boat ramps: Paris, Rainbow west (two ramps), Rainbow east, and from Merkley Lake Road. Walk-in hunting is allowed. Walk-in access can occur from the Rainbow Dike. Parking is allowed in designated areas only.

Temporary blinds of natural vegetation may be constructed, but such blinds are available for general use on a first-come, first served basis. Construction of permanent blinds is prohibited. The Refuge's two Architectural Barriers Act (ABA)–compliant hunting/photography blinds are available to disabled sportsmen on a first come, first served basis one-half hour before sunrise to one half hour after sunrise. After this time, they are available to the general hunting public. These blinds are open for use September 20-January 20. Reservations are not required.

Supporting access to the hunting area are an information kiosk devoted to current hunting information, five boat ramps with parking areas, restrooms along the main access road, and a trail spur from the Rainbow Dike. Refuge staff conducts annual maintenance on the dikes and trail spur, hunt blinds, boat ramps, and parking areas, including mowing and gravelling as needed.

Need and Availability of Resources:

Category and Itemization	One-time ($000)	Annual ($000/yr)
Administration and management:	$0	$3k
Maintenance: Roads, boat ramps, buoys, blinds, signs, water delivery	$0	 $40k
Monitoring: Law enforcement	$0	 $5k
Offsetting revenues: TOTALS	$0 $0	$0 $48k

Once the CD is approved through the CCP process, Federal funds will be requested through the Service budget process. Other sources (monetary and non-monetary) will be sought through strengthened partnerships, grants, coordination with other agencies, and additional Refuge operations funding to support a safe, quality public use program.

Anticipated Impacts of the Use(s):

Impacts to Habitat. The primary impact hunters have on habitat is the trampling of vegetation and creation of social trails, which in turn often function as conduits for movement of plant species, including nonnative, invasive species (Benninger-Truax et al. 1992, Hansen and Clevenger 2005). The impacts of waterfowl hunters on Refuge habitat is expected to be minor. The hunting season on the Refuge starts and ends outside of the growing season of most plants, and is short due to early freeze-up, so trampling and the spread of invasive plants is not a major issue. There is a possibility of boats used for waterfowl hunting aiding in the spread of aquatic invasive species into the waters of the Refuge. Informational media in hunting brochures, placards at Refuge launch areas; periodic inspections and early detection monitoring help reduce the likelihood of infestation.

Impacts to Wildlife (General). Hunting, by its nature, results in the intentional take of individual animals, as well as wounding and disturbance (DeLong 2002). It can also alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, and Cole and Knight 1990). Waterfowl are wary, seeking refuge from all forms of disturbance, but particularly those associated with loud noise and rapid movement (Dahlgren and Korschgen 1992). Numerous studies show human activities associated with hunting (boating, vehicle disturbance, human presence) cause increased flight time in waterfowl species, which requires a considerable amount of energy (Kahl 1991, Havera et al. 1992, Knapton et al. 2000, Kenow et al. 2003). Human disturbance compels waterfowl to change feeding habits, for example, feeding only at night or deserting feeding areas entirely, resulting in weight loss (Dahlgren and Korschgen 1992).

In addition to loss of individuals of target species, hunting causes disturbance to non-target species because of noise (most notably the report of a firearm), human presence, and general disturbance associated with the activity. Hunting results in the increase of non-target species being injured or killed (accidentally or intentionally) in addition to waterfowl being crippled or killed and not retrieved. These disturbances are manifested by alertness, fright (obvious or unapparent), flight, swimming, disablement or death in non-target species (Dahlgren and Korschgen 1992).

Hunting can contribute to the well-being of wildlife by giving people a deeper appreciation of wildlife and a better understanding of the importance of wildlife and habitat conservation, which ultimately contributes to the NWRS mission. The hunting community remains the largest support base for funding wildlife management programs and Refuges provide an opportunity for a high-quality waterfowl hunting experience to all citizens regardless of economic standing. Many individual Refuges have developed extensive public information and education programs bringing hunters into contact with Refuge activities and facilitating awareness of wildlife issues beyond hunting. Hunting is one of the six priority public uses of the NWRS.

Impacts of Hunting on Waterfowl.

<u>*Impacts on waterfowl populations:*</u> The hunting of waterfowl in the United States is based upon a thorough regulatory setting process that involves numerous sources of waterfowl population and harvest monitoring data. Waterfowl populations throughout the United States are managed through an administrative process known as flyways, of which there are four (Pacific, Central, Mississippi, and Atlantic). Idaho is included in the Pacific Flyway. A review of the policies, processes, and procedures for waterfowl hunting is covered in a number of documents.

Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds be closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR 20) establishing the Migratory Bird Hunting Frameworks. The frameworks are essentially permissive, in that hunting of migratory birds would not be permitted without them. Thus, in effect, annual Federal regulations both allow and limit the hunting of migratory birds. The Migratory Bird Hunting Frameworks provide season dates, bag limits, and other options for states to select from, which should result in the level of harvest determined to be appropriate based upon Service-prepared annual biological assessments detailing the status of migratory game bird populations. In North America, the process for establishing waterfowl hunting regulations is conducted annually. In the United States, the process involves a number of scheduled meetings (Flyway Study Committees, Flyway Councils, Service Regulations Committee, etc.) in which information regarding the status of waterfowl populations and their habitats is presented to individuals within the agencies responsible for setting hunting regulations. In addition, public hearings are held and the proposed regulations are published in the Federal Register to allow public comment.

For waterfowl, annual assessments used in establishing the Frameworks include the Breeding Population and Habitat Survey, which is conducted throughout portions of the United States and Canada. This survey is used to establish an annual Waterfowl Population Status Report. In addition, the number of waterfowl hunters and resulting harvest are closely monitored through both the Harvest Information Program (HIP) and the Parts Survey (Wing Bee). Since 1995, such information has been used to support the adaptive harvest management (AHM) process for setting duck-hunting regulations. Under AHM, a number of decision-making protocols determine the choice (package) of pre-determined regulations (appropriate levels of harvest) that comprise the framework offered to states that year. Each state's wildlife commission then selects season dates, bag limits, shooting hours, and other options from the their prospective Flyway package. Their selections can be more restrictive, but cannot be more liberal than AHM allows. Thus, the level of hunting opportunity afforded each state increases or decreases each year in accordance with the annual status of waterfowl populations.

Season dates and bag limits for National Wildlife Refuges open to hunting are never longer or larger than the State regulations. In fact, based upon the findings of an environmental assessment developed when a Refuge opens a new hunting activity, season dates and bag limits may be more restrictive than the State allows. Each National Wildlife Refuge considers the cumulative impacts to hunted migratory species through the Migratory Bird Frameworks published annually in the Service's regulations on Migratory Bird Hunting.

Hunting on refuges as a whole, or Bear Lake NWR specifically, is not likely to have an adverse effect on the status of any recognized waterfowl population in North America. Several points support this contention including (1) the proportion of national waterfowl harvest that occurs on National Wildlife Refuges is small; 2) there are no waterfowl populations that occur wholly or exclusively on National Wildlife Refuges; 3) Annual hunting regulations within the United States are established to levels consistent with the current population status; 4) Refuges cannot permit more liberal seasons than provided for in Federal frameworks; and 5) Refuges purchased with funds derived from the Federal Duck Stamps must limit hunting to 40 percent of the available area. While Bear Lake NWR does not fall into this final category, there is sufficient sanctuary area on the Refuge to allow for undisturbed feeding and resting, even in the midst of the hunting season. Refuge-specific regulations are designed to minimize impacts. Both hunt regulations and sanctuary will be continually monitored and evaluated to ascertain their value in balancing the disturbance caused by allowing hunting on the Refuge. Under the stipulations outlined above, this activity does not materially detract from meeting Refuge purposes or the Refuge System mission.

Local impacts to waterfowl populations: The Federal Harvest Information Program estimates that 16,800 hunters in Idaho spent an average of 102,700 days hunting and harvested 225,100 ducks annually during 2001-2010. Over that same time period, the harvest information program estimates Idaho hunters harvested 59,800 Canada geese annually. This is the third highest total in the Pacific Flyway, behind Oregon and Washington, respectively. Between 1990 and 2004 (the last year for which data were available), between 200 and 1000 waterfowl were harvested on the Refuge annually. The number of waterfowl currently harvested on the Refuge is unknown, but based on the numbers of hunters using the Refuge and the short season, it is likely to represent a small percentage of total numbers harvested in the state, and an even smaller percentage of the total flyway harvest.

Effect on waterfowl distribution and use of habitat: Belanger and Bedard (1995) concluded that disturbance caused by hunting can modify the distribution and use of various habitats by birds. In Denmark, Madsen (1995) experimentally tested disturbance effects of hunting by the establishment of two experimental reserves where hunting activity was manipulated such that sanctuary areas were created in different parts of the study area in different hunting seasons. In both areas, waterbird numbers increased, most strongly in hunted species (a three- to 40-fold increase), with highest densities found in sanctuary areas, regardless of where these sanctuaries were sited. At Sacramento National Wildlife Refuge, in California, researchers found statistically significant differences in the densities of northern pintails among hunting units, units adjacent to hunting units, units adjacent to auto tour route, and units isolated from disturbance (Wolder 1993). Prior to the opening of hunting season, pintail used units in proportion to their availability, indicating no preference to particular areas.

Belanger and Bedard (1989) studied the effect of disturbances to staging greater snow geese in a Quebec bird sanctuary over 471 hours of observation. They found that the level of disturbance (defined as any event causing all or part of the goose flock to take flight) that prevailed on a given day in fall influenced goose use of the sanctuary on the following day. When disturbance exceeded two events per hour, it produced a 50 percent drop in the mean number of geese present in the sanctuary the next day.

Effects on energetics and survival: Hunting limits access of waterfowl to food resources and may modify migration timing. Madsen (1988 as cited by Dahlgren and Korschgen 1992) suggested that hunting on the coastal wetlands of Denmark modified waterfowl movements and caused birds to leave the area prematurely. However, Kahl (1991) suggested that lack of adequate access to food may decrease survival of canvasbacks by causing birds to remain on a staging site longer and forage under suboptimal conditions, or by causing birds to migrate in shorter flights with more frequent stops.

Disturbance due to hunting has caused waterfowl to cease feeding or resting activities, thus decreasing energy intake and increasing energy expenditure. At Chincoteague NWR, Morton et al. (1989) found that wintering black ducks experienced reduced energy intake while doubling energy expenditure by increasing the time spent in locomotion in response to disturbance. Belanger and Bedard (1995) in a quantitative analysis, estimated that neither the response to disturbance by flying away and promptly returning to the foraging site to resume feeding, nor the response of flying away (leaving the foraging site for a roosting site, thus interrupting feeding) allowed snow geese to balance their daytime energy budget.

At high disturbance rates (>two/hour—these included hunting and transport-related disturbance), Belanger and Bedard estimated that an increase in night feeding as a behavioral compensation mechanism could not counterbalance energy lost during the day. Likewise, geese could not compensate for a loss in feeding time by increasing their daily foraging behavior to maximize food intake during undisturbed periods. Belanger and Bedard suggested mitigation with spatial or temporal buffer zones.

Application to Bear Lake NWR: The studies cited above display the variety and scale of negative impacts to waterfowl from hunting. The most likely effect will be a shift in waterfowl populations away from hunted areas to non-hunted areas of the Refuge. Under the CCP, approximately 7,450 acres of the Refuge will be open to waterfowl hunting seven days per week. The sanctuary area provided for waterfowl (areas of the Refuge closed to hunting) is more than 10,600 acres, exceeding the size (0.5-0.7 square miles) recommended by Kahl (1991), and it has a low edge-to-area ratio.

The fall waterfowl habitat (permanent open water for loafing, deep emergent wetland, shallow emergent wetland, submerged aquatic habitat, and croplands) available to migratory birds on the Refuge is currently estimated at 16,167 acres. Within the hunt area, 6,624 acres will be classified as fall waterfowl habitat (open water, deep emergent vegetation, shallow emergent vegetation, and submergent aquatic vegetation.) This comprises approximately 40 percent percent of the Refuge's total fall waterfowl habitat. Break out of waterfowl habitat types in hunt and sanctuary units is provided in Table B-1. The hunt units currently contain about 48 percent of the loafing habitat (open water) on the Refuge. All croplands are located within the sanctuary area. Under the habitat management proposed in this CCP, acreage of open water and shallow emergent wetlands will decrease compared to current conditions, since proposed management will convert a portion of these habitats to other habitat types (e.g., submerged aquatic.) Acreage of submerged aquatic vegetation (which provides high-quality waterfowl food) will increase, from 436 acres (current) to approximately 3,000 acres. Total acres of deep emergent habitat will increase slightly. Due to the change in habitat area and distribution in the proposed management under this CCP, although the hunt area will remain the same, a slightly higher percentage of the fall waterfowl habitat base will be hunted (47 percent), and less open water (loafing) habitat will be available. However, about the same percentage of the loafing habitat (open water) and shallow emergent wetland will be located within the hunt area. Both the total acreage and percent of deep emergent wetland located within the hunt area will increase (1,877 to 2,370 acres; 36 percent to 44 percent). A higher percentage (63 percent) of submerged aquatic vegetation will be located within the hunt area. Acres of submerged aquatics both within and outside the hunt area will increase compared to current conditions. As in current management, no crops will be located within the hunt area. Therefore overall, habitat changes under proposed management will change the acreage and distribution of habitat types, but adequate loafing and feeding areas will exist outside the hunt area. In addition to considerations concerning habitat availability, only non-toxic shot is permitted.

Table B-1. Distribution of fall waterfowl habitat in hunted vs. non hunted units under current and proposed management.

	Cropland	Shallow Emergent Wetland	Deep Emergent Wetland	Submerged Aquatic	Permanent Open Water (Loafing)	Total Fall Waterfowl Habitat
Current Management						
Hunted Units	0	2258	1877	277	2212	6624
Non Hunted Units	90	3602	3336	159	2356	9543
Total Current Acres	90	5860	5213	436	4568	16167
Percent of Habitat in Hunted Units	0%	39%	36%	64%	48%	41%
Proposed Management						
Hunted Units	0	1400	2370	1900	1240	6910
Non Hunted Units	80	2370	2990	1100	1380	7920
Total Proposed/Target Acres	80	3770	5360	3000	2620	14830
Percent of Habitat in Hunted Units	0%	37%	44%	63%	47%	47%

Notes: Proposed/target acres are estimates based on proposed management in the CCP; rounded to nearest 5 acres.
Hunted Units: Rainbow Complex, Mud Lake Complex north of buoy line
Non Hunted Units: North Meadow, Bloomington, and Bunn Lake Complexes; Mud Lake S of buoy line

Given the small number of waterfowl hunting visits to the Refuge (estimated at approximately 185 visits annually) and the short hunting season, disturbance rates are expected to be low. Disturbance could be expected from both hunters on foot, and hunters using motorized and nonmotorized boats. Since the traversable waters of Bear Lake NWR are not deep, boaters use small boats with a shallow draft powered by 2-cycle or 4-cycle engines. A handful of waterfowl hunters may use nonmotorized boats (e.g., canoes) to access the units. Although boats can cause disturbance to waterfowl, due to the low numbers of hunters, and the small size, and slow speeds of boats used to access waterfowl hunting, both the frequency and the footprint of disturbance will be limited. A 15 mph speed limit for boats will be instituted to reduce disturbance to wildlife.

Impacts to Other Wildlife-dependent Recreational Uses. Public lands attract a variety of user groups who often have conflicting needs. Hunting (especially gunshot noise) has the potential to disturb Refuge visitors engaged in other wildlife-dependent recreational uses. There may be safety concerns associated with hunters using the same areas accessed by wildlife observers and photographers. However, impacts to other wildlife-dependent recreational users are expected to be minimal due to the low number of visitors to the Refuge in fall and winter The youth hunt is generally scheduled for the last weekend in September, with the regular hunting season opening the first weekend in October and typically ending by mid to late November, depending on timing of freezeup. By October the number of visitors other than waterfowl hunters drops markedly due to cold weather.

Other uses that may occur at the same time and place as waterfowl hunting include vehicle traffic on the Salt Meadow Unit Wildlife Observation Route, hiking on roads that are open to vehicle travel, and hiking, cross-country skiing and snowshoeing within the hunt area.

The accessible walking trail is closed to walking on September 20 and can only be used by hunters to access ABA-accessible blinds after that time. Although non-hunters may walk or drive on the Auto Tour Route, which is within the hunt area, the road is wide (between 12 and 20 feet) and is located on elevated dikes with good visibility. To promote visitor safety, hiking, cross-country skiing, and snowshoeing will be limited to service roads and dikes within the hunt area from July 1-January 20 under proposed management. Other measures to reduce potential conflicts between hunters and other user groups include providing information at the trailhead kiosks, and in the Refuge's brochure that clearly indicates permitted uses and rules of conduct.

Conflicts between waterfowl hunters and other Refuge users have never been documented and will likely remain negligible for the near future. The current low level of use does not warrant a spatial or temporal separation of hunting from non-hunting public uses at this time. If the number of non-hunters using the hunt area during the hunt season increases significantly, the potential for accidents or user group conflicts may also increase. Conflicts between hunters and non-hunters, and between different types of hunters, will be monitored and addressed if necessary. No significant effects to roads, trails, or other infrastructure from the hunting program are foreseen. Normal road, trail, and facility upkeep and maintenance will continue to be necessary.

By its very nature, waterfowl hunting has very few if any positive effects on waterfowl and other birds while the activity is occurring, but it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses. Public review of a step-down Hunt Plan (see Stipulations) as required under Service policy will be conducted before implementing changes to the Refuge waterfowl hunting program.

Determination:

____Use is Not Compatible

_X__Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Hunters must obey all State and Federal hunting regulations.
- Hunters may possess only approved nontoxic shot while in the field.
- Nonmotorized and motorized boats are allowed September 20-January 15 within the designated waterfowl hunting area (the Rainbow and Salt Meadow Units, the Merkley Lake

Unit, and the Mud Lake Unit north of the buoy line). Boats will not exceed the 15 mph speed limit.
- The use of air-thrust boats is prohibited.
- Only portable blinds or temporary blinds constructed of natural vegetation can be used in the waterfowl hunting area. Blinds will be available for general use on a first-come, first-served basis. Portable blinds must be removed from the refuge at the end of each day.
- All personal property, including decoys and boats, must be removed from the refuge at the end of each day.
- Hunting dogs will be under hunter control at all times.
- Camping, overnight use, and fires are prohibited. The use or possession of alcoholic beverages while hunting is prohibited.
- The two ABA-accessible hunting blinds are open for use Sept, 20-Jan 20. They are available to disabled sportsmen on a first-come, first-serve basis one-half hour before sunrise to one half hour after sunrise. After this time, they are available to the general hunting public to use.
- Hunt areas and no hunting zones will be posted at least two weeks before the hunting season begins.
- Refuge staff will conduct law enforcement, maintain hunting facilities, and monitor wildlife impacts.

Justification:

Hunting is a priority wildlife-dependent use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Service’s policy is to provide expanded opportunities for these wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management. Facilitating hunting on the Refuge would increase visitor knowledge and appreciation of fish and wildlife resources. This enhanced understanding would foster increased public stewardship of natural resources and support for the Service’s management actions in achieving the refuge purposes and the mission of the National Wildlife Refuge System.

Waterfowl hunting at Bear Lake NWR as described in this CD contributes to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. Because sanctuary from human disturbance is provided in other areas of the Refuge, this waterfowl hunting program will not interfere with the Refuge achieving its purposes of providing *sanctuary and a breeding ground for migratory birds*. The use contributes to the purpose of *wildlife-oriented recreational development*. It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened from allowing hunting to occur on the Refuge. The relatively limited number of individuals expected to be adversely affected due to hunting will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing hunting to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

This program as described was determined to be compatible because: hunter use levels on Bear Lake NWR are relatively low during most days of the waterfowl hunting season (October through

November) and sufficient restrictions will ensure that high-quality feeding and resting habitat will be available in relatively undisturbed areas to accommodate the needs of the waterfowl and other wetland birds.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

2027 Mandatory 15-year Re-evaluation date (for priority public uses)

_____Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

_X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 2, Waterfowl Hunting on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
<u>Concurrence</u> Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

B.7 Compatibility Determination for Upland Game Hunting on Bear Lake National Wildlife Refuge

RMIS Database Uses: Upland Game Hunting

Refuge Name: Bear Lake National Wildlife Refuge (NWR)

Location: Bear Lake County, Idaho

Date Established: 1968

Establishing and Acquisition Authorities:

- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

- "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species … " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... the Secretary … may accept and use … real … property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors … " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species … or (B) plants … " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "... for the development, advancement, management, conservation, and protection of fish and wildlife resources … " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "… for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude … " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)
- "... for conservation purposes … " 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

The U.S. Fish and Wildlife Service (Service) proposes to continue to allow hunting of upland game (gray partridge, sage-grouse, sharp-tailed grouse, ruffed grouse, pheasants, and cottontail rabbits) on Bear Lake NWR in accordance with State and Federal regulations. Hunting of game as an activity is conducted by the general public under regulatory authority of the National Wildlife Refuge System Improvement Act. Because quality upland game hunting occurs on other lands in the area, and populations of these species on the Refuge is low, few hunters pursue upland game on the Refuge, with an estimated ten upland game hunting visits per year. Although hunting of upland game is allowed throughout the area open to waterfowl hunting (7,450 acres), most of this area is wetland habitat not used by these species. Upland habitat is limited to 300 acres on the east side of the Refuge, along Merkley Lake Road. The Refuge adheres to Idaho State seasons and regulations. Seasons are as follows:

Gray partridge	October 1-January 31
Sage-grouse	Set by IDFG in August (in 2011 Bear Lake County was closed to sage-grouse hunting)
Sharp-tailed grouse	October 1-October 31
Ruffed grouse	August 30-December 31
Pheasants	October 20-November 30 Youth hunt Oct 5-Oct 11
Cottontail Rabbit	September 1-February 28

Reference: IDFG 2012. Upland Game, Furbearer, Turkey Seasons and Rules, 2012-13 and 2013-14. URL: http://fishandgame.idaho.gov/public/docs/rules/uplandRules.pdf

Upland game hunting on Refuge lands is an extension of the activity already occurring on adjacent public and private lands. No Refuge-specific permits or hunter check-in procedures are required. Hunter access will be from the existing parking area along the Merkley Lake (County) Road.

To ensure a quality hunt and visitor and staff safety, all hunting activities are in accordance with Federal, State, and Refuge-specific regulations. Use of nontoxic shotshells is required. Hunting is a priority public use identified in the National Wildlife Refuge Improvement Act of 1997 and it has traditionally occurred at the Refuge without adverse impacts to the purposes for which the Refuge was established. The hunt program is administered in accordance with sound wildlife management principles and the utmost concern for public safety. Because they can reduce the loss of injured game and hence can reduce the overall impact to the resource, dogs used in the act of hunting are allowed on the Refuge.

Need and Availability of Resources:

The following funds will be required to run a program as designed under the CCP.

Category and Itemization	**One-time ($000)**	**Annual ($000/yr)**
Administration and management:	$0	$2k
Maintenance:	$0	$0
Monitoring: Law enforcement; biology	$0	 $3k
Offsetting revenues: TOTALS	$0 $0	$0 $5k

Anticipated Impacts of Described Use:

Impacts to Hunted Species. The direct effect of hunting on upland game species is mortality, wounding, and disturbance. Hunting seasons and bag limits for upland game are set by the Idaho Department of Fish and Game with the goal of providing hunting opportunities while managing for sustainable wildlife populations. The Idaho Department of Fish and Game's 2010 Upland Game Progress Report (Knetter et al. 2010) notes that of the species of upland game birds that are legal to hunt on Oxford Slough WPA, populations of gray partridge (an introduced species) and sharp-tailed grouse (native), are considered stable or increasing in Idaho's Southeast Region over the past 10-15 years. Populations of forest grouse (including rufed grouse) can vary widely from year to year, based on annual production. Indications from harvest and production data over the last 15 years suggest a trend in more hunters harvesting a greater number of birds. Ring-necked pheasant (another introduced species) have undergone a long-term decline as a result of declining habitat quality due to changes in farming practices. Sage-grouse, a native species and species of conservation concern, are declining. Populations in Idaho's Southeast Region appear to be low. Due to declining numbers of sage-grouse in Idaho, the IDFG has instituted more restrictive seasons and bag limits in recent years. In 2011, IDFG Area 1 (including Bear Lake County) was closed to sage grouse hunting. Limited data on rabbits and hares have been collected in Southeast Region.

The impacts to populations of upland game, both locally and regionally, caused by hunting of upland game on Bear Lake NWR are likely inconsequential due to the small amount of upland habitat on the Refuge, the paucity of those species on the Refuge, and the low numbers of hunters pursuing those species. The most frequently hunted upland game species on the Refuge are gray partridge and cottontail rabbit. Few grouse (of any species) or pheasant use the Refuge due to its lack of suitable habitat, and few, if any, grouse or pheasant are harvested on the Refuge each year. The low number of grouse and pheasant, and the subsequent lack of hunter pursuit means there is little impact to these species related to hunting on the Refuge.

Impacts to Other Wildlife Species. Upland game hunting occurs in the fall and winter, after the nesting season for birds and the rearing season for all forms of wildlife. While the presence of hunters can temporarily influence resident game and non-game wildlife by increasing their level of stress and possibly causing them to flee in alarm. It is expected that impacts to non-target species will be minimal because hunting seasons do not coincide with nesting seasons, so reproduction will not be reduced by hunting. Disturbance to the daily activities, such as feeding and resting, of wintering non-hunted birds and other wildlife might occur. However, these occurrences are infrequent and short lived, and limited to a small portion of the Refuge (300 acres of upland habitat on the east side of the Refuge, west of the Merkley Lake Road). The impacts caused by upland game hunting to other species inhabiting the Refuge are likely inconsequential due to the small amount of upland habitat where this use occurs, and the low number of hunters engaged in this use.

Refuge regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles are restricted to roads and the harassment or taking of any non-target wildlife is not permitted. Although ingestion of lead shot by non-hunted wildlife could be a cumulative impact, it is not relevant at the Refuge because non-toxic shot is required.

Impacts to Other Wildlife-dependent Recreational Uses. Hunting (especially gunshot noise) has the potential to disturb Refuge visitors engaged in other wildlife-dependent recreational uses. Upland game hunting occurs in upland habitat on the east side of the Refuge, on the east side of the Merkley Lake Road. This area is separated from areas used by the non-hunting public. The auto tour route is located more than 5 miles from uplands where this activity occurs. Visitors may hike on roads and dikes within the hunt area from July 1-January 20, however, these activities occur 3 miles or more from the area where upland game hunting occurs. The walking trail and Canoe Trail are closed during the upland game hunting season. Since relatively few visitors engage in upland game hunting on the Refuge, and most upland game hunting occurs when other visitation to the Refuge is low, impacts to non-hunting visitors will be minimal. Conflicts with waterfowl hunters or other visitors have not been documented.

Summary and Application to Bear Lake NWR. While upland game hunting has no positive effects on these species as the activity is occurring, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. To date, this activity has shown no assessable environmental impact to the Refuge, its habitats or wildlife species.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses. Public review of a step-down Hunt Plan (see Stipulations) as required under Service policy will be conducted before implementing changes to the Refuge upland game hunting program.

Determination:

____Use is Not Compatible

__X__Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Hunters must obey all State and Federal hunting regulations.
- Hunters may possess only approved nontoxic shot while in the field.
- All personal property must be removed from the refuge at the end of each day.
- Hunting dogs will be under hunter control at all times.
- Camping, overnight use, and fires are prohibited. The use or possession of alcoholic beverages while hunting is prohibited.

- Hunt areas and no hunting zones will be posted at least two weeks before the hunting season begins.
- Refuge staff will conduct law enforcement, maintain hunting facilities, and monitor wildlife impacts.

Justification:

This use has been determined compatible provided the above stipulations are implemented. Upland game hunting would contribute to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. The use contributes to the purpose of *wildlife-oriented recreational development*. Hunting is also one of the six wildlife-dependent recreational uses of the National Wildlife Refuge System as stated in the National Wildlife Refuge System Improvement Act of 1997. The hunting program follows all applicable laws, regulations and policies including: 50 CFR, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Bear Lake NWR goals and objectives. Conducting this program does not alter the Refuge's ability to meet habitat goals, provide for public safety and support several primary objectives of the Refuge.

Upland game hunting seasons and bag limits are established by the State of Idaho, ensuring the continued well-being of overall populations. Hunting does result in the taking of individuals within the overall population, but restrictions are designed to safeguard an adequate breeding population from year to year. It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened from allowing upland game hunting to occur on the Refuge. The relatively limited number of individuals expected to be adversely affected by hunting will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing upland game hunting to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_2027_ Mandatory 15-year Re-evaluation date (for priority public uses)

_____Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

References:

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USFWS (U.S. Fish and Wildlife Service). 2012b. Comprehensive conservation plan for Bear Lake National Wildlife Refuge.

Signatures for Compatibility Determination 3, Upland Game Hunting on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

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B.8 Compatibility Determination for Sport Fishing on Bear Lake National Wildlife Refuge

RMIS Database Uses: Sport Fishing

Refuge Name: Bear Lake National Wildlife Refuge (NWR)

Location: Bear Lake County, Idaho

Date Established: 1968

Establishing and Acquisition Authorities:

- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

- "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species … " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... the Secretary … may accept and use … real … property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors … " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species … or (B) plants … " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "... for the development, advancement, management, conservation, and protection of fish and wildlife resources … " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "… for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude … " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)
- "... for conservation purposes … " 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

Current Use. The Refuge is currently open to pole-and-line and bow fishing for carp, perch, and trout on the Outlet Canal north of the Paris Dike, between the Paris Dike south to its former location, and just north of the Lifton Pumping Station. Currently the Lifton Pumping Station fishing area is fenced off and effectively closed to fishing. The Refuge receives about 20 fishing visits annually and most visitors are angling for carp. Anglers must comply with all Refuge-specific and Idaho State regulations. The Refuge is included in the "All Waters Open All Year" general fishing season (IDFG 2011). No fees or special permits are required to fish on the Refuge. Based upon staff observations it is believed that there is little fishing pressure.

Proposed Use. We will continue to allow pole-and-line and bow fishing for carp, perch, and trout on the Outlet Canal north of the Paris Dike, and between the former Paris Dike south to its former location. We propose to close the area north of the Lifton Pumping Station to fishing because it is fenced off and there is no vehicle parking available. We will develop a safer and more comfortable fishing experience by building a fishing pier or platform immediately north of the Paris Dike. The Refuge will open the southeast portion of the Refuge along Merkley Lake Road to bank fishing.

Availability of Resources:

The following funds will be required to administer the revised fishing program:

Category and Itemization	**One-time ($000)**	**Annual ($000/yr)**
Administration and management:	$0	$2k
Maintenance: Roads, proposed fishing platform, signs	$0	$4k
Monitoring: Law enforcement and biological	$0	$4k
Special equipment, facilities, or improvements: Construct fishing platform and interpretive signs	$30k	$0
Offsetting revenues: TOTALS	$0 $30k	$0 $10k

Anticipated Impacts of Described Use:

Recreational fishing can impact the aquatic community by direct and indirect mortality (both of target and non-target species), changes in species composition and other trophic effects, and changes within species (stunting, changes in behavior) when fishing occurs at high levels (Blaber et al. 2000, Allen et al. 2005, Lewin et al. 2006). Many of the targeted species at the Refuge are introduced species such as common carp and yellow perch that compete with native coldwater fish species. Removal of individuals of these non-native species may benefit native species by reducing competition and predation (Cornelius 2006). Given the low numbers of anglers using the Refuge, and the opportunity for most species to move freely into and out of the Refuge, Bear Lake proper, and the

Bear River, it is not likely that there are significant impacts (positive or negative) to the fish community.

Fishing can cause disturbance to birds and other wildlife that use the Refuge. Species likely to experience some level of disturbance include foraging wading birds (great blue heron, American bittern, and snowy egret) foraging and nesting waterfowl (mallard, cinnamon teal, gadwall, Canada goose, and ring-necked duck), foraging and nesting passerines (red-winged blackbird and marsh wren), foraging raptors (osprey and bald eagle), and mammals (moose, skunk, and badger).

Most research studies have focused on short-term responses to human disturbance such as flushing, nest abandonment, site avoidance, etc. Little information is available on long-term or large-scale responses such as relocation of major staging areas, changes in productivity and demographics, or changes in prey/forage selection. Fishing has been shown to affect the reproduction, distribution, behavior, and abundance of bird species (Bell and Austin 1985; Cooke 1987; Korschgen and Dahlgren 1992).

When lead fishing sinkers or jigs are lost through broken line or other means, birds can inadvertently eat them. Water birds like loons and swans often swallow lead when they scoop up pebbles from the bottom of a lake or river to help grind their food. Eagles ingest lead by eating fish which have themselves swallowed sinkers (Minnesota Pollution Control Agency 2012). Lead is highly toxic to fish, birds, and other animals (including humans) and therefore the use of lead fishing tackle is being banned in a growing number of states. While the use of lead fishing tackle is legal in Idaho, the use of lead fishing tackle is prohibited at Bear Lake NWR. Discarded tackle and line also pose a threat to fish-eating birds.

Activities associated with fishing, such as human noise, would cause some birds to flush and go elsewhere. In addition, vegetation trampling, and deposition of litter or lost gear are likely to occur. Impacts to bank stability and water quality have not been documented at the current low participation levels, but may occur should levels increase in the future.

As stated above, the number of anglers using the Refuge is relatively low because there are limited places available for fishing opportunities. Since the level of fishing activity is low, there is very limited disturbance to birds and limited impacts to vegetation through trampling. Thus, impacts to fish and wildlife resources associated with this activity are not significant.

Public Review and Comment:

Public review and comment were solicited in conjunction with the release of the Draft CCP/EA for Bear Lake National Wildlife Refuge (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination:

____Use is Not Compatible

_ X _Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Anglers must park in designated parking areas and walk to fishing areas.

- Camping, overnight use, and fires are prohibited.
- Littering is prohibited.
- All persons fishing shall be required to have a valid State license and follow applicable Refuge and Idaho State regulations.
- Law enforcement patrols will be conducted periodically to ensure compliance with State and Refuge regulations.
- Possession or use of lead weights and sinkers is prohibited (50 CFR Ch. 1, Section 32.31).

Justification:

Fishing is listed as a priority wildlife-dependent use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Service's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and to ensure that they receive enhanced attention during planning and management. Although fishing can result in disturbance to wildlife and habitat, disturbances on the Refuge are expected to be intermittent, minor, and short-term, and are not expected to diminish the value of the Refuge for its stated purposes. Facilitating this use on the Refuge would increase visitor knowledge and appreciation of fish and wildlife resources. This enhanced understanding would foster increased public stewardship of natural resources and support for the Service's management actions in achieving the refuge purposes and the mission of the National Wildlife Refuge System.

There is more than an adequate amount of undisturbed habitat available to the majority of waterfowl, waterbirds, and other wildlife for escape and cover, such that their abundance and use of the Refuge will not be measurably lessened from allowing fishing to occur. Stipulations will help reduce or eliminate any unwanted impacts of the use. The relatively limited number of individual animals expected to be adversely affected due to fishing will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing fishing will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the Refuge was established.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

2027 Mandatory 15-year Re-evaluation date (for priority public uses)

_____Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

References:

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USFWS (U.S. Fish and Wildlife Service). 2012b. Comprehensive conservation plan for Bear Lake National Wildlife Refuge.

Signatures for Compatibility Determination 4, Sport Fishing on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

B.9 Compatibility Determination for Research and Monitoring on Bear Lake National Wildlife Refuge

RMIS Database Uses: Research and Monitoring

Refuge Name: Bear Lake National Wildlife Refuge (NWR), Thomas Fork Unit

Location: Bear Lake NWR: Bear Lake County, Idaho
Thomas Fork Unit: Bear Lake County, Idaho

Date Established: Bear Lake NWR: 1968
Thomas Fork Unit: 1995

Establishing and Acquisition Authorities:

Bear Lake NWR:
- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Thomas Fork Unit:

Consolidated Farm and Rural Development Act (7 U.S.C. § 2002)

Refuge Purpose(s):

Bear Lake NWR:
- "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species … " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ... or (B) plants ... " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

Thomas Fork Unit:

- "... for conservation purposes ... " 7 U.S.C. § 2002 (Consolidated Farm and Rural Development Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

The Refuge staff receives periodic requests from non-Service entities (e.g., universities, State agencies, other Federal agencies, nongovernmental organizations) to conduct research, scientific collecting, and surveys on refuge lands. These project requests can involve a wide range of natural and cultural resources as well as public-use management issues including basic absence/presence surveys, collection of new species for identification, habitat use and life-history requirements for specific species/species groups, practical methods for habitat restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, identification and analyses of paleontological specimens, modeling of wildlife populations, bioprospecting, and assessing response of habitat/wildlife to disturbance from public uses. Projects may be species-specific, refuge-specific, or evaluate the relative contribution of the refuge lands to larger landscapes (e.g., ecoregion, region, flyway, national, international) issues and trends.

The Service's Research and Management Studies (4 RM 6) and Appropriate Refuge Uses (603 FW 1.10D(4)) policies indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat as well as their natural diversity. Projects that contribute to refuge-specific needs for resource and/or wilderness management goals and objectives, where applicable, will be given a higher priority over other requests.

Availability of Resources:

Refuge staff responsibilities for projects by non-Service entities will be primarily be limited to the following: review of proposals, prepare SUP(s) and other compliance documents (e.g., Section 7 of the Endangered Species Act of 1973, Section 106 of the National Historic Preservation Act), and monitor project implementation to ensure that impacts and conflicts remain within acceptable levels (compatibility) over time. Additional administrative support, logistical and operational support may also be provided depending on each specific request. Estimated costs for one-time (e.g., prepare SUP) and annually re-occurring tasks by Refuge staff and other Service employees will be determined for each project. Sufficient funding in the general operating budget of the Refuge(s) must be available to cover expenses for these projects. The terms and conditions for funding and staff support necessary to administer each project on the Refuge(s) will be clearly stated in the SUP(s).

The Refuge has the following staffing and funding to administratively support and monitor research that is currently taking place on refuge lands (see table below). Any substantial increase in the number of projects will create a need for additional resources to oversee the administration and monitoring of the investigators and their projects. Any substantial additional costs above those itemized below may result in finding a project not compatible unless expenses are offset by the investigator(s), sponsoring agency, or organization.

Need and Availability of Resources:

Category and Itemization	One-time ($)	Annual ($/yr)
Administration and management		$1,000
Maintenance		$1,000
Monitoring		$1,000
Special equipment, facilities, or improvement		$0
Offsetting revenues		$0

Itemized costs in the previous table are current estimates calculated using a 3 percent base cost of a GS-12 Refuge Manager.

Anticipated Impacts of Described Use:

Use of the Refuge(s) to conduct research, scientific collecting, and surveys would generally provide information that would benefit fish, wildlife, plants, and their habitats. Scientific findings gained through these projects provide important information regarding life-history needs of species and species groups as well as identify or refine management actions to achieve resource management objectives in refuge management plans (especially CCPs). Reducing uncertainty regarding wildlife and habitat responses to refuge management actions in order to achieve desired outcomes reflected in resource management objectives is essential for adaptive management in accordance with 522 DM 1.

If project methods impact or conflict with refuge-specific resources, priority wildlife-dependent public uses, other high-priority research, wilderness, and refuge habitat and wildlife management programs, then it must be clearly demonstrated that its scientific findings will contribute to resource management and that the project cannot be conducted off refuge lands for the project to be compatible. The investigator(s) must identify methods/strategies in advance required to minimize or eliminate the potential impact(s) and conflict(s). If unacceptable impacts cannot be avoided, then the project will not be compatible. Projects that represent public or private economic use of the natural resources of any national wildlife refuge (e.g., bioprospecting), in accordance with 16 U.S.C. 715s, must contribute to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System mission to be compatible (50 C.F.R. 29.1).

Impacts will be project- and site-specific, where they will vary depending upon nature and scope of the fieldwork. Data collection techniques will generally have minimal animal mortality or disturbance, habitat destruction, no introduction of contaminants, or no introduction of non-indigenous species. In contrast, projects involving the collection of biotic samples (plants or animals) or requiring intensive ground-based data or sample collection will have short-term impacts. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) will be collected for identification and/or experimentation and statistical analysis. Where possible, researchers will coordinate and share collections to reduce sampling needed for multiple projects. For example, if one investigator collects fish for a diet study and another research examines otoliths, then it may be possible to accomplish sampling for both projects with one collection effort.

Investigator(s) obtaining required State and Federal collecting permits will also ensure minimal impacts to fish, wildlife, plants, and their habitats. After incorporating the above strategies, projects will not be compatible if they will result in long-term or cumulative effects. A Section 7 consultation under the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884, as amended Public Law 93-205) will be required for activities that may affect a federally listed species and/or critical habitat. Only projects that have no effect or result in not likely to adversely affect determinations will be considered compatible. Currently, no listed species occur on Bear Lake NWR or the Thomas Fork Unit.

Spread of invasive plants and/or pathogens is possible from ground disturbance and/or transportation of project equipment and personnel, but it will be minimized or eliminated by requiring proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary (see Attachment 4). If after all practical measures are taken and unacceptable spread of invasive species is anticipated to occur, then the project will be found not compatible without a restoration or mitigation plan.

There also could be localized and temporary effects from vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Impacts may also occur from infrastructure necessary to support projects (e.g., permanent transects or plot markers, exclosure devices, monitoring equipment, solar panels to power unattended monitoring equipment). Some level of disturbance is expected with these projects, especially if investigator(s) enter areas closed to the public and collect samples or handle wildlife. However, wildlife disturbance (including altered behavior) will usually be localized and temporary in nature. Where long-term or cumulative unacceptable effects cannot be avoidable, the project will not be found compatible. Project proposals will be reviewed by refuge staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to refuge management issues and understanding of natural systems.

At least six months before initiation of fieldwork (unless an exception is made by prior approval of the Refuge Manager), project investigator(s) must submit a detailed proposal using the format provided in Attachment 1. Project proposals will be reviewed by refuge staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to refuge management issues and understanding of natural systems. This assessment will form the primary basis for allowing or denying a specific project. Projects that result in unacceptable refuge impacts will not be found compatible. If allowed and found compatible after approval, all projects also will be assessed during implementation to ensure impacts and conflicts remain within acceptable levels.

If the proposal is approved, then the Refuge Manager will issue an SUP(s) with required stipulations (terms and conditions) of the project to avoid and/or minimize potential impacts to refuge resources as well as conflicts with other public-use activities and refuge field management operations. After approval, projects also are monitored during implementation to ensure impacts and conflicts remain within acceptable levels based upon documented stipulations.

The combination of stipulations identified above and conditions included in any SUP(s) will ensure that proposed projects contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats on the Refuge(s). As a result, these projects will help fulfill refuge purpose(s); contribute to the Mission of the NWRS; and maintain the biological integrity, diversity, and environmental health of the Refuge(s).

Projects that are not covered by the Refuge's Inventory and Monitoring Plan, or inventory and monitoring strategies under the objectives in this CCP will require additional NEPA documentation.

Public Review and Comment:

This CD was prepared concurrent with the Bear Lake NWR CCP. Public notice was provided and open houses were held and written comments were solicited from the public during the scoping period for the Draft CCP/EA. Public review and comment were solicited during the draft CCP/EA comment period.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Each project will require an SUP. Annual or other short-term SUPs are preferred; however, some permits will be for a longer period, if needed, to allow completion of the project. All SUPs will have a definite termination date in accordance with 5 RM 17.11. Renewals will be subject to Refuge Manager review and approval based timely submission of and content in progress reports, compliance with SUP stipulations, and required permits.

- Projects will adhere to scientifically defensible protocols for data collection, where available and applicable.
- Investigators must possess appropriate and comply with conditions of State and Federal permits for their projects.
- If unacceptable impacts to natural resources or conflicts arise or are documented by the refuge staff, then the Refuge Manager can suspend, modify conditions of, or terminate an on-going project already permitted by SUP(s) on a refuge(s).
- Progress reports are required at least annually for multiple-year projects. The minimum required elements for a progress report will be provided to investigator(s) (see Attachment 2).
- Final reports are due one year after completion of the project unless negotiated otherwise with the Refuge Manager.
- Continuation of existing projects will require approval by the Refuge Manager.
- The refuge staff will be given the opportunity to review draft manuscript(s) from the project before being submitted to a scientific journal(s) for consideration of publication.
- The refuge staff will be provided with copies (reprints) of all publications resulting from a refuge project.
- The refuge staff will be provided with copies of raw data (preferably electronic database format) at the conclusion of the project.
- Upon completion of the project or annually, all equipment and markers (unless required for long-term projects), must be removed and sites must restored to the Refuge Manager's satisfaction. Conditions for clean-up and removal of equipment and physical markers will be stipulated in the SUP(s).
- All samples collected on refuge lands are the property of the Service even while in the possession of the investigator(s). Any future work with previously collected samples not clearly identified in the project proposal will require submission of a subsequent proposal for

review and approval. In addition, a new SUP will be required for additional project work. For samples or specimens to be stored at other facilities (e.g., museums), a memorandum of understand will be necessary (see Attachment 3).

- Sampling equipment as well as investigator(s) clothing and vehicles (e.g., ATV, boats) will be thoroughly cleaned (free of dirt and plant material) before being allowed for use refuge lands to prevent the introduction and/or spread of pests. Where necessary, use quarantine methods (see Attachment 4).
- The NWRS, the specific Refuge, names of refuge staff and other Service personnel that supported or contributed to the project will be appropriately cited and acknowledged in all written and oral presentations resulting from projects on refuge lands.
- At any time, refuge staff may accompany investigator(s) in the field.

Investigator(s) and support staff will follow all refuge-specific regulations that specify access and travel on the Refuge(s).

Justification:

Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they expand scientific information available for resource management decisions. In addition, only projects that directly or indirectly contribute to the enhancement, protection, use, preservation, and management of refuge wildlife populations and their habitats generally will be authorized on refuge lands. In many cases, if it were not for the refuge staff providing access to refuge lands and waters along with some support, the project would never occur and less scientific information would be available to the Service to aid in managing and conserving the refuge resources. By allowing the use to occur under the stipulations described above, it is anticipated that wildlife species which could be disturbed during the use will find sufficient food resources and resting places so their abundance and use will not be measurably lessened on the Refuge(s). Additionally, it is anticipated that monitoring, as needed, will prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats. As a result, these projects will not materially interfere with or detract from fulfilling refuge purpose(s); contributing to the mission of the NWRS; and maintaining the biological integrity, diversity, and environmental health of the Refuge(s).

Mandatory Re-evaluation Date: (provide month and year for “allowed” uses only)

_____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

Signatures for Compatibility Determination 5, Research and Monitoring on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

Attachment 1

FORMAT FOR PROPOSALS TO CONDUCT RESEARCH OR LONG-TERM MONITORING ON NATIONAL WILDLIFE REFUGES

A Special Use Permit (SUP) is required to conduct research and/or long-term monitoring on refuge lands. To receive a SUP, a detailed project proposal using the following format must be submitted to the Refuge Manager approximately six months prior to the start of the project.

B.9.1.1 Title:

Principal Investigator(s):

Provide the name(s) and affiliation(s) of all principal investigator(s) that would be responsible for implementation of the research and/or long-term monitoring described in the proposal. In addition, provide a brief description or attach vitae of expertise for principal investigator(s) germane to work described in the proposal.

Background and Justification:

In a narrative format, describe the following as applicable:

- *The resource management issue (e.g., decline in Pisonia rainforest) and/or knowledge gap regarding ecological function that currently exists with any available background information.*
- *Benefit of project findings (e.g., management implications) to resources associated with the Refuge.*
- *Potential consequences if the conservation issue and/or knowledge gap regarding ecological function is not addressed.*

B.9.1.2 Objectives:

Provide detailed objective(s) for the proposed project.

Methods and Materials:

Provide a detailed description of the methods and materials associated with field and laboratory work (if applicable) to be conducted for the project. Methods should include the following:

- *study area(s)*
- *number of samples;*
- *sampling dates and locations*
- *sampling techniques*
- *data analyses including **statistical methods** and **significance levels**.*

Previously published methods should be cited without explanation; whereas, new or modified techniques should be described in detail. Include number of personnel as well as all facilities and equipment (e.g., vehicles, boats, structures, markers) required to collect samples/data. Provide a clear description of the relationships among study objectives, field methods, and statistical analyses.

B.9.1.3 Permits:

Identify all State or Territorial and Federal permits required if applicable.

B.9.1.4 Potential Impacts to Refuge Resources:

Describe potential impacts to threatened or endangered species as well as other refuge plants, wildlife, and fish species that could result from the implementation of project activities on the Refuge. Consider the cumulative impacts associated with this project.

B.9.1.5 Animal Welfare Plan:

If appropriate, attach a copy of the Institutional Animal Care and Use review and/or animal welfare plans that are required by the principal investigator's affiliation.

B.9.1.6 Partnerships and Funding Sources:

List other participating institutions, agencies, organizations, or individuals as well as the nature and magnitude of their cooperative involvement (e.g., funding, equipment, personnel).

B.9.1.7 Project Schedule:

Provide estimated initiation and completion dates for field sampling, laboratory work, data analyses, and report/manuscript preparation. If the project is divided into phases to be accomplished separately provide separate initiation and completion dates for each phase.

B.9.1.8 Reports and Raw Data:

Establish a schedule for annual progress and final reports; include adequate time for peer review of the final report/manuscript. Draft reports/manuscripts should be submitted to the Refuge Manager for review prior to submission for consideration of publication. At the conclusion of a research study (manuscripts accepted for publication), an electronic copy of the data (e.g., GIS vegetation layers, animal species composition and numbers, genetics) should be provided to the Refuge Manager. For long-term monitoring projects, the Service also requires raw data for management and planning purposes for the Refuge(s).

B.9.1.9 Publications:

Describe the ultimate disposition of study results as publications in scientific journals, presentation at professional symposiums, or final reports.

B.9.1.10 Disposition of Samples:

If the project entails the collection of biotic and/or abiotic (e.g., sediment) samples, then describe their storage. Although the samples may be in the possession of scientists for the purposes of conducting the project in accordance with the SUP, the Service retains ownership of all samples collected on refuge lands. If the samples would be used for subsequent research activities that are not described within the original proposal, a new proposal must be submitted to the Refuge Manager to obtain a SUP before initiation of the follow-up project. After conclusion of the research activities, consult with the Refuge Manager regarding the final disposition of the samples. If specimens would be curated at a museum, then prepare a MOU using the format provided in Attachment 3.

Attachment 2

ANNUAL PROGRESS REPORTS FOR REFUGE RESEARCH AND LONG-TERM MONITORING PROJECTS

B.9.1.11 Study title:

B.9.1.12 Fiscal year:

B.9.1.13 Progress:

In a narrative format, summarize the work that was completed on the study including the number and types of samples collected and/or data analyses.

B.9.1.14 Important findings:

In narrative format, generally describe any conclusions and/or management recommendations that may be drawn from the work completed to date.

B.9.1.15 Describe problems encountered:

In narrative format, describe any problems that were encountered during the year and their effects upon the study.

B.9.1.16 Proposed resolution to problems:

For each problem encountered, describe the actions that have been taken to remediate it.

B.9.1.17 Preparer:

B.9.1.18 Date prepared:

Attachment 3

MEMORANDUM OF UNDERSTANDING
FOR CURATORIAL SERVICES
BETWEEN THE

(Name of the Federal agency)

AND THE

(Name of the Repository)

This Memorandum of Understanding is entered into this (**day**) day of (**month and year**), between the United States of America, acting by and through the (**name of the Federal agency**), hereinafter called the Depositor, and the (**name of the Repository**), hereinafter called the Repository, in the State/Territory of (**name of the State/Territory**).

The Parties do witnesseth that

WHEREAS, the Depositor has the responsibility under Federal law to preserve for future use certain collections of paleontological specimens and/or biological samples as well as associated records, herein called the Collection, listed in Attachment A which is attached hereto and made a part hereof, and is desirous of obtaining curatorial services; and

WHEREAS, the Repository is desirous of obtaining, housing and maintaining the Collection, and recognizes the benefits which would accrue to it, the public and scientific interests by housing and maintaining the Collection for study and other educational purposes; and

WHEREAS, the Parties hereto recognize the Federal Government's continued ownership and control over the Collection and any other U.S. Government-owned personal property, listed in Attachment B which is attached hereto and made a part hereof, provided to the Repository, and the Federal Government's responsibility to ensure that the Collection is suitably managed and preserved for the public good; and

WHEREAS, the Parties hereto recognize the mutual benefits to be derived by having the Collection suitably housed and maintained by the Repository;

NOW THEREFORE, the Parties do mutually agree as follows:

1. The Repository shall:

a. Provide for the professional care and management of the Collection from the (**names of the resources**) sites, assigned (**list site numbers**) site numbers. The collections were recovered in connection with the (**name of the Federal or federally authorized project)** project, located in (**name of the nearest city or town**), (**name of the county, if applicable**) county, in the State/Territory of (**name of the State/Territory**)

b. Assign as the Curator, the Collections Manager and the Conservator having responsibility for the work under this Memorandum, persons who are qualified museum professionals and whose expertise is appropriate to the nature and content of the Collection.

c. Begin all work on or about (**month, date and year**) and continue for a period of (**number of years**) years or until sooner terminated or revoked in accordance with the terms set forth herein.

d. Provide and maintain a repository facility having requisite equipment, space and adequate safeguards for the physical security and controlled environment for the Collection and any other U.S. Government-owned personal property in the possession of the Repository.

e. Not in any way adversely alter or deface any of the Collection except as may be absolutely necessary in the course of stabilization, conservation, scientific study, analysis and research. Any activity that would involve the intentional destruction of any of the Collection must be approved in advance and in writing by the Depositor.

f. Annually inspect the facilities, the Collection and any other U.S. Government-owned personal property. Every **(number of years**) years inventory the Collection and any other U.S. Government-owned personal property. Perform only those conservation treatments as are absolutely necessary to ensure the physical stability and integrity of the Collection, and report the results of all inventories, inspections and treatments to the Depositor.

g. Within five days of discovery, report all instances of *and* circumstances surrounding loss of, deterioration and damage to, or destruction of the Collection and any other U.S. Government-owned personal property to the Depositor, and those actions taken to stabilize the Collection and to correct any deficiencies in the physical plant or operating procedures that may have contributed to the loss, deterioration, damage or destruction. Any actions that would involve the repair and restoration of *any of* the Collection and any other U.S. Government-owned personal property must be approved in advance and in writing by the Depositor.

h. Review and approve or deny requests for access to or short-term loan of the Collection (or a part thereof) for scientific and educational uses. In addition, refer requests for consumptive uses of the Collection (or a part thereof) to the Depositor for approval or denial.

i. Not mortgage, pledge, assign, repatriate, transfer, exchange, give, sublet, discard or part with possession of any of the Collection or any other U.S. Government-owned personal property in any manner to any third party either directly or indirectly without the prior written permission of the Depositor, and redirect any such request to the Depositor for response. In addition, not take any action whereby any of the Collection or any other U.S. Government-owned personal property shall or may be encumbered, seized, taken in execution, sold, attached, lost, stolen, destroyed or damaged.

2. The Depositor shall:

a. On or about (month, date and year), deliver or cause to be delivered to the Repository the Collection, as described in Attachment A, and any other U.S. Government-owned personal property, as described in Attachment B.

b. Assign as the Depositor’s Representative having full authority with regard to this Memorandum, a person who meets pertinent professional qualifications.

c. Every (number of years) years, jointly with the Repository's designated representative, have the Depositor's Representative inspect and inventory the Collection and any other U.S. Government-owned personal property, and inspect the repository facility.

d. Review and approve or deny requests for consumptively using the Collection (or a part thereof).

3. Removal of all or any portion of the Collection from the premises of the Repository for scientific or educational purposes; any conditions for handling, packaging and transporting the Collection; and other conditions that may be specified by the Repository to prevent breakage, deterioration and contamination.

4. The Collection or portions thereof may be exhibited, photographed or otherwise reproduced and studied in accordance with the terms and conditions stipulated in Attachment C to this Memorandum. All exhibits, reproductions and studies shall credit the Depositor, and read as follows: "Courtesy of the **(name of the Federal agency**)." The Repository agrees to provide the Depositor with copies of any resulting publications.

5. The Repository shall maintain complete and accurate records of the Collection and any other U.S. Government-owned personal property, including information on the study, use, loan and location of said Collection which has been removed from the premises of the Repository.

6. Upon execution by both parties, this Memorandum of Understanding shall be effective on this **(day**) day of **(month and year**), and shall remain in effect for (**number of years**) years, at which time it would be reviewed, revised, as necessary, and reaffirmed or terminated. This Memorandum may be revised or extended by mutual consent of both parties, or by issuance of a written amendment signed and dated by both parties. Either party may terminate this Memorandum by providing 90 days written notice. Upon termination, the Repository shall return such Collection and any other U.S. Government-owned personal property to the destination directed by the Depositor and in such manner to preclude breakage, loss, deterioration and contamination during handling, packaging and shipping, and in accordance with other conditions specified in writing by the Depositor. If the Repository terminates, or is in default of, this Memorandum, the Repository shall fund the packaging and transportation costs. If the Depositor terminates this Memorandum, the Depositor shall fund the packaging and transportation costs.

7. Title to the Collection being cared for and maintained under this Memorandum lies with the Federal Government.

IN WITNESS WHEREOF, the Parties hereto have executed this Memorandum.

Signed: (**signature of the Federal Agency Official**) **Date:** (Date)

Signed: (**signature of the Repository Official**) **Date:** (Date)

Attachment 3A: Inventory of the Collection

Attachment 3B: Inventory of any other U.S. Government-owned Personal Property

Attachment 3C: Terms and Conditions Required by the Depositor

Attachment 4

ALIEN SPECIES QUARANTINE RESTRICTIONS FOR NATIONAL WILDLIFE REFUGES

A. Introduction

Thank you for your interest in conducting research/monitoring on the Refuge(s). To protect wildlife and habitat communities found on the Refuge, visitation is carefully regulated and requires that each individual, or group, secure a Special Use Permit (SUP) to gain access to the Refuge. Each SUP clearly outlines the responsibilities of each permittee, including specific quarantine policies, which may be more detailed than the policies listed within this document. Details for securing a SUP can be found by contacting the Refuge Manager. Prospective scientific researchers must apply for the SUP at least six months prior to their proposed study period.

One of the gravest threats to the Refuge(s) is the introduction of alien plant and animal species. The practices described below are complex, but the Service has found them to be effective at greatly reducing additional introductions of invasive species on Refuge(s).

B. Definitions

1. **Clothing**: all apparel, including shoes, socks, over and under garments.
2. **Soft gear**: all gear such as books, office supplies, daypacks, fannypacks, packing foam, or similar material, camera bags, camera/binocular straps, microphone covers, nets, holding or weighing bags, bedding, tents, luggage, or any fabric or material capable of harboring seeds or insects.
3. **New Clothing/Soft Gear**: new retail items, recently purchased and never used.
4. **Refuge Dedicated Clothing/Soft Gear**: items that have ONLY been used at the Refuge(s), and which have been stored in a quarantined environment between trips to the Refuge(s).
5. **Sensitive Gear:** computers, optical equipment, and other sensitive equipment.
6. **Non-Sensitive Equipment and Construction Materials**: building materials, power and hand tools, generators, misc. machinery, etc.
7. **Suitable Plastic Packing Container:** packing containers must be constructed of smooth, durable plastic which can be easily cleaned and would not harbor seeds or insects. Packing containers may be re-used for multiple trips to the Refuge(s), but must be thoroughly cleaned before each trip and strictly dedicated to refuge-related projects.
   a. Examples of APPROPRIATE plastic packing containers are 5-gallon plastic buckets and plastic totes constructed with a single layer and having a smooth surface. All appropriate packing containers must have tight fitting plastic lids.
   b. An example of an INAPPROPRIATE plastic packing container is US mail totes. Mail totes are typically constructed of cardboard-like plastic that provides a porous multi-layered surface, allowing seeds and insects to easily hitch-hike.

C. Special Use Permit (SUP)

All persons requesting use of the Refuge(s) must secure a SUP, as described in Section A above, and agree to comply with all refuge requirements to minimize the risk of alien species introductions.

D. Quarantine Inspections

All personal gear, supplies, equipment, machinery, vehicles (e.g., ATVs, trucks, trailers), and vessels (e.g., planes, boats, ships, barges) would be inspected for quarantine compliance by Service staff prior to entering the Refuge(s) and again before departing the Refuge(s). A concerted effort would be made to ensure that alien pests are not transported. Service staff on the Refuge(s) would inspect outbound cargo prior to transport.

E. Prohibited Items (Transport of the following items are strictly <u>prohibited</u>)

1. Rooted plants, cuttings, flowers, and seeds (raw or propagative).
2. Soil, sand, gravel, or any other material that may harbor unwanted plant and animal species.
3. Animals (no exceptions).
4. Cardboard (paper and plastic cardboard harbors seeds and insects).

F. Regulated Items (Transport of the following items are strictly <u>regulated</u>)

1. Food items have the potential to carry alien pests and are therefore selected, packed and shipped with great care for consumption on the Refuge(s). Foods would not be allowed on the Refuge(s) without prior authorization.
2. Because wood products often harbor seeds and insect, only treated wood that has been painted or varnished may be allowed on the Refuge(s). Approved wood products must also be frozen for 48 hours or fumigated as described in Section K below.

G. Packing Procedures

Ensure that the environment selected for packing has been well cleaned and free of seeds and insects. Keep packing containers closed as much as possible throughout the packing process so insects cannot crawl in before the containers have been securely closed. Quarantine procedures should be performed as close to the transportation date as possible to ensure that pests do not return as hitch-hikers on the packing containers.

H. Packing Containers

1. All supplies and gear must be packed and shipped in SUITABLE PLASTIC PACKING CONTAINERS (see Section A for definitions of packing containers). Packing containers must be constructed of smooth, durable plastic that has been thoroughly cleaned prior to use.
2. Packing containers may be re-used for multiple trips to the Refuge(s), but must be thoroughly cleaned before each trip and strictly dedicated to refuge-related projects. Cardboard containers are strictly prohibited because they can harbor seeds and insects.

I. Clothing and Soft Gear

1. All persons entering the Refuge(s) must have NEW or REFUGE DEDICATED clothing and soft gear (including all footwear).
    a. Freeze all clothing and soft gear for 48 hours (including both new and refuge dedicated).
    b. Fumigation under a tarp or in a large container is also an option.

J. Sensitive Equipment

All sensitive gear (e.g., optical equipment, computers, satellite phones, other electronic equipment) must be thoroughly inspected and cleaned.

K. Non-Sensitive Equipment and Construction Materials

1. All non-sensitive equipment, machinery, and construction materials that are water resistant must be steam cleaned or pressure washed to ensure the removal of all dirt, insects, and seeds from external surfaces.
2. All non-water resistant items must be tented and fumigated to kill unwanted pests or frozen for 48 hours.
3. Quarantine procedures should be performed as close to the transportation date as possible to ensure that pests do not return to the equipment or packing containers.

L. Aircraft Quarantine

Aircraft personnel would ensure that the plane has been thoroughly cleaned and free of any alien species prior to flying to the Refuge(s). The aircraft captain would notify the Service at least ten full working days prior to all flights departing for the Refuge(s) in order to arrange a quarantine inspection of all cargo bound for the Refuge(s). Inspections would take place the scheduled day of departure.

M. Commercial Ships and Barges, and Private Sailing and Motor Vessel Quarantine

1. Ship owners or captains would notify the Service at least ten full working days prior to all vessels departing for the Refuge(s) in order to arrange a quarantine inspection of all vessels and cargo bound for the Refuge(s). The inspection would be scheduled as close to the departure date as possible.
2. Ship owners or captains would ensure that all ships and barges entering the Refuge(s) have had their hulls cleaned of fouling marine/freshwater organisms. The ships and barges must depart for the Refuge(s) within 14 days of having had the hulls cleaned. All ship and barge hulls must be re-cleaned should the vessel return to a port for greater than 14 days before returning to the Refuge(s). Results of all hull cleanings must be submitted to the Service two full working days prior to the vessel departure. Contact the refuge office for additional details.
3. No discharge of ballast water, grey water, sewage, or waste of any kind would be allowed by any vessel within the refuge boundary (e.g., 12-mile territorial sea).

B.10 Compatibility Determination for Agricultural Practices (Farming and Haying) on Bear Lake National Wildlife Refuge

RMIS Database Uses: Agriculture (Farming and Haying)

Refuge Name: Bear Lake National Wildlife Refuge (NWR) and the Thomas Fork Unit

Location: Bear Lake NWR and Thomas Fork Unit: Bear Lake County, Idaho

Date Established: 1968

Establishing and Acquisition Authorities:

Bear Lake NWR:
- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

Bear Lake NWR.

On May 15, 1968, 17,573 acres of land in Bear Lake County, Idaho, was set aside as Bear Lake National Wildlife Refuge by Public Land order 4415. This was followed by Public Land Order 4545 which withdrew an additional 48.81 acres on December 28, 1968. While no formal purposes were included within these Land Orders, withdrawn lands assumed the following purposes:
- "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ... or (B) plants ... " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

Thomas Fork Unit.

The Thomas Fork Unit was transferred in fee title, to the U.S. Fish and Wildlife Service from the Farm Home Administration (U.S. Department of Agriculture) on September 28, 1995.

The Thomas Fork Unit was acquired for:

- "…conservation purposes" under the Consolidated Farm and Rural Development Act (7 U.S.C. § 2002).

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

Refuge crops are planted to promote sustained use of these areas by migrating waterfowl by providing an accessible, high-energy food source during late fall and early winter as wetland habitats freeze up. Barley and/or wheat have been planted on the Refuge since 1969. Annual Narrative Reports from that era note two main refuge objectives were being met by the farming program: 1) To provide a needed food source for brooding Canada geese; and 2) to alleviate crop depredation complaints from neighboring land owners.

By the mid-1980s Refuge waterfowl and cranes were consuming 100 percent of Refuge lure crops and depredation complaints were rising. Subsequently the Refuge increased planted crop acreage and from 1988 to 1994, the farming program entailed a dry farm rest rotation with small acreages of barley and alfalfa grown for migratory bird use through the migration and nesting periods. Mallard, Canada goose, and sandhill crane use on these areas was high, with still close to 100 percent utilization by November of each year. Summer fallowing (fall residual crop tilled and left idle the following growing season) was used as part of the farming rotation to build up soils and combat noxious weeds. In the past, no chemical fertilizers were used. Some Refuge fields have been planted to alfalfa for goose/crane browse and to fix nitrogen in the soils for later rotation to barley a few years later.

Upon Refuge establishment, negotiated hay sale permits were awarded to individuals and entities that had previously hayed the lands which became Bear Lake NWR. Individual landowners adjacent to the hayed fields and with livestock operations in the Bear Lake Valley were given first priority to secure USFWS permits and continue their haying operations. The 1960s Refuge haying and grazing program was designed to maintain emergent bulrush and cattail encroachment. By the 1980s, Refuge staff recognized that conflicts with livestock grazing had affected wildlife production and damage had occurred to Refuge habitat (USFWS 1994b). In many cases the same units were being both hayed and grazed. These concerns were addressed by reducing grazing permits and changing the amount and timing of grazing. In 1993, the Refuge fully reexamined grazing as a habitat management tool to determine if it met the criteria for a compatible Refuge use. Managers concluded that it was not compatible, and grazing permits were phased out, with 1994 being the last year of issuance. Problems documented from the grazing program were: increased nutrient loading in wetlands, reduction of residual nesting cover that reduced nest success, and direct mortality to nesting sandhill cranes from impacts with grazing allotment fences (USFWS 1996).

While grazing was removed as a compatible Refuge use, haying was still considered compatible with Refuge purposes and hay permits continued to be issued. Haying occurs on the Refuge under Special Use Permits with either a negotiated or bid rate per ton of hay harvested, or recently as Cooperative Land Management Agreements (CLMA). CLMAs stipulate that the cooperator plants grains and/or legumes for wildlife in exchange for harvesting Refuge hay.

Current Management. Cooperative agriculture (farming and haying) is a management tool that allows the Refuge to provide forage and habitat for migratory birds and resident wildlife. The Refuge uses Cooperative Land Management Agreements (CLMAs) for crop production. CLMAs are negotiated agreements between the Refuge and a private party, and are used to implement cooperative programs that help achieve Refuge purposes as well as provide an economic benefit to the farmer. Under Refuge CLMAs, private farmers (cooperators) raise a Refuge-specified crop in a designated field or fields, and are entitled to remove hay from the Refuge in exchange for farming the agricultural crop. Cooperators also maintain fences and water control infrastructure, conduct weed control, manage water levels, and spray for weeds when needed.

For landowners who do not participate in the crop production CLMAs, the Refuge issues Special Use Permits (SUPs) to manage haying in designated fields. Private ranchers or farmers, generally landowners adjacent to the Refuge, hay Refuge fields to provide short stature habitat for wildlife. The rancher or farmer pays the Refuge a negotiated or bid price per ton of hay removed. CLMA and SUP holders use their own farm equipment such as tractors, swathers, balers, and diskers. The cooperator in a CLMA or permittee within an SUP, are responsible for all the costs of production.

Current farming use: Refuge farm fields currently comprise 135 acres: 91 acres (ten fields) on Bear Lake NWR, and 44 acres (four fields) on the Thomas Fork Unit. On Bear Lake NWR, farming occurs on the North Meadows Complex (two fields/10.7 acres), Bloomington Complex (five fields/54.7 acres), and the Bunn Lake Complex (three fields/25.1 acres).

Currently, all farming on Bear Lake NWR and the Thomas Fork Unit is done via CLMAs. Crops grown include cereal grains and green forage for migratory waterfowl (primarily Canada goose) and sandhill crane use. Grain crops grown to meet the high energy demands of migratory waterfowl and cranes include, but are not limited to, winter wheat and spring barley. Winter wheat also provides green forage for geese. Legumes, including, but not limited to, annual clover and alfalfa, are used to fix nitrogen, build soil, and provide for spring and early summer use by Canada geese and sandhill cranes. One hundred percent of crops are left in the field where they are available to wildlife, primarily fall-migrating waterfowl and sandhill cranes. All crop selections are agreed to by the Refuge, and special conditions are documented in the CLMA. Genetically modified crops are not allowed, however fertilizers can be used by the Cooperator.

Crop fields planted in one year are fallowed the following year. In any given year, 70 percent of crop fields are planted in small grain and 30 percent are in summer fallow. CLMA crop planting and fallowing occur in the spring and the fall of each year. Implementation of farming is dependent on weather and other environmental conditions. In years with anomalous weather conditions, activity dates may be varied upon consultation with the Refuge staff.

Weed control methods are used as necessary to improve the growth of desirable vegetation and reduce competition from weed species. Preventing infestations is the most effective strategy. Early detection followed by rapid response (ED/RR) helps prevent new invasive plant occurrences from becoming established. The Refuge staff and cooperators conduct searches of Refuge lands and waters regularly to identify new occurrences and implement efforts to control and eradicate these species. The Refuge uses an integrated pest management (IPM) approach to control weeds (Appendix F), whereby management options are selected based on-site conditions. All applications of herbicides conform to the specific pesticide label requirements. The Refuge reviews pesticide use annually and submits pesticide use proposals for all applications conducted on Refuge lands. The use of insecticides, fungicides and other chemicals are not permitted.

Current haying use: Previous and current hay management objectives center upon: impeding encroachment of deep emergent hardstem bulrush or cattail from becoming too dense or an impenetrable stand; providing areas of green browse for waterfowl; and increasing edge habitat between emergent cover and open water. Bear Lake haying operations are intended to simultaneously decrease the peripheral edge of emergent bulrush and cattail habitat and provide abundant green leafy browse within grassy meadows for Refuge species that prefer to forage within short-cover habitats. Haying occurs within meadow grass and forb, spike and wire rush, sedge, and even hardstem or alkali bulrush habitats. From 1968 to 2011, the Refuge issued from 12 to 20 hay permits annually, and 994 to 2,054 tons of hay was harvested on 2,117 to 2,896 acres annually.

On the Thomas Fork Unit, refuge staff and funding was used to plant grain crops until Special Use Permits (SUPs) were issued to local farmers in 1998 to both hay and plant grain crops on the Thomas Fork Unit. Two to three permits have been issued annually to local landowners since 1998. In 2007 the issuance of SUPs was discontinued and Refuge haying continued under Cooperative Land Management Agreements (CLMAs) with local landowners. From 1996 through 2011, between 49 and 340 tons of hay were harvested to manage short-cover habitat on 337 acres of the Thomas Fork Unit.

Since 2003, the Refuge retired hay units as permit holders decided to no longer hay on the Refuge. Most units that were retired were notably wet and difficult to dewater to conduct haying operations. Currently, 2,896 acres of Bear Lake NWR and 337 acres of the Thomas Fork Unit are hayed annually, either in exchange for crops under CLMAs, or under SUPs. Approximately 80 percent of Bear Lake NWR’s wet meadow habitat is maintained in early successional status through the Refuge’s haying program. The short stature habitat of hayed meadows provides productive brooding and foraging areas for Canada geese. Less than 20 percent of wet meadow habitat is maintained in late successional status. (Late successional status is defined as wet meadow habitat where greater than 90 percent of the community contains dense residual cover and/or greater than 20 percent of the community is forb dominant. Currently, hay fields must be flooded in the spring through the early summer and then drained to allow for haying activity. Wetland units are dewatered annually by August 1st to facilitate hay removal. Water levels are managed by Refuge staff using existing dikes and water control structures. CLMA and SUP haying activities occur from August 1 to September 15.

Proposed Management. Considering the minimal coverage of quality upland nesting habitat on Bear Lake NWR, it was necessary to reassess the importance of small grain production and short-cover objectives within Refuge meadow grass habitats. Refuge farming and haying will continue under similar authorities and stipulations as current management. The Refuge will continue to use Best Management Practices (see Stipulations below). Special conditions currently in place will continue, including additional restrictions on pesticide uses, limits to the types of crops grown, and no haying until after August 1 to reduce the risk of destroying nests of ground nesting birds. Proposed changes to the farming and haying program are as follows.

Proposed farming management: The Refuge will focus proposed agriculture and forage production on those fields that have been receiving moderate to high goose use in recent years. Subsequently, the Refuge will farm 124 acres (8 percent decrease) of small grain and legume crops for waterfowl and other key wildlife species (80 acres/eight fields on the Bear Lake NWR, and 44 acres/four fields on the Thomas Fork Unit). Two crop fields on the North Meadows Complex of Bear Lake NWR (11 acres) will be restored to native meadow grass to increase the amount of this limited habitat on the Refuge. This represents a 12 percent reduction in farming on Bear Lake NWR and 0 percent reduction in farming on the Thomas Fork Unit.

Refuge crops will be rotated and will annually consist of approximately 65 percent small grain such as fall wheat or spring barley, 15 percent summer fallow, with the residual crop either left standing or turned over and left idle through the next summer; and approximately 20 percent of Refuge crops planted in legumes (15 percent planted as annual clover and 5 percent in alfalfa) and rotated within a ten-year legume/small grain cycle.

The Refuge will plant annual clover on fields scheduled for summer fallow on the Thomas Fork Unit. This proposed approach on the Thomas Fork Unit will phase out spring wheat and move toward planting fall wheat to attempt to provide grain for migrating birds the following fall, and provide additional desirable green leafy browse for geese during the spring and early summer. The Refuge will reduce conventional fall tillage practices of residual planted crops and rotationally summer fallow rested (unplanted) fields through the next summer.

Additionally the Refuge has proposed five-year adaptive management Refuge evaluations of the geographic distribution and regional acreage of small grain production operations, to determine if more or less Refuge agriculture production is warranted on the Refuge in the future.

Proposed haying management: As the planning team began examining soils, vegetation, and wetland data for development of the CCP, it became clear that the Refuge was haying almost all (80-90 percent) of its wet meadow habitat, as well as some additional shallow emergent habitat.

Under the CCP, haying on the Bear Lake NWR and Thomas Fork Unit will still occur, but will be reduced to 1,492 acres (42 percent of the current 3,533 hayed acres) by 2027. The Refuge will continue haying a total of 1,342 acres (Bear Lake NWR: 1,127 acres; Thomas Fork Unit: 215 acres). This represents a 61 percent reduction in haying on Bear Lake NWR and a 36 percent reduction in haying on the Thomas Fork Unit. On Bear Lake NWR, haying will be phased out on 1,769 acres over a 15-year time frame. Reductions will occur in three, five-year cycles: 2013-2017; 2018-2022; 2023-2027. The 123-acre haying reduction on the Thomas Fork Unit will be phased in over a five-year time frame. Retired hayed units will primarily be wetter units, which under current management, must be dewatered to facilitate hay removal. With the reduction in haying operations, more shallow marsh and wet meadow habitat will remain inundated through the summer than under current management.

On Bear Lake NWR, an approximately 60:40 ratio of hayed-to-unhayed meadow will be maintained (no more than 60 percent of the refuge’s hay meadows will be hayed annually). By 2027, 70 percent of hay meadows (approx. 800 acres) will be placed in a rotational haying operation, while 30 percent (approx. 300 acres) will be annually hayed. On the Thomas Fork Unit, all 215 acres will be hayed rotationally. Approximately 40 percent of wet meadow habitat will be maintained in early successional status through the Refuge’s haying program, while 60 percent of wet meadow habitat will be maintained in late successional status.

Need and Availability of Resources:

Category and Itemization	One-time ($)	Annual ($/yr)
Administration and management:	$	$3,000
Maintenance:	$	$0
Monitoring:	$	$2,000
Offsetting revenues: TOTALS	$ $	$3,000 $2,000

Anticipated Effects of Described Use:

Farming.

Effects of farming to refuge wildlife: Both current and proposed management recognize the benefits for providing supplemental forage for migratory waterfowl and waterbirds within the Pacific and Bear River migratory corridor. Refuge farming practices (both current and proposed) are designed for the predominate benefit of waterfowl (ducks, geese and greater sandhill cranes). However, many other species (e.g., long-billed curlews, porcupine, sage-grouse, bald eagles) would benefit directly or indirectly from Refuge crops. Croplands on the Refuge promote sustained use of the area by migrating waterfowl by providing an accessible, high-energy food source during late fall and early winter as wetlands freeze up.

Most waterfowl are opportunistic feeders, and some species such as Canada geese, snow geese, mallard, northern pintails, and teal have learned to capitalize on the abundant foods produced by agriculture (Bellrose 1976). During the last century, migration routes and wintering areas have changed in response to availability of these foods (Fredrickson and Drobney 1979). Some species have developed such strong migratory traditions that many populations are now dependent on agricultural foods for their migration or winter survival (Ringelman 1990). However, during breeding and molting periods, waterfowl require a balanced diet with high protein content. Agricultural foods, most of which are neither nutritionally balanced nor high in protein, are seldom used during these periods. During fall, winter, and early spring, when vegetative foods make up a large part of their diet, agricultural foods are preferred forage except in arctic and subarctic environments (Sugden 1971).

Effects of farming to refuge habitats: Cropland farming currently represents approximately 1 percent of Bear Lake NWR (134 acres) and 4.4 percent of the Thomas Fork Unit (44 acres). Under the CCP, farmed acres will be reduced to >1 percent of Bear Lake NWR (124 acres) and remain the same on the Thomas Fork Unit. There will be a minor negative impact on availability of grain for fall migrating geese and cranes, since the amount of land under cultivation will decrease slightly by 11 acres in proposed management. However, proposed management will not impart any additional losses to native habitats from farming, since all proposed farm fields have already been in agricultural production.

Bear Lake NWR will retain eight small agricultural fields on the Bloomington and Bunn Lake Complexes. The juxtaposition of these fields in close proximity to other habitats is required to meet the life history requirements of identified key species and justifies the continued farming of these eight small agricultural complexes to adequately reduce waterfowl depredation on adjacent private property. Agricultural fields targeted for removal from production on Bear Lake NWR generally have low to moderate waterfowl use, so their removal should not impact waterfowl habitat use substantially. Refuge restoration of 11 acres of former agriculture to native meadow grass in the North Meadows Complex West and Center Entrance Fields will reduce the risk of bird power line collisions and increase limited meadow grass habitat on the Refuge.

Activities associated with crop production, including ground disturbance and field to field movement of cultivating and harvesting equipment, can disturb soils. Direct impacts of cropland management include exposure of soils to wind erosion and impacts from farm machinery. In general, tillage and cropping that leaves soil bare for portions of the year negatively affect soil quality indicators (Nelson et al. 2006) such as aggregate stability, infiltration rates, and available water capacity. Compaction can result from the use of farming equipment for seeding, causing undesirable increases in bulk density, while tilling may also prevent the accumulation of, or accelerate the decomposition of organic matter (USDA NRCS).

Current fall crop residues are generally removed by tilling after harvest, but proposed management will implement a conservation tillage system and fallow residual crops through the fall and into the next summer. Subsequently, proposed management will reduce the total tilling of agricultural fields on the Refuge through the implementation of conservation tillage practices and by restoring 11 acres of agriculture fields at Bear Lake NWR. EPA’s guidance for estimating Particulate Matter (PM) emissions from agricultural crop tilling involves combining a constant emission factor with county-level activity data, including the silt content of surface soils, the number of tillings performed in a year for each crop type, and the acres of each crop type (EPA 2001, 2004). While no PM emissions data exist for Southeastern Idaho, it is estimated that the Refuge contribution to PM emissions will be less under proposed management, but no significantly degradation is expected to local or regional air quality from either current or proposed management action. While there will obviously be some continued impact to soil quality within proposed management, a reduction in the acreage under cultivation should impart a minor beneficial impact on soil and water quality when compared to current management.

Cultivation and disturbance of soils fosters an undesirable opportunity for the introduction or spread of weeds on the Refuge. Invasive weed species have the potential to reduce habitat quality and forage opportunity and have been identified as one of the most serious threats to Refuge habitats. Farming may also result in the use and introduction into the environment of chemical agents from pesticide usage. In addition, small mammals, reptiles, and amphibians may be occasionally subject to mortality from farm machinery, and nesting birds may be occasionally disrupted and nests destroyed.

In the absence of irrigation water or fertilizer, Refuge crops must be planted following snowmelt and are then subject to annual rainfall patterns for grain production. By slowly converting some Refuge crops to fall planted wheat, crops will begin growing in fall, lie dormant through winter, and then take maximum advantage of snowmelt during early spring growth periods. Similar to spring planted crops, fall planted crops produce grain for the next fall migration; however, fall planted crops will provide additional Refuge browse during spring/early summer for geese. Among the benefits of the rotational practices proposed by the Refuge are higher soil organic matter and nitrogen, lower fossil energy inputs, yields similar to those of conventional systems, and conservation of soil moisture and water resources, which is especially advantageous under drought conditions (Pimentel et al. 2005)

Fall tillage as a current agricultural practice eliminates valuable winter food and cover for Refuge wildlife and causes soil nutrient loss. By implementing a Refuge conservation tillage system in the proposed management, the Refuge will improve soil retention, reduce fertilizer costs, and reduce erosion. As soil-conserving measures increase, upland wildlife habitat quality also improves (Lines and Perry, 1978; Miranowski and Bender, 1982). Among the benefits resulting from rotational practices proposed by the Refuge will be higher soil organic matter and nitrogen, lower fossil energy inputs, yields similar to those of conventional systems, and conservation of soil moisture and water resources, which is especially advantageous under drought conditions (Pimentel et al. 2005)

Proposed five-year Refuge evaluations of the geographic distribution and acreage of small grain production operations will improve the Refuge's ability to adaptively determine future agricultural needs. By monitoring regional trends in crop production within proposed management the Refuge will become more adaptive and be able to provide increased agricultural crop production for wildlife or the ability to further restore additional agriculture habitats, should conditions warrant.

<u>*Effects to listed species from farming:*</u> Currently there are no listed species inhabiting the Refuge. Should agricultural farming management conflicts occur with listed species in the future; the Refuge will eliminate impacts to listed species or develop and implement minimization measures under Section 7 consultation of the Endangered Species Act. If deemed necessary, the cooperative farming program will be halted until all protective and minimizing measures can be evaluated and implemented as necessary.

<u>*Effects to priority public uses from farming:*</u> The agricultural fields targeted to provide forage for focal wildlife species indirectly support wildlife-dependent recreational activities such as wildlife observation and photography.

Haying.

<u>*Effects of haying to refuge wildlife:*</u> Current management strategies target a disproportionate amount (80 percent) of Refuge meadows and grasslands to be managed for short-cover habitat values, subsequently favoring only a few select species that have proven highly adaptable to habitats altered by agricultural land-use practices. In proposed management, Refuge haying reductions will be phased in over 15 years and limited to the acreage deemed by the Refuge staff to be suitable for short-cover management actions on 1,127 acres at Bear Lake NWR (a 61 percent reduction from the current 2,896 acres) and 214 acres at Thomas Fork (a 37 percent reduction from the current 337 acres).

The Refuge creates early successional short-stature habitats by haying wet meadows. These habitats provide easily accessible open foraging areas for several species that have proven highly adaptable to anthropogenic habitat alterations. Hayed Refuge areas provide preferred short-cover habitat for wildlife such as greater sandhill cranes, long-billed curlew, and Canada geese (Eldred 2009, La Sorte and Boecklen 2005).

The Refuge current haying objectives are designed to provide extensive short statured habitat across the Refuge and attempt to increase wildlife foraging opportunities within artificially low stature vegetation. Potential wildlife benefits frequently cited for providing managed short-cover grassland include: increased palatability of grasses for grazers, increased invertebrate forage availability and detection rates, reduced physical obstruction, and increased security from predators during grazing or foraging activity (Deveruex et al. 2006).

Hayed or naturally occurring short-cover habitats are comprised of low density herbaceous grass and forbs of 0-4 inches in height with bare ground, or light vegetative litter, easily visible. Ground foraging birds can easily move through this type of habitat and tend to select short cover habitat over dense grass habitat. Wildlife which select short-cover habitat include avian species in the Meadow Foraging Guild (e.g., greater sandhill crane, long-billed curlew, Canada goose, western meadowlark, American robin, cattle egret; Grazing Waterfowl Guild (e.g., American widgeon, American coot, gadwall, Canada geese); and Upland Nesting Guild (e.g., long-billed curlew, black-necked stilt, killdeer). The species representative of the “short cover guild, for the purposes of this evaluation, are the sandhill crane (meadow foraging), Canada goose (Meadow Foraging/Grazing Waterfowl), black-necked stilt (Upland Nesting) and, finally, long-billed curlew (Meadow Foraging).

Dense cover habitat on the Refuge is defined as taller native or non-native unhayed herbaceous cover, at least 10-12 inches in height, dense enough to effectively conceal a passerine, shorebird, or duck nest from overhead or lateral view. Birds selecting dense cover for foraging and nesting include species in the Upland Nesting Waterfowl Guild (i.e., northern pintail, mallard, cinnamon teal, northern shoveler, gadwall); the Meadow Nesting Shorebird Guild (i.e., Wilsons’ phalarope, willet, common snipe); the Secretive Marsh Bird Guild (i.e., American bittern, Virginia rail, sora rail); and the Shallow Over-water Nesting Marsh Bird Guild (i.e., black tern, marsh wren, red-winged blackbird, yellow-headed blackbird, northern harrier). The species considered most representative of the “dense cover guild” for the purposes of this evaluation are the sandhill crane (Meadow Nesting), Wilson’s phalarope (Meadow Nesting), Northern Pintail (Upland Nesting), and Black tern (Shallow Over-Water Nesting).

Current and proposed haying will reduce the height of the meadow grasses to the benefit of passerine species that prefer short grass pastures as a foraging habitat (Whitehead et al. 1995, Perkins et al. 2000, Devereux et al. 2004). Several mechanisms may underpin this choice including greater visibility for monitoring predators and conspecifics, improved prey accessibility and better mobility for foragers (Whittingham and Markland 2002, Butler and Gillings 2004, Whittingham and Evans 2004, Wilson et al. 2005). Conventional wisdom in agricultural and range management is that removal of “excess” or “decadent” plant litter increases sunlight and solar radiation, thereby warming soils earlier and promoting more available succulent plant growth earlier in the spring than areas covered by dense litter (Lecain et al. 2000). In Northern California, the abundance and diversity of birds, particularly sandhill cranes, on hayed meadow were equal to or greater than the abundance and diversity of birds on nonhayed plots (Epperson et al. 1999). However, Epperson and colleagues (1999) noted that cranes spent more time foraging and less time alert in hayed plots and concluded that foraging and vigilance by cranes to be more efficient in hayed meadows.

A second explanation of the preference of newly cut grass is that haying changes invertebrate activity or availability, for example by causing a temporary flush of prey (Vickery et al. 2001). The advantage to foraging in an area where prey is concentrated by mowing is intuitive (Dunwiddie 1991, Cattin et al. 2003), but it is less obvious why mowing could influence soil invertebrates. It is possible that the action of mowing changes the activity rates of soil-dwelling prey because of noise and vibration, especially when large machinery is used. Prey may respond to the disturbance by changing their activity rates in some way that translates into an increase in capture efficiency for short-cover foragers.

Insects form particularly valuable protein-rich forage bases within wet meadows (Fredrickson and Reid 1988, Wissinger 1999). Mowing or haying may affect the meadows associated invertebrate community (Purvis and Curry 1981, Morris 1990). If a meadow is hayed annually, the timing of the cut will affect the invertebrates present. The later the cut, the more time invertebrates will have to complete their life cycle. Many insect larvae develop in the seedheads of grasses and flowering plants. For example, cutting in June will have the greatest effect on planthoppers (Delphacidae) and many fly species, whilst cutting in July/August will adversely affect leafhoppers (Cicadellidae). Intake efficiency of foraging passerine birds was found to be greater in recently hayed units (Deveruex et al. 2006). Both intake rate and foraging efficiency are important determinants of a small bird's survival. Deveruex and colleagues (2006) results showed that although no more prey were captured on newly mown/hayed grasslands, energy expenditure was reduced because fewer searches were required for each prey captured.

While increased access to invertebrates is the principal advantage cited for short-cover management practices (Schekkerman and Beintema 2007), an unanticipated effect of short-cover haying operations is that little vegetative complexity for hosting invertebrate substrate remains. Temporally flooded meadow wetlands are so productive because the base of the biotic pyramid is large and diverse and nutrient cycling is dynamic (van der Valk 1989). Because energy flows from the lowest levels of the pyramid in unhayed or mowed habitat, detritus sustains much of the biomass and structure of the community (van der Valk 1989). Excessive litter removal from current haying practices affects the balance between litter removal and accumulation in shallow wetland habitat, causing unwanted effects upon primary and secondary wetland productivity. Small litter accumulations may not provide adequate substrate for invertebrates; however, large accumulations may alter surface hydrology through peat formation or nutrient binding (Magee 1993). Invertebrate production may be impeded because of unfavorable conditions associated with hydrology, substrate, and nutrient availability in scant or heavy litter accumulations (Magee 1993). Proposed management will reduce hayed acreage moderately from the current levels, thereby providing a more diverse litter layer in wet meadows and various stages of litter size and decay. In comparison to current management, proposed hay management optimizes management of invertebrates for a more diverse array of foraging waterbirds and wildlife.

Haying involves the use of farm equipment to mow, rake, bale, and transport hay in grassland areas. The greatest potential for disturbance to wildlife occurs during mowing. Disturbance varies with vegetation composition and density, habitat use, wildlife species distribution and density, and time of year. Birds, mammals, amphibians and reptiles may be temporarily or permanently displaced, injured, or killed. Collectively, several studies show a direct and often substantial impact of the harvesting process on the fauna, especially from the mowing stages, and that this impact depends on the techniques and equipment used, as well as the equipment settings, and the habitat and ecology of each species (Humbert et al. 2009). In Oregon, private hay fields appear to support more than 5,000 breeding shorebirds (inferred by Paullin et al. 1977). These authors stated that young shorebirds were especially vulnerable to mortality from hay cutting. In early July (July 1 and 13) hay mowing was documented to have killed the following: Wilson's phalaropes; long-billed curlews; soras, common snipe, and blackbirds. They further found that, unlike ducks, shorebirds, especially Wilson's phalarope, tend to remain in hay meadows to feed after hatching. Consequently, earlier nesting species may be directly vulnerable to mowing. An added indirect effect to fledging shorebirds is that dewatering actions within current management may concentrate young birds near limited food resources in remaining water, increasing their vulnerability to not only mortality from haying equipment, but to predators (Ivey, pers. comm.). Several studies suggest that early hay mowing mortality is greatest in the first two weeks of July (Labisky 1957, Braun et al. 1978, Sargeant and Raveling 1992, Dale et al. 1997).

Hay cutting within the Bear Lake Valley begins as early as mid-June, likely causing very high rates of shorebird mortality on private property adjacent to the Refuge. Current and proposed management delays hay operators from initiating mowing or harvest of Refuge hay until August1 to ensure cutting occurs after the nesting season for grassland species is complete. Multiple researchers and management plans support the actions to minimize wildlife mortality from seasonal hay mowing by not allowing haying operations any earlier then August 1 (Warner and Etter 1989, Bollinger et al. 1990, Licht 1997, Krapu et al. 2000, Dechant 2003, Perlut 2006, USDOA 2007) and for assessing feasibility in proposed management for delaying haying operations further into mid-late August. Recommendations from managers of some grassland management areas indicate that waiting until mid-July for mowing or haying operations is adequate; however, waiting until mid-August will help prevent impacts to double and triple-brooded species that occur at Bear Lake NWR such as savannah sparrows and meadowlarks (Warren and Anderson 2005).

On Bear Lake NWR, the nesting cover provided on the Dingle Unit is of greatest value to ground nesting birds and those wildlife species that use moderate-to-dense vegetative cover. Subsequently continuance in providing short-cover habitat is a lower priority on the Dingle Unit. The three-unit, 1,791-acre North Meadows Complex, which includes the Dingle Unit, has historically been managed for hay production over wildlife needs. Continuation of this approach, in current management, requires unnatural water management regimes with high spring flooding, followed by a very rapid summer drawdown to facilitate haying operations. This type of unnatural and static water management would continue to limit potential for fledging waterbirds that require shallow flooded habitats, through the summer, to reach flight stage (Slayer and Willims 1997, Horung and Foote 2006). The 70 percent reduction in haying proposed for the North Meadows Complex will sizably improve wetland management capability for focal wildlife and is a sensible balance between the predisposition for short-cover objectives of current management.

The western portion of the Thomas Fork is a mosaic of large hayed expanses, interspersed with areas of tall emergent wetland vegetation. Unhayed patches of emergent stands of cattail and bulrush occur in the sloughs or marsh areas that are too wet to hay. Since the Thomas Fork Unit is recognized as important migration habitat for sandhill cranes, as well as providing nesting/brooding habitat for a small number of crane pairs, haying a portion of the Unit to provide short cover is a reasonable management strategy. Short cover is of value on the Thomas Fork to sandhill cranes and other short cover foraging species, notably Canada geese and perhaps long-billed curlews. Conversely, the eastern segment values are more aligned with the needs for dense cover-preferring species that are currently restricted to a very limited amount of unhayed area of tall emergent fragments. By reducing the annual acreage hayed on the Thomas Fork by 36 percent, from 337 acres to 215 acres in proposed management, the overall wildlife value of the unit will be increased for upland and meadow nesting species.

In summary, there is good evidence that food abundance is the main driver in determining bird usage of fields for both invertebrate-feeders (Brickle et al. 2000), and seed-eaters (Robinson and Sutherland 199, Moorcroft et al. 2002). However, food availability (i.e., abundance modified by ease of access to that food) has also been shown to be an important factor in determining bird usage (Henderson and Evans 2000, Henderson et al. 2001). Management for short structure, and the abundance and availability of food resources to birds, are inextricably linked (McCracken and Tallowin 2004). Haying or mowing affects grass height, and hence the amount of, and access to, food resources in different ways. Proposed management, with low to moderate disturbance from haying is more compatible with maintaining rich seed and invertebrate food resources and more diverse heterogeneous meadow habitat. This allows for both adequate food resources and areas where birds can access those resources, and provides taller denser habitat for upland nesting waterfowl, secretive marsh birds, and shallow over-water nesting birds. Continuation of haying, as proposed in current management, will predominantly benefit common bird species such as meadow foragers, grazers, and upland nesters, as it results in low vegetative diversity, structurally uniform habitats that contain few broad-leaved plant species and a reduced diversity of invertebrate food resources for birds (Lefranc 1997). Objectives as outlined in Refuge proposed management integrate an understanding of the factors that determine why birds forage in particular fields as well as how the major management practices can be modified to produce habitats that are suitable not only for species who readily adapt to anthropogenic changes in habitat, but a diverse suite of species. By offsetting current agricultural practices on 1,965 acres, and still providing short-cover on 1,491 acres, the Bear Lake NWR and the Thomas Fork Unit will provide a diverse realm of nesting and foraging habitats for both breeding and migrating wildlife during several key times in their annual life histories (Rollins 1981, Heitmeyer 1989).

Effects of haying to refuge habitats: Under proposed management, the Refuge will moderately reduce haying operations from 3,233 acres to increase the inundation of shallow marsh and wet meadow habitat through the summer. The proposal is to reduce haying by 61 percent (to 1,127 acres) on Bear Lake NWR over a 15-year timeframe, and by 36 percent (to 214 acres) on the Thomas Fork Unit over a five-year timeframe. Under proposed management, the acreage of wet meadow, alkali meadow, and meadow grass (upland) habitats on Bear Lake NWR will increase from 1,123 acres to 2,361 acres by 2027, as hay units are retired and restored to native habitats. We will also increase the coverage of late successional wet meadow habitat on remaining hayed units to a minimum of 60 percent coverage.

A confounding indirect effect of current hay operations requires the Refuge to dewater wetland units annually during late summer to facilitate hay removal. This type of annual drawdown must happen out of necessity, regardless of wetland habitat condition or Refuge objectives, in order to accommodate hay operators and permit hay removal. Because of the hay unit distribution in current management, many wetland units will continue to be dewatered annually by August 1 to facilitate hay removal and provide short-stature grasses, often at a time when fledgling waterbirds require these shallowly flooded habitats to reach flight stage.

While long-term hydrologic regimes shape invertebrate adaptive strategies, annual variation in the hydroperiod determines the occurrence and abundance within any given season (Fredrickson 1988, Reid 1985). Because invertebrate communities are also linked to hydrology (Swanson 1977, Fredrickson and Taylor 1982, Batzer 1983) current management actions, as described in current management, would continue to dewater wet meadows earlier to facilitate haying operations and continue to shift the distribution and availability patterns of aquatic invertebrates or possibly eliminate more moisture-tolerant taxa from hayed habitats (Euliss 1999). Proposed management will reduce haying by 61 percent by 2027, from 3,233 acres to 1,491 acres and supply a diverse mosaic of wetland cover types, while improving hydrologic management capability on the North Meadow, Bloomington, and Bunn Lake Complexes of Bear Lake NWR.

In assessing the positive and negative effect from haying on the Refuge, it is important to recognize the valuable role that temporarily flooded meadows play within Refuge ecosystems of larger seasonally and semi-permanently flooded habitats and upland dry meadows and upland shrub habitats. Flooded meadow habitat mosaics, where proximate to both tall emergent wetland and upland habitat, create a richness of habitat biodiversity that would not occur if the habitats existed in isolation from one another. Proposed management will moderately reduce meadow and upland haying operations to maintain inundation of wetland shallow marsh and wet meadow habitat through the summer. By decreasing haying operations and regaining as much as possible of the former hydrograph, proposed management will increase temporary and seasonally flooded habitats through properly timed inundation to provide an adequate hydrologic regime within wet meadow habitat.

This will increase habitat structure, litter accumulation, nutrient cycling, and ultimately, the invertebrate insects migratory waterbirds are dependent upon within these important habitat types.

In the Refuge's proposed management for all of Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough Waterfowl Production Area (Please see Section B.19) haying will be immediately reduced Refuge-wide by 554 acres (16 percent initial reduction) in 2013, with 673 additional acres (35 percent cumulative reduction) phased-out from 2013-2017, and an approximate 400-410 acres phased-out in each subsequent five-year interval of 2018-2022 and 2023-2027 (46 percent and 58 percent cumulative reduction respectively). By 2027 the Refuge will reduce haying by 58 percent to hay a collective total of 1,491 acres on the Bear Lake NWR, Thomas Fork Unit, and Oxford Slough WPA.

Subsequently, 2,041 acres of formerly hayed Refuge habitats will evolve through the succession of various annual and perennial species and form denser meadow grasslands. As most adjacent land-use practices throughout the Valley provide ample short-cover foraging habitat, it is anticipated that the reduction in the Refuge hay program will only reflect a negligible decrease in short-cover foraging and browsing habitat for waterfowl, geese, and cranes within the Bear Lake Valley. Although the Refuge acres devoted to providing short-stature forage will decrease under this proposed restorative management direction, it is expected that the change in annual waterfowl use days for the Refuge will be minor. Restoration of hayed units to native meadow and grassland habitats will provide slightly less accessible forage than current management, but the difference should be negligible. Alternatively, by not having to dewater productive wet meadows for haying operations, the proposed management strategy will considerably improve water management capabilities in several wetland units and provide increased security in waterbird roosting areas proximate to important native wet meadow habitats and forage.

Birds respond to the heterogeneity of habitats at several spatial scales (Wiens 1985), from the landscape (e.g., Bear River Watershed) to the site (e.g., Bear Lake NWR), to the microsite scale (e.g., foraging areas within wetlands). Because ephemerality is a dominant characteristic of natural wetlands (Fredrickson and Reid 1990), waterbirds have evolved flexible behavior to take advantage of water level fluctuations at a variety of scales (Kushlan 1989; Skagen and Knopf 1993, 1994). As it is unlikely that all resource needs can be indefinitely met by one wetland patch, aquatic birds probably supplement their resource intake by using multiple wetlands within a mosaic (Dunning et al. 1992; Farmer and Parent 1997). Limitation of shallow habitats on the Refuge by dewatering wetlands to facilitate haying and maintaining shallow habitat into the early fall in current management, is a cause for concern as access to food during the nonbreeding season can be a significant density-dependent cause of mortality in migratory shorebirds (Goss-Custard 1979).

Irrespective of water depth management, invertebrate resources must be abundant and periodically replenished if habitats are to function for extended periods (Miller 1987; Krapu and Reinecke 1992; Rehfisch 1994; Davis and Smith 1998). Invertebrate productivity is influenced by wetland plant composition, organic debris, temperature, substrate manipulations and flooding regimes (Neckles, Murkin and Cooper 1990; Rehfisch 1994; Batzer et al. 1997; Sanders 2000; Ausden et al. 2001). Invertebrate abundance is dependent upon cycles of spring flooding, summer evaporation, and fall inundation from rainfall. In hayed units with consistently lowered fall water levels, invertebrate forage resources are limited, if not depleted in current management (Eldridge 1992; Helmers 1992) and have lessened temporary and seasonally flooded habitat reducing the function and value of flooded habitat for Refuge wildlife.

Habitat fragmentation from human land-uses, such as haying, tends to increase the amount of edge adjacent to uplands (Laurance and Yensen 1991), thus subjecting upland wildlife populations to new or increased ecological interactions (e.g., predation, parasitism) associated with these edges (Wilcove et al. 1986). The prevailing principle of wildlife management is that increased edge and fragmentation of habitat negatively affect numerous species of nesting birds by increasing depredation or parasitism rates of nests (Paton 1994). Several specific studies report elevated rates of nest predation in fragmented forested and wetland landscapes (Robinson et al. 1995, Donovan et al. 1997, Hartley and Hunter 1998) and in small habitat remnants (Small Hunter 1988, Wilcove 1985).

In a Canadian prairie wetland study, daily survival rate of upland nesting birds was highest in dense nesting cover and fields hayed late in the season, while idle pasture (hayed the previous year) and rights-of-way exhibited similar but lower nest success (Pasitischiniak-Arts and Messier 1995). These researchers also found nest survival was higher in spring than in summer for one of three years studied. In all years and habitats, significantly, more mammals than birds depredated waterfowl nests. In all years and habitats, significantly more mammals than birds depredated waterfowl nests. The relative importance of the two classes of predators was similar among delayed hay, dense nesting cover and rights-of-ways, but differed from idle pasture (hayed the previous year) where avian predation was higher (Pasitischiniak-Arts and Messier 1995).

Pacha and Petit (2008) studied the overall changes in vegetation and landscape structure changes due to management practices over two decades in Great Britain and the effects of fragmentation on a particular species. Their results indicated that there can be a general impoverishment in upland meadow vegetation from un-relinquished agricultural haying, with decreases in diversity, species richness and habitat quality leading to upland meadows becoming ten times more isolated than 20 years ago.

The east portion of Bear Lake NWR transitions into sagebrush-steppe habitat on the slope upward into the surrounding rolling benchlands of Merkley Mountain. Consequently, the eastern portion of Bear Lake NWR will benefit from the proposed reduction in haying, to decrease habitat fragmentation and benefit upland shrub nesting waterfowl (i.e., Northern pintail) and sagebrush obligate wildlife (e.g., sage-grouse, sage sparrow, sage thrasher), and provide connective corridor for upland and meadow nesting shorebirds (e.g., Wilson’s phalarope) to mesic brooding wetland habitat through the summer.

Haying operations in wet soil types are noted to cause greater impacts to soil compaction and vegetation damage than on drier upland sites (Gilley at al 1996). Gilley (1996) further documented that soil roughness was significantly greater and bulk density significantly less on undisturbed long-term idle sites than hayed areas. The relatively large bulk densities measured on the hay fields imply that considerable compaction occurs at or near the soil surface from those operations (Murphy 2004). Recent trends for increased size and use of tractors and agricultural machinery has additionally increased the probability of soil compaction during farm operations (Martel and MacKenzie 1980). Soil compaction by machinery has an indirect effect on soil invertebrates. Some earthworms can burrow into compacted soil (Joschko, Diestel and Larink 1989) but others have their activity restricted by compaction under conditions of high water (Kretzschmar 1991). Soil compaction has also been shown to decrease slug populations (Ferguson, Barratt and Jones 1988). (Rabotnov (1974) found a decrease in proportion of soil geophytic grass in Russia, which could be partially explained by soil compaction as a result of hay collection.

Haying reductions proposed will reduce haying in wet or moist meadows, where equipment may adversely impact vegetation and soil. Additionally, haying occurs on the Refuge in mid-August and early September, in some of the driest months of the year. To further minimize soil compaction or damage in proposed management, fields that have been saturated by rain will not be hayed until soil conditions can support the required haying equipment. Since the Refuge proposes that haying only occur in a drier time of the year for warm-season grasses on well-drained soil types, impacts from soil compaction will be decreased in comparison to current management (Murphy 2004).

<u>*Effects to listed species from haying:*</u> Currently there are no listed species inhabiting the Refuge. Should hay management conflicts occur with listed species in the future, the Refuge will eliminate impacts to listed species or develop and implement minimization measures under Section 7 consultation of the Endangered Species Act. If deemed necessary, the cooperative farming program will be halted until all protective and minimizing measures can be evaluated and implemented as necessary.

<u>*Effects to priority public uses from haying:*</u> Farming and haying on the refuge does not occur in areas that are open to the public; therefore there are no impacts to public uses.

Anticipated Cumulative Effects of Agricultural Uses (Farming and Haying):

Genetically Modified Organisms. The NWRS does not authorize refuges to use genetically modified organisms (GMO) for agricultural uses. However, GMO seeds could be in-use on surrounding private farm crops now or in the near future. Pollen blown on the wind or carried by pollinator species may be capable of transferring genetically engineered traits, such as herbicide resistance and pest resistance, to closely related wild plants on the Refuge. Genetically engineered plants with weedy wild relatives are of particular concern to the Refuge. If expressed in the genetic background of a weed species, a transgene could increase the fitness of the weed in nature (Stewart et al. 2000). Laboratory studies have shown non-target pollinator species may also be harmed by wind-blown pollen. Monarch butterfly larvae have been shown in both laboratory and field tests (Losey et al. 1999, Jesse and Obrycki 2000) to suffer growth and mortality effects after feeding on milkweed plants dusted by corn pollen that was genetically engineered to express a bacterial toxin.

Pesticides. The Refuge can select less toxic pesticides and standardize operational procedures to minimize the immediate and accumulative effect of pesticides in the environment. However, the Refuge has no control over surrounding land-use and agricultural practices, thereby increasing the risk of acute and chronic exposures to wildlife from herbicides. Acute exposure is a single exposure or multiple brief exposures occurring within a short time (e.g., 24 hours or less in humans). Chronic exposures are those that extend over the average lifetime or for a significant portion of the lifetime of the species (USFS 2005). Herbicides from the Refuge will result in a moderate to minor risk from acute chemical exposure. However, unquantified and increasing risks from acute and chronic exposure may occur via the aggregate impacts from Refuge herbicide applications when combined with private, county, and State herbicide applications within the Bear Lake Valley.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Farming Use on Bear Lake NWR.

- Cropland farming will be done under an approved Cropland Management Plan per agency policy.
- Annual cooperative farming agreements will be established with the cooperator per agency policy.
- The cooperative farmer is required to perform habitat maintenance work to sustain the field conditions for the benefit of wildlife. Work may include mechanical weed control and fertilization.
- The agreement does not imply or establish a use precedent. Future use of the area will be based on the most satisfactory use of the land for wildlife benefits, cooperator performance, habitat management needs, and administrative needs.
- All improvements made to the Refuge as a result of this Cooperative Land Management Agreement become the property of the United States.
- The Cooperator will be responsible to perform fence maintenance, weed control, crop planting and water management as detailed in annual work plans within each CLMA.
- The cooperative farmer will exercise care to prevent fire and will assume responsibility for fire, which may result from his/her operations.
- No Refuge equipment will be provided for use by the cooperator.
- At the end of the permit period, cooperator is responsible for removing all equipment from refuge lands.
- The cooperator shall be responsible for repairing damage to refuge facilities or habitat beyond normal wear and tear resulting from his/her operation.
- Pest plants and weeds will be controlled in accordance with the refuge's IPM program using methods such as crop rotation, mechanical treatment, biological controls, and approved pesticides.
- Insecticides, fungicides and other chemicals will not be permitted under this agreement. Fertilizers can be used by the Cooperator to fertilize crops.
- Pesticide use must be in compliance with the Service policy requirements for completing an approved Pesticide Use Proposal, and it must meet other State and Federal requirements.
- Cooperators will provide a record of herbicides used including chemical name, amount used, date, location, and how applied.
- Pesticide applicators must meet all State, Federal and agency requirements.
- Diligence shall be exercised in the control of county-listed invasive weeds.
- Equipment of cooperating farmers will be cleaned prior to being moved onto the refuge and between fields when working in areas with weed infestations
- No genetically modified crops are allowed.
- Monitoring of the cropland farming program will be performed by qualified Refuge staff.

Haying Use on Bear Lake NWR.

- Haying will be done under an approved Cropland Management Plan per agency policy.

- Annual cooperative haying agreements will be established with the cooperator per agency policy.
- The Refuge will assess local Bear Lake Valley hay values at least every three years, or more often if needed, to insure CLMAs are being conducted at a fair market value.
- Haying activities will start on or after August 1 each year and be completed by September 15, including removal of baled hay.
- Haying activities will start on or after August 1 each year and be completed by September 15, including removal of baled hay.
- Haying shall occur after August 1 to minimize impacts to ground nesting birds.
- The permittee shall remove all equipment and materials from the Refuge by the end of the haying season.
- Haying cooperators will provide a written report and record of annual hay harvest to Refuge
- The agreement does not imply or establish a use precedent. Future use of the area will be based on the most satisfactory use of the land for wildlife benefits, cooperator performance, habitat management needs, and administrative needs.
- The cooperator shall be responsible for repairing damage to refuge facilities or habitat beyond normal wear and tear resulting from his/her operation.
- Monitoring of the haying program will be performed by qualified Refuge staff, including surveys to determine if haying is adversely impacting ground nesting birds.

Special Conditions for Bid Sale Haying Permits on Bear Lake NWR.

1. No upland grass areas, old fence lines, or haystack yards may be hayed without prior approval.
2. Permittee must notify the Refuge Manager immediately upon completion of baling to set up time for weighing of hay.
3. No hay may be removed from Refuge lands prior to the weighing of a hay sample unless the permittee is transporting the hay to a commercial scale for weighing.
4. Permittee must notify the Refuge manager of the correct bale tally within 48 hours of completion of baling.
5. No pesticides will be used and no burning will be allowed on Refuge lands.
6. All hay cut shall be removed from Refuge lands.
7. All waste materials from haying operation shall be immediately removed from Refuge lands and no hay shall be stacked on the Refuge.
8. Nonuse of a permit shall be cause for cancellation of a permittee’s privilege.
9. Failure to make the payment within the specified time will result in cancellation of the permit.

Special Conditions for Negotiated Sale Haying Permits on Bear Lake NWR.

1. No upland grass areas, old fence lines, or haystack yards may be hayed without prior approval.
2. Permittee <u>must</u> notify the Refuge Manager immediately upon completion of baling to set up time for weighing of hay.

3. No hay may be removed from Refuge lands prior to the weighing of a hay sample unless the permittee is transporting the hay to a commercial scale for weighing.
4. Permittee must notify the Refuge manager of the correct bale tally within 48 hours of completion of baling.
5. No pesticides will be used and no burning will be allowed on Refuge lands.
6. All hay cut shall be removed from Refuge lands.
7. All waste materials from haying operation shall be immediately removed from Refuge lands and no hay shall be stacked on the Refuge.
8. All permittees shall use the hat in their own livestock feeding operation off the Refuge. Resale of the hay is not permitted.
9. Nonuse of a permit shall be cause for cancellation of a permittee’s privilege.
10. Failure to make the payment within the specified time will result in cancellation of the permit.

Justification:

The Refuge’s agricultural program is designed to provide areas of high-energy carbohydrates and protein (winter wheat, barley, and legumes), and green forage grasses to meet the food energy needs of migrating waterfowl and cranes, and to reduce crop depredation in nearby agricultural fields. Wildlife known to use the Refuge grain fields are primarily sandhill crane and Canada geese. One hundred fifty to two hundred cranes have been counted in the Refuge grain fields. In periods of severe weather, having a readily available source of high-energy foods can sustain waterfowl and cranes during critical periods of nutritional and physical stress when other food sources generally are unavailable.

The Refuge manages all habitats to provide a variety of foods that will help migratory waterfowl. Although native vegetation provides higher levels of protein, fiber, and water than most agricultural crops, crops can provide easily accessible high energy foods that are more readily digestible than native plants and can reduce foraging time required to meet caloric demands (Raveling 1979, Alisauskas and Ankney 1992, Baldassare and Bolen 2006). Waterfowl are able to exploit a variety of habitats to meet their daily and seasonal food requirements and the Refuge provides a diversity of food supplies (native and non-native) in relative proximity to each other. Many birds also prefer to forage and rest in areas with the good visibility that hayed acreage provides to better detect predators such as coyotes. Haying removes tall vegetation that would restrict visibility and helps control weeds. In addition, the agricultural fields provided for target wildlife species indirectly support wildlife-dependent recreational activities such as wildlife observation and photography.

While agricultural crops are typically not limiting within the regional landscape, agricultural fields where all grain is produced and retained for wildlife use are. Changes to local agricultural planting practices in the area surrounding the Bear Lake NWR and increased efficiency in harvest equipment, has resulted in a reduction in the availability of energy producing foods for migratory waterfowl. Because this trend is likely to continue in the future, Refuge cropland management will be essential for waterfowl management in future years, both to provide food for wildlife and reduce crop depredation in nearby agricultural lands. Considering recent off-Refuge conversions from small grain to alfalfa and meadow hay production, Refuge agricultural crops will continue to be required to provide a supplemental as well as a depredation benefit to local farmers still growing small grain crops (Mclvor and Conover 2003).

Short stature, wet meadow hay ground provides open areas for sandhill crane foraging. Birds selecting short cover include the following guilds: the meadow guild represented by the sandhill crane, western meadowlark, and cattle egret; the grazing waterfowl guild represented by American widgeon, Canada goose, American coot, and gadwall; and the upland-nesting shorebird guild represented by the long-billed curlew, American avocet, black-necked stilt, and killdeer. When juxtaposed with dense cover late successional wet meadow habitat (unhayed) and other palustrine emergent marsh habitat types, short cover can provide seasonally valuable habitat for their use. Birds selecting dense cover for foraging and nesting include the following guilds: upland nesting waterfowl guild represented by northern pintail, mallard, cinnamon teal, northern shoveler, and gadwall; the wet meadow nesting shorebird guild represented by Wilson’s phalarope, willet, and common snipe; the secretive marsh bird guild represented by American bittern, Virginia rail, and sora rail; and the shallow over-water nesting marsh bird guild represented by black tern, marsh wren, red-winged blackbird, yellow-headed blackbird, and northern harrier. Other species also benefit from haying; however, other management tools, such as mowing and burning, provide the same habitat characteristics, and additionally, leave nutrients within the unit and in the case of mowing, provide invertebrate substrate. While hayed wet meadow habitat is certainly not in limited supply throughout the Bear Lake Valley, it does provide some habitat benefits for wildlife.

Returning some agricultural fields to their former wetland habitat types will help to halt the loss of wetlands locally, regionally, and nationally. This will have a relatively small, but positive, impact on the majority of species on the Refuge dependent on wetlands for some part (or all) of their life cycle. By implementing phased reductions of hayed acreage and restoring retired hay units to wet meadow, alkali meadow, and upland meadow habitats, acreages in these habitat types will increase from 1,123 acres to 2,361 acres on Bear Lake NWR (an increase of 110 percent). By implementing hay management strategies to reduce the coverage of early successional wet meadow habitat to less than 40 percent, the structure and composition of native meadow grass habitat will be greatly improved.

The reduction of haying on the Refuge will have a negligible impact on the availability of short grass habitat in the Bear Lake Valley. Hayed short-grass pastures will continue to provide optimal open foraging areas for several wetland dependent wildlife species such as greater sandhill cranes, Canada geese, and white-faced ibis, while dense late-successional wet meadows will provide habitat for a diverse suite of waterfowl, waterbirds, and shorebirds during several key times in their annual life histories (Rollins 1981, Heitmeyer 1989). By providing a mixture of short (hayed) and dense cover, and both native and non-native habitats, proposed management will help maintain the biological integrity, diversity, and environmental health of the Refuge. These factors in turn contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats.

By conducting the agricultural program under the management practices and stipulations described above, management anticipates that wildlife will find abundant native and non-native food resources and resting places on the Refuge. Additionally, it is anticipated that the results of monitoring will prevent negative impacts to fish, wildlife, plants, and their habitats and that the agricultural program will contribute to achieving Refuge purpose(s) and the Mission of the National Wildlife Refuge System.

As a management tool, cooperative land management use is a beneficial Refuge operation in meeting purposes of the Refuge as well as goals and objectives established in the CCP. The farming and haying activities within the cooperative land management program contribute to achieving Refuge purposes and goals identified in the CCP, as well as the National Wildlife Refuge System mission, by providing valuable foraging areas for migrating waterfowl and sandhill cranes, and habitat for nesting, foraging, and brood rearing for a variety of migratory birds and resident wildlife. As a result, cooperative farming contributes to achieving refuge purpose(s); contributes to the Mission of the NWRS; and helps maintain the biological integrity, diversity, and environmental health of the Refuge. Allowing the use as described above will not materially detract or interfere with the purposes for which the refuge was established or the mission of the Refuge System.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 6, Agricultural Practices on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

B.11 Compatibility Determination for Dog Walking on Bear Lake National Wildlife Refuge

RMIS Database Uses: Dog walking

Refuge Name: Bear Lake National Wildlife Refuge (NWR)

Location: Bear Lake County, Idaho

Date Established: 1968

Establishing and Acquisition Authorities:

- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

- “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- “... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... ” 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- “... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... ” 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- “... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ... or (B) plants ... ” 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- “... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... ” 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- “... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... ” 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

“The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

Existing Use. Approximately 20 visits by people walking dogs occur on Bear Lake NWR per year. These visits occur from late spring through early fall. Visitors walking dogs have been observed using the Entrance Road where wildlife numbers are low. No negative interactions with wildlife or other visitors have been documented. Visitors using the auto tour route generally do not exit their vehicles. Dog walkers have never been observed on the auto tour route.

Proposed Use. We propose to allow dog walking on Refuge roads and trails on the Bear Lake NWR, with stipulations to ensure public safety and compatibility of this use. Dog walking will be allowed on the 2.4-mile Auto Tour Route and 1.9-mile seasonal pedestrian trail (March 15-Sept 20) of Bear Lake NWR. Dog walking will also be allowed on the proposed boardwalk on the southeast border of the Refuge along North Beach Road. Dogs will be required to be on a leash at all times. Dog walking will not be allowed off the roads and trails. Feces must be removed from roads and trails and disposed of properly. Restrictions on this activity will be clearly posted at refuge entrances, parking lots, and in the refuge brochure and website.

Dog walking will be monitored annually along with other uses of the Refuge roads and trails to ensure compliance, and compatibility with wildlife management and wildlife-dependent recreational activities. If monitoring indicates routine non-compliance or compatibility conflicts, the Service will evaluate the need for limiting or prohibiting dog walking. This CD will be revised in ten years or sooner to incorporate additional data and new information.

Availability of Resources:

Maintenance of Refuge roads and trails incurs costs, but costs are not directly related to dog walking. Roads are routinely maintained for vehicle activity and to repair holes made by burrowing wildlife. No additional expense for dog walkers is anticipated. Since dog walking will be restricted to the roads and trails, the major portion of the funds needed to support this activity are in the form of salaries for maintaining the existing roads and trails, monitoring public use and biological impacts, enforcing regulations, and exotic species control. Thus the Refuge has sufficient staff and funding to allow the use.

Need and Availability of Resources

Category and Itemization	**One-time ($000)**	**Annual ($000/yr)**
Administration and management:	$0	$1k
Maintenance:	$0	$0
Monitoring: Biological monitoring if use increases	$0	$2k
Offsetting revenues: TOTALS	$0 $0	$0 $3k

Anticipated Impacts of Described Use:

The impacts of dog walking, as conducted on Bear Lake NWR, have not been studied in detail. Dog walking has the potential of impacting shorebird, waterfowl, marsh bird, and other migratory bird populations feeding and resting near trails or roads during certain times of the year.

Impacts to Habitat. Both hikers and dog walkers can cause structural damage to plants and increase soil compaction. The degree of surface compaction is dependent on topography, soil structure, and soil moisture (Whittaker 1978). Impacts of trampling on vegetation and soils commonly noted on trails (Dale and Weaver 1974, Liddle 1975) are unlikely to occur on the well-defined, gravel surfaces of roads and trails. The Service repairs, operates, and patrols the Auto Tour Road. Maintenance activities include planting trees, shrubs, and tall vegetation at points along the roadside, herbicide spraying, road grading, and gravel replenishment, as needed. Although dog-walkers will be required to remain on the roads and trails, some users may leave the trail to provide drinking water for their dogs, or to observe and photograph wildlife. Plants may be trampled in the process and wildlife disturbed. Currently, there is little evidence of this user group leaving roads and trails.

Impacts to Wildlife (Disturbance).

<u>*Wildlife response to dog walking:*</u> Among the proposed public uses of the Auto Tour Road, a human with a dog will elicit the greatest stress reaction in wildlife. In the case of birds, the presence of dogs may, reduce bird diversity and abundance in woodlands (Banks and Bryant 2007) and staging areas (Burger 1986, Lafferty 2001a,b), flush incubating birds from nests (Yalden and Yalden 1990), disrupt breeding displays (Baydack 1986), disrupt foraging activity in shorebirds (Hoopes 1993), and disturb roosting activity in ducks (Keller 1991). Many of these authors indicated that dogs with people, dogs on-leash, or loose dogs provoked the most pronounced disturbance reactions from their study animals. However, the greatest stress reaction results from unanticipated disturbance. Animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielsen and Smith 1995).

The effects of human disturbance can be reduced by restricting human activity to an established trail, having disturbance free food areas for wildlife, and requiring dogs to be on a short leash under the control of the owner at all times. Sime (1999) concluded that maintaining control of pets while in wildlife habitats reduces the potential of disturbance, injury, or mortality to wildlife. In a study comparing wildlife responses to human and dog use on and off trails, Miller et al. (2001) recommended prohibiting dogs or restricting use to trails to minimize disturbance and that natural land managers can implement spatial and behavioral restrictions in visitor management to reduce disturbance by such activities on wildlife. Korschgen and Dahlgren (1992) and Fox and Madsen (1997) state the importance of disturbance-free food reserves and areas as a management alternative to minimize human disturbances. Dog walkers will be restricted to established, well-defined roads and paths that are sufficiently distant from wildlife habitat to prevent significant disturbance.

Despite thousands of years of domestication, dogs still maintain instincts to hunt and chase. Given the appropriate stimulus, those instincts can be triggered. Dogs that are unleashed or not under the control of their owners may disturb or potentially threaten the lives of some wildlife. In effect, off-leash dogs increase the radius of human recreational influence or disturbance beyond what it would be in the absence of a dog. Dog-walkers will be required to maintain physical control of their animal while on the Refuge, thereby reducing the potential and severity of these impacts to wildlife. Special competition or dog training events will not be allowed since dogs function as an extension of their owner, and group size has been found to increase wildlife response to disturbance (Geist et al. 2005, Sime 1999, Yosef 2000). Restrictions on this activity will be clearly posted at refuge entrances, parking lots, and in the refuge brochure and website.

The role of dogs in wildlife diseases is poorly understood. However, dogs host endo- and ecto-parasites and can contract diseases from, or transmit diseases to, wild animals. In addition, dog waste is known to transmit diseases that may threaten the health of some wildlife and other domesticated animals. Domestic dogs can potentially introduce various diseases and transport parasites into wildlife habitats and to humans (Overgaauw 2009, Sime 1999). In order to minimize the risk of disease introduction, dog walkers will be required to pick up dog feces and dispose of them properly.

Overall impact to Bear Lake NWR: The studies cited above show that dog walking can and does disturb wildlife. Based on the circumstances described in the scientific literature, it is reasonable to assume similar effects could occur on Bear Lake NWR in most areas where dog walking is allowed. However, we anticipate the impacts of dog walkers will be small, as a result of restricting this use to roads and trails, imposing a leash requirement, requiring removal of dog feces, and educating the public on the effects of recreation on wildlife and habitat.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Dog-walkers will be required to stay on trails and designated roadways throughout the year.
- Use is restricted to daylight hours only.
- Dogs must be kept leashed at all times.
- Dog droppings will be collected and disposed of properly off the Refuge by the responsible party. If domestic animal waste becomes a problem, dog-walking will be reevaluated.
- Regulations will be available to the public through a Refuge brochure.
- Directional, informational and interpretive signs will be posted and maintained to help keep visitors on trails and help educate the public on minimizing wildlife and habitat disturbance.
- Use will be periodically evaluated for disturbance to wildlife, especially if use numbers increase.

Justification:

Although dog walking is not a wildlife-dependent public use of the Refuge, as defined by statute (16 U.S.C. 668dd et seq.) this occasional use of the Refuge roads and trails is expected to have negligible impacts to wildlife habitat when compared to the effects of other public uses (Klein 1993). Potential for wildlife and habitat disturbance is minimal given the indirect approach of this activity, the enforcement of the leash rule and removal of dog feces. Restricting the disturbance to established roads and trails with appropriate set-back distances (buffers) will increase the predictability of public use on the Refuge, allowing wildlife to habituate to non-threatening activities. Impacts of dog walking will be monitored and if they, or other impacts, are discovered, this compatibility determination will be reevaluated. Direct costs to administer existing levels of dog walking on Refuge roads and trails will be minor because costs will already be covered by the existing Complex budget for maintaining wildlife-dependent public uses.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened from allowing dog walking on Refuge roads and trails. The relatively limited number of individuals expected to be adversely affected due to dog walking will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing dog walking to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X__Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

References:

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Signatures for Compatibility Determination 7, Dog Walking on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

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B.12 Compatibility Determination for Canoeing and Kayaking on Bear Lake National Wildlife Refuge

RMIS Database Uses: Canoeing and Kayaking (nonmotorized boating)

Refuge Name: Bear Lake National Wildlife Refuge (NWR)

Location: Bear Lake County, Idaho

Date Established: 1968

Establishing and Acquisition Authorities:

- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

- "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ... or (B) plants ... " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

We propose to allow recreational boating using nonmotorized boats (kayaks and canoes) on Bear Lake NWR, with stipulations described below.

Existing Uses. Most nonmotorized boat use at Bear Lake NWR occurs on the 7,400-foot Canoe Trail constructed in 2004, which is open July 1-September 20. Access to the Canoe Trail is via a graveled ramp at the trail head. The Boy Scouts of America's Camp Hunt brings about 120 Scouts to the Refuge each summer to use the Canoe Trail and earn a badge. Scouts carry binoculars and are also watching wildlife at the same time. Both motorized and nonmotorized boats are currently allowed in the 7,450-acre seasonally open (hunting) area, from September 20 through January 15; however, most if not all boating use appears to be by waterfowl hunters to access the hunt area.

Proposed Use. We propose to continue to allow nonmotorized boats on the 7,400-foot Canoe Trail from July 1-September 20. We propose to discontinue boating in the seasonally open hunt area, other than by hunters to access waterfowl hunting opportunities during the waterfowl hunting season.

Availability of Resources:

Category and Itemization	**One-time ($000)**	**Annual ($000/yr)**
Administration and management:	$0	$3k
Maintenance: Maintenance of boat ramps	$0	$5k
Monitoring: Biological and Law Enforcement	$0	$8k
Offsetting revenues: TOTALS	$0 $0	$0 $16k

The refuge has sufficient staff and resources to allow the use.

Anticipated Impacts of Described Use:

The Refuge provides crucial breeding, foraging, and resting habitat for migratory birds, including waterfowl, shorebirds, and other waterbirds. Recreational boating can affect their use in Refuge waters, altering distribution, reducing use of particular habitats or entire areas, altering feeding behavior and nutritional status, and causing premature departure from areas. (Knight and Cole 1995). More sensitive species may find it difficult to secure adequate food or loafing sites as their preferred habitat becomes fragmented and recreation-related disturbances increase (Skagen et al. 1991; Pfister et al. 1992). Motorized boats generally have more impact on wildlife than nonmotorized boats because motorboats produce a combination of movement and noise (Tuite et al. 1983; Knight and Cole 1995). For example, a significant decrease in the proportion of bald eagles feeding at a site was observed when motorized boating activity occurred within 200 meters of that area in the preceding 30 minutes (Skagen 1980). Motorized boats can also cover a larger area in a relatively short time, in comparison to nonmotorized boats. Boating pressure on wintering waterfowl in Germany had reached such a high level that it was necessary to establish larger sanctuaries and implement a seasonal closure on water sports and angling (Bauer et al. 1992).

Canoes and kayaks can cause significant disturbance based on their ability to penetrate into shallower areas of a marsh (Speight 1973; Knight and Cole 1995). In the Ozark National Scenic Riverway, green-backed heron activity declined on survey routes when canoes and boat use increased on the main river channel (Kaiser and Fritzell 1984). Canoes or slow-moving boats have also been observed to disturb nesting great blue herons (Vos et al. 1985). Huffman (1999) found that nonmotorized boats within 30 meters of the shoreline in south San Diego Bay caused all wintering waterfowl to flush between the craft and shore. However, compared to motorboats, canoes and kayaks appear to have less disturbance effects on most wildlife species (Jahn and Hunt 1964; Huffman 1999; DeLong 2002).

Although nonmotorized boating has a potential to impact wetland wildlife, the very limited number of visitors engaged in this activity, and the limited area and time of year this activity occurs is expected to result in few of the impacts described above. Implementing the prescribed measures listed in the "Stipulations" section should also reduce many of these impacts. Adequate amounts of undisturbed habitat will be available to the majority of waterfowl and other wetland birds because most of the Refuge is closed to boating, and boating regulations will be maintained and enforced.

The Refuge will also implement a monitoring program to help assess disturbance effects on wildlife and habitat. Improved outreach and educational information for Refuge visitors involved in activities associated with boating will also help to reduce the impacts associated with nonmotorized boating activities.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Signs will be installed and maintained to mark closed areas and seasonal closures.
- Periodic law enforcement will help ensure compliance with area closures. Regulations will be described in brochures and posted on informational Refuge kiosks. Boat operators are required to be in compliance with all applicable Refuge, U.S. Coast Guard, and Idaho State laws.
- Monitoring of boating activities and associated effects on waterfowl, waterbirds, and other migratory birds will be conducted and evaluated regularly. Monitoring data will be used by the Refuge Manager in the periodic re-evaluation of this Compatibility Determination.

Justification:

Although nonmotorized boating is not a wildlife-dependent public use of the Refuge, as defined by statute (16 U.S.C. 668dd et seq.), wildlife-dependent recreational activities such as environmental education, interpretation, and wildlife observation/photography) are facilitated by boating. Providing opportunities for wildlife-dependent priority public uses will contribute toward fulfilling provisions under the National Wildlife Refuge System Administration Act as amended in 1997.

Although the use can result in disturbance to wildlife, as described above, it is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened by allowing nonmotorized boating on the Refuge. The relatively limited number of individuals expected to be adversely affected due to nonmotorized boating will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing nonmotorized boating to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established, or the Refuge System mission.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

References:

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Speight, M.C.D. 1973. Outdoor recreation and its ecological effects: a bibliography and review. Discussion Papers in Conservation 4. University College of London, England. 35 pp.

Thornburg, D.D. 1973. Diving duck movements on Keokuk Pool, Mississippi River. Journal of Wildlife Management 37:382-389.

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Vos, D.K., R.A. Ryder, and W.D. Graul. 1985. Response of breeding great blue herons to human disturbance in northcentral Colorado. Colonial Waterbirds 8:13-22.

Signatures for Compatibility Determination 8, Canoeing and Kayaking on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

B.13 Compatibility Determination for Bicycling, Cross-Country Skiing, and Snowshoeing on Bear Lake National Wildlife Refuge

RMIS Database Uses: Bicycling, Cross-Country Skiing, Snowshoeing

Refuge Name: Bear Lake National Wildlife Refuge (NWR)

Location: Bear Lake County, Idaho

Date Established: Bear Lake NWR: 1968

Establishing and Acquisition Authorities:

- Public Land Order 4415, May 15, 1968, withdrawing land for Bear Lake NWR (33 FR 7151)
- Public Land Order 4545, December 28, 1968, addition of lands to Bear Lake NWR (33 FR 19948)
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Refuge Recreation Act, as amended (16 U.S.C. § 460k-460k-4)
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-742j, not including 742l)
- Endangered Species Act (16 U.S.C. § 1534)

Refuge Purpose(s):

- "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- "... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... " 16 U.S.C. § 460k-1 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... " 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).
- "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species ... or (B) plants ... " 16 U.S.C. § 1534 (Endangered Species Act of 1973)
- "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... " 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956)
- "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... " 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

Existing Use. Currently, cross-county skiing and snowshoeing are allowed on all roads open to vehicle traffic year round, and on trails/roads open from September 20-January 15 as conditions permit. Cross-country skiing and snowshoeing are allowed throughout the 7,450-acre seasonally open (hunt) area, July 1-Jan 20 as conditions permit. Bicycling is allowed on roads open to vehicle travel year-round, including the Auto Tour Route. Bicycling, cross-country skiing, and snowshoeing are not common activities at the Bear Lake NWR. An average of five bicyclists use Bear Lake NWR per year. Cross-country skiing and snowshoeing visits to Bear Lake NWR are estimated at 300 per year. Biking, skiing, or snowshoeing, visitors may view or photograph wildlife. However, these activities are treated separately, since these uses are not defined as wildlife-dependent recreational uses under the National Wildlife Refuge System Administration Act of 1966, as amended, and they do not automatically support the six wildlife-dependent priority uses.

Proposed Use. We propose to continue to allow bicycling, cross-country skiing, and snowshoeing on Refuge roads and trails on the Bear Lake NWR as noted above, except that only service roads and dikes within the seasonally open area (7,450 acres) of the Refuge will be open to pedestrian use (including cross-country skiing and snowshoeing as conditions permit) July 1-Feb 28.

Availability of Resources:

Maintenance of Refuge roads and trails incurs costs, but costs are not directly related to bicycling, cross-country skiing, and snowshoeing. Roads and trails will not be groomed specifically for skiing and snowshoeing. Roads are routinely maintained for vehicle activity and to repair holes made by burrowing wildlife. No additional expense for these activities is anticipated. Since these activities will be restricted to the roads and trails, the major portion of the funds needed to support this activity are in the form of salaries for maintaining the existing roads and trails, monitoring public use and biological impacts, enforcing regulations, and exotic species control. Thus the Refuge has sufficient staff and funding to allow the use.

Category and Itemization	One-time ($000)	Annual ($000/yr)
Administration and management:	$0	$2k
Maintenance: Posting signs and removing snow from entrance road	$0	 $2k
Monitoring: Biological monitoring if use increases	$0	 $5k
Offsetting revenues: TOTALS	$0 $0	$0 $9k

Anticipated Impacts of Described Use:

Wildlife Response to Bicycling. Rapid movement directly toward wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing (Knight and Cole 1995).

Knight and Cole (1991) suggest that sound may elicit a much milder response from wildlife if animals are visually buffered from the disturbance. Depending on the level of use and compliance to regulations restricting off-trail use, some impact to wildlife will be expected. Although biking has the potential to cause flushing of birds from breeding and foraging habitats, bicycling on the Refuge is not anticipated to cause large disturbances to wildlife due to the small number of bicyclists using the Refuge.

Wildlife Response to Cross-country Skiing and Snowshoeing. In two different studies of winter recreation impacts to wildlife in Yellowstone National Park (YNP), Aune (1981) and Cassirer (1990) found that, except for coyotes, all wildlife species observed (mostly big game) reacted more quickly to an approaching skier than to a snowmobile, and the flight distance was generally greater from skiers. Bison were found to respond dramatically to skiers who were off established trails. All wildlife species studied, including bison, were wary of people on foot. Aune (1981) also observed that in YNP, elk were less likely to flee from snowmobiles or skiers late in the winter than they were earlier in the season. He suggested that this was likely due in part to habituation by elk to snowmobile traffic and in part to decreased vigor of elk later in the season combined with the increasing difficulty of flight through deep, crusted snow. Proximity of escape cover that breaks the line of sight between elk and the disturbance may reduce flight distances and consequently the amount of energy used in flight. Moving automobiles and trail bikes had little effect on elk resting in timber at distances of only 0.13 miles (Lyon and Ward 1982).

Ferguson and Keith (1982) researched the influence of cross-country ski trail development and skiing on elk and moose distribution in Elk Island National Park in Alberta, Canada. They found no indication that overwinter distribution of elk was altered by cross-country skiing activity. However, it did appear that elk moved away from ski trails, particularly those that were heavily used, during the ski season.

Aune (1981) also reported average elk flight distances of 53.5 meters (175.5 feet) in response to skiers at Yellowstone National Park. In another study, elk began to move when skiers approached to within 15 meters (50 feet) in an area heavily used by humans year-round, and within 400 meters (1,312 feet) in an area where human activity is much lower (Cassirer et al. 1992). Elk in YNP fled more frequently and over greater distances from skiers off established trails than from skiers on established trails (Aune 1981).

Rudd and Irwin (1985) investigated the movements of moose in response to cross-country skiing and found that the average distance 19 moose moved away from people on snowshoes or skis was 16.6 yards, and the average distance at which moose were displaced was 80.7 yards.

Overall Impact at Bear Lake NWR. The studies cited above show that these activities can and do disturb wildlife. However we anticipate the impacts will be small, given the relatively low numbers of users and the limited amount of wildlife activity on the refuge during the winter months when skiing and snowshoeing occur. In addition, restricting cross-country skiing, snowshoeing, and bicycling to designated trails and/or roads should minimize the potential impacts and allow wildlife in the area to habituate to the use.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination:

____Use is Not Compatible

_X__Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Bicyclists, snowshoers and cross-country skiers are required to stay on trails and designated roadways and adhere to temporal restrictions.
- Regulations will be available to the public through a Refuge brochure.
- Directional, informational and interpretive signs will be posted and maintained to help keep visitors on trails and help educate the public on minimizing wildlife and habitat disturbance.
- Uses will be periodically evaluated for disturbance to wildlife, especially if use numbers increase.

Justification:

Although bicycling, cross-country skiing, and snowshoeing are not a wildlife-dependent public uses of the Refuge, as defined by statute (16 U.S.C. 668dd et seq.) these occasional uses of the Refuge roads and trails is expected to have negligible impacts to wildlife habitat when compared to the effects of other public uses (Klein 1993). Potential for wildlife and habitat disturbance is minimal given the low level of these uses, and for skiing and snowshoeing, the time of year the use occurs. Restricting the disturbance to established roads and trails with appropriate set-back distances (buffers) will increase the predictability of public use on the Refuge, allowing wildlife to habituate to non-threatening activities. Impacts of these activities will be monitored and if they, or other impacts, are discovered, this compatibility determination will be reevaluated. Direct costs to administer existing levels of bicycling, cross-country skiing, and snowshoeing on Refuge roads and trails will be minor because costs will already be covered by the existing Complex budget for maintaining wildlife-dependent public uses.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessened from allowing bicycling, cross-country skiing, and snowshoeing on Refuge roads and trails. The relatively limited number of individuals expected to be adversely affected due to these activities will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing bicycling, snowshoeing, and cross-country skiing to occur with stipulations will not materially detract or interfere with the purposes for which the Refuge was established or the Refuge System mission.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X__Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

References:

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Knight, R.L. and D.N. Cole. 1991. Effects of recreational activity on wildlife in wildlands. Transactions of the North American Wildlife and Natural Resources Conference 56:238-247.

Knight, R.L. and D.N. Cole. 1995. Wildlife responses to recreationists. Pages 71-79 in: R.L. Knight and K.J. Gutzwiller, eds. Wildlife and recreationists. Covelo, CA: Island Press.

Lyon, J. and A.L. Ward. 1982. Elk and land management. Pages 443-478 in: J.W. Thomas and D.E. Toweill, eds. Elk of North America: ecology and management. Harrisburg, PA: Stackpole Books.

Rudd, L.T. and L.L. Irwin. 1985. Wintering moose vs. oil/gas activity in western Wyoming. Alces 21:279-298.

Signatures for Compatibility Determination 9, Bicycling, Cross-Country Skiing, and Snowshoeing on Bear Lake National Wildlife Refuge:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

B.14 Compatibility Determination for Wildlife Observation and Photography, Interpretation, and Environmental Education on Oxford Slough Waterfowl Production Area

RMIS Database Uses: Wildlife Observation, Wildlife Photography, Interpretation, and Environmental Education

Refuge Name: Oxford Slough Waterfowl Production Area (WPA)

Location: Franklin and Bannock Counties, ID

Date Established: 1985

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. § 718(c))

Refuge Purpose(s):

- "... as Waterfowl Production Areas subject to ... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Current Use. Non-consumptive wildlife-dependent recreation (defined here as wildlife observation, photography, environmental education and interpretation) are designated as priority public uses under the Refuge Improvement Act and can enhance the users' appreciation of Refuge and Waterfowl Production areas, the National Wildlife Refuge System, wildlife, their habitats, and the human environment.

Due to the often harsh and long winters in the Oxford Slough area, most of this use will be conducted during the late spring, summer, and early fall. It is expected that most wildlife observation and photography occurs from the County road (Oxford Road), and the 0.24-mile access road. Free-roam access by foot or nonmotorized boat is currently allowed year-round. Bear Lake NWR staff maintains facilities to support self-guided wildlife observation and photography at Oxford Slough WPA, including boundary fencing and signs, a 0.24-mile graveled entrance road, a small (approx. 350 square foot) parking area, and a graveled boat ramp for shallow draft boats at the terminus of the entrance road.

Proposed Use. We propose to continue the use as described above, except that free-roam access by foot or nonmotorized boat will be allowed August 1-March 31. From April 1-July 31, the WPA, except for the entrance road and parking lot, will be closed to public access to protect colonies of nesting Franklin's gulls and white-faced ibis. SE Idaho Complex staff will develop volunteer-led educational opportunities for youth groups (schools and Scouts) and the general public. The focus at of environmental education on the WPA will be on waterfowl, colonial nesting birds, and the importance of reliable water supplies to successful waterfowl production.

One or more viewing areas will be developed that will allow visitors to enjoy wildlife from a distance, with information on seasons and species of wildlife that could be observed and photographed. An interpretive panel will be developed and installed along the roadway with a view of the Cooper headstone. Although this headstone is difficult to read due to wear, we can see that it marks the gravesite of Mary Jane Cooper, possibly wife of V.J. Cooper, one of the early settlers in the area. It is the only known burial on the unit. A brochure will be developed describing the WPA and the activities that may be enjoyed there, including wildlife to be seen.

Need and Availability of Resources:

Category and Itemization	One-time ($000)	Annual ($000/yr)
Administration and management:	$0	$5k
Maintenance: Existing and proposed public use facilities	$0	$5k
Monitoring: Law enforcement and biological	$0	$10k
Special equipment, facilities, or improvements: Development of viewing areas and interpretive materials	$20k	$0
Offsetting revenues: TOTALS	$0 $20k	$0 $20k

Once the CD is approved through the CCP process, Federal funds will be requested through the Service budget process. Other sources (monetary and non-monetary) will be sought through strengthened partnerships, grants, coordination with other agencies, and additional Refuge operations funding to support a safe, quality public use program. Increased volunteer assistance, strengthened existing partnerships, and new partnerships will be sought to support these programs in an effective, safe, and compatible manner. Bear Lake Refuge staff will increase volunteer recruiting efforts. Volunteers, interns, and various user groups when provided appropriate training can assist the Refuge with monitoring, education and interpretation programs, and maintenance projects on Oxford Slough WPA. With additional assistance as described above, staffing and funding is expected to be sufficient to manage these uses.

Anticipated Impacts of the Use(s):

Impacts resulting from the proposed use include both direct and indirect impacts to wildlife resources and the associated habitat. Direct impacts have an immediate effect on wildlife and generally result from the public's interaction with wildlife. Indirect impacts will include actions taken by the public that will impact habitat or reduce access to habitat.

Direct Impacts. We expect these impacts to include the presence of humans disturbing wildlife, which typically results in a temporary displacement of individuals. Some species such as sandhill cranes avoid the areas people frequent, while others such as raccoons and skunks seem unaffected by or even drawn to the presence of humans.

Negative impacts to wildlife have been documented when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Responses of wildlife to human activities include: departure from site, use of suboptimal habitat, altered behavior (Burger 1981, Morton et al. 1989, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990). McNeil et al. (1992) found that many waterfowl species avoid disturbance by feeding at night instead of during the day. The location of recreational activities impacts species in different ways. Miller et al. (1998) found that nesting success was lower near recreational trails, where human activity was common, than at greater distances from the trails. A number of species have shown greater reactions when pedestrian use occurred off trail (Miller, 1998). Klein (1989) found migratory dabbling ducks to be the most sensitive to disturbance, and that migrant ducks were more sensitive when they first arrived, in the late fall, than later in winter. She also found gulls and sandpipers to be apparently insensitive to human disturbance, with Burger (1981) finding the same to be true for various gull species. Gutzwiller et al. (1997) found that singing behavior of some songbirds was altered by low levels of human intrusion. Pedestrian travel can impact normal behavioral activities, including feeding, reproductive, and social behavior. Studies have shown that ducks and shorebirds are sensitive to pedestrian activity (Burger 1981, 1986). Resident waterbirds that are regularly exposed to human disturbance tend to be less sensitive than migrants, especially when migrants first arrive at a site (Klein 1993). In areas where human activity is common, birds tolerated closer approaches than in areas receiving less activity.

Burger (1981) found that wading birds were extremely sensitive to disturbance in the northeastern United States. Disturbance during critical times in the breeding cycle may cause colony abandonment in colonial-nesting waterbirds. White-faced ibis are susceptible to colony abandonment resulting from human intrusion into colonies during the early nesting period (Ryder and Manry 1994). While gulls are relatively insensitive to disturbance while foraging away from breeding colonies, they can be extremely sensitive to human disturbance at nesting sites. Franklin's gulls are particularly sensitive to human disturbance early in the breeding cycle and again during the chick phase, and would abandon with excessive human exposure (Guay 1968). Abandonment of nests is less likely with young than eggs but may still occur with repeated disturbance (Burger and Gochfeld 1994). To help mitigate these impacts to colonial-nesting waterbirds, the WPA will be closed to free-roam access from April 1 through July 31 under proposed management. Between April 1 and July 31, visitors must remain on the access road and parking area.

Cumulative and Indirect/Secondary Impacts. People can be vectors for invasive plants by moving seeds or other propagules from one area to another. Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. The threat of invasive plant establishment will always be an issue requiring annual monitoring and treatment when necessary. Southeast Idaho Refuge Complex staff will work at eradicating invasive plants at Oxford Slough WPA and educating the visiting public. Providing and maintaining access points to the WPA indirectly impacts wildlife by creating barriers to movement, through vegetation removal and management, and abrupt edge creation that may lead to increased predation (Ratti and Reese 1988). Other indirect impacts may include the creation of social trails by visitors accessing the WPA on foot (trail edges may concentrate prey species and may be used by predators as travel corridors), deposition of litter, and erosion caused by damage to vegetation from trampling. Despite the potential for the above effects to result from public visitation, the physical impacts, disturbance to wildlife and habitat, and disturbances on the WPA are expected to be intermittent, minor, and short-term, and in the context of the WPA being closed to public use during the breeding season for waterfowl and waterbirds, allowing these uses on the WPA are not expected to diminish the value of the WPA for its stated purposes.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination: (check one below)

____Use is Not Compatible

_X_ Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Activities associated with this proposed use are restricted to those portions of the WPA that are open to the general public during daylight hours.
- Adherence to seasonal use restrictions to reduce disturbance to nesting waterfowl and other wildlife. No access by foot or boat will be allowed from April 1-July 31, except by permit. Access by foot or nonmotorized boat is permitted August 1-March 31.
- Camping, overnight use, and fires are prohibited.
- Littering is prohibited.
- Collection of plants and animals is prohibited unless a Special Use Permit is obtained from the Southeast Idaho Refuge Complex (except wildlife captured while engaged in hunting).
- Signs and brochures will be provided by the Southeast Idaho Refuge Complex. Verbal instructions from Refuge Complex staff will promote appropriate use of trails and blinds to minimize wildlife and habitat disturbance. These materials will clearly state pertinent WPA regulations.
- Southeast Idaho Refuge Complex staff will periodically monitor and evaluate sites and programs to determine if objectives are being met and the resource is not being degraded.

Justification:

Wildlife Photography, Observation, Interpretation, and Environmental Education are listed as priority wildlife-dependent uses for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the

National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Service's policy is to provide expanded opportunities for wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and to ensure that they receive enhanced attention during planning and management. Facilitating these uses on the WPA will increase visitor knowledge and appreciation of fish and wildlife resources. This enhanced understanding will foster increased public stewardship of natural resources and support for the Service's management actions in achieving the WPA's purposes and the mission of the National Wildlife Refuge System.

There is a more than an adequate amount of undisturbed habitat available to the majority of waterfowl, waterbirds, and other wildlife for escape and cover, such that their abundance and use of the Refuge will not be measurably lessened from allowing wildlife observation and photography, interpretation, and environmental education to occur. There is no evidence that these uses at current participation levels materially interfere with the purposes of the WPA. Stipulations will help reduce or eliminate any unwanted impacts of these uses. The relatively limited number of individual animals expected to be adversely affected due to these uses will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing wildlife observation and photography, interpretation, and environmental education will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the WPA was established.

Mandatory 10- or 15-Year Re-evaluation Date: (provide month and year for "allowed" uses only)

_X_ Mandatory 15-year reevaluation date (for wildlife-dependent public uses)

____Mandatory 10-year reevaluation date (for all uses other than wildlife-dependent public uses)

NEPA Compliance for Refuge Use Decision: (check one below)

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

_X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 10, Wildlife Observation, Photography, Environmental Education, and Interpretation at Oxford Slough WPA:

Prepared by: ______________________ (Signature) 12-4-2012 (Date)

Refuge Manager/
Project Leader
Approval: ______________________ (Signature) 12/6/12 (Date)

<u>Concurrence</u>

Refuge Supervisor: ______________________ (Signature) 2/11/13 (Date)

Acting Regional Chief,
National Wildlife
Refuge System (for
HI, ID, OR,
PI, and WA): ______________________ (Signature) 2/11/13 (Date)

B.15 Compatibility Determination for Waterfowl Hunting on Oxford Slough Waterfowl Production Area

RMIS Database Uses: Waterfowl Hunting, Snipe Hunting

Refuge Name: Oxford Slough Waterfowl Production Area (WPA)

Location: Franklin and Bannock Counties, ID

Date Established: 1985

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. § 718(c))

Refuge Purpose(s):
- "... as Waterfowl Production Areas subject to ... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd et seq.).

Description of Use(s):

The U.S. Fish and Wildlife Service (Service) proposes to continue to allow hunting of waterfowl (ducks, geese, mergansers, and coots) and snipe on the Oxford Slough WPA in accordance with State regulations. All Waterfowl Production Areas, including Oxford Slough WPA, are open to recreational hunting in accordance with the Migratory Bird Hunting and Conservation Stamp Act, provided that all forms of hunting or entry on all or any part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations. Waterfowl and migratory bird hunting in the United States is guided by an established regulatory process that involves numerous sources of waterfowl population and harvest data. Harvest data are reported by hunters to the State and season and bag limits are adjusted accordingly to ensure that overall populations of game species remain healthy into the future.

The entire WPA is open to waterfowl hunting. Waterfowl hunting is permitted seven days per week, from sunrise to sunset, during the State waterfowl hunting season. The State waterfowl season typically starts the first of October and runs through the end of January. Shooting hours correspond to State regulations (½ hour before sunrise until sunset).

Because of the high elevation at the WPA, most hunting occurs in early October before temperatures drop. Freezing of the marsh usually occurs by the middle of November, so quality hunting usually ends early, even though the Idaho waterfowl hunting season remains open into January. Waterfowl hunting visits are estimated at 80 visits annually.

Non-toxic shot is required, and hunters may not possess lead shot in the field. Temporary blinds of natural vegetation may be constructed, but such blinds are available for general use on a first-come, first served basis. Construction of permanent blinds is prohibited.

Walk-in hunting is allowed. Hunters may use nonmotorized boats to access hunting areas. Parking is allowed in designated areas only. Because they can reduce the loss of waterfowl to the hunter's bag and hence can reduce the overall impact to the resource, dogs used in support of hunting are allowed on the WPA.

Supporting access to the hunting area are a 0.24-mile graveled entrance road, a small (approx. 350 square foot) parking area, and a boat ramp for shallow draft boats at the terminus of the entrance road. No other facilities are provided. Bear Lake Refuge staff conducts annual maintenance on these facilities.

Proposed Use. We propose to continue waterfowl hunting on Oxford Slough WPA as described above, except that we will develop and administer a youth hunt according to Idaho State regulations (usually the weekend prior to the regular hunting season opener), and develop an ABA-accessible hunter access trail and parking lot.

Need and Availability of Resources:

Category and Itemization	**One-time ($000)**	**Annual ($000/yr)**
Administration and management:	$0	$3k
Improve parking area for ABA access, construct accessible hunter access trail	$20k	
Maintenance: Entrance road, boat ramp, signs, water delivery	$0	$5k
Monitoring: Law enforcement	$0	$2k
Offsetting revenues: TOTALS	$0 $20k	$0 $10k

Once the CD is approved through the CCP process, Federal funds will be requested through the Service budget process. Other sources (monetary and non-monetary) will be sought through strengthened partnerships, grants, coordination with other agencies, and additional Refuge operations funding to support a safe, quality public use program.

Anticipated Impacts of the Use(s):

Impacts to Habitat. Since hunting requires off-trail use in the pursuit and/or recovery of game, trampling of vegetation and creation of social trails may result from hunting activity. However due to the low numbers of waterfowl hunters on the WPA, this is not a significant concern. Of greater concern is the inadvertent introduction of non-native plants. Propagules of non-native plants can be transported into new areas on hunters' boots, clothing, dogs and equipment (Benninger-Traux et al. 1992). Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. Invasive plants will be controlled and monitored as part of the Refuge's Integrated Pest Management Plan.

Impacts to Wildlife (General). Hunting, by its nature, results in the intentional take of individual animals, as well as wounding and disturbance (DeLong 2002). It can also alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, and Cole and Knight 1990). Waterfowl are wary, seeking refuge from all forms of disturbance, but particularly those associated with loud noise and rapid movement (Dahlgren and Korschgen 1992). Numerous studies show human activities associated with hunting (boating, vehicle disturbance, human presence) cause increased flight time in waterfowl species, which requires a considerable amount of energy (Kahl 1991, Havera et al. 1992, Knapton et al. 2000, Kenow et al. 2003). Human disturbance compels waterfowl to change feeding habits, for example, feeding only at night or deserting feeding areas entirely, resulting in weight loss (Dahlgren and Korschgen 1992).

In addition to loss of individuals of target species, hunting causes disturbance to non-target species because of noise (most notably the report of a firearm), human presence, and general disturbance associated with the activity. Hunting results in the increase of non-target species being injured or killed (accidentally or intentionally) in addition to waterfowl being crippled or killed and not retrieved. These disturbances are manifested by alertness, fright (obvious or unapparent), flight, swimming, disablement or death in non-target species (Dahlgren and Korschgen 1992).

Hunting can contribute to the well-being of wildlife by giving people a deeper appreciation of wildlife and a better understanding of the importance of wildlife and habitat conservation, which ultimately contributes to the NWRS mission. The hunting community remains the largest support base for funding wildlife management programs, and Refuges and Waterfowl Production Areas provide an opportunity for a high-quality waterfowl hunting experience to all citizens regardless of economic standing. Many individual Refuges and Waterfowl Production Areas have developed extensive public information and education programs bringing hunters into contact with Refuge activities and facilitating awareness of wildlife issues beyond hunting. Hunting is one of the six priority public uses of the NWRS.

Impacts of Hunting on Waterfowl.

<u>Impacts on waterfowl populations:</u> The hunting of waterfowl in the United States is based upon a thorough regulatory setting process that involves numerous sources of waterfowl population and harvest monitoring data. Waterfowl populations throughout the United States are managed through an administrative process known as flyways, of which there are four (Pacific, Central, Mississippi, and Atlantic). Idaho is included in the Pacific Flyway. A review of the policies, processes, and procedures for waterfowl hunting is covered in a number of documents.

Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds be closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR 20) establishing the Migratory Bird Hunting Frameworks. The frameworks are essentially permissive, in that hunting of migratory birds would not be permitted without them. Thus, in effect, annual Federal regulations both allow and limit the hunting of migratory birds. The Migratory Bird Hunting Frameworks provide season dates, bag limits, and other options for states to select from, which should result in the level of harvest determined to be appropriate based upon Service-prepared annual biological assessments detailing the status of migratory game bird populations. In North America, the process for establishing waterfowl hunting regulations is conducted annually. In the United States, the process involves a number of scheduled meetings (Flyway Study Committees, Flyway Councils, Service Regulations Committee, etc.) in which information regarding the status of waterfowl populations and their habitats is presented to individuals within the agencies responsible for setting hunting regulations. In addition, public hearings are held and the proposed regulations are published in the Federal Register to allow public comment.

For waterfowl, annual assessments used in establishing the Frameworks include the Breeding Population and Habitat Survey, which is conducted throughout portions of the United States and Canada. This survey is used to establish an annual Waterfowl Population Status Report. In addition, the number of waterfowl hunters and resulting harvest are closely monitored through both the Harvest Information Program (HIP) and the Parts Survey (Wing Bee). Since 1995, such information has been used to support the adaptive harvest management (AHM) process for setting duck-hunting regulations. Under AHM, a number of decision-making protocols determine the choice (package) of pre-determined regulations (appropriate levels of harvest) that comprise the framework offered to states that year. Each state's wildlife commission then selects season dates, bag limits, shooting hours, and other options from the their prospective Flyway package. Their selections can be more restrictive, but cannot be more liberal than AHM allows. Thus, the level of hunting opportunity afforded each state increases or decreases each year in accordance with the annual status of waterfowl populations.

Season dates and bag limits for Waterfowl Production Areas are never longer or larger than the State regulations. Cumulative impacts to hunted migratory species are considered through the Migratory Bird Frameworks published annually in the Service's regulations on Migratory Bird Hunting.

Hunting on Waterfowl Production Areas as a whole, or the Oxford Slough WPA specifically, is not likely to have an adverse effect on the status of any recognized waterfowl population in North America. Several points support this contention including (1) the proportion of national waterfowl harvest that occurs on Waterfowl Production Areas is small; 2) there are no waterfowl populations that occur wholly or exclusively on Waterfowl Production Areas; 3) Annual hunting regulations within the United States are established to levels consistent with the current population status; and 4) WPAs cannot permit more liberal seasons than provided for in Federal frameworks. Specific regulations are designed to minimize impacts. Under the stipulations outlined above, this activity does not materially detract from meeting the WPA's purposes or the Refuge System mission.

Local impacts to waterfowl populations: The Federal Harvest Information Program estimates that 16,800 hunters in Idaho spent an average of 102,700 days hunting and harvested 225,100 ducks annually during 2001-2010. Over that same time period, the harvest information program estimates Idaho hunters harvested 59,800 Canada geese annually. This is the third highest total in the Pacific Flyway, behind Oregon and Washington, respectively. Between 1990 and 2004 (the last year for which data were available), between 200 and 1000 waterfowl were harvested on the Refuge annually. The number of waterfowl currently harvested on the WPA is unknown, but based on the numbers of hunters using the WPA and the short season, it is likely to represent a small percentage of total numbers harvested in the state, and an even smaller percentage of the total flyway harvest.

Effect on waterfowl distribution and use of habitat: Belanger and Bedard (1995) concluded that disturbance caused by hunting can modify the distribution and use of various habitats by birds. In Denmark, Madsen (1995) experimentally tested disturbance effects of hunting by the establishment of two experimental reserves where hunting activity was manipulated such that sanctuary areas were created in different parts of the study area in different hunting seasons. In both areas, waterbird numbers increased, most strongly in hunted species (3-40 fold increase), with highest densities found in sanctuary areas, irrespective of where these sanctuaries were sited. At Sacramento National Wildlife Refuge, in California, researchers found statistically significant differences in the densities of northern pintails among hunting units, units adjacent to hunting units, units adjacent to auto tour route, and units isolated from disturbance (Wolder 1993). Prior to the opening of hunting season, pintail used units in proportion to their availability, indicating no preference to particular areas.

Belanger and Bedard (1989) studied the effect of disturbances to staging greater snow geese in a Quebec bird sanctuary over 471 hours of observation. They found that the level of disturbance (defined as any event causing all or part of the goose flock to take flight) that prevailed on a given day in fall influenced goose use of the sanctuary on the following day. When disturbance exceeded two events per hour, it produced a 50 percent drop in the mean number of geese present in the sanctuary the next day.

Effects on energetics and survival: Hunting limits access of waterfowl to food resources and may modify migration timing. Madsen (1988 as cited by Dahlgren and Korschgen 1992) suggested that hunting on the coastal wetlands of Denmark modified waterfowl movements and caused birds to leave the area prematurely. However, Kahl (1991) suggested that lack of adequate access to food may decrease survival of canvasbacks by causing birds to remain on a staging site longer and forage under suboptimal conditions, or by causing birds to migrate in shorter flights with more frequent stops.

Disturbance due to hunting has caused waterfowl to cease feeding or resting activities, thus decreasing energy intake and increasing energy expenditure. At Chincoteague NWR, Morton et al. (1989) found that wintering black ducks experienced reduced energy intake while doubling energy expenditure by increasing the time spent in locomotion in response to disturbance. Belanger and Bedard (1995) in a quantitative analysis, estimated that neither the response to disturbance by flying away and promptly returning to the foraging site to resume feeding, nor the response of flying away (leaving the foraging site for a roosting site, thus interrupting feeding) allowed snow geese to balance their daytime energy budget.

At high disturbance rates (>two/hour—these included hunting and transport-related disturbance), Belanger and Bedard estimated that an increase in night feeding as a behavioral compensation mechanism could not counterbalance energy lost during the day. Likewise, geese could not compensate for a loss in feeding time by increasing their daily foraging behavior to maximize food intake during undisturbed periods. Belanger and Bedard suggested mitigation with spatial or temporal buffer zones.

Impacts to Other Wildlife Species. In addition to loss of individual target species, hunting results in the increase of non-target species being injured or killed (accidentally or intentionally). Disturbance to the daily activities, such as feeding and resting, of wintering non-hunted birds and other wildlife might occur. Hunting causes disturbance to non-target species because of noise (most notably the report of a firearm), human presence and general disturbance associated with the activity. These disturbances are manifested by alertness, fright (obvious or unapparent), flight, swimming, disablement or death in non-target species (Dahlgren and Korschgen 1992). This effect is likely a minor negative effect due to the low numbers of waterfowl hunters using the WPA. WPA regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Motorized vehicles are restricted to roads and the harassment or taking of any non-target wildlife is not permitted. Although ingestion of lead shot by non-hunted wildlife could be a cumulative impact, it is not relevant at the WPA because non-toxic shot is required. The waterfowl hunting season does not coincide with nesting seasons, so reproduction will not be directly impacted by hunting.

Impacts to Other Wildlife-dependent Recreational Uses. Hunting (especially gunshot noise) has the potential to disturb visitors to the WPA engaged in other wildlife-dependent recreational uses. However, use of the WPA for activities other than hunting appears to be low. The hunting season also coincides with the onset of cold weather in the area, making it unlikely that other uses, and therefore conflicts, will occur.

Application to Oxford Slough WPA. The studies cited above display the variety and scale of negative impacts to waterfowl from hunting. The most likely effect of hunting will be temporary displacement of waterfowl. Given the size of the WPA (1,840 acres or 2.875 square miles) and the small number of hunters using the WPA, it is likely that waterfowl will find sufficient undisturbed areas within the WPA during the hunting season. Potentially, especially in years with low water availability, waterfowl could be displaced from the WPA to nearby areas of fall waterfowl habitat (Swan Lake, the Twin Lakes Reservoir, the Oneida Narrows Reservoir, Weston Reservoir, and the Marsh Creek area).

Given the small number of waterfowl hunting visits to the WPA (estimated at approximately 80 visits annually) and the short hunting season, both disturbance rates and the total number of disturbance events will be expected to be low. Disturbance could be expected from both hunters on foot, and hunters using nonmotorized boats. Due to the small size and slow speeds of boats used to access waterfowl hunting, disturbance will be limited to a small area.

Impacts to other wildlife-dependent recreational users are expected to be minimal due to the low number of non-hunting visitors to the WPA. Conflicts between waterfowl hunters and other users or the WPA have never been documented and will likely remain negligible for the near future. The current low level of use does not warrant a spatial or temporal separation of hunting from non-hunting public uses at this time.

By its very nature, waterfowl hunting has very few if any positive effects on waterfowl and other birds while the activity is occurring, but it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012a) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012b) contains a summary of the comments and Service responses.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Hunters must obey all State and Federal hunting regulations.
- Hunters may possess only approved nontoxic shot while in the field.
- Nonmotorized boats are allowed. Motorized boats are prohibited.
- Only portable blinds or temporary blinds constructed of natural vegetation can be used. Blinds will be available for general use on a first-come, first-served basis. Portable blinds must be removed from the WPA at the end of each day.
- All personal property, including decoys and boats, must be removed from the WPA at the end of each day.
- Hunting dogs will be under hunter control at all times.
- Camping, overnight use, and fires are prohibited. The use or possession of alcoholic beverages while hunting is prohibited.
- Hunt areas and no hunting zones will be posted at least two weeks before the hunting season begins.
- Southeast Idaho Refuge Complex staff will conduct law enforcement, maintain hunting facilities, and monitor wildlife impacts.

Justification:

Hunting is a priority wildlife-dependent use for the National Wildlife Refuge System through which the public can develop an appreciation for fish and wildlife (Executive Order 12996, March 25, 1996 and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). The Service's policy is to provide expanded opportunities for these wildlife-dependent uses when compatible and consistent with sound fish and wildlife management and ensure that they receive enhanced attention during planning and management. Facilitating hunting on the Waterfowl Production Area (WPA) will increase visitor knowledge and appreciation of fish and wildlife resources. This enhanced understanding will foster increased public stewardship of natural resources and support for the Service's management actions in achieving the WPA's purposes and the mission of the National Wildlife Refuge System.

Waterfowl hunting at Oxford Slough WPA as described in this CD contributes to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. Because sanctuary from human disturbance is provided during the breeding season for waterfowl and other migratory birds, this waterfowl hunting program will not interfere with the WPA achieving its purposes of *waterfowl production* and *any other management purpose, for migratory birds*. It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the WPA will not be measurably lessened from allowing hunting to occur on the WPA. The relatively limited number of individuals expected to be adversely affected due to hunting will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing hunting to occur with stipulations will not materially detract or interfere with the purposes for which the WPA was established or the Refuge System mission.

This program as described was determined to be compatible because: hunter use levels on Oxford Slough WPA are relatively low during most days of the waterfowl hunting season. Consequently, feeding and resting habitat will be available in relatively undisturbed areas to accommodate the needs of the waterfowl and other wetland birds.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

2027 Mandatory 15-year Re-evaluation date (for priority public uses)

_____Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

References:

Belanger, L. and J. Bedard. 1989. Responses of staging greater snow geese to human disturbance. Journal of Wildlife Management 53:713-719.
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Signatures for Compatibility Determination 11, Waterfowl Hunting on Oxford Slough Waterfowl Production Area:

Prepared by: ______________________ (Signature) 12-4-2012 (Date)

Refuge Manager/
Project Leader
Approval: ______________________ (Signature) 12/6/12 (Date)

<u>Concurrence</u>

Refuge Supervisor: ______________________ (Signature) 2/11/13 (Date)

Acting Regional Chief,
National Wildlife
Refuge System: ______________________ (Signature) 2/11/13 (Date)

B.16 Compatibility Determination for Hunting of Resident Game, Upland Game, and Furbearers on Oxford Slough Waterfowl Production Area

RMIS Database Uses: Hunting of Resident Game, Upland Game, and Furbearers

Refuge Name: Oxford Slough Waterfowl Production Area (WPA)

Location: Franklin and Bannock Counties, ID

Date Established: 1985

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. § 718(c))

Refuge Purpose(s):
- "... as Waterfowl Production Areas subject to ... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

All WPAs are open to recreational hunting in accordance with the Migratory Bird Hunting and Conservation Stamp Act, provided that all forms of hunting or entry on all or any part of individual areas may be temporarily suspended by posting upon occasions of unusual or critical conditions of, or affecting land, water, vegetation, or wildlife populations. The Service will allow continued recreational hunting of resident game, upland game and furbearers at Oxford Slough WPA according to State regulations. Although open to all state seasons listed below, the majority of use occurs from mid-September though the end of December. Ring-necked pheasant, sharp-tailed grouse, mourning dove, sandhill crane, gray partridge, Columbian ground squirrels, and mule deer are probably the most hunted species, other than waterfowl, on the Oxford Slough WPA. Resident game, upland game and furbearer hunting visits at this unit are estimated at less than 50 per year.

Big Game. Oxford Slough WPA is part of Idaho's Unit 74 hunting area. Big game hunting seasons for Unit 74 are listed below. Hunting for deer (mule and white-tail), elk, antlered moose, mountain lion, and wolf are allowed in State hunting units that include the WPA. Following delisting in May 2011, the Idaho Fish and Game Commission authorized Idaho's second wolf hunting season and a wolf trapping season in portions of the state. Two wolf tags are permitted in Idaho's Southeast Zone. There has been no hunt for pronghorn in Unit 74 for more than ten years. Until 2009, a general hunt for black bear was allowed in Unit 74 but no bears were harvested in the unit, and very few in the SE Idaho region. There has been no black bear hunt in Unit 74 since 2010.

Species/Hunt	Dates
Reg. Deer Tag General, Any Weapon	Oct 10-Oct 24
Reg. Deer Tag General Archery Only	Aug 30-Sep 30
Elk—Archery Only, Any Elk	Aug 30-Sept 30
Elk—Any weapon, Antlerless Only	Oct 25-Nov 15
Elk—Muzzleloader Only—Antlerless Only	Nov 16-Nov 30
Moose—Controlled Hunt, Antlered Only (SE Region)	Controlled hunt, five tags issued Aug 30-Nov 23
Mountain Lion	Aug 30-Mar 31
Wolf—Southern Idaho	Aug 30-Mar 31

Upland Game. Ruffed grouse may be taken from August 30-December 31. Gray partridge season runs from September 18-January 31. Sage grouse season is set in August each year; however, in 2011 IDFG Area 1 (all of Franklin County and Bannock County east of I-15, including Oxford Slough WPA) was closed to sage grouse hunting. Sharp-tailed grouse can be hunted from October 1-31. Pheasant hunting occurs from October 15-November 30. Sandhill crane season and open areas are set in August. Mourning dove season is September 1-30. Eurasian collared doves may be taken at any time and in any amount. Idaho conducts spring and fall turkey hunts, both controlled and general; dates vary by season and open area. American crow can be taken from October 1-January 31.

Furbearers and Unprotected Species. In Idaho's southeast region, hunting and trapping of either sex of northern river otter occurs from October 22-March 15; either sex of American beaver, muskrat, and mink occurs from October 22-April 15; either sex of American badger and red fox occurs from July 1-June 30; and either sex of bobcat from December 14-February 16. However, northern river otter and beaver are not known to occur on the WPA. Animals classified by Idaho as "predators" or "unprotected" can be taken all year. Coyotes, raccoons, jackrabbits, skunks, weasels, starling, Columbian ground squirrels, feral pigeons, and others, are included in these categories.

Need and Availability of Resources:

The following funds will be required to run the hunting program as designed under the CCP.

Category and Itemization	One-time ($000)	Annual ($000/yr)
Administration and management:	$0	$2k
Maintenance: Fencing, signs, gravel road and parking area	$0	$2k
Monitoring: Law enforcement	$0	$3k
Offsetting revenues: TOTALS	$0 $0	$0 $7k

Sufficient funding and staffing is available to allow the use.

Anticipated Impacts of Described Use:

General Impacts to Habitat. Since hunting requires off-trail use in the pursuit and/or recovery of game, trampling of vegetation and creation of social trails may result from hunting activity. However due to the low numbers of waterfowl hunters on the WPA, this is not a significant concern. Of greater concern is the inadvertent introduction of non-native plants. Propagules of non-native plants can be transported into new areas on hunters' boots, clothing, dogs and equipment (Benninger-Traux et al. 1992). Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. Invasive plants will be controlled and monitored as part of the Refuge's Integrated Pest Management Plan.

Impacts to Hunted Species. Hunting, by its nature, results in the intentional take of individual animals, as well as wounding and disturbance (DeLong 2002). It can also alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, and Cole and Knight 1990). While hunting does cause mortality and disturbance to those species hunted, bag limits, season dates, and other regulations are set to protect the long-term health of wildlife populations.

Local impact to upland birds

Population and harvest data: The Idaho Department of Fish and Game's 2010 Upland Game Progress Report (Knetter et al. 2010) notes that of the species of upland game birds that are legal to hunt on Oxford Slough WPA, populations of gray partridge (an introduced species), sharp-tailed grouse (native), and turkey (introduced) are considered stable or increasing in Idaho's Southeast Region over the past 10-15 years. Ring-necked pheasant (another introduced species) have also undergone a long-term decline as a result of declining habitat quality due to changes in farming practices. Sage-grouse, a native species and species of conservation concern, are declining and populations in southeast Idaho appear to be low. As a result, the IDFG has instituted more restrictive seasons and bag limits for sage-grouse in recent years. In 2011, IDFG Area 1 (including Franklin and Bannock Counties east of Highway 15) was closed to sage grouse hunting.

Ring-necked pheasant, sharp-tailed grouse, mourning dove, sandhill crane, and gray partridge are thought to be the most hunted upland bird species on the WPA, as the other species are present intermittently due to marginal habitat. Due to the low numbers of hunters using the WPA, the WPA does not contribute any significant harvest numbers to the total estimated for the Southeast region of the state and even less statewide. SE Idaho Refuge Complex staff participates in pre-migration surveys for sandhill cranes, but does not currently perform any other inventory or monitoring for the upland game bird, big game, or furbearer species that occur on the WPA, nor does it track harvest of these species on the WPA. Therefore assessment of impacts to sandhill cranes and mourning doves are based on USFWS population estimates and harvest statistics, while impact assessment for resident wildlife species are based on population estimates and harvest statistics compiled by the Idaho Department of Fish and Game.

Mourning dove population and harvest data: Based on Call Count Survey data (calls heard) and Breeding Bird Survey data, the abundance of mourning doves has decreased in the Western Management Unit (Arizona, California, Idaho, Nevada, Oregon Utah, and Washington) during the long term (1966-2011) (Seamans et al. 2011). Currently harvest of mourning doves in the Western Management Unit, is governed by the Revised Mourning Dove Harvest Management Strategy (March 13, 2008), which is a transitional step toward implementation of the strategy envisioned in the Mourning Dove National Strategic Harvest Management Plan (USFWS 2005). Currently, call-count surveys (birds heard and birds seen), the North American Breeding Bird Survey, and indirect population growth rate estimates calculated from harvest and banding data are used to produce composite estimates of dove trends at the management unit scale that are used in the annual setting of mourning dove hunting seasons. The initial composite trend models used as the basis of the 2008 Revised Strategy will likely be replaced by population models, pending continued and expanded support for a banding and wing survey programs, and research generating information fueling the population models. Idaho harvest was 143,300 doves in 2009 +/- 38 percent and 90,600 +/- 39 percent in 2010 or about 6 percent of the total harvest in the Western Management Unit (Raftovich et al. 2011).

Sandhill crane population and harvest data: Sandhill cranes are managed cooperatively by the States and the U.S. Fish and Wildlife Service. Harvest quotas are established annually by the Service. Each year the allowable harvest is allocated among states based on approximate sandhill crane abundance and seasonal distribution. The Pacific and Central Flyway Management Plan for the Rocky Mountain Population (RMP) of Sandhill Cranes established a population objective (17,000-21,000 birds), and identifies surveys used to monitor recruitment and harvest levels that are designed to maintain a stable abundance (Subcommittee on Rocky Mountain Greater Sandhill Cranes 2007). Since 1995, a fall pre-migration (September) survey has been used as the primary tool for monitoring population change of Rocky Mountain population of greater sandhill cranes. Surveys were initiated in Southeast Idaho at this time (Knetter et al. 2009). All sandhill crane hunters in the range of the RMP must obtain a state permit to hunt cranes, which provides the sampling frame for independent harvest estimates and allows for assignment of harvest quotas by state. In many areas, harvest estimates are supplemented by periodic mandatory check-station reporting. The Plan allows for the regulated harvest of cranes when the population index exceeds 15,000, as estimated by the average of the three most recent reliable surveys conducted on fall pre-migration staging areas. As outlined in the management plan, the most recent reliable three-year running average (2008, 2009 and 2010) was used to determine the 2010 harvest allocation. Based on the allowable harvest formula for this population, 1,270 sandhill cranes may be harvested from the RMP during the 2012-2013 hunting season. In 2011 17,494 cranes were counted in the September survey and the most recent three-year average was 19,626 cranes.

Idaho's 2012 crane harvest allocation, as directed by the Pacific Flyway Council Rocky Mountain Population Crane Plan, is 225 cranes, down from 410 in 2011. There are two reasons Idaho's allocation declined in 2012: (1) There were a reduced number of birds during the fall 2011 crane survey. As a result, the overall flyway allocation declined; and (2) The base allocation for each state was modified in 2012. The allocation is revised once every five years. In Idaho, the number of cranes and the proportion of cranes in the total population has declined. As a result, the Idaho allocation of the harvest declined from 22 percent to 16.7 percent (IDFG 2012b).

In recent years, there have been five hunt areas in Idaho. To accommodate the reduced harvest allocation, in 2012 the Department proposed to decrease the number of tags available in each hunt area. Furthermore, due to increasing numbers of cranes in the Swan Lake area in the Southeast Region, the Department proposed to create a new hunt area with 30 tags. The proposed new Swan Lake Hunt Area is located in Bannock County east of I-15 and south of Hwy 30, and Franklin County west of Hwy 91 from the Utah state line to the junction of Hwy 34 and continuing west of Hwy 34 and 91 to the Franklin County-Caribou County line. The hunt area includes Oxford Slough WPA (IDFG 2012b).

Big game population and harvest data: Population and hunting objectives for big game species, including deer, elk, and mountain lion, are set in management plans developed by the Idaho Department of Fish and Game. Elk are meeting population objectives in Idaho's Southeast Region, The Bannock elk management zone, and Unit 74 (Rachael et al. 2010b). Therefore, liberal seasons and regulations are in effect. 244 hunters took 25 elk, 166 archery hunters took 11 elk, and 31 muzzleloader hunters took two elk. In 2006, 193 hunters took 32 elk and in 2001 240 hunters took 45 elk. In 2010, three mountain lions were taken by hunters in Unit 74. In 2011 no moose were taken in Unit 74, while in 2010 five moose were taken (all tags were filled) (IDFG Harvest Statistics website).

Mule deer populations have declined in southeast Idaho since the early 1990s. As a result, the number of hunters pursuing mule deer, harvest, and hunter success rates have declined. Few to no white-tailed deer occur in Idaho's Southeast Region due to lack of suitable habitat (Rachael et al. 2010a). In Unit 74 in 2011, 1,110 hunters took 255 deer, of which 0.8 percent (two deer) were white-tails; 101 archery hunters took 11 deer (all mule deer). In 2006, 1348 hunters took 491 deer (all mule deer) and in 2001, 1412 hunters took 593 deer (IDFG Harvest Statistics website). The IDFG notes that since 1970, Idaho's population has increased 106 percent, while the number of resident deer tags sold has decreased 24 percent. The proportion of Idaho residents purchasing a deer tag has dropped from 23 percent in 1970 to fewer than 9 percent in 2006. This decline is attributable primarily to a changing culture, but is more pronounced in recent years because of lower mule deer numbers (IDFG 2008).

There has been no hunt for pronghorn in Unit 74 for more than ten years. Until 2009, a general hunt for black bear was allowed in Unit 74 but no bears were harvested in the unit, and very few in the SE Idaho region. There has been no black bear hunt in Unit 74 since 2010.

In April 2009, the U.S. Fish and Wildlife Service delisted gray wolves in the northern Rocky Mountain Distinct Population Segment, excluding Wyoming, from the protections of the Endangered Species Act (ESA), and returned wolf management authorities to those states. Following a Federal District Court decision, wolves were relisted under the ESA on August 5, 2010. On April 15, 2011, the 2009 delisting rule was reissued. Wolf management responsibility returned to the State of Idaho on May 5, 2011. Following delisting in May 2011, the Idaho Fish and Game Commission authorized Idaho's second wolf hunting season and a wolf trapping season in portions of the state. Two wolf tags are permitted in Idaho's Southeast Zone. In the 2011-2012 season, one wolf was legally controlled for harassing livestock in hunt Unit 73 (Idaho Department of Fish and Game and Nez Perce Tribe 2012).

Mule deer are thought to be the most hunted big game species on the WPA, as the other species are present intermittently due to marginal habitat. Due to the low numbers of hunters using the WPA, the WPA does not contribute any significant harvest numbers to the total estimated for the Southeast region of the state and even less statewide.

Mule deer population and harvest data: The Bannock Population Management Unit (PMU) (PMU 9) represents the least productive mule deer habitats in southeastern Idaho. Low quality habitat, combined with variable winter conditions undoubtedly cause mule deer numbers to vary considerably over time. Overall, mule deer numbers in hunt units within the Bannock PMU appear to be highly volatile with wide fluctuations over relatively short time periods. Mule deer densities in southeast Idaho are relatively low compared to historic levels, following the winter of 1992-1993, when significant winter mortality occurred. Harvest management has been conservative since that time. Recent observed recruitment rates are consistent with either stable or slightly declining populations. (Rachael et al. 2010a). There was a 28 percent hunter success rate (three-year average) in the PMU. Between 2003 and 2009, the percentage of four-point or higher bucks varied between 29 percent and 45 percent. Although mule deer have undergone a long-term decline in southern Idaho (IDFG 2008), populations are sufficiently healthy to support hunting under conservative harvest management.

Elk population and harvest data: Since the late 1980s, populations of elk in the Bannock Zone have expanded dramatically in most of the zone. Calf recruitment rates have not been measured in this zone, however, the rapidly increasing numbers observed and changes in distribution suggest a highly productive herd. Objectives for Bannock Zone are to maintain a wintering elk population of 510-745 cows and 125-165 bulls, including 60-110 adult bulls (Rachael et al. 2010b). Although no population estimate exists for this zone, field reports, combined with incidental observations from deer surveys, indicate that current numbers exceed objectives. The IDFG concluded that a reduction in cows is necessary to alleviate significant depredation concerns and reduce the occupancy of elk in important mule deer winter ranges. A reduction in bulls and adult bulls will provide for hunter demand of antlered elk and balance bull numbers with cow numbers. Aggressive harvest rates will be necessary to achieve population objectives (Rachael et al. 2010b). The liberal season (the archery, any weapon and muzzleloader only seasons combined run from August 30-Nov 30) and inclusion of an antlerless harvest indicates a healthy population of elk sufficient to support hunting.

Moose, mountain lion, and wolf population and harvest data: Prior to the 1950s, there were too few moose in Idaho's Southeast Region to justify harvest. The first hunt for moose in the region was held in 1959 when five antlered-only permits were issued. With continued growth of the population, harvest has increased to recent levels of over 150 moose in 11 GMUs. Portions of the region continue to be colonized by moose, and populations apparently are increasing. Ninety-five antlered-only and 65 antlerless-only permits were offered in the Southeast Region in 2009. Mandatory harvest reports identified high success rate (84 percent for antlered moose and 68 percent for antlerless moose). Conservative permit levels likely allow for passive population expansion and growth, particularly in those areas being newly colonized (Toweill et al. 2010). Because of the highly controlled nature of distributing moose permits and the limited number of permits available in Unit 74 (five permits, antlered only) the negative effects of hunting moose on the WPA will be negligible.

Mountain lions are judged to be at relatively high levels in most areas of the Bannock Zone (Rachael et al. 2010b). Only 3 mountain lion were harvested in Unit 74 in 2010. This minor harvest will have very little impact on the lion population in Idaho's southeast region. Wolves are rare in the Southern Idaho management zone. During 2011, no documented packs or groups occupied the Southern Idaho Zone (Idaho Department of Fish and Game and Nez Perce Tribe 2012). Two tags are allowed. The impacts caused by wolf hunting on the WPA are likely inconsequential due to the paucity of wolves on the WPA and the subsequent lack of hunters pursuing them.

<u>Furbearer population and harvest data:</u> Muskrat, mink, American badger, red fox, and bobcat occur on the WPA and may be hunted. Coyotes, raccoons, jackrabbits, skunks, weasels, and Columbian ground squirrels are classified as unprotected species and may be hunted at any time. Of unprotected species, ground squirrels are thought to be the most hunted species on the WPA.

Beginning with the 2002-2003 trapping season, Catch-Per-Unit-Effort (CPUE), which measures the harvest of furbearers by trapping per unit of time has been used to predict population trends of furbearers in Idaho (White and Crea 2010). CPUE for muskrat dropped markedly from the 2002-2003 to the 2003-2004 season; however it has been relatively stable since the 2003-2004 season. Statewide population trends, based upon animals trapped per 100 trap-nights were stable to slightly declining for bobcat, raccoon, and coyote. Trend was down for most other furbearers, although CPUE increased for skunk, badger, mink, and coyote compared to the 2008-9 season. Badger, skunks, and weasel are usually trapped incidentally to trapping for other species. Many trappers, who report harvest of badger, skunks, weasel, and sometimes otter, do not report trap nights or traps set for these four species since they are trapping for other species. Therefore, CPUE may not be an accurate reflection of population trend for badger, otter, skunks, and weasel. Populations of Columbian ground squirrels and jackrabbits are not tracked by the State of Idaho.

<u>*Impacts to breeding waterfowl and waterbirds:*</u> Since the primary upland game and big game species hunted at Oxford Slough are ring-necked pheasant, sharp-tailed grouse, mourning dove, sandhill crane, gray partridge, ground squirrels, and mule deer, and hunting for these species occurs well after the breeding season for waterfowl and colonial nesting waterbirds (e.g., Franklin's gull and white-faced ibis), impact to the central purpose of the WPA (waterfowl production) and to colonial nesting waterbirds will be negligible.

Impacts to Other Wildlife Species.

In addition to loss of individual target species, hunting results in the increase of non-target species being injured or killed (accidentally or intentionally). Disturbance to the daily activities, such as feeding and resting, of wintering non-hunted birds and other wildlife might occur. Hunting causes disturbance to non-target species because of noise (most notably the report of a firearm), human presence and general disturbance associated with the activity. These disturbances are manifested by alertness, fright (obvious or unapparent), flight, swimming, disablement or death in non-target species (Dahlgren and Korschgen 1992). This effect is likely a minor negative effect due to the low numbers of hunters using the WPA. WPA regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles are restricted to roads and the harassment or taking of any non-target wildlife is not permitted. Although ingestion of lead shot by non-hunted wildlife could be a cumulative impact, it is not relevant at the WPA because non-toxic shot is be required. Hunting seasons do not coincide with nesting seasons, so reproduction will not be directly impacted by hunting.

Impacts to Other Wildlife-dependent Recreational Uses. Hunting (especially gunshot noise) has the potential to disturb refuge visitors engaged in other non-hunting wildlife-dependent recreational uses. Since relatively few visitors engage in upland game and big game hunting on the WPA, and most upland game and big game hunting occurs when other visitation to the WPA is low, impacts to non-hunting visitors will be minimal.

Summary and Application to Oxford Slough WPA. The impacts to populations of resident game, upland game, and furbearers, both locally and regionally, caused by hunting on the Oxford Slough WPA are likely inconsequential due to the low numbers of hunters pursuing those species. While hunting has no positive effects on these species as the activity is occurring, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012a) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012b) contains a summary of the comments and Service responses. Public review of a step-down Hunt Plan (see Stipulations) as required under Service policy will be conducted before implementing changes to the WPA's upland game and big game hunting programs.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User Stipulations.

- Hunters must obey all State and Federal hunting regulations. Hunters may possess only approved nontoxic shot while in the field, with the exception that hunters may use slugs and shot containing lead to hunt turkey and deer.
- Camping, overnight use and fires are prohibited. The use or possession of alcoholic beverages while hunting is prohibited.
- Vehicle access is prohibited beyond approved access roads, trails, and parking lots.
- All personal property must be removed from the refuge at the end of each day.
- Hunting dogs will be under hunter control at all times.
- Hunt areas will be posted at least two weeks before the hunting season begins.
- Southeast Idaho Refuge Complex staff will conduct law enforcement, maintain hunting facilities, and monitor wildlife impacts.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is being permitted as it is a priority public use and will not interfere with the WPA achieving its purposes of *waterfowl production* and *any other management purpose, for migratory birds*. The hunting of resident game, upland game, and furbearers on the Oxford Slough WPA will contribute to the mission of the National Wildlife Refuge System by providing a wildlife-oriented recreational benefit to Americans. Hunting is also one of the six wildlife-dependent recreational uses of the National Wildlife Refuge System as stated in the National Wildlife Refuge System Improvement Act of 1997.

Hunting does result in the taking of individuals within the overall population, but restrictions are designed to safeguard an adequate breeding population from year to year. Resident game hunting seasons and bag limits are established by the State of Idaho, ensuring the continued well-being of overall populations. Consistent with the System mission, resident game and furbearer hunting on WPAs results in management of populations and is not a "control" program intending to eliminate certain species for the benefit of others. As migratory birds, sandhill cranes and mourning doves are managed cooperatively by the States and the U.S. Fish and Wildlife Service. In the case of sandhill cranes, harvest quotas are established annually by the Service to maintain population objectives specified in the management plan for this species.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the WPA will not be measurably lessened from allowing the hunting of resident game, upland game, and furbearers to occur on the WPA. The relatively limited number of individuals expected to be adversely affected by hunting will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing the hunting of resident game, upland game, and furbearers to occur with stipulations will not materially detract or interfere with the WPA's purpose of waterfowl production, or the Refuge System mission.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

2027 Mandatory 15-year Re-evaluation date (for priority public uses)

____Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 12, Hunting of Resident Game, Upland Game, and Furbearers on Oxford Slough Waterfowl Production Area:

Prepared by: ______________________ (Signature) 12-4-2012 (Date)

Refuge Manager/
Project Leader
Approval: ______________________ (Signature) 12/6/2012 (Date)

<u>Concurrence</u>

Refuge Supervisor: ______________________ (Signature) 2/11/13 (Date)

Acting Regional Chief,
National Wildlife
Refuge System: ______________________ (Signature) 2/11/13 (Date)

B.17 Compatibility Determination for Trapping of Furbearers on Oxford Slough Waterfowl Production Area

RMIS Database Uses: Trapping of Furbearers

Refuge Name: Oxford Slough Waterfowl Production Area (WPA)

Location: Franklin and Bannock Counties, ID

Date Established: 1985

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. § 718(c))

Refuge Purpose(s):

- "... as Waterfowl Production Areas subject to ... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use(s):

Trapping of resident furbearers by the public, in accordance with State and Federal regulations, is allowed on the Oxford Slough WPA. This compatibility determination does not apply to trapping activities where the Service awards a contract or permit for the removal of animals to facilitate management (i.e., predator control of ground-nesting birds or protection for water control structures and roadways from flooding or dam blow-out). The entire WPA is open to trapping. By regulation (50 CFR 31.16), lands acquired as WPAs are open to public trapping unless closed under the authority of 50 CFR 25.21. In Idaho's southeast region, trapping of either sex of northern river otter occurs from October 22-March 15; either sex of American beaver, muskrat, and mink occurs from October 22-April 15; either sex of American badger and red fox occurs from July 1-June 30; and either sex of bobcat from December 14-February 16. Animals classified by Idaho as "predators" or "unprotected" can be taken all year. Coyotes, raccoons, jackrabbits, skunks, weasels, Columbian ground squirrels, starlings, feral pigeons, and others, are included in this category.

The presence of river otter and American beaver is not documented at the WPA, so the potential to trap those species is probably negligible. Muskrat and mink are probably common species, however population studies should be undertaken to verify population densities. Some red fox are seen at the

WPA every year, so successful trapping is likely, but again, study is needed to ascertain populations. No documentation exists of the presence of American badger on the unit; however, since this species is secretive, trapping efforts could meet with some success. Bobcats have also been seen infrequently, so trapping of this species could also have limited success. Animals in the "predator" or "unprotected" category are probably fairly common on the WPA, so good success could be anticipated trapping or otherwise hunting those species.

Need and Availability of Resources:

The following funds will be required to run the hunting program as designed under the CCP.

Category and Itemization	One-time ($000)	Annual ($000/yr)
Administration and management:	$0	$2k
Maintenance:	$0	$0
Monitoring: Law enforcement	$0	$3k
Offsetting revenues: TOTALS	$0 $0	$0 $5k

Anticipated Impacts of Described Use:

Impacts to Habitat. Since hunting requires off-trail use in the pursuit and/or recovery of game, trampling of vegetation and creation of social trails may result from hunting activity. However due to the low numbers of waterfowl hunters on the WPA, this is not a significant concern. Of greater concern is the inadvertent introduction of non-native plants. Propagules of non-native plants can be transported into new areas on hunters' boots, clothing, dogs and equipment (Benninger-Traux et al. 1992). Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. Invasive plants will be controlled and monitored as part of the Refuge's Integrated Pest Management Plan.

Local Impacts to Furbearer Species.

Population and harvest data: The direct effect of trapping on wildlife is mortality, wounding, and disturbance. The Idaho State Department of Fish and Game monitors furbearer populations and sets harvest quotas to ensure sustainable populations. Mandatory trapper reports are used to estimate the statewide harvest of furbearers by licensed trappers, the distribution of the harvest, and the market value of the state's furbearer harvest. Beginning with the 1993-1994 trapping season, questions on how many days the trapper spent afield scouting and setting/checking traps, and how many hours, on average, the trapper spent afield each day was included. Results of this information were then projected to estimate the statewide trapping effort both in total hours and days afield. Beginning with the 2002-2003 trapping season, these questions were changed to include Catch-Per-Unit-Effort (CPUE). CPUE measures the harvest per unit of time and will be useful in predicting population trends. CPUE is based on the premise that as populations decline, fewer animals are available to be trapped; therefore, CPUE should decline, or vice versa, as populations increase, CPUE will increase. CPUE is calculated by multiplying the total number of nights trapped by the average number of traps set per night (for a given species) and then dividing the number of animals trapped by this number. CPUE is recorded as animals trapped per 100 trap nights (White and Crea 2010).

CPUE for muskrat dropped markedly from the 2002-2003 to the 2003-2004 season; however it has been relatively stable since the 2003-2004 season. Statewide population trends, based upon animals trapped per 100 trap-nights were stable to slightly declining for bobcat, raccoon, and coyote. Trend was down for most other furbearers, although CPUE increased for skunk, badger, mink, and coyote compared to the 2008-9 season. Badger, skunks, and weasel are usually trapped incidentally to trapping for other species. Many trappers, who report harvest of badger, skunks, weasel, and sometimes otter, do not report trap nights or traps set for these four species since they are trapping for other species. Therefore, CPUE may not be an accurate reflection of population trend for badger, otter, skunks, and weasel.

The Idaho Department of Fish and Game (Department) sold 1,114 trapping licenses for the 2009-2010 season. Harvest reports for the 2009-2010 season were submitted by 843 (76 percent) of the 1,114 licensed trappers. Trappers reported harvesting 30,222 animals. The muskrat, beaver, coyote, raccoon, marten, and mink, were the most frequently harvested species. Statewide, 19,026 muskrat, 2,303 coyote, 1332 raccoon, 964 mink, 715 bobcat, 752 red fox, 704 skunks, 189 badger, and 114 weasel were trapped or harvested in the 2009-2010 season (White and Crea 2010).

Oxford Slough WPA is located in both Bannock and Franklin Counties. Muskrat accounted for more than 90 percent of furbearers trapped or harvested in these counties during the 2009-2010 season (736 animals in Bannock County and 1,373 in Franklin County). Combined this represents 11 percent of the total muskrat harvest statewide. These counties account for a low percentage of the harvest of all other furbearers (White and Crea 2010). It is unknown how many muskrat are harvested on the WPA annually, but given the stable trends for muskrat over the past decade it is unlikely that muskrat trapping on the WPA is having a significant negative effect on muskrat populations statewide. Given the low numbers of other furbearers harvested in Franklin and Bannock counties, the impact of the trapping program on these species is likely to be minor.

Impacts to Waterfowl and Other Migratory Birds. Public trapping can potentially impact the waterfowl production of WPAs through both direct and indirect impacts. Direct impacts are those where there is an immediate cause and effect relationship between the activity and the resources required to fulfill the waterfowl production purpose and System mission. Direct impacts may include such effects as killing or displacing of waterfowl during the pair bonding/nesting season, or destruction of nests by trampling. Indirect impacts are those where the effects of the permitted activity affect other populations or habitats that in turn have direct impacts on waterfowl production and the System purpose. Indirect impacts may include catch of target and non-target species that are predators on waterfowl and/or nests, or removal of species that induce habitat change (i.e., beaver or muskrat).

Impacts, either direct or indirect, may be negative, neutral, or positive. Because of the temporal separation of trapping activities and the nesting season for waterfowl and other migratory birds, direct impacts to waterfowl production, or breeding populations of other migratory birds, by trappers is negligible. Muskrat trappers using the WPA after early March, undoubtedly disturb individuals on occasion, and cause temporary displacement of waterfowl from specific and limited areas. These impacts will be occasional, temporary, and isolated to small geographic areas. Late-season trapping activity does have the potential to disturb colonial-nesting waterbirds, such as Franklin’s gull and white-faced ibis. While most trapping activity occurs in fall, winter, and early spring prior to the breeding season for waterfowl and waterbirds, the trapping seasons for American beaver, muskrat, and mink (October 22-April 15) and American badger and red fox (July 1-June 30) overlap with the breeding season for these species. Management recommendations for Franklin's gull and white-faced ibis include limiting disturbance to colonies from April 1-August 1 (Burger and Gochfeld 1994, Guay 1968, Ryder and Manry 1994). To date no disturbance of nesting colonies due to trapping activity has been documented. Any habitat change as a result of the physical impacts of trapping activity (trampling, etc.) has not been documented.

Indirect impacts to waterfowl production do result from the removal of animals under a trapping program. Most species of interest to trappers, and common "non-target" catches (i.e., skunk, free-ranging house cat), are predators on waterfowl at some point in the production cycle. Management of red fox and mink populations, through a regulated trapping program is, at worst, a neutral impact, and likely a positive one in most cases on the waterfowl production purpose. Timing of the removal of predators also affects the impact that this activity has on waterfowl production. Again, depending on the time of year, impacts on waterfowl production may be neutral or positive. Due to the low levels of predators trapped in Franklin and Bannock Counties, only a slight positive impact to waterfowl production will be likely to result from the trapping program.

Other indirect impacts on waterfowl production occur as a result of the manipulation of populations of species that affect habitat, e.g., beaver or muskrat. Beaver have not been documented at Oxford Slough WPA, but the WPA does support muskrat. By their nature, muskrats affect habitat that, in turn, may affect waterfowl production. Upon initial analysis, we often think of muskrat, with their propensity to maintain open water, as beneficial to waterfowl production. In exceptionally large marshes and in pre-settlement times, this is/was likely the case. However, the landscape has been altered through agricultural conversion so that few historic ecosystem functions remain intact. Other than the fact that water continues to flow downhill, the hydrology of this landscape bears little resemblance to its pre-settlement conditions. Dikes, levees, roads, culverts, pumps, and water control structures work to move and confine water with calculated purpose. Ramifications of disruption to this system can include private property damage, public safety hazards, and legal liability. As a result, the Service intensely manages water on WPAs to provide for waterfowl production and to fulfill the mission of the National Wildlife Refuge System. High muskrat populations are detrimental to levees and dikes as individuals burrow into these structures and compromise the structural integrity. Without the ability to control water levels, our waterfowl production purpose will suffer, as will our ability to contribute to the System mission. A public trapping program facilitates management of muskrat populations at such levels that many benefits created by this species are realized, yet the ability of the Service to manage water levels is not compromised.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Trapping activity must be conducted in compliance with existing State regulations.
- Southeast Idaho Complex staff will monitor colonies of white-faced ibis and Franklin’s gulls. If disturbance caused by trapping is documented, seasonal restrictions will be instituted.

Justification:

Direct impacts to the waterfowl production purpose are negligible due to the temporal separation of most trapping activity and the use of WPAs by waterfowl for production, and by colonial nesting birds. Muskrat and red fox trapping occurring after early March may cause limited disturbance of individuals and pairs. These temporary and isolated disturbance events result in temporary displacement of birds from a specific location. Due to the duration of these events, the small number of individual waterfowl involved, and the limited geographic area impacted by the presence of one or a few individuals, these impacts on waterfowl production and the System mission are negligible. While the potential for disturbance to colonies of white-faced ibis and Franklin’s gull due to late-season trapping of muskrat and red fox exists, impacts of trapping to colonial nesting birds has not been documented to date. If monitoring demonstrates unacceptable impacts seasonal restrictions on trapping will be instituted.

Consistent with the System mission, public trapping on WPAs results in management of populations and is not a “control” program intending to eliminate certain species for the benefit of others. However, indirect impacts to waterfowl production (either directly through the removal of predators, or indirectly, through removal of species such as beaver or muskrat that affect water management capabilities.) These impacts are generally positive, though they vary depending upon timing of removal, size of the WPA, adjacent land management practices, and other factors.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the WPA will not be measurably lessened from public trapping to occur on the WPA. The relatively limited number of individuals expected to be adversely affected by trapping will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing this public trapping program to occur with stipulations will not materially detract or interfere with the WPA’s purpose of waterfowl production, or the Refuge System mission.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

2027 Mandatory 15-year Re-evaluation date (for priority public uses)

____Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 13, Trapping of Furbearers on Oxford Slough Waterfowl Production Area:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
<u>Concurrence</u>		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

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B.18 Compatibility Determination for Research and Monitoring on the Oxford Slough Waterfowl Production Area

RMIS Database Uses: Research and Monitoring

Refuge Name: Oxford Slough Waterfowl Production Area (WPA)

Location: Franklin and Bannock Counties, ID

Date Established: 1985

Establishing and Acquisition Authorities:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. § 718(c))

Refuge Purpose(s):
- "... as Waterfowl Production Areas subject to ... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

The Southeast Idaho NWR Complex staff receives periodic requests from non-Service entities (e.g., universities, State agencies, other Federal agencies, nongovernmental organizations) to conduct research, scientific collecting, and surveys on refuge lands, including the Oxford Slough WPA. These project requests can involve a wide range of natural and cultural resources as well as public-use management issues including basic absence/presence surveys, collection of new species for identification, habitat use and life-history requirements for specific species/species groups, practical methods for habitat restoration, extent and severity of environmental contaminants, techniques to control or eradicate pest species, effects of climate change on environmental conditions and associated habitat/wildlife response, identification and analyses of paleontological specimens, modeling of wildlife populations, bioprospecting, and assessing response of habitat/wildlife to disturbance from public uses. Projects may be species-specific, refuge-specific, or evaluate the relative contribution of the refuge lands to larger landscapes (e.g., ecoregion, region, flyway, national, international) issues and trends.

The Service's Research and Management Studies (4 RM 6) and Appropriate Refuge Uses (603 FW 1.10D(4)) policies indicate priority for scientific investigatory studies that contribute to the enhancement, protection, use, preservation, and management of native wildlife populations and their habitat as well as their natural diversity. Projects that contribute to refuge-specific needs for resource and/or wilderness management goals and objectives, where applicable, will be given a higher priority over other requests.

Availability of Resources:

Refuge Complex staff responsibilities for projects by non-Service entities will be primarily be limited to the following: review of proposals, prepare SUP(s) and other compliance documents (e.g., Section 7 of the Endangered Species Act of 1973, Section 106 of the National Historic Preservation Act), and monitor project implementation to ensure that impacts and conflicts remain within acceptable levels (compatibility) over time. Additional administrative support, logistical and operational support may also be provided depending on each specific request. Estimated costs for one-time (e.g., prepare SUP) and annually re-occurring tasks by Refuge Complex staff and other Service employees will be determined for each project. Sufficient funding in the general operating budget of the WPA must be available to cover expenses for these projects. The terms and conditions for funding and staff support necessary to administer each project on the WPA will be clearly stated in the SUP(s).

The Southeast Idaho Refuge Complex has the following staffing and funding to administratively support and monitor research that is currently taking place on refuge lands (see table below). Any substantial increase in the number of projects will create a need for additional resources to oversee the administration and monitoring of the investigators and their projects. Any substantial additional costs above those itemized below may result in finding a project not compatible unless expenses are offset by the investigator(s), sponsoring agency, or organization.

Category and Itemization	One-time ($)	Annual ($/yr)
Administration and management		$1,000
Maintenance		$1,000
Monitoring		$1,000
Special equipment, facilities, or improvement		$0
Offsetting revenues		$0

Itemized costs in the previous table are current estimates calculated using a 3 percent base cost of a GS-12 Refuge Manager.

Anticipated Impacts of Described Use:

Use of the Refuge(s) to conduct research, scientific collecting, and surveys will generally provide information that will benefit fish, wildlife, plants, and their habitats. Scientific findings gained through these projects provide important information regarding life-history needs of species and species groups as well as identify or refine management actions to achieve resource management objectives in refuge management plans (especially CCPs). Reducing uncertainty regarding wildlife and habitat responses to refuge management actions in order to achieve desired outcomes reflected in resource management objectives is essential for adaptive management in accordance with 522 DM 1.

If project methods impact or conflict with refuge-specific resources, priority wildlife-dependent public uses, other high-priority research, wilderness, and refuge habitat and wildlife management programs, then it must be clearly demonstrated that its scientific findings will contribute to resource management and that the project cannot be conducted off refuge lands for the project to be compatible. The investigator(s) must identify methods/strategies in advance required to minimize or eliminate the potential impact(s) and conflict(s). If unacceptable impacts cannot be avoided, then the project will not be compatible. Projects that represent public or private economic use of the natural resources of any national wildlife refuge (e.g., bioprospecting), in accordance with 16 U.S.C. 715s, must contribute to the achievement of the WPA's purposes or the National Wildlife Refuge System mission to be compatible (50 C.F.R. 29.1).

Impacts will be project- and site-specific, where they will vary depending upon nature and scope of the fieldwork. Data collection techniques will generally have minimal animal mortality or disturbance, habitat destruction, no introduction of contaminants, or no introduction of non-indigenous species. In contrast, projects involving the collection of biotic samples (plants or animals) or requiring intensive ground-based data or sample collection will have short-term impacts. To reduce impacts, the minimum number of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates, vertebrates) will be collected for identification and/or experimentation and statistical analysis. Where possible, researchers will coordinate and share collections to reduce sampling needed for multiple projects. For example, if one investigator collects fish for a diet study and another research examines otoliths, then it may be possible to accomplish sampling for both projects with one collection effort.

Investigator(s) obtaining required State or Federal collecting permits will also ensure minimal impacts to fish, wildlife, plants, and their habitats. After incorporating the above strategies, projects will not be compatible if they will result in long-term or cumulative effects. A Section 7 consultation under the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884, as amended Public Law 93-205) will be required for activities that may affect a federally listed species and/or critical habitat. Only projects that have no effect or result in not likely to adversely affect determinations will be considered compatible. At this time, no Federally listed species occur on the WPA.

Spread of invasive plants and/or pathogens is possible from ground disturbance and/or transportation of project equipment and personnel, but it will be minimized or eliminated by requiring proper cleaning of investigator equipment and clothing as well as quarantine methods, where necessary **(**see Attachment 4). If after all practical measures are taken and unacceptable spread of invasive species is anticipated to occur, then the project will be found not compatible without a restoration or mitigation plan.

There also could be localized and temporary effects from vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Impacts may also occur from infrastructure necessary to support a projects (e.g., permanent transects or plot markers, exclosure devices, monitoring equipment, solar panels to power unattended monitoring equipment). Some level of disturbance is expected with these projects, especially if investigator(s) enter areas closed to the public and collect samples or handle wildlife. However, wildlife disturbance (including altered behavior) will usually be localized and temporary in nature. Where long-term or cumulative unacceptable effects cannot be avoidable, the project will not be found compatible. Project proposals will be reviewed by refuge staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to refuge management issues and understanding of natural systems.

At least six months before initiation of fieldwork (unless an exception is made by prior approval of the Refuge Manager), project investigator(s) must submit a detailed proposal using the format provided in Attachment 1. Project proposals will be reviewed by refuge staff and others, as needed, to assess the potential impacts (short-term, long-term, and cumulative) relative to benefits of the investigation to refuge management issues and understanding of natural systems. This assessment will form the primary basis for allowing or denying a specific project. Projects that result in unacceptable refuge impacts will not be found compatible. If allowed and found compatible after approval, all projects also will be assessed during implementation to ensure impacts and conflicts remain within acceptable levels.

If the proposal is approved, then designated SE Idaho Refuge Complex staff will issue an SUP(s) with required stipulations (terms and conditions) of the project to avoid and/or minimize potential impacts to the WPA's resources as well as conflicts with other public-use activities and WPA field management operations. After approval, projects also are monitored during implementation to ensure impacts and conflicts remain within acceptable levels based upon documented stipulations.

The combination of stipulations identified above and conditions included in any SUP(s) will ensure that proposed projects contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats on the WPA. As a result, these projects will help fulfill WPA purpose(s); contribute to the Mission of the NWRS; and maintain the biological integrity, diversity, and environmental health of the WPA.

Projects that are not covered by the WPA's Inventory and Monitoring Plan, or inventory and monitoring strategies under the objectives in this CCP will require additional NEPA documentation.

Public Review and Comment:

This CD was prepared concurrent with the Bear Lake NWR CCP. Public notice was provided and open houses were held and written comments were solicited from the public during the scoping period for the Draft CCP/EA. Public review and comment were solicited during the Draft CCP/EA comment period.

Determination:

____Use is Not Compatible

_X__Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Each project will require an SUP. Annual or other short-term SUPs are preferred; however, some permits will be for a longer period, if needed, to allow completion of the project. All SUPs will have a definite termination date in accordance with 5 RM 17.11. Renewals will be subject to review and approval by SE Idaho Refuge Complex staff, based on timely submission of and content in progress reports, compliance with SUP stipulations, and required permits.

- Projects will adhere to scientifically defensible protocols for data collection, where available and applicable.
- Investigators must possess appropriate and comply with conditions of State and Federal permits for their projects.
- If unacceptable impacts to natural resources or conflicts arise or are documented by the refuge staff, then SE Idaho Refuge Complex staff can suspend, modify conditions of, or terminate an on-going project already permitted by SUP(s) on a refuge(s).
- Progress reports are required at least annually for multiple-year projects. The minimum required elements for a progress report will be provided to investigator(s) (see Attachment 2).
- Final reports are due one year after completion of the project unless negotiated otherwise with SE Idaho Refuge Complex staff.

- Continuation of existing projects will require approval by SE Idaho Refuge Complex staff.
- The SE Idaho Refuge Complex staff will be given the opportunity to review draft manuscript(s) from the project before being submitted to a scientific journal(s) for consideration of publication.
- The SE Idaho Refuge Complex staff will be provided with copies (reprints) of all publications resulting from a refuge project.
- The SE Idaho Refuge Complex staff will be provided with copies of raw data (preferably electronic database format) at the conclusion of the project.
- Upon completion of the project or annually, all equipment and markers (unless required for long-term projects), must be removed and sites must restored to the SE Idaho Refuge Complex staff's satisfaction. Conditions for clean-up and removal of equipment and physical markers will be stipulated in the SUP(s).
- All samples collected on refuge lands are the property of the Service even while in the possession of the investigator(s). Any future work with previously collected samples not clearly identified in the project proposal will require submission of a subsequent proposal for review and approval. In addition, a new SUP will be required for additional project work. For samples or specimens to be stored at other facilities (e.g., museums), a memorandum of understand will be necessary (see Attachment 3).
- Sampling equipment as well as investigator(s) clothing and vehicles (e.g., ATV, boats) will be thoroughly cleaned (free of dirt and plant material) before being allowed for use on WPA lands to prevent the introduction and/or spread of pests. Where necessary, use quarantine methods (see Attachment 4).
- The NWRS, the WPA, names of SE Idaho Refuge Complex staff and other Service personnel that supported or contributed to the project will be appropriately cited and acknowledged in all written and oral presentations resulting from projects on refuge lands.
- At any time, SE Idaho Refuge Complex staff may accompany investigator(s) in the field.
- Investigator(s) and support staff will follow all refuge-specific regulations that specify access and travel on the WPA.

Justification:

Research, scientific collecting, and surveys on refuge lands are inherently valuable to the Service because they will expand scientific information available for resource management decisions. In addition, only projects that directly or indirectly contribute to the enhancement, protection, use, preservation, and management of refuge wildlife populations and their habitats generally will be authorized on refuge lands, including Waterfowl Production Areas. In many cases, if it were not for the SE Idaho Refuge Complex staff providing access to WPA lands and waters along with some support, the project would never occur and less scientific information would be available to the Service to aid in managing and conserving the refuge resources. By allowing the use to occur under the stipulations described above, it is anticipated that wildlife species that could be disturbed during the use will find sufficient food resources and resting places so their abundance and use will not be measurably lessened on the Refuge(s). Additionally, it is anticipated that monitoring, as needed, will prevent unacceptable or irreversible impacts to fish, wildlife, plants, and their habitats. As a result, these projects will not materially interfere with or detract from fulfilling WPA purpose(s); contributing to the mission of the NWRS; and maintaining the biological integrity, diversity, and environmental health of the Refuge(s).

Mandatory Re-evaluation Date: (provide month and year for "allowed" uses only)

____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

Signatures for Compatibility Determination 14, Research and Monitoring on the Oxford Slough Waterfowl Production Area:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
<u>Concurrence</u> Refuge Supervisor:	(Signature)	2/11/13 (Date)
Regional Chief, Acting National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

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B.19 Compatibility Determination for Agricultural Practices (Farming and Haying) on Oxford Slough Waterfowl Production Area

RMIS Database Uses: Agriculture (Farming and Haying)

Refuge Name: Oxford Slough Waterfowl Production Area (WPA)

Location: Franklin and Bannock Counties, Idaho

Date Established: 1985

Establishing and Acquisition Authorities:

Oxford Slough WPA:
- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. § 718(c))

Refuge Purpose(s):

Oxford Slough WPA.

The 1,878-acre Oxford Slough WPA was purchased in fee title from the Federal Land Bank on April 25, 1985. Lands were purchased using Federal Duck Stamp Funds, allocated by the Migratory Bird Hunting and Conservation Stamp Act, which provided that the area be managed under the following purposes:
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)
- "... as Waterfowl Production Areas subject to ... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

WPA crops are planted to promote sustained use of these areas by migrating waterfowl by providing an accessible, high-energy food source during late fall and early winter as wetland habitats freeze up.

Current Management. Agricultural practices on the Oxford Slough WPA include haying and planting crops such as cereal grains and clover.

Current farming use: Staff currently farms 79 acres in seven farm fields on Oxford Slough WPA. Crops are rotational farmed in 70 percent small grain (split between fall wheat and spring barley) and 30 percent summer fallow or leguminous (alfalfa) cover crops. Generally, small grain fields are planted one year and rotated into a spring fallow the following year. Staff previously implemented active restoration on over half of the agricultural fields at Oxford Slough by planting native upland grasses to restore historic fields to dense nesting grass cover.

A Cooperative Land Management Agreement (CLMA) has been in effect since WPA acquisition in 1985. CLMAs allow private farmers (cooperator) to raise a specified crop in a designated field or fields, in exchange for harvest of hay from the WPA. The WPA has been working with one cooperative farmer at Oxford Slough WPA since 2007 for both farming and haying. Consistent with the annual CLMA the cooperative farmer plants WPA crops, fallows fields, repairs fences, and controls WPA water rights in exchange for harvesting hay and winter wheat. Water for irrigation is managed by the CLMA using existing irrigation and water control structures. Genetically modified crops are not allowed.

Current haying use: Staff manages 300 acres of annual hayed short-cover meadow at Oxford Slough WPA. Hay fields must be irrigated in the spring through the early summer and then dewatered to allow the hayed grasses to dry before haying activity. Haying operations are restricted until August 1 and can occur through September 15.

Proposed Management.

Proposed farming management: The WPA will continue to farm 30 of the 79 acres in two of the seven farm fields as managed crops on Oxford Slough WPA. This constitutes a 62 percent reduction in crops on Oxford Slough WPA within the implementation of proposed management.

The WPA proposes to continue with using CLMAs for agricultural production and will continue to leave the WPA crop share in the field where it will be available to wildlife. The CLMA cooperator will use his/her own farm equipment such as tractors, swathers, balers, and diskers. CLMA crop planting and fallowing will continue as current management in the spring and the fall of each year and haying activities will be conducted from August 1 to September 15. In years with anomalous weather conditions, activity dates may be varied upon consultation with WPA staff.

Need and Availability of Resources:

Category and Itemization	One-time ($)	Annual ($/yr)
Administration and management:	$	$1,000
Maintenance:	$	$0
Monitoring:	$	$500
Offsetting revenues:	$	$0
TOTALS	$	$1,500

Anticipated Impacts of Described Use:

Farming.

Effects of farming to refuge wildlife: Both current and proposed management of Oxford Slough WPA recognize the benefits for providing supplemental forage for migratory waterfowl and waterbirds within the Pacific and Bear River migratory corridor. WPA farming practices (both current and proposed) are designed for the predominate benefit of waterfowl (ducks, geese and greater sandhill cranes). However, many other species (e.g., long-billed curlews, porcupine, sage-grouse, bald eagles) would benefit directly or indirectly from WPA crops. Croplands on the WPA promote sustained use of the area by migrating waterfowl by providing an accessible, high-energy food source during late fall and early winter as wetlands freeze up.

Most waterfowl are opportunistic feeders, and some species such as Canada geese, snow geese, mallard, northern pintails, and teal have learned to capitalize on the abundant foods produced by agriculture (Bellrose 1976). During the last century, migration routes and wintering areas have changed in response to availability of these foods (Fredrickson and Drobney 1979). Some species have developed such strong migratory traditions that many populations are now dependent on agricultural foods for their migration or winter survival (Ringelman 1990). However, during breeding and molting periods, waterfowl require a balanced diet with high protein content. Agricultural foods, most of which are neither nutritionally balanced nor high in protein, are seldom used during these periods. During fall, winter, and early spring, when vegetative foods make up a large part of their diet, agricultural foods are preferred forage except in arctic and subarctic environments (Sugden 1971).

Effects of farming to refuge habitats: As the only Waterfowl Production Area in Region 1 of the U.S. Fish and Wildlife Service, the extent and quality of upland habitat for nesting waterfowl is critical. The 79 acres currently farmed represents >5 percent of the WPAs total habitat. The WPA proposes to maintain 30 of the 79 acres currently farmed in agricultural production on Oxford Slough WPA. This constitutes a 62 percent reduction in crops. Under proposed management, farmed acres will be reduced to 30 acres to occur on >2 percent of Oxford Slough WPA. There will be a very minor impact on availability of grain for fall migrating geese and cranes, since the amount of land under cultivation will decrease by 49 acres in proposed management. However, proposed management will not impart any additional losses to native habitats from farming, since all proposed farm fields have already been in agricultural production. Additionally, the juxtaposition of native and cropland in proposed management will provide greater native and crop food diversity and habitat resiliency.

Activities associated with crop production, including ground disturbance and field to field movement of cultivating and harvesting equipment can disturb soils. Direct impacts of cropland management include exposure of soils to wind erosion and impacts from farm machinery. In general, tillage and cropping that leaves soil bare for portions of the year negatively affect soil quality indicators (Nelson et al. 2006) such as aggregate stability, infiltration rates, and available water capacity. Compaction can result from the use of farming equipment for seeding, causing undesirable increases in bulk density, while tilling may also prevent the accumulation of, or accelerate the decomposition of organic matter (USDA NRCS).

Current fall crop residues are generally removed by tilling after harvest, but proposed management will implement a conservation tillage system and fallow residual crops through the fall and into the next summer. Subsequently, proposed management will reduce the total tilling of agricultural fields on the WPA through the implementation of conservation tillage practices and by restoring 49 acres of agriculture fields at Oxford Slough. EPA's guidance for estimating Particulate Matter (PM) emissions from agricultural crop tilling involves combining a constant emission factor with county-level activity data, including the silt content of surface soils, the number of tillings performed in a year for each crop type, and the acres of each crop type (EPA 2001, 2004). While no PM emissions data exist for Southeastern Idaho, it is estimated that the WPA contribution to PM emissions would be less under proposed management, but no significantly degradation is expected to local or regional air quality from either current or proposed management action. While there will obviously be some continued impact to soil quality within proposed management, a reduction in the acreage under cultivation should impart a minor beneficial impact on soil and water quality when compared to current management.

Cultivation and disturbance of soils fosters an undesirable opportunity for the introduction or spread of weeds on the WPA. Invasive weed species have the potential to reduce habitat quality and forage opportunity and have been identified as one of the most serious threats to WPA habitats. Farming may also result in the use and introduction into the environment of chemical agents from pesticide usage. In addition, small mammals, reptiles, and amphibians may be occasionally subject to mortality from farm machinery, and nesting birds may be occasionally disrupted and nests destroyed.

The WPA previously restored over half of the WPAs former agricultural fields by planting native upland grasses for dense nesting cover. Crop fields surrounding the northeast hillside of Oxford Slough are still subject to rill erosion during summer rain events. Active sagebrush restoration, as developed in proposed management along the periphery of these agricultural areas is required to stabilize the site. Proposed management will minimize the effects occurring from the loss of quality topsoilm which degrades water quality in the Slough.

Proposed five-year WPA evaluations of the geographic distribution and acreage of small grain production operations will improve the WPA's ability to adaptively determine future agricultural needs. By monitoring regional trends in crop production within proposed management the WPA will become more adaptive and be able to provide increased agricultural crop production for wildlife or the ability to further restore additional agriculture habitats, should conditions warrant.

Effects to listed species from farming: Currently there are no listed species inhabiting the WPA. Should agricultural farming management conflicts occur with listed species in the future; the WPA will eliminate impacts to listed species or develop and implement minimization measures under Section 7 consultation of the Endangered Species Act. If deemed necessary, the cooperative farming program will be halted until all protective and minimizing measures can be evaluated and implemented as necessary.

Effects to priority public uses from farming: The agricultural fields targeted to provide forage for focal wildlife species indirectly support wildlife-dependent recreational activities such as wildlife observation and photography.

Haying.

Effects of haying to refuge wildlife: The Oxford Slough WPAcontains very productive meadow habitat. Current management will continue to maintain 300 acres of hay, which is 96 percent (227 acres) of the total seasonally flooded meadow grass habitat on the WPA. This approach leaves little habitat for nesting and fledging waterbirds and reduces secure habitat that provides corridors for wildlife egress to and from the WPA.

By reducing haying operations by 50 percent (150 acres), proposed management will achieve an equitable distribution of hayed vs. unhayed areas (60:40) on Oxford Slough WPA and improve the juxtaposition of early and late successional habitats for a suite of nesting and foraging wildlife (Jarvis and Harris 1971, Fefer 1977, Bishop and Vrtiska 2008).

The WPA creates early successional short-stature habitats by haying wet meadows. These habitats provide easily accessible open foraging areas for several species that have proven highly adaptable to anthropogenic habitat alterations. Hayed WPA areas provide preferred short-cover habitat for wildlife such as greater sandhill cranes, long-billed curlew, and Canada geese (Eldred 2009, La Sorte and Boecklen 2005).

The WPA's current haying objectives are designed to provide extensive short statured habitat across the WPA and attempt to increase wildlife foraging opportunities within artificially low stature vegetation. Potential wildlife benefits frequently cited for providing managed short-cover grassland include: increased palatability of grasses for grazers, increased invertebrate forage availability and detection rates, reduced physical obstruction, and increased security from predators during grazing or foraging activity (Deveruex et al. 2006).

Hayed or naturally occurring short-cover habitats are comprised of low density herbaceous grass and forbs of 0-4 inches in height with bare ground, or light vegetative litter, easily visible. Ground foraging birds can easily move through this type of habitat and tend to select short cover habitat over dense grass habitat. Wildlife which select short-cover habitat include avian species in the Meadow Foraging Guild (e.g., greater sandhill crane, long-billed curlew, Canada goose, western meadowlark, American robin, cattle egret; Grazing Waterfowl Guild (e.g., American widgeon, American coot, gadwall, Canada geese); and Upland Nesting Guild (e.g., long-billed curlew, black-necked stilt, killdeer). The species representative of the "short cover guild, for the purposes of this evaluation, are the sandhill crane (meadow foraging), Canada goose (Meadow Foraging/Grazing Waterfowl), black-necked stilt (Upland Nesting) and, finally, long-billed curlew (Meadow Foraging).

Dense cover habitat on the WPA is defined as taller native or non-native unhayed herbaceous cover, at least 10-12 inches in height, dense enough to effectively conceal a passerine, shorebird, or duck nest from overhead or lateral view. Birds selecting dense cover for foraging and nesting include species in the Upland Nesting Waterfowl Guild (i.e., northern pintail, mallard, cinnamon teal, northern shoveler, gadwall); the Meadow Nesting Shorebird Guild (i.e., Wilsons' phalarope, willet, common snipe); the Secretive Marsh Bird Guild (i.e., American bittern, Virginia rail, sora rail); and the Shallow Over-water Nesting Marsh Bird Guild (i.e., black tern, marsh wren, red-winged blackbird, yellow-headed blackbird, northern harrier). The species considered most representative of the "dense cover guild" for the purposes of this evaluation are the sandhill crane (Meadow Nesting), Wilson's phalarope (Meadow Nesting), Northern Pintail (Upland Nesting), and Black tern (Shallow Over-Water Nesting).

Current and proposed haying will reduce the height of the meadow grasses to the benefit of passerine species that prefer short grass pastures as a foraging habitat (Whitehead et al. 1995, Perkins et al. 2000, Devereux et al. 2004). Several mechanisms may underpin this choice including greater visibility for monitoring predators and conspecifics, improved prey accessibility and better mobility for foragers (Whittingham and Markland 2002, Butler and Gillings 2004, Whittingham and Evans 2004, Wilson et al. 2005). Conventional wisdom in agricultural and range management is that removal of "excess" or "decadent" plant litter increases sunlight and solar radiation, thereby warming soils earlier and promoting more available succulent plant growth earlier in the spring than areas covered by dense litter (Lecain et al. 2000). In Northern California, the abundance and diversity of birds, particularly sandhill cranes, on hayed meadow were equal to or greater than the abundance and diversity of birds on nonhayed plots (Epperson et al. 1999). However, Epperson and colleagues (1999) noted that cranes spent more time foraging and less time alert in hayed plots and concluded that foraging and vigilance by cranes to be more efficient in hayed meadows.

A second explanation of the preference of newly cut grass is that haying changes invertebrate activity or availability, for example by causing a temporary flush of prey (Vickery et al. 2001). The advantage to foraging in an area where prey is concentrated by mowing is intuitive (Dunwiddie 1991, Cattin et al. 2003), but it is less obvious why mowing could influence soil invertebrates. It is possible that the action of mowing changes the activity rates of soil-dwelling prey because of noise and vibration, especially when large machinery is used. Prey may respond to the disturbance by changing their activity rates in some way that translates into an increase in capture efficiency for short-cover foragers.

Insects form particularly valuable protein rich forage bases within wet meadows (Fredrickson and Reid 1988, Wissinger 1999). Mowing or haying may affect the meadows associated invertebrate community (Purvis and Curry 1981, Morris 1990). If a meadow is hayed annually, the timing of the cut will affect the invertebrates present. The later the cut, the more time invertebrates will have to complete their life cycle. Many insect larvae develop in the seedheads of grasses and flowering plants. For example, cutting in June will have the greatest effect on planthoppers (Delphacidae) and many fly species, whilst cutting in July/August will adversely affect leafhoppers (Cicadellidae). Intake efficiency of foraging passerine birds was found to be greater in recently hayed units (Deveruex et al. 2006). Both intake rate and foraging efficiency are important determinants of a small bird’s survival. Deveruex and colleagues (2006) results showed that although no more prey were captured on newly mown/hayed grasslands, energy expenditure was reduced because fewer searches were required for each prey captured.

While increased access to invertebrates is the principal advantage cited for short-cover management practices (Schekkerman and Beintema 2007), an unanticipated effect of short-cover haying operations is that little vegetative complexity for hosting invertebrate substrate remains. Temporally flooded meadow wetlands are so productive because the base of the biotic pyramid is large and diverse and nutrient cycling is dynamic (van der Valk 1989). Because energy flows from the lowest levels of the pyramid in unhayed or mowed habitat, detritus sustains much of the biomass and structure of the community (van der Valk 1989). Excessive litter removal from current haying practices affects the balance between litter removal and accumulation in shallow wetland habitat, causing unwanted effects upon primary and secondary wetland productivity. Small litter accumulations may not provide adequate substrate for invertebrates; however, large accumulations may alter surface hydrology through peat formation or nutrient binding (Magee 1993). Invertebrate production may be impeded because of unfavorable conditions associated with hydrology, substrate, and nutrient availability in scant or heavy litter accumulations (Magee 1993). Proposed management will reduce hayed acreage moderately from the current levels, thereby providing a more diverse litter layer in wet meadows and various stages of litter size and decay. In comparison to current management, proposed hay management optimizes management of invertebrates for a more diverse array of foraging waterbirds and wildlife.

Haying involves the use of farm equipment to mow, rake, bale, and transport hay in grassland areas. The greatest potential for disturbance to wildlife occurs during mowing. Disturbance varies with vegetation composition and density, habitat use, wildlife species distribution and density, and time of year. Birds, mammals, amphibians and reptiles may be temporarily or permanently displaced, injured, or killed. Collectively, several studies show a direct and often substantial impact of the harvesting process on the fauna, especially from the mowing stages, and that this impact depends on the techniques and equipment used, as well as the equipment settings, and the habitat and ecology of each species (Humbert et al. 2009). In Oregon, private hay fields appear to support more than 5,000 breeding shorebirds (inferred by Paullin et al. 1977). These authors stated that young shorebirds were especially vulnerable to mortality from hay cutting. In early July (July 1 and 13) hay mowing was documented to have killed the following: Wilson's phalaropes; long-billed curlews; soras, common snipe, and blackbirds. They further found that, unlike ducks, shorebirds, especially Wilson's phalarope, tend to remain in hay meadows to feed after hatching. Consequently, earlier nesting species may be directly vulnerable to mowing. An added indirect effect to fledging shorebirds is that dewatering actions within current management may concentrate young birds near limited food resources in remaining water, increasing their vulnerability to not only mortality from haying equipment, but to predators (Ivey, pers. comm.). Several studies suggest that early hay mowing mortality is greatest in the first two weeks of July (Labisky 1957, Braun et al. 1978, Sargeant and Raveling 1992, Dale et al. 1997).

Hay cutting within the Oxford Slough area begins as early as mid-June, likely causing very high rates of shorebird mortality on private property adjacent to the WPA. Current and proposed management delays hay operators from initiating mowing or harvest of WPA hay until August1st to ensure cutting occurs after the nesting season for grassland species is complete. Multiple researchers and management plans support the actions to minimize wildlife mortality from seasonal hay mowing by not allowing haying operations any earlier then August 1 (Warner and Etter 1989, Bollinger et al. 1990, Licht 1997, Krapu et al. 2000, Dechant 2003, Perlut 2006, USDOA 2007) and for assessing feasibility in proposed management for delaying haying operations further into mid-late August. Recommendations from managers of some grassland management areas indicate that waiting until mid-July for mowing or haying operations is adequate; however, waiting until mid-August will help prevent impacts to double and triple-brooded species that occur at Oxford Slough WPA such as savannah sparrows and meadowlarks (Warren and Anderson 2005).

In summary, there is good evidence that food abundance is the main driver in determining bird usage of fields for both invertebrate-feeders (Brickle et al. 2000), and seed-eaters (Robinson and Sutherland 199, Moorcroft et al. 2002). However, food availability (i.e., abundance modified by ease of access to that food) has also been shown to be an important factor in determining bird usage (Henderson and Evans 2000, Henderson et al. 2001). Management for short structure, and the abundance and availability of food resources to birds, are inextricably linked (McCracken and Tallowin 2004). Haying or mowing affects grass height, and hence the amount of, and access to, food resources in different ways. Proposed management, with low to moderate disturbance from haying is more compatible with maintaining rich seed and invertebrate food resources and more diverse heterogeneous meadow habitat. This allows for both adequate food resources and areas where birds can access those resources, and provides taller denser habitat for upland nesting waterfowl, secretive marsh birds, and shallow over-water nesting birds. Continuation of haying, as proposed in current management, will predominantly benefit common bird species such as meadow foragers, grazers, and upland nesters, as it results in low vegetative diversity, structurally uniform habitats that contain few broad-leaved plant species and a reduced diversity of invertebrate food resources for birds (Lefranc 1997). Management objectives as outlined in the WPA proposed management integrate an understanding of the factors that determine why birds forage in particular fields as well as how the major management practices can be modified to produce habitats that are suitable not only for species who readily adapt to anthropogenic changes in habitat, but a diverse suite of species. By offsetting current agricultural practices on 150 acres, and reducing current hayed areas from 300 acres to 150 acres, the Oxford Slough WPA will provide a diverse realm of nesting and foraging habitats for both breeding and migrating wildlife during several key times in their annual life histories (Rollins 1981, Heitmeyer 1989).

Effects of haying to refuge habitats: Under proposed management, the WPA will moderately reduce haying operations from 300 acres to increase the inundation of wet meadow habitat through the summer. The proposal is to reduce haying by 50 percent (to 150 acres) on Oxford Slough WPA over a five-year timeframe and change the proportion of total wet meadow habitat hayed from 94 percent to only 60 percent hayed.

While long-term hydrologic regimes shape invertebrate adaptive strategies, annual variation in the hydroperiod determines the occurrence and abundance within any given season (Fredrickson 1988, Reid 1985). Because invertebrate communities are also linked to hydrology (Swanson 1977, Fredrickson and Taylor 1982, Batzer 1983) current irrigation regimes in the Oxford Slough area, will continue to dewater wet meadows earlier to facilitate haying operations and continue to shift the distribution and availability patterns of aquatic invertebrates or possibly eliminate more moisture-tolerant taxa from hayed habitats (Euliss 1999). Proposed management will reduce haying by 62 percent by 2017, from 300 acres to 150 acres and supply a diverse mosaic of wetland cover types, while working to improve the hydrologic management capability on the WPA.

In assessing the positive and negative effect from haying on the WPA, it is important to recognize the valuable role that temporarily flooded meadows play within WPA ecosystems of larger seasonally and semi-permanently flooded habitats and upland dry meadows and upland shrub habitats. Flooded meadow habitat mosaics, where proximate to both tall emergent wetland and upland habitat, create a richness of habitat biodiversity that would not occur if the habitats existed in isolation from one another. Proposed management will moderately reduce meadow and upland haying operations to maintain inundation of wetland shallow marsh and wet meadow habitat through the summer. By decreasing haying operations and regaining as much as possible of the former hydrograph, proposed management will increase temporary and seasonally flooded habitats through properly timed inundation to provide an adequate hydrologic regime within wet meadow habitat. This will increase habitat structure, litter accumulation, nutrient cycling, and ultimately, the invertebrate insects migratory waterbirds are dependent upon within these important habitat types.

By 2017 staff will reduce haying by 50 percent on the WPA. Subsequently, 150 acres of formerly hayed WPA habitats will evolve through the succession of various annual and perennial species and form denser meadow grasslands. As most adjacent land-use practices throughout the Oxford Slough area provide ample short-cover foraging habitat, it is anticipated that the reduction in the WPA hay program will only reflect a negligible decrease in short-cover foraging and browsing habitat for waterfowl, geese, and cranes. Although the WPA acres devoted to providing short-stature forage will decrease under this proposed restorative management direction, it is expected that the change in annual waterfowl use days on the WPA will be minor. Restoration of hayed units to native meadow and grassland habitats will provide slightly less accessible forage than current management, but the difference should be negligible. Alternatively, the management strategy will work to improve water management capabilities in several wetland units and provide increased security in waterbird roosting areas proximate to important native wet meadow habitats and forage.

Birds respond to the heterogeneity of habitats at several spatial scales (Wiens 1985), from the landscape (e.g., Bear River Watershed) to the site (e.g., Oxford Slough WPA), to the microsite scale (e.g., foraging areas within wetlands). Because ephemerality is a dominant characteristic of natural wetlands (Fredrickson and Reid 1990), waterbirds have evolved flexible behavior to take advantage of water level fluctuations at a variety of scales (Kushlan 1989; Skagen and Knopf 1993, 1994). As it is unlikely that all resource needs can be indefinitely met by one wetland patch, aquatic birds probably supplement their resource intake by using multiple wetlands within a mosaic (Dunning et al. 1992; Farmer and Parent 1997). Limitation of shallow habitats on the WPA due to the current irrigation regime in the Oxford Slough area, and maintaining shallow habitat into the early fall in current management, is a cause for concern as access to food during the nonbreeding season can be a significant density-dependent cause of mortality in migratory shorebirds (Goss-Custard 1979).

Irrespective of water depth management, invertebrate resources must be abundant and periodically replenished if habitats are to function for extended periods (Miller 1987; Krapu and Reinecke 1992; Rehfisch 1994; Davis and Smith 1998). Invertebrate productivity is influenced by wetland plant composition, organic debris, temperature, substrate manipulations and flooding regimes (Neckles, Murkin and Cooper 1990; Rehfisch 1994; Batzer et al. 1997; Sanders 2000; Ausden et al. 2001). Invertebrate abundance is dependent upon cycles of spring flooding, summer evaporation, and fall inundation from rainfall. In hayed units with consistently lowered fall water levels, invertebrate forage resources are limited, if not depleted in current management (Eldridge 1992; Helmers 1992) and have lessened temporary and seasonally flooded habitat reducing the function and value of flooded habitat for WPA wildlife.

Haying operations in wet soil types are noted to cause greater impacts to soil compaction and vegetation damage than on drier upland sites (Gilley at al 1996). Gilley (1996) further documented that soil roughness was significantly greater and bulk density significantly less on undisturbed long-term idle sites than hayed areas. The relatively large bulk densities measured on the hay fields imply that considerable compaction occurs at or near the soil surface from those operations (Murphy 2004). Recent trends for increased size and use of tractors and agricultural machinery has additionally increased the probability of soil compaction during farm operations (Martel and MacKenzie 1980). Soil compaction by machinery has an indirect effect on soil invertebrates. Some earthworms can burrow into compacted soil (Joschko, Diestel and Larink 1989) but others have their activity restricted by compaction under conditions of high water (Kretzschmar 1991). Soil compaction has also been shown to decrease slug populations (Ferguson, Barratt and Jones 1988). (Rabotnov (1974) found a decrease in proportion of soil geophytic grass in Russia, which could be partially explained by soil compaction as a result of hay collection.

Haying reductions proposed will reduce haying in wet or moist meadows, where equipment may adversely impact vegetation and soil. Additionally, haying occurs on the WPA in mid-August and early September, in some of the driest months of the year. To further minimize soil compaction or damage in proposed management, fields that have been saturated by rain will not be hayed until soil conditions can support the required haying equipment. Since the WPA proposes that haying only occur in a drier time of the year for warm-season grasses on well-drained soil types, impacts from soil compaction will be decreased in comparison to current management (Murphy 2004).

Effects to listed species from haying: Currently there are no listed species inhabiting the WPA. Should hay management conflicts occur with listed species in the future; the WPA will eliminate impacts to listed species or develop and implement minimization measures under Section 7 consultation of the Endangered Species Act. If deemed necessary, the cooperative farming program will be halted until all protective and minimizing measures can be evaluated and implemented as necessary.

Effects to priority public uses from haying: The agricultural fields targeted to provide forage for focal wildlife species indirectly support wildlife-dependent recreational activities such as wildlife observation and photography.

Anticipated Cumulative Effects of Agricultural Uses (Farming and Haying).

Genetically modified organisms: The NWRS does not authorize refuges to use genetically modified organisms (GMO) for agricultural uses. However, GMO seeds could be in-use on surrounding private farm crops now or in the near future. Pollen blown on the wind or carried by pollinator species may be capable of transferring genetically engineered traits, such as herbicide resistance and pest resistance, to closely related wild plants on the WPA. Genetically engineered plants with weedy wild relatives are of particular concern to the WPA. If expressed in the genetic background of a weed species, a transgene could increase the fitness of the weed in nature (Stewart et al. 2000). Laboratory studies have shown non-target pollinator species may also be harmed by wind-blown pollen. Monarch butterfly larvae have been shown in both laboratory and field tests (Losey et al. 1999, Jesse and Obrycki 2000) to suffer growth and mortality effects after feeding on milkweed plants dusted by corn pollen that was genetically engineered to express a bacterial toxin.

Pesticides: The WPA can select less toxic pesticides and standardize operational procedures to minimize the immediate and accumulative effect of pesticides in the environment. However, the WPA has no control over surrounding land-use and agricultural practices, thereby increasing the risk of acute and chronic exposures to wildlife from herbicides. Acute exposure is a single exposure or multiple brief exposures occurring within a short time (e.g., 24 hours or less in humans). Chronic exposures are those that extend over the average lifetime or for a significant portion of the lifetime of the species (USFS 2005). Herbicides from the WPA will result in a moderate to minor risk from acute chemical exposure. However, unquantified and increasing risks from acute and chronic exposure may occur via the aggregate impacts from WPA herbicide applications when combined with private, county, and State herbicide applications within the Oxford Slough region.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipluations Necessary to Ensure Compatility:

Farming Use.

- Cropland farming will be done under an approved Cropland Management Plan per agency policy.
- Annual cooperative farming agreements will be established with the cooperator per agency policy.

- The cooperative farmer is required to perform habitat maintenance work to sustain the field conditions for the benefit of wildlife. Work may include mechanical weed control and fertilization.
- The agreement does not imply or establish a use precedent. Future use of the area will be based on the most satisfactory use of the land for wildlife benefits, cooperator performance, habitat management needs, and administrative needs.
- All improvements made to the WPA as a result of this Cooperative Land Management Agreement become the property of the United States.
- The Cooperator will be responsible to perform fence maintenance, weed control, crop planting and water management as detailed in annual work plans within each CLMA.
- The cooperative farmer will exercise care to prevent fire and will assume responsibility for fire, which may result from his/her operations.
- No Refuge equipment will be provided for use by the cooperator.
- At the end of the permit period, cooperator is responsible for removing all equipment from WPA lands.
- The cooperator shall be responsible for repairing damage to WPA facilities or habitat beyond normal wear and tear resulting from his/her operation.
- Pest plants and weeds will be controlled in accordance with the WPA's IPM program using methods such as crop rotation, mechanical treatment, biological controls, and approved pesticides.
- Insecticides, fungicides and other chemicals will not be permitted under this agreement. Fertilizers can be used by the Cooperator to fertilize crops.
- Pesticide use must be in compliance with the Service policy requirements for completing an approved Pesticide Use Proposal, and it must meet other State and Federal requirements.
- Cooperators will provide a record of herbicides used including chemical name, amount used, date, location, and how applied.
- Pesticide applicators must meet all State, Federal and agency requirements.
- Diligence shall be exercised in the control of county-listed invasive weeds.
- Equipment of cooperating farmers will be cleaned prior to being moved onto the WPA and between fields when working in areas with weed infestations
- No genetically modified crops are allowed.
- Monitoring of the cropland farming program will be performed by qualified WPA staff.

Haying Use.

- Haying will be done under an approved Cropland Management Plan per agency policy.
- Annual cooperative haying agreements will be established with the cooperator per agency policy.
- Staff will assess local hay values at least every three years, or more often if needed, to insure CLMAs are being conducted at a fair market value.
- Haying activities will start on or after August 1 each year and be completed by September 15, including removal of baled hay.
- Haying activities will start on or after August 1 each year and be completed by September 15, including removal of baled hay.
- Haying shall occur after August 1 to minimize impacts to ground nesting birds.
- The permittee shall remove all equipment and materials from the WPA by the end of the haying season.
- Haying cooperators will provide a written report and record of annual hay harvest to WPA

- The agreement does not imply or establish a use precedent. Future use of the area will be based on the most satisfactory use of the land for wildlife benefits, cooperator performance, habitat management needs, and administrative needs.
- The cooperator shall be responsible for repairing damage to WPA facilities or habitat beyond normal wear and tear resulting from his/her operation.
- Monitoring of the haying program will be performed by qualified WPA staff, including surveys to determine if haying is adversely impacting ground nesting birds.

Justification:

The Oxford Slough WPA agricultural program is designed to provide areas of high-energy carbohydrates and protein (winter wheat, barley, and legumes), and green forage grasses to meet the food energy needs of migrating waterfowl and cranes, and to reduce crop depredation in nearby agricultural fields. In periods of severe weather, having a readily available source of high-energy foods can sustain waterfowl and cranes during critical periods of nutritional and physical stress when other food sources generally are unavailable.

At present, migratory needs of key wildlife species compared to the relative paucity of small grain production in the surrounding landscape justifies the continuation of a scaled-back farming program at Oxford Slough WPA. As the only Waterfowl Production Area in Region 1 of the Fish and Wildlife Service, the extent and quality of upland habitat for upland nesting waterfowl is also critical. To that end, the WPA must balance agriculture forage crop production with suitable upland nesting cover.

The WPA manages all habitats to provide a variety of foods that will help migratory waterfowl. Although native vegetation provides higher levels of protein, fiber, and water than most agricultural crops, crops can provide easily accessible high energy foods that are more readily digestible than native plants and can reduce foraging time required to meet caloric demands (Raveling 1979, Alisauskas and Ankney 1992, Baldassare and Bolen 2006). Waterfowl are able to exploit a variety of habitats to meet their daily and seasonal food requirements and the WPA provides a diversity of food supplies (native and non-native) in relative proximity to each other. Many birds also prefer to forage and rest in areas with the good visibility that hayed acreage provides to better detect predators such as coyotes. Haying removes tall vegetation that would restrict visibility and helps control weeds. In addition, the agricultural fields provided for target wildlife species indirectly support wildlife-dependent recreational activities such as wildlife observation and photography.

While agricultural crops are typically not limiting within the regional landscape, agricultural fields where all grain is produced and retained for wildlife use are. Changes to local agricultural planting practices in the area surrounding the Oxford Slough and increased efficiency in harvest equipment, has resulted in a reduction in the availability of energy producing foods for migratory waterfowl. Because this trend is likely to continue in the future, WPA cropland management will be essential for waterfowl management in future years, both to provide food for wildlife and reduce crop depredation in nearby agricultural lands. Considering recent conversions from small grain to alfalfa and meadow hay production, WPA agricultural crops will continue to be required to provide a supplemental as well as a depredation benefit to local farmers still growing small grain crops (Mclvor and Conover 2003).

Short stature, wet meadow hay ground provides open areas for sandhill crane foraging. Birds selecting short cover include the following guilds: the meadow guild represented by the sandhill crane, western meadowlark, and cattle egret; the grazing waterfowl guild represented by American widgeon, Canada goose, American coot, and gadwall; and the upland-nesting shorebird guild represented by the long-billed curlew, American avocet, black-necked stilt, and killdeer. When juxtaposed with dense cover late successional wet meadow habitat (unhayed) and other palustrine emergent marsh habitat types, short cover can provide seasonally valuable habitat for their use. Birds selecting dense cover for foraging and nesting include the following guilds: upland nesting waterfowl guild represented by northern pintail, mallard, cinnamon teal, northern shoveler, and gadwall; the wet meadow nesting shorebird guild represented by Wilson's phalarope, willet, and common snipe; the secretive marsh bird guild represented by American bittern, Virginia rail, and sora rail; and the shallow over-water nesting marsh bird guild represented by black tern, marsh wren, red-winged blackbird, yellow-headed blackbird, and northern harrier. Other species also benefit from haying; however, other management tools, such as mowing and burning, provide the same habitat characteristics, and additionally, leave nutrients within the unit and in the case of mowing, provide invertebrate substrate. While hayed wet meadow habitat is certainly not in limited supply throughout the Oxford Slough region, it does provide some habitat benefits for wildlife.

Returning some agricultural fields to their former wetland habitat types will help to halt the loss of wetlands locally, regionally, and nationally. This will have a relatively small, but positive, impact on the majority of species on the WPA dependent on wetlands for some part (or all) of their life cycle. By implementing hay management strategies to reduce the coverage of early successional wet meadow habitat to less than 60 percent, the structure and composition of native meadow grass habitat will be greatly improved.

The reduction of haying on the WPA will have a negligible impact on the availability of short grass habitat in the Oxford Slough region. Hayed short-grass pastures will continue to provide optimal open foraging areas for several wetland dependent wildlife species such as greater sandhill cranes, Canada geese, and white-faced ibis, while dense late-successional wet meadows will provide habitat for a diverse suite of waterfowl, waterbirds, and shorebirds during several key times in their annual life histories (Rollins 1981, Heitmeyer 1989). By providing a mixture of short (hayed) and dense cover, and both native and non-native habitats, proposed management will help maintain the biological integrity, diversity, and environmental health of the WPA. These factors in turn contribute to the enhancement, protection, conservation, and management of native wildlife populations and their habitats.

By conducting the agricultural program under the management practices and stipulations described above, management anticipates that wildlife will find abundant native and non-native food resources and resting places on the WPA. Additionally, it is anticipated that the results of monitoring will prevent negative impacts to fish, wildlife, plants, and their habitats and that the agricultural program will contribute to achieving WPA purpose(s) and the Mission of the National Wildlife Refuge System.

As a management tool, cooperative land management use is a beneficial WPA operation in meeting purposes of the WPA as well as goals and objectives established in the CCP. The farming and haying activities within the cooperative land management program contribute to achieving WPA purposes and goals identified in the CCP, as well as the National Wildlife Refuge System mission, by providing valuable foraging areas for migrating waterfowl and sandhill cranes, and habitat for nesting, foraging, and brood rearing for a variety of migratory birds and resident wildlife. As a result, cooperative farming contributes to achieving WPA purpose(s); contributes to the Mission of the NWRS; and helps maintain the biological integrity, diversity, and environmental health of the WPA.

Allowing the use as described above will not materially detract or interfere with the purposes for which the WPA was established or the mission of the Refuge System.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_Environmental Assessment and Finding of No Significant Impact

___Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 15, Agricultural Practices on Oxford Slough Waterfowl Production Area:

Prepared by: ______________ (Signature) 12-4-2012 (Date)

Refuge Manager/
Project Leader
Approval: ______________ (Signature) 12/6/12 (Date)

Concurrence

Refuge Supervisor: ______________ (Signature) 2/11/13 (Date)

Acting Regional Chief,
National Wildlife
Refuge System: ______________ (Signature) 2/11/13 (Date)

B.20 Compatibility Determination for Cross-Country Skiing and Snowshoeing on the Oxford Slough WPA

RMIS Database Uses: Cross-Country Skiing, Snowshoeing

Refuge Name: Oxford Slough Waterfowl Production Area (WPA)

Location: Franklin and Bannock Counties, ID

Date Established: 1985

Establishing and Acquisition Authorities:

- Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. § 715 et seq.)
- Migratory Bird Hunting and Conservation Stamp Act (16 U.S.C. § 718(c))

Refuge Purpose(s):

- "... as Waterfowl Production Areas subject to ... all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)
- "... for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act)

National Wildlife Refuge System Mission:

"The mission of the [National Wildlife Refuge] System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

Description of Use:

We will continue to allow cross-country skiing and snowshoeing on the WPA. Currently, cross-county skiing and snowshoeing is allowed throughout the WPA as conditions permit. Seasonal restrictions on wildlife observation and photography (the WPA is closed to these activities from April 1-July 31) also apply to cross-country skiing and snowshoeing. Cross-country skiing, and snowshoeing are not common activities at the Oxford Slough WPA. Skiing or snowshoeing, visitors may view or photograph wildlife. However, these activities are treated separately, since these uses are not defined as wildlife-dependent recreational uses under the National Wildlife Refuge System Administration Act of 1966, as amended, and they do not automatically support the six wildlife-dependent priority uses.

Availability of Resources:

Maintenance of the WPA entrance road incurs costs, but costs are not directly related to cross-country skiing and snowshoeing. The road will not be groomed specifically for skiing and snowshoeing. Roads are routinely maintained for vehicle activity and to repair holes made by burrowing wildlife. No other facilities (e.g., trails) will be provided for this use. No additional expense for these activities is anticipated. The major portion of the funds needed to support this activity are in the form of salaries for maintaining the existing entrance road, monitoring public use and biological impacts, and enforcing regulations. Thus the Refuge has sufficient staff and funding to allow the use.

Category and Itemization	One-time ($000)	Annual ($000/yr)
Administration and management:	$0	$1k
Maintenance: Posting signs and removing snow from entrance road	$0	$2k
Monitoring: Biological monitoring if use increases	$0	$1k
Offsetting revenues: TOTALS	$0 $0	$0 $4k

Anticipated Impacts of Described Use:

In two different studies of winter recreation impacts to wildlife in Yellowstone National Park (YNP), Aune (1981) and Cassirer (1990) found that, except for coyotes, all wildlife species observed (mostly big game) reacted more quickly to an approaching skier than to a snowmobile, and the flight distance was generally greater from skiers. Bison were found to respond dramatically to skiers who were off established trails. All wildlife species studied, including bison, were wary of people on foot. Aune (1981) also observed that in YNP, elk were less likely to flee from snowmobiles or skiers late in the winter than they were earlier in the season. He suggested that this was likely due in part to habituation by elk to snowmobile traffic and in part to decreased vigor of elk later in the season combined with the increasing difficulty of flight through deep, crusted snow. Proximity of escape cover that breaks the line of sight between elk and the disturbance may reduce flight distances and consequently the amount of energy used in flight. Moving automobiles and trail bikes had little effect on elk resting in timber at distances of only 0.13 miles (Lyon and Ward 1982).

Ferguson and Keith (1982) researched the influence of cross-country ski trail development and skiing on elk and moose distribution in Elk Island National Park in Alberta, Canada. They found no indication that overwinter distribution of elk was altered by cross-country skiing activity. However, it did appear that elk moved away from ski trails, particularly those that were heavily used, during the ski season.

Aune (1981) also reported average elk flight distances of 53.5 meters (175.5 feet) in response to skiers at Yellowstone National Park. In another study, elk began to move when skiers approached to within 15 meters (50 feet) in an area heavily used by humans year-round, and within 400 meters (1,312 feet) in an area where human activity is much lower (Cassirer et al. 1992). Elk in YNP fled more frequently and over greater distances from skiers off established trails than from skiers on established trails (Aune 1981).

Rudd and Irwin (1985) investigated the movements of moose in response to cross-country skiing and found that the average distance 19 moose moved away from people on snowshoes or skis was 16.6 yards, and the average distance at which moose were displaced was 80.7 yards.

Overall Impact at Oxford Slough WPA. The studies cited above show that cross-country skiing and snowshoeing can and do disturb wildlife. However we anticipate the impacts will be small, given the relatively low numbers of users and the limited amount of wildlife activity on the WPA during the winter months when skiing and snowshoeing occur.

Public Review and Comment:

Public review and comments were solicited in conjunction with release of the Draft CCP/EA (USFWS 2012) in order to comply with the National Environmental Policy Act and with Service policy. Appendix P of the CCP (USFWS 2012) contains a summary of the comments and Service responses.

Determination:

____Use is Not Compatible

_X_ Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

- Snowshoers and cross-country skiers are required to adhere to temporal access restrictions.
- Regulations will be available to the public through a WPA brochure.
- Directional, informational and interpretive signs will be posted and maintained to educate the public on minimizing wildlife and habitat disturbance.
- Uses will be periodically evaluated for disturbance to wildlife, especially if use numbers increase.

Justification:

Although cross-country skiing and snowshoeing are not a wildlife-dependent public uses of the Refuge, as defined by statute (16 U.S.C. 668dd et seq.) these occasional uses of the WPA are expected to have negligible impacts to wildlife habitat when compared to the effects of other public uses (Klein 1993). Potential for wildlife and habitat disturbance is minimal given the low level of these uses and the time of year the use occurs. Impacts of these activities will be monitored and if they, or other impacts, are discovered, this compatibility determination will be reevaluated. Direct costs to administer existing levels of cross-country skiing and snowshoeing on the WPA will be minor because costs will already be covered by the existing Complex budget for maintaining wildlife-dependent public uses.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Refuge will not be measurably lessoned from allowing cross-country skiing and snowshoeing on the WPA. The relatively limited number of individuals expected to be adversely affected due to these activities will not cause wildlife populations to materially decline, the physiological condition and production of wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Thus, allowing snowshoeing and cross-country skiing to occur with stipulations will not materially detract or interfere with the purposes for which the WPA was established or the Refuge System mission.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

____Mandatory 15-year Re-evaluation date (for priority public uses)

2022 Mandatory 10-year Re-evaluation date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision:

____Categorical Exclusion without Environmental Action Statement

____Categorical Exclusion and Environmental Action Statement

__X_ Environmental Assessment and Finding of No Significant Impact

____Environmental Impact Statement and Record of Decision

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Signatures for Compatibility Determination 16, Cross-Country Skiing and Snowshoeing on Oxford Slough Waterfowl Production Area:

Prepared by:	(Signature)	12-4-2012 (Date)
Refuge Manager/ Project Leader Approval:	(Signature)	12/6/12 (Date)
Concurrence		
Refuge Supervisor:	(Signature)	2/11/13 (Date)
Acting Regional Chief, National Wildlife Refuge System:	(Signature)	2/11/13 (Date)

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National Wildlife Refuge System Information
1 800/344 WILD

March 2013

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

Front Cover
Sandhill cranes
Justine Belson/USFWS

Back Cover
White-faced ibis
© Bill Bouton

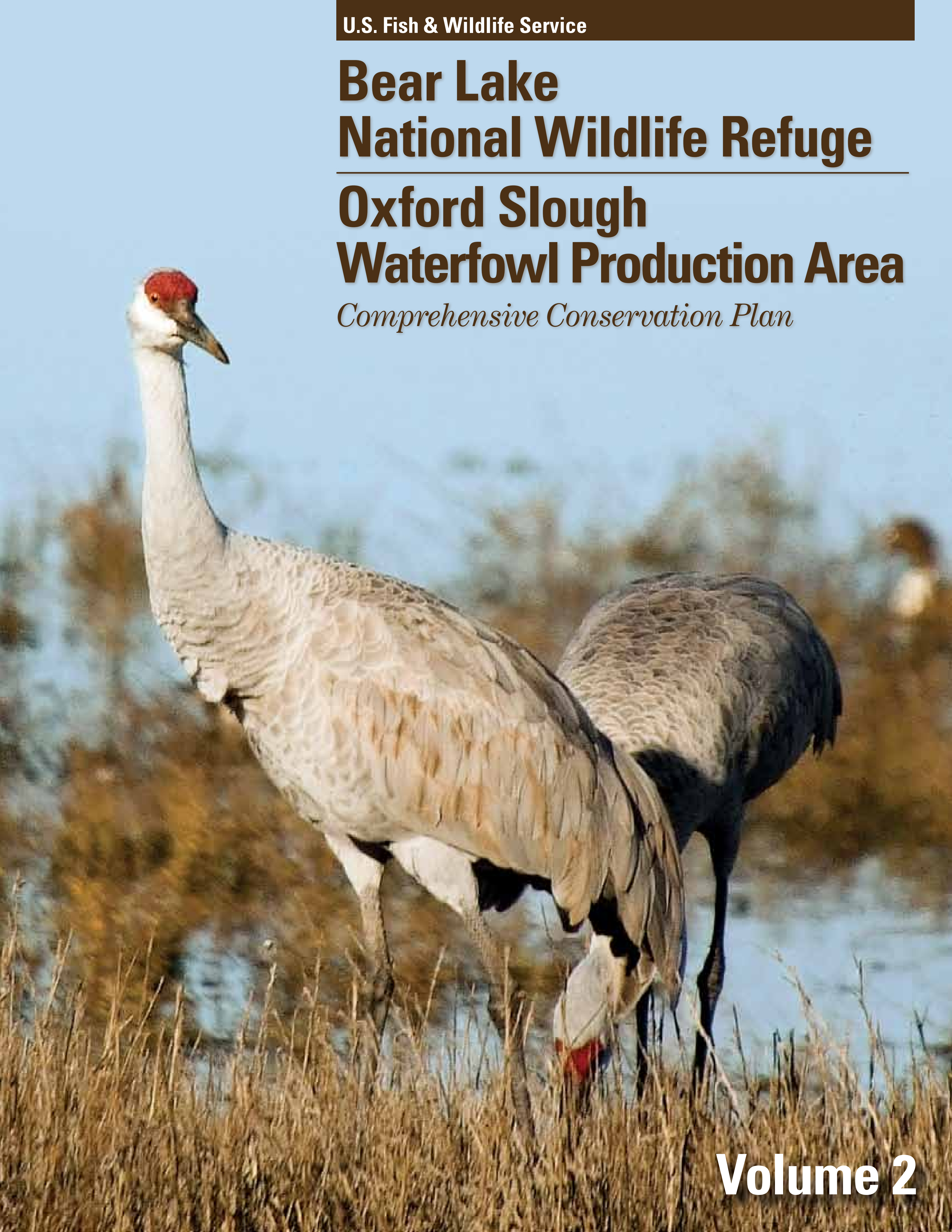
Inside Front Cover
Sandhill crane on wing
Steve Emmons/USFWS

U.S. Fish & Wildlife Service

Bear Lake National Wildlife Refuge

Oxford Slough Waterfowl Production Area

Comprehensive Conservation Plan



Volume 2

Our Vision for the Future

Bear Lake National Wildlife Refuge

Bear Lake National Wildlife Refuge, nestled in the Bear Lake Valley of southeastern Idaho, continues to be a paradise for wildlife. Native peoples, explorers, farmers, and ranchers were drawn to the valley's plentiful natural resources: wildlife, land, and water. Today and tomorrow, visitors and residents alike enjoy a beautiful landscape that supports the modern-day dichotomies of small towns and rugged wilderness, farm fields and natural meadows, diversion canals and marshes, livestock and wildlife.

An integral part of this landscape, the future of the Refuge depends on the carefully managed waters of the Bear River and Bear Lake flowing through a system of man-made structures and providing sustenance for humans and wildlife. Visitors to the Refuge will always hear the laughter of coots and the trilling of marsh wrens, the soft wind through the grass before the ducks arrive and the crack of expanding ice that follows the exodus of geese.

People will see trumpeter swans escorting their broods through the emerald-green marsh and feel gratified that mule deer, moose, badger, beaver, trout, garter snakes, and leopard frogs will have homes for a long time to come here at Bear Lake NWR.

Thomas Fork Unit

The Thomas Fork Unit of Bear Lake NWR is located in the bucolic Thomas Fork Valley at the border of Wyoming and Idaho. This lovely valley, bordered by the Preuss and Sublette Ranges, harkens back to the days of rugged pioneers traveling the Oregon Trail, attempting to ford the Thomas Fork Creek, and trading goods and services with the Native Americans. Hay and willows, cranes and herons, chub and trout, cattle and pronghorn will ever be a part of this diverse panorama.

People who love the scenic beauty of the Thomas Fork Valley will continue to work together to improve the quality of the creek and its surrounding lands. Healthy waters and lands will always be the backbone of sustainable agriculture and ranching as well as key for providing food and home for wildlife. As part of the larger Bear River Watershed, the vigor of the Thomas Fork Unit will remain integral to the overall quality of the landscape.

Oxford Slough Waterfowl Production Area

Oxford Slough Waterfowl Production Area is situated in a lush valley surrounded by the Caribou National Forest with Oxford Peak and the Bannock Range in the background. Oxford Creek is one of the many streams that flow into the valley to create the Oxford Slough, which acts as a natural catchment for runoff from the adjacent mountain ranges.

Oxford Slough will persist as a small but important part of the Bear River Watershed, providing water and well-being to wildlife and humans. Franklin's gulls, sage-grouse, coyotes, and cattle continue to co-exist in this peaceful valley drenched in morning mist. Ducks and white-faced ibis decorate the skies on their feeding flights between the marsh and wet meadows. Land managers and landowners will collaborate for years to come to provide optimal water quality and quantity, understanding that what's good for the critters is usually good for people too.

Comprehensive Conservation Plans provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

VOLUME 2
CONTENTS

Appendices

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Appendix C. Implementation

C.1 Overview

Implementation of the CCP will require increased funding, which will be sought from a variety of sources. This plan will depend on additional Congressional allocations, partnerships, and grants. There are no guarantees that additional Federal funds will be made available to implement any of these projects. Other sources of funds will need to be obtained (both public and private). Activities and projects identified will be implemented as funds become available.

Many of the infrastructure and facility projects will be eligible for funding through construction or Federal Lands Highway Program funds (i.e., Refuge Roads).

The Comprehensive Conservation Plan proposes several projects to be implemented over the next 15 years. All of these projects are included in the Refuge Management Information System (RONS—Refuge Operational Needs System or FBMS—Federal Budget Management System), which is used to request funding from Congress. Currently, a large backlog of maintenance needs exists on the Refuge. An attempt at reducing this backlog needs to be addressed and is included here in the analysis of funding needs. The RONS or FBMS databases are used to propose new projects to implement the CCP to meet refuge goals and objectives and legal mandates.

Annual revenue-sharing payments to Bear Lake County will continue. If the Refuge undergoes a boundary expansion, additional in lieu of tax payments will be made to the county. See Chapter 5 for a summary of the economic effects.

Monitoring activities will be conducted on a percentage of all new and existing projects and activities to document wildlife populations and changes across time, habitat conditions and responses to management practices. Actual monitoring and evaluation procedures will be detailed in step-down management plans.

C.1.1 Step-Down Plans

The Comprehensive Conservation Plan is one of several plans necessary for Refuge management. The CCP provides guidance in the form of goals, objectives, and strategies for several Refuge program areas but may lack some of the specifics needed for implementation. Step-down management plans will be developed for individual program areas within approximately five years after CCP completion. All step-down plans require appropriate NEPA compliance; implementation may require additional permits. Step-down plans for the Refuge follow. Project-specific plans, with appropriate NEPA compliance, may be prepared outside of these step-down plans.

Step Down Management Plan	Status (Date Completed and/or Date to be Prepared/Updated)
IPM Plan	2013 (prepared concurrently with CCP, Appendix F)
Habitat Management Plan	2013 (CCP meets requirements for HMP)
Fire Management Plan	2014. Current plan completed March 2009, included with CCP (Appendix G).
Cultural Resources Plan	2013 (Prepared concurrently with CCP, Appendix H.)
Fishing Plan	2017
Visitor Services Plan	2017
Environmental Education Plan	2017
Step Down Plans Identified in CCP Strategies:	
Inventory and Monitoring Plan	2015
Hazard Analysis and Critical Control Point Plan	2017
Land Protection Plan	Refuge will evaluate need for LPP
Cropland Management Plan (revision and update)	2019
Outreach and Communications Plan	2014
Visitor Contact Point and Site Plan	2017

C.2 Costs to Implement CCP

The following sections detail both one time and recurring costs for various projects. One-time costs reflect the initial costs associated with a project, such as the purchase of equipment, contracting services, construction, purchase of land, etc. Recurring costs reflect the future operational and maintenance costs associated with the project.

C.2.1 One-Time Costs

One-time costs are project costs that have a startup cost associated with them, such as purchasing a new vehicle for wildlife and habitat monitoring or designing and installing an interpretive sign. Some are full project costs for those projects that can be completed in three years or less. One-time costs can include the cost of temporary or term salary associated with a short-term project. Salary for new positions and operational costs are reflected in operational or recurring costs.

Funds for one-time costs will be sought through increases in refuge base funding, special project funds, grants, etc. Some projects also might require land acquisition funds, or other special appropriations or grants. Some costs listed below as one time may be distributed through the 15-year life of the CCP and a portion of the total project completed yearly.

Projects listed below in Table C-1 show one-time costs, such as those associated with building and facility needs such as offices, public use facilities, road improvements, and new signs. One-time costs are also associated with habitat restoration and protection projects such as specific forestry and wetland projects, research and land acquisition. New research projects, because of their short-term nature, are considered one time projects, and include costs of contracting services or hiring a temporary for the short-term project. Some project costs are displayed as ranges since there are many factors that could influence the number of acres managed per year.

Table C-1. Estimates of one-time costs under the CCP. These data are separated into two tables, Wildlife and Habitat and Public Use, and each is organized by goals and objectives.

Goal 2. Riparian and In-stream	*Provide high-quality riparian habitat within the watershed for focal wildlife species life history requirements, while simulating natural environmental processes.*			
2.1 Restore wooded riparian and in-stream habitats				
	Current Management	**Future Management**	**Priority**	**Funding**
Acres of wooded riparian habitat restored	0	134		
Total One-time Restoration Cost	$0	$1,139,900 (8,500/acre)	H	1260, RONS
Miles of in-stream habitat restored	0	5		
Total One-time Restoration Cost	$0	$500,000-50,000,000 (100,000-10,000,000/mile)	H	1260, RONS, FONS, Challenge Grants, Matching Funds w/partners
For Bonneville cutthroat trout, work in partnership with PacifiCorp and IDFG to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge	$0	$4,000,000	H	1260, RONS, FONS, Challenge Grants, Matching Funds w/partners
Total one-time cost	$0	$5,639,900-55,139,900		

Goal 3. Uplands	*Maintain and protect the existing integrity of functional early successional upland habitat and restore the natural range of variability and resiliency to late successional upland habitat.*			
3.1b: Restore Meadow Grass (intermittently flooded) Habitat				
	Current Management	**Future Management**	**Priority**	**Funding**
Acres of meadow grass habitat restored	0	214		
Total One-time Restoration Cost	$0	$64,200 (300/acre)	H	1260, RONS
3.1c: Restore Mixed Shrub (Rabbitbrush, Greasewood, and Sagebrush) Habitat				
	Current Management	**Future Management**	**Priority**	**Funding**
Acres of mixed shrub habitat restored	0	79		
Total One-time Restoration Cost	$0	$27,650 (350/acre)	H	1260, RONS
Goal 4. Forage Crops	*Provide a supplemental on-refuge forage base for carbohydrate and protein requirements of migratory waterfowl and landbirds within the Pacific and Bear River migratory corridor.*			
4.1a: Bear Lake NWR Forage Crops				
	Current Management	**Future Management**	**Priority**	**Funding**
Acres of meadow grass habitat restored	0	11		
Total One-time Restoration Cost	$0	$3,300 (300/acre)	H	1260, RONS
4.1c: Oxford Slough WPA Forage Crops				
	Current Management	**Future Management**	**Priority**	**Funding**
Acres of upland habitat restored	0	49		
Total One-time Restoration Cost	$0	$15,925 (325/acre)	H	1260, RONS

Table C-1. Public Use Management Direction: One-Time Costs

Goal 5. Wildlife-dependent Recreation and Education	***Increase public understanding and appreciation of wildlife, and build support for Bear Lake NWR by providing opportunities for all visitors to participate in safe, quality wildlife-dependent recreation and education programs while minimizing wildlife disturbance.***			
5.1 Conduct outreach				
	Current Management	**Future Management**	**Priority**	**Funding**
Revise refuge website with improved photos, navigation aids, and maps. Provide interactive web capability for visitors to electronically post wildlife observations and photos. Post PDF files of all publications on refuge website.	$0	$10,000	L	
Develop Outreach and Communications Plan	$0	$5,000	H	1260
Total One-Time Cost	$0	$15,000		
5.2 Welcome and Orient Visitors				
	Current Management	**Future Management**	**Priority**	**Funding**
Develop Visitor Contact Station and Site Plan	$0	$5,000	H	1260
Place directional signs to BLNWR at the junction of Hwys 30 and 89 in Montpelier, and at the junction of W. Center Road and Dingle Road in Dingle	$0	$4,000	H	1260, Refuge Roads

Revise and reprint BLNWR brochure	$5,000	$5,000	H	
Develop and provide to the public a wildlife brochure specific to the Thomas Fork Unit	$0	$5,000	H	1260
For the Thomas Fork Unit, develop off-site visitor orientation facilities, signage, and interpretive panels at areas strategic for wildlife viewing	$0	$20,000-30,000	M	1260, Refuge Roads
Oxford Slough WPA: improve visitor orientation facilities, signage, and interpretation	$0	$20,000-30,000	H	1260, Refuge Roads
Develop and provide to the public an informational brochure specific to Oxford Slough WPA	$0	$5,000	H	1260
Total One-Time Cost	$5,000	$64,000-84,000		
5.3 Wildlife Observation and Photography				
	Current Management	**Future Management**	**Priority**	**Funding**
At BLNWR, provide two additional pullouts/wide spots/passing areas for vehicle passage on the ATR	$0	$5,000 ($2,500 per pullout)	H	1260, Refuge Roads
At BLNWR, provide seasonal spotting scope along ATR and on accessible walking trail with view of cormorant and gull nesting colony	$0	$4,000	H	1260

At BLNWR, develop a boardwalk and elevated viewing platform along the southeastern side of the Refuge adjacent to North Beach Road	$0	$55,000-120,000	M	Refuge Roads, Special Project Funding
At BLNWR, develop one turn-out and one major vehicle turn-off with a small parking area, informational panels and seasonal spotting along Merkley Lake Road	$0	$50,000-75,000	M	Refuge Roads, Special Project Funding
At Oxford Slough WPA, provide viewing areas with information on seasons and species of wildlife that could be observed and photographed	$0	$30,000	M	Refuge Roads, Special Project Funding
Total One-Time Cost	$0	$149,000-239,000		
Future				
Future	**Current Management**	**Future Management**	**Priority**	**Funding**
Develop refuge-specific curricula for EE and I programs that meet State standards	$0	$2,000	H	1260
At BLNWR, provide interpretive panels along the ATR in order to inform visitors of the NWRS mission and the Refuge’s place in the larger landscape	$0	$10,000	H	1260, Refuge Roads, Special Funding Project

At Oxford Slough WPA, provide interpretive panels at areas strategic for viewing the unit	$0	$10,000	M	1260, Refuge Roads, Special Funding Project
At Thomas Fork Unit, work with the states of Idaho and Wyoming and Bear Lake County to develop displays along overlooks on Highways 89 and 30 to interpret the TFU's role in the NWRS, its importance in the Bear River Watershed, and as part of the Oregon-California Trail	$0	$10,000	M	1260, Refuge Roads, Special Funding Project
Total One-Time Cost	$0	$32,000		
5.5 a + b: Provide Quality Waterfowl and Upland Game Hunting Opportunities				
	Current Management	**Future Management**	**Priority**	**Funding**
BLNWR acres Open to Waterfowl Hunting	7,000	7,000		
BLNWR acres open to upland game hunting	300	300		
TFU acres open to waterfowl and upland game hunting	0	0		
Create a tear sheet with map for hunters and post printable PDF file on refuge website	$0	$2,000	H	1260
Place signs for hunter access points, parking areas, and boat ramps	$0	$2,000	H	1260

Develop programs in addition to youth hunt to attract and educate youth hunters	$0	$2,000	H	1260
Secure access easement to Rainbow Inlet Canal boat launch and parking area	$4,000	$4,000		
Total One-Time Cost	$4,000	$10,000		
5.5 c + d: Provide a quality hunting and trapping program at Oxford Slough WPA				
	Current Management	**Future Management**	**Priority**	**Funding**
Oxford Slough WPA acres open to hunting and trapping	1,878	1,878		
Develop and provide an information panel and brochure or tear sheet describing hunting and trapping opportunities and regulations	$0	$5,000	H	1260
Develop an ADA-accessible hunter access trail and parking area	$0	$30,000	H	1260
In conjunction with BLNWR, develop programs in addition to youth hunt to attract and educate youth hunters	$0	$500		
Total One-Time Cost	$0	$35,500		

5.6: Provide quality fishing opportunities at BLNWR				
	Current Management	**Future Management**	**Priority**	**Funding**
The Outlet Canal north of the former Paris Dike and an area immediately north of the Lifton Pump Station are open for fishing	✓	✓		
Open banks along Merkley Lake Road for fishing	0	1 mile		
Post informational and regulatory signs along Merkley Lake Road fishing area	$0	$1,000	M	1260
Improve access to bank fishing by constructing one or two piers or platforms in areas already open for fishing	$0	$5,000-$10,000	M	1260
Total One-Time Cost	$0	$6,000-11,000		
5.7: Develop partnerships, a strong volunteer base, and a Friends Group to assist with developing and delivering visitor services programs				
	Current Management	**Future Management**	**Priority**	**Funding**
Develop and build Friends Group to support the SE Idaho NWR Complex, focusing on BLNWR and Oxford Slough WPA	$0	$5,000	*H*	1260, 1263
Total One-Time Costs	$9,000	$6,066,575-55,681,575		

C.2.2 Operational (Recurring) Costs

Operational costs reflect refuge spending of base funds allocated each year. These are also known as recurring costs and are usually associated with day to day operations and projects that last longer than three years.

Table C-2 displays projected operating costs under the CCP. The CCP reflects increased funding needs for proposed increases in public uses and facilities, increased habitat restoration and conservation activities, and new monitoring needs. This table includes such things as salary, operational expenditures such as travel, training, supplies, utilities and annual maintenance costs.

Table C-2 includes costs for permanent and seasonal staff needed year after year. It does not include staff costs associated with special projects; these are summarized in Table C-1.

Table C-2 is also related to the Refuge Annual Performance Plan. The table does not project costs other than operational. This data are separated into two tables, Wildlife and Habitat and Public Use and each is organized by goals.

Table C-2. Wildlife and Habitat Recurring Costs

Goal 1. Wetlands	*Provide high quality refuge wetland habitat that simulates the ecological processes and functional values of the historic Dingle Marsh, while providing for the life history requirements of focal wildlife species*				
1.1 Tall Emergent Wetlands (Permanently and Semi-Permanently Flooded) **1.2 Ephemeral Wetlands (Seasonally and Temporally Flooded)**					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Total acres tall emergent wetlands	17,110	15,773			
Total acres ephemeral wetlands	1,556	2,593			
Manipulate water levels using existing water control infrastructure	$7,800	$15,600		H	1260, 1262
Mechanical disturbance, prescribed fire, and herbicide	$5,000	$10,000		H	1260, 1262
Annual WCS and fish screen maintenance	$4,000	$4,000		H	1262
Annual dike maintenance	$15,600	$15,600		H	1262
Monitor for invasive species	$0	$4,000	Biological Technician	H	1260
Monitor for adaptive management	$0	$4,000	Biological Technician	H	1260
Every five years use GIS to determine proportions of habitat types to inform adaptive management	$0	$3,000 = $15,000 every five years amortized over the 15-yr life of the CCP		H	1260

For Alkali Meadow habitat, initiate pilot study to test direct seeding and container plantings to restore target halophytic vegetation and alkali habitat function	$0	$4,000	Biological Technician	H	1260
Total annual cost	$32,400	$60,200			

Goal 2. Riparian and In-stream Habitats	***Provide high quality refuge wetland habitat that simulates the ecological processes and functional values of the historic Dingle Marsh, while providing for the life history requirements of focal wildlife species***				
2.1 Wooded Riparian and In-stream Habitats					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Total Acres Wooded Riparian	92 acres	134 acres			
Riparian restoration project area	0	134 acres			
Total Miles In-Stream Habitat	3 miles	5 miles			
In-stream project restoration area	0	5 miles			
Fence naturally regenerating woodland to exclude ungulate browsing. Fertilize, if advantageous.	$0	$5,000		H	1262

Goal 2. Riparian and In-stream Habitats	***Provide high quality refuge wetland habitat that simulates the ecological processes and functional values of the historic Dingle Marsh, while providing for the life history requirements of focal wildlife species***				
If natural regeneration does not adequately meet objectives, plant woodland tree and shrub species on appropriate sites	$0	$10,000 = Amortization of expenses for 15-year project including fencing, planting, fertilizing, monitoring, replanting, controlling invasive species	Biological Technician		1260, 1262
Invasive species management using IPM techniques	$1,000	$2,000		H	1262
Place large woody debris if needed, as identified in habitat inventories and surveys	$0	$2,750 (amortized over 15-yr life of CCP since areas needing treatment may appear over time)	Biological Technician	M	1260, 1262
Maintain streamside vegetation	$0	$2,000	Biological Technician	H	1260, 1262
Monitor riparian vegetation for adaptive management	$0	$1,500	Biological Technician	H	1260
Total annual cost	$1,000	$17,000			

Goal 3. Upland Habitat	***Maintain and protect the existing integrity of functional early successional upland habitat and restore the natural range of variability and resiliency to late successional upland habitat***				
3.1 a: Alkali Upland Meadow (Intermittently Flooded) Habitat **3.1 b: Meadow Grass (Intermittently Flooded) Habitat** **3.1 c: Mixed Shrub (Rabbitbrush, Greasewood, and Sagebrush) Habitat**					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Acres of Alkali Upland Meadow	442	467			

Management of water levels and timing to increase acreage	$1,500	$3,000		H	1260, 1262
Management of invasive species using IPM	$1,000	$2,000		H	1262
Use of prescribed fire in a mosaic pattern to increase acreage	$0	$6,500-13,000 (Amortized over 15-yr life of CCP		M	1260
If needed, planting of alkali sacaton and saltgrass, etc.	$0	$1,000 (Amortized over 15-year life of CCP)	Biological Technician	M	1260, 1262
Acres of Meadow Grass	920	1,134			
Management of water levels and timing to increase acreage	$1,500	$3,000		H	1260, 1262
Management of invasive species using IPM	$1,000	$2,000		H	1262
Maintain residual cover through native grass plantings, and periodic prescribed fires	$0	$2,500 (amortized over 15-year life of CCP)	Biological Technician	H	1260, 1262
Acres of Mixed Shrub	463	542			
Management of invasive species using IPM	$1,000	$2,000		H	1260, 1262
Conduct periodic shrub inventory to assess resistance and resilience of habitat	$0	$2,000	Biological Technician	H	1260
Total annual cost	$6,000	$24,000-30,500			

Goal 4. Upland Forage Crops	***Provide a supplemental on-refuge forage base for carbohydrate and protein requirements of migratory waterfowl and landbirds within the Pacific and Bear River migratory corridor***				
4.1 Provide Crops for Migratory Wildlife 4.2 Haying					
	Current	**Future**	**New Staff**	**Priority**	**Funding**

Goal 4. Upland Forage Crops	***Provide a supplemental on-refuge forage base for carbohydrate and protein requirements of migratory waterfowl and landbirds within the Pacific and Bear River migratory corridor***				
	Management	**Management**			
Acres of upland forage crops	214	154			
Hay unit acreage	3,533	1,491			
Administer CLMAs and/or SUPs to achieve goals. Permit holder will perform all work directed by management.	$3,000	$4,500		H	1260
Manipulate water levels to facilitate hay and crop programs	$1,500	$3,000			
Monitor habitat and wildlife use to inform adaptive management	$0	$2,000	Biological Technician	H	1260
Total annual cost	$4,500	$9,500			

Goal 5. Wildlife-dependent Recreation and Education	***Increase public understanding and appreciation of wildlife, and build support for Bear Lake NWR by providing opportunities for all visitors to participate in safe, quality wildlife-dependent recreation and education programs while minimizing wildlife disturbance.***				
5.1 Conduct outreach to community, conservation, and outdoor recreation groups by 2014 to expand public awareness of wetland and upland species diversity and ecology, habitat management actions, and the mission of the National Wildlife Refuge System.					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Recruit and train volunteers; develop education programs	$0	$5,000	Visitor Services Manager (Complex); Park Ranger	H	1260
Provide guided wildlife-based tours to youth groups and the general public	$0	$2,000	Park Ranger	H	1260
Participate in at least one community event annually	$0	$500	Park Ranger	H	1260
Total annual costs	$0	$7,500			

5.2 Welcome and Orient Visitors: Improve existing operational capacity of refuge public-visitor contact and orientation to better serve the visiting public, including people with disabilities, by enhancing the visiting public's safety, sanitation, comfort, orientation, and ease of access to the Refuge.					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
BL and OS: Continue to obtain baseline data on visitation; conduct counts and observations to back up/calibrate traffic counter data	$0	$2,000	Park Ranger	H	1260
BL and OS: Provide and monitor visitor sign-in and comment stations at trail heads and photography and hunting blinds	$0	$2,000	Park Ranger	H	1260
Total annual costs		$4,000			
5.3: Provide ample opportunities for self-guided wildlife observation and photography by annually maintaining a 2.4-mile year-round auto tour loop, 1.9-mile seasonal accessible pedestrian trail with two accessible photography blinds, and the 1.5-mile seasonal Canoe Trail.					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Auto tour maintenance	$5,000	$5,000		H	1262
Conduct at least one guided wildlife-based refuge tour per month from May-September	$0	$2,000	Park Ranger	H	1260
Periodically monitor and evaluate public-use sites and programs to inform adaptive management	$0	$2,000	Park Ranger	H	1260
Total annual costs	$5,000	$9,000			

5.4 Environmental Education and Interpretation: By 2020, develop formal environmental education programs for K-12 students, which serves 300 students annually and delivers messages about wetland values and functions and watershed health, with emphasis on the Bear River watershed and the life histories and habitat needs of waterfowl and waterbirds.					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Conduct teacher training workshops	$0	$2,000	VSM; Park Ranger	H	1260
Host at least one Field Day event for students annually	$0	$500	Park Ranger	H	1260
Recruit interns from university education programs to design and conduct EE and I programs	$0	$1,000	Visitor Services Manager (VSM) (Complex); Park Ranger	H	1260
Develop and administer on-refuge opportunities for scouting programs (Birding Badge, Conservation Badge, and “leave no trace”)	$0	$1,000	VSM; Park Ranger		
Working with partners, develop and administer citizen science programs that involve students from multiple grade levels in monitoring activities	$0	$2,000	VSM; Park Ranger; Biological Technician	H	1260
OS: Provide volunteer-led educational opportunities for youth groups and the general public	$0	$500	VSM; Park Ranger		
Total annual costs	$0	$7,000			
5.5 Provide Quality Waterfowl and Upland Game Hunting Opportunities					
Bear Lake NWR **5.5 a: Provide a quality and safe waterfowl hunt program on 7,000 acres that includes youth and disabled hunters; and minimizes conflicts between hunters, adjacent landowners, and other users groups.** **5.5 b: Provide a quality, safe hunt for upland game birds on 300 acres**					

	Current Management	Future Management	New Staff	Priority	Funding
Maintain two ADA-accessible hunting blinds and associated trails	$500	$500		H	1262
Post additional “hunting” and “no hunting” signage before season	$500	$500		H	1262
Provide a Youth Hunt one weekend prior to the opening of the regular hunt season	$500	$500		H	1260, 1262
Conduct law enforcement	$2,000	$4,000	Additional LEO	H	1260
Monitor wildlife disturbance or impacts	$0	$2,000	Bio Tech	H	1260
Total annual cost	$3,500	$7,500			
Oxford Slough WPA **5.4c: Provide a quality, safe waterfowl, big and small game hunting, and trapping program on 1,840 acres (100%) that includes youth and disabled hunters, and minimizes conflicts between hunters, adjacent landowners, and other user groups.**					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Monitor wildlife disturbance or impacts	$0	$2,000	Biological Technician	H	1260
Conduct law enforcement	$2,000	$4,000	Additional LEO	H	1260
Total annual cost	$2,000	$6,000			
Bear Lake NWR **5.6 Provide a quality, safe fishing program for trout, yellow perch, suckers, chub, and carp, including bowfishing for carp**					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Maintain signs and fishing infrastructure	$0	$500		H	1262
Conduct law enforcement	$500	$1,000	Additional LEO	H	1260
Monitor wildlife disturbance or impacts	$0	$1,000	Biological Technician	H	1260
Total annual cost	$500	$2,500			

5.7 Develop partnerships, a strong volunteer base, and a Friends Group to assist with developing and delivering visitor services programs at Bear Lake NWR and Oxford Slough WPA.					
	Current Management	**Future Management**	**New Staff**	**Priority**	**Funding**
Oversee environmental education and volunteer programs	$0	$4,000	VSM; Park Ranger	H	1260
Develop and administer partnerships with regional universities to develop and deliver EE and I programs and teacher training, and to conduct surveys and monitoring to support refuge biological goals and objectives	$0	$4,000	VSM; Park Ranger; Biological Technician	H	1260
Total annual cost	$0	$8,000			

C.2.3 Staffing

Staff is needed to conserve and enhance the quality and diversity of indigenous wildlife habitats on the Bear Lake NWR. With the proper staffing to implement this plan, habitat management practices can be implemented and monitoring of flora and fauna responses to management can be applied. This will allow us to implement adaptive management strategies that are crucial for long-term success in meeting the mission, goals, and objectives of the Refuge.

Staff will interact with the public for education purposes and to provide for public safety. Maintenance staff will maintain facilities and equipment. Training of staff and coordination among staff, volunteers, and partners will ensure the mission and guiding principles of the National Wildlife Refuge System endure.

The following proposed full development level staffing plan will achieve CCP goals within 15 years. The rate at which this station achieves its full potential to fulfill the objectives and strategies contained in the plan is totally dependent upon receiving adequate funding and staffing.

Table C-3 below shows the staffing levels needed to fully implement the CCP. Note that these costs are already included (project by project) in the recurring costs. The table simply provides a picture of how the staff structure will look and provides an indication of what percent of the total recurring costs will be allocated toward staff. Staff positions so marked are for the Southeast Idaho NWR Complex and will also serve the other refuges in the Complex. These numbers include the cost of employee benefits.

Table C-3. Bear Lake NWR Staffing Chart under Management Proposed in CCP
PFT= Permanent Full Time Employee; FTE= Full Time Employee

Position Title		Series/Grade	Annual Salary
Refuge Manager	PFT	GS-0485-12	$108,000
Biological Technician	PFT	GS-0485-7/9	$75,000
Park Ranger/Volunteer Coordinator	PFT	GS-0025-5/7	$65,000
Engineering Equipment Operator	PFT	WG-5716-10	$81,000
Engineering Equipment Operator	PFT	WG-5716-9	$75,000
Complex Wildlife Biologists (2)	0.25 FTE	GS-0486-9/11	$25,000
Complex Visitor Services Manager	0.25 FTE	GS-0485-9/11	$25,000
Complex Refuge Law Enforcement Officers (2)	0.25 FTE	GS-0025-7/9	$20,000
Complex Fire Management Officer	0.10 FTE	GS-xxxx-11	$10,000
Complex Fire Fuels Specialist	0.10 FTE	GS-xxxx-9	$8,000
Totals	5.95 FTE		$492,000

C.2.4 Partnership Opportunities

The Refuge’s goals offer opportunities for partnerships with other agencies, interest groups, and schools. Coordinated partnership efforts will focus on habitat restoration, land protection, environmental education, fish and wildlife monitoring, outreach, and quality wildlife-dependent recreation. Current and potential future partners include local schools, Friends of Southeast Idaho NWR Complex, Idaho Department of Fish and Game, Highlands Cooperative Weed Management Area, Bear Lake Watch, PacifiCorp, Ducks Unlimited, Trout Unlimited, The Nature Conservancy, and many others. Partnerships like these will increase our effectiveness, knowledge, and community support, as well as reduce refuge operating costs. The Refuge will strive to exchange information with neighboring landowners to promote protection of valuable wildlife habitat in the Bear River watershed.

C.2.5 Budget Summary

Table C-4 summarizes the data from the above tables and displays the total funding needs over the 15-year life of the CCP for Bear Lake National Wildlife Refuge to implement the CCP in full.

Table C-4. Budget Summary: Funding Needed to Implement CCP

Budget Category	Current Management	Future Management
One Time Expenditures		
Wildlife and Habitat	$0	$5,750,075-55,250,075
Public Use	$9,000	$316,500-431,500
Subtotal	**$9,000**	**$ 6,066,575-55,681,575**
Recurring Costs (Annual costs totaled over 15-year life of CCP)		
Wildlife and Habitat	$43,900 x 15 =$658,649	$110,700-117,200 x 15 =$1,660,500-$1,758,000
Public Use	$11,000 x 15 =$165,000	$51,500 x 15 =$772,500
Subtotal	**$823,649**	**$2,433,000-$2,530,500**
Total CCP Cost	**$832,649**	**$8,499,575-$58,212,07**

Appendix D. Wilderness Review

D.1 Introduction

The Bear Lake National Wildlife Refuge (Refuge) is located in southeast Idaho at an elevation of 5,900 feet. It is situated within the Bear Lake valley and is part of the Bear River watershed. The Refuge's approved boundary encompasses 21,500 acres. Currently, the Refuge consists of three distinct jurisdictional units—Bear Lake NWR (18,606 acres); Thomas Fork Unit (1,015 acres); and Oxford Slough WPA (1,878 acres).

D.1.1 Policy for Wilderness Reviews

U.S. Fish and Wildlife Service policy (Part 602 FW 3.4 C.(1) (c)) requires that wilderness reviews be completed as part of the Comprehensive Conservation Planning process. This review includes the re-evaluation of refuge lands existing during the initial 10-year review period of The Wilderness Act of 1964, as amended (16 U.S.C. 1131-1136) as well as new lands and waters added to the NWRS since 1974. A preliminary inventory of the wilderness resources is to be conducted during pre-acquisition planning for new or expanded refuges (341 FW 2.4 B., "Land Acquisition Planning"). NWRS policy on Wilderness Stewardship (610 FW 1-5) includes guidance for conducting wilderness reviews (610 FW 4, Wilderness Review and Evaluation).

D.1.2 Criteria for Evaluating Lands for Possible Inclusion in the National Wilderness Preservation System

The Wilderness Act of 1964, as amended (16 U.S.C. 1131-1136) provides the following description of wilderness:

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act as an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions ... "

The following criteria for identifying areas as wilderness are outlined in Section 2(c) of the Act and are further expanded upon in NWRS policy (610 FW 4). The first three criteria are evaluated during the inventory phase; the fourth criterion is evaluated during the study phase.

1. generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
2. has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
3. has at least five thousand acres of land or is of a sufficient size as to make practicable its preservation and use in an unimpaired condition; and
4. may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value

Criterion 3 is further defined in Section 3(c) of the Act as 1) a roadless area of 5,000 contiguous acres or more, or 2) a roadless island. Roadless is defined as the absence of improved roads suitable and maintained for public travel by means of four-wheeled, motorized vehicles that are intended for highway use.

D.1.3 The Wilderness Review Process

A wilderness review is the process of determining whether the Service should recommend NWRS lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: wilderness inventory, wilderness study, and wilderness recommendation.

Wilderness Inventory

The inventory is a broad look at a refuge to identify lands and waters that meet the minimum criteria for wilderness—size, naturalness, and outstanding opportunities for solitude or primitive and unconfined type of recreation. All areas meeting the criteria are preliminarily classified as Wilderness Study Areas (WSAs). If WSAs are identified, the review proceeds to the study phase.

Wilderness Study

During the study phase, WSAs are further analyzed:

- for all values of ecological, recreational, cultural, economic, symbolic
- for all resources, including wildlife, vegetation, water, minerals, soils
- for existing and proposed public uses
- for existing and proposed refuge management activities within the area,
- to assess the Refuge's ability to manage and maintain the wilderness character in perpetuity, given the current and proposed management activities. Factors for evaluation may include, but are not limited to staffing and funding capabilities, increasing development and urbanization, public uses, and safety.

We evaluate at least an "All Wilderness Alternative" and a "No Wilderness Alternative" for each WSA to compare the benefits and impacts of managing the area as wilderness as opposed to managing the area under an alternate set of goals, objectives, and strategies that do not involve wilderness designation. We may also develop "Partial Wilderness Alternatives" that evaluate the benefits and impacts of managing portions of a WSA as wilderness.

In the alternatives, we evaluate:

- the benefits and impacts to wilderness values and other resources
- how each alternative will achieve the purposes of the Wilderness Act and the NWPS
- how each alternative will affect achievement of refuge purpose(s) and the Refuge's contribution toward achieving the Refuge System mission
- how each alternative will affect maintaining and, where appropriate, restoring biological integrity, diversity, and environmental health at various landscape scales
- other legal and policy mandates
- whether a WSA can be effectively managed as wilderness by considering the effects of existing private rights, land status and service jurisdiction, refuge management activities and refuge uses and the need for or possibility of eliminating Sec 4 (c) prohibited uses

Wilderness Recommendation

If the wilderness study demonstrates that a WSA meets the requirements for inclusion in the National Wilderness Preservation System, a wilderness study report should be written that presents the results of the wilderness review, accompanied by a Legislative Environmental Impact Statement (LEIS). The wilderness study report and LEIS that support wilderness designation are then transmitted through the Secretary of Interior to the President of United States, and ultimately to the United States Congress for action. Refuge lands recommended for wilderness consideration by the wilderness study report would retain their WSA status and be managed as "… wilderness according to the management direction in the final CCP until Congress makes a decision on the area or we amended the CCP to modify or remove the wilderness recommendation" (610 FW 4.22B). When a WSA is revised or eliminated, or when there is a revision in "wilderness stewardship direction, we include appropriate interagency and tribal coordination, public involvement, and documentation of compliance with NEPA" (610 FW 3.13).

The following constitutes the inventory phase of the wilderness review for the Bear Lake National Wildlife Refuge.

D.1.4 Previous Wilderness Reviews

There have been no previous wilderness reviews conducted for the Refuge.

D.1.5 Lands Considered Under This Wilderness Review

All Service-owned lands and waters (in fee title) within the Bear Lake National Wildlife Refuge approved boundary were considered during this wilderness review.

D.2 Wilderness Inventory

D.2.1 Unit Size: Roadless areas meet the size criteria if any one of the following standards apply:

- An area with over 5,000 contiguous acres solely in FWS ownership.
- A roadless island of any size. A roadless island is defined as an area surrounded by permanent waters or an area that is markedly distinguished from the surrounding lands by topographical or ecological features.
- An area of less than 5,000 contiguous Federal acres that is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and of a size suitable for wilderness management.
- An area of less than 5,000 contiguous Federal acres that is contiguous with a designated wilderness, recommended wilderness, or area under wilderness review by another Federal wilderness managing agency such as the Forest Service, National Park Service, or Bureau of Land Management.
- The Thomas Fork Unit and Oxford Slough WPA do not meet the minimum size requirements for consideration of wilderness, while the Bear Lake NWR Unit meets the minimum size requirements for a wilderness area. The Bear Lake NWR unit is subdivided into managed wetland impoundments with a series of man-made dikes and levees.

D.2.2 Naturalness and Wildness: the area generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable

This criterion must be evaluated in the context of current natural conditions and societal values and expectations without compromising the original intent of the Wilderness Act. It is well recognized that there are few areas remaining on the planet that could be truly classified as primeval or pristine, with even fewer, if any, existing in the conterminous United States. Likewise, few areas exist that do not exhibit some impact from anthropogenic influences, be it noise, light, or air pollution; water quality or hydrological manipulations; past and current land management practices; road or trails, suppression of wildfires; invasions by non-native species of plants and animals; or public uses. While allowing for the near-complete pervasiveness of modern society on the landscape, the spirit of the Wilderness Act is to protect lands that still retain the wilderness qualities of: 1) natural, 2) untrammeled, 3) undeveloped. These three qualities are cornerstones of wilderness character. For areas proposed or designated as wilderness, wilderness character must be monitored to determine baseline conditions and thereafter be periodically monitored to assess the condition of these wilderness qualities. Proposed and designated wilderness areas by law and policy are required to maintain wilderness character through management and/or restoration in perpetuity.
Defining the first two qualities (natural and untrammeled) requires a knowledge and understanding of the ecological systems which are being evaluated as potential wilderness. Ecological systems are comprised of three primary attributes—composition, structure, function. Composition is the components that make up an ecosystem, such as the habitat types, native species of plants and animals, and abiotic (physical and chemical) features. These contribute to the diversity of the area. Structure is the spatial arrangement of the components that contribute to the complexity of the area. Composition and structure are evaluated to determine the naturalness of the area. Function is the processes that result from the interaction of the various components both temporally and spatially, and the disturbance processes that shape the landscape. These processes include but are not limited to predator-prey relationships, insect and disease outbreaks, nutrient and water cycles, decomposition, fire, windstorms, flooding, and both general and cyclic weather patterns. Ecological functions are evaluated to determine the wildness or untrammeled quality of the area.

The third quality assessment is whether an area is undeveloped. Undeveloped refers to the absence of permanent structures such as roads, buildings, dams, fences, and other man-made alterations to the landscape. Exceptions can be made for historic structures or structures required for safety or health considerations, providing they are made of natural materials and relatively unobtrusive on the landscape.

General guidelines used for evaluating areas for wilderness potential during this wilderness inventory process include:

- The area should provide a variety of habitat types and associated abiotic features, as well as a nearly complete complement of native plants and wildlife indicative of those habitat types. Non-native and invasive species should comprise a negligible portion of the landscape.
- The area should be spatially complex (vertically and/or horizontally) and exhibit all levels of vegetation structure typical of the habitat type, have an interspersion of these habitats, and provide avenues for plant and wildlife dispersal.
- The area should retain the basic natural functions that define and shape the associated habitats including but not limited to flooding regimes, fire cycles, unaltered hydrology and flowage regimes, basic predator-prey relationships including herbivory patterns.
- Due to their size, islands may not meet the habitat guidelines in 1 and 2 above. Islands should, however, exhibit the natural cover type with which it evolved and continue to be

shaped and modified by natural processes. Islands should be further analyzed during the study portion of the review, if they provide habitat for a significant portion of a population, or key life cycle requirements for any resources of concern, or listed species.

- Potential wilderness areas should be relatively free of permanent structures or man-made alterations. Areas may be elevated to the study phase if existing structures or alterations can be removed or remediated within a reasonable timeframe, and prior to wilderness recommendation to the Secretary of the Interior.

The refuge units are comprised of predominately of emergent wetlands, wet meadow, riparian, and shrub habitats. In general, these habitats are comprised of native tree, shrub, forb and grass communities. Wet meadow and upland grass habitats are actively managed to achieve short grass and other successional vegetation stages for waterfowl, sandhill cranes, and shorebirds. This management includes prescribed fire, and haying to achieve refuge purposes for short grass habitats. Invasive plant species are a significant threat to the meadows and uplands, so a variety of Integrated Pest Management techniques are used to keep these species in check. These techniques include: prescribed fire, mechanical manipulation, and herbicide applications. A small portion of the upland areas are farmed for grain crops to provide forage for migratory waterfowl and cranes.

Riparian habitats have been degraded through cattle grazing and establishment of invasive plant species. The riparian habitat is in need of restoration, a process which may include the use of herbicides, mechanical equipment, and seeding or transplanting of native species. The natural hydrology of the riparian areas has likewise been altered by upstream water withdrawals and therefore, it does not exhibit the natural dynamics of a functional riparian system.

Sagebrush habitats on the Refuge have been significantly altered through decades of cattle grazing and invasions by non-native plant species, the most notable being cheatgrass. Over 30 percent of the sagebrush habitat is in need of restoration. Management and restoration activities will require prescribed fire, mechanical removal, and herbicide applications.

The refuge unit is intensively managed to provide the habitat conditions necessary for achieving refuge purposes for waterfowl, shorebirds, and other waterbirds. Most of these habitats require some restoration activities over the long term to re-establish the natural vegetation and function of those habitats, and to meet refuge purposes. Due to the current habitat condition and ongoing and proposed management needs, the unit does not meet the criteria for naturalness and wildness.

D.2.3 Outstanding Solitude or Primitive or Unconfined Recreation:

A designated wilderness area must provide outstanding opportunities for solitude, or a primitive and unconfined type of recreation. Possession of only one of these outstanding opportunities is sufficient for an area to qualify as wilderness, and it is not necessary for one of these outstanding opportunities to be available on every acre. Furthermore, an area does not have to be open to public use and access to qualify under these criteria.

Opportunities for solitude refer to the ability of a visitor to be alone and secluded from other visitors in the area. Primitive and unconfined recreation means nonmotorized, dispersed outdoor recreation activities that are compatible and do not require developed facilities or mechanical transport. Primitive recreation activities may provide opportunities to experience challenge and risk, self-reliance, and adventure.

Approximately 40 percent of Bear Lake Refuge lands are currently open to public use. Hunting and other wildlife-dependent recreational activities are allowed; camping is not allowed. The individual parcels are relatively small in size and though they could provide a degree of solitude and primitive recreation to some individuals under certain circumstances (such as the winter months), overall they do not provide outstanding opportunities for solitude or a primitive type of recreation.

D.2.4 Inventory Summary and Conclusion:

Based on this inventory, the refuge unit does not meet the basic criteria for inclusion into the National Wilderness Preservation System. Only one unit is greater than 5,000 acres, but is subdivided into managed wetland impoundments with a series of man-made dikes and levees. The refuge lands are actively managed for wetland and upland habitat characteristics using a variety of techniques, including grazing, herbicide use for invasive plants, prescribed fire, and mechanical manipulations. Much of the refuge lands have undergone significant degradation due to nearly a century of livestock grazing, hydrologic alterations, and invasions by non-native plant species. These lands do not fulfill the criteria for naturalness and wildness, and therefore do not possess outstanding wilderness character. The Refuge provides some unique recreational opportunities; however, these opportunities are not considered to be outstanding.

Table D-1. Results of Wilderness Inventory for Bear Lake National Wildlife Refuge

Refuge Unit:	Bear Lake	Thomas Fork	Oxford Slough
(1) Unit Size: has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unconfined condition, or is a roadless island	Yes	No	No
(2) Naturalness and wildness: generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable	No	No	No
(3a) Outstanding opportunities for solitude	No	No	No
(3b) Outstanding opportunities for primitive and unconfined recreation	No	No	No
(4) contains ecological, geological or other features of scientific, educational, scenic, or historical value	N/A	N/A	N/A
Area qualifies as a wilderness study area (meets criteria 1,2, and 3a or 3b)	No	No	No

Appendix E. Refuge Resources of Concern and Priorities

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E.1 Refuge Resources of Concern and Management Priorities

The priorities associated with wildlife and habitat management for a National Wildlife Refuge and are determined through the identification of refuge Resources of Concern. Prioritizing **refuge Resources of Concern** begins with assembling a near comprehensive list of species and habitats that could potentially drive a refuge's management

The U.S. Fish and Wildlife Service (FWS) has developed a process for formulating the Resources of Concern described in this appendix. It entails first assessing:

- **National Wildlife Refuge System (NWRS) trust resource responsibilities** (i.e., threatened and endangered species and migratory birds) for Bear Lake NWR.
- Species, species groups, and/or communities that support Bear Lake National Wildlife **Refuge purposes**.
- Developing a comprehensive list of all the species of Bear Lake NWR and their conservation needs and status as identified in prominent **International, National, Regional, or State ecosystem plans**.

Additional analysis of resources of concern will entail documenting:

- **Biological integrity, diversity, and environmental health** of natural, functional communities such as those found under historic conditions that need to be maintained and, where appropriate, restored at Bear Lake NWR.

Subsequently, refuge staff will then:

- Identify a subset of **Focal Resources** as prioritized refuge Resources of Concern, by selective filtering the Comprehensive Refuge Resources of Concern list to species and communities that represent the needs of larger groups of species or communities on the Refuge.
- Categorize the highest **Priority** to manage on refuge as Focal Resources of Concern by identifying **Priority Habitats**.

This iterative process for the identification of resources of concern ultimately concludes in the formulation of the Bear lake NWR **Conservation Targets**, in which:

- The specific characteristics of Focal Resources are used to describe the attributes required in each priority habitat type requiring management on Bear Lake NWR.

E.1.1 National Wildlife Refuge System Resources of Concern for Bear Lake NWR

National Wildlife Refuge System (NWRS) Resources of Concern are identified in the National Wildlife Refuge System Mission Goals and Refuge Purposes Policy (601 FWS). The first three NWRS goals (601 FW 1.8) identify the natural resource conservation priorities for the System.

A. Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.

B. Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

C. Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.”

Each of these groups of NWRS Resources of Concern is further described below.

- Migratory Birds: A list of all species of migratory birds protected by the Migratory Bird Treaty Act (16 U.S.C. 703-711) and subject to the regulations on migratory birds is contained in subchapter B of title 50 CFR § 10.13. The Migratory Birds Program also maintains subsets of this list that provide priorities at the national, regional, and ecoregional (bird conservation regions) scales.

- Interjurisdictional Fish: Interjurisdictional fish are those “…populations that two or more States, nations, or Native American tribal governments manage because of their geographic distribution or migratory patterns (710 FW 1.5H).” Examples include anadromous species of salmon and free-roaming species endemic to large river systems, such as paddlefish and sturgeon (601 FW 1).

- Threatened and Endangered Species: The Endangered Species Act (16 U.S.C. §§ 1531-1544, December 28, 1973, as amended 1976-1982, 1984 and 1988) states in SEC. 8A.(a) that “The Secretary of the Interior… is designated as the Management Authority and the Scientific Authority for purposes of the Convention and the respective functions of each such Authority shall be carried out through the United States Fish and Wildlife Service.” The Act also requires that “all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.”

- Marine Mammals: The Marine Mammal Protection Act of 1972 (16 U.S.C. 13611407) prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

- Significant or Rare Communities and Ecosystems: Plant and habitat communities, are also NWRS Resources of Concern when they are rare, declining, underrepresented, represent important ecological/ecosystem processes and/or when they are important in the maintenance or restoration of biological integrity, diversity, and environmental health.

Table E-1. National Wildlife Refuge System Resources of Concern for Bear Lake NWR

NWRS Resources of Concern	Supporting Resources of Concern for Bear Lake NWR
Migratory Birds:	214 species of migratory birds use the Refuge for breeding or migratory life history events
Interjurisdictional Fish:	N/A: No interjurisdictional fish occur at Bear Lake NWR
Threatened and Endangered Species:	N/A: No ESA listed species occur at Bear Lake NWR at this time
Significant or Rare Communities and Ecosystems:	Red glasswort Purple meadow-rue

E.1.2 Resources of Concern from Refuge Purposes of Bear Lake NWR

The Refuge System Improvement Act, and subsequent policy, requires that each refuge be managed to fulfill both its establishment purpose and the mission of the Refuge System. The Policy, *National Wildlife Refuge System Mission and Goals and Refuge Purposes* (601 FW 1), explains the relationship between these two. Where there is a conflict, individual refuge purposes have priority. A detailed discussion of the authorities and purposes of Bear lake NWR can be found in Chapter 2. Table E-2 summarizes Resources of Concern identified in the purpose statements of Bear Lake NWR.

Table E-2. Resources of Concern Identified in the Purposes of Bear Lake NWR

Species, Species Group, or Habitat	Supporting Bear Lake NWR Habitat Type(s)	Life History Requirement(s)	Documentation
Great Basin Canada Goose	Old Fields, Emergent Wetlands, Wet Meadows, Agricultural	Nesting, Brood Rearing, and Migration	
Greater Sandhill Crane	Emergent Wetlands; Wet Meadows; Riparian, Agriculture	Nesting, Brood Rearing, and Migration	
Redhead	Emergent wetlands	Nesting and Brood Rearing	
Bonneville cutthroat trout	Riparian (Thomas Fork)	All	

E.1.3 Resources of Concern from Regional Wildlife Conservation Plans Applicable to Bear Lake NWR

Various conservation plans, reports, and datasets developed by the FWS or in cooperation with our conservation partners provide information to identify species and habitats that are, or could be, supported by the Refuge. Table E-3 documents a comprehensive list of the flora and fauna of Bear Lake NWR and the conservation "status" of these species as identified in the following regional or State plans:

Partners In Flight: The Partners in Flight (PIF) long-term strategy document commonly referred to as "**The Flight Plan**," lists the following set of goals:

1. Conservation when it should be done, before species become endangered
2. Conservation that stresses both healthy ecosystems and wise management of natural resources
3. Conservation in breeding, migration, and wintering habitat
4. Groundbreaking partnerships that foster voluntary cooperation among public and private landowners.

Their proactive stance is to "keep common birds common."

The Bear Lake Valley is located at the confluence of three physiographic regions (PR) including the Utah Mountains (69), Wyoming Basin (86), and **Basin and Range (80)**. Key wetland dependent species found on Bear Lake NWR and Oxford Slough WPA include long-billed curlew (PR 69); Wilson's phalarope (PR 86); and American white pelican, Franklin's gull, and American avocet (PR 80). Primary habitats and species specific to the project area are further detailed in the State Specific, Idaho Partners in Flight Conservation Plan.

Idaho Partners in Flight, Idaho Bird Conservation Plan (IBCP): The Idaho Bird Conservation Plan stresses the importance of four primary habitats, two of which are located on BLNWR and Oxford Slough WPA; riparian and non-riverine wetlands. The plan only recognizes the Basin and Range physiographic region, but further delineates critical species and habitat objectives specific to the State. Objectives for these key habitats include:

> **Riparian** – By 2025, restore at least 10 percent of the historical extent of each riparian system …
> **Non-riverine wetland** – obtain a net increase in the number of acres (hectares) of wetlands in Idaho, focusing on the same types and amounts that historically occurred.
>
> The **IBCP** lists protection of non-riverine wetlands as a high priority task and the project area contains two of the three, priority wetland sites; lacustrine and depressional. While mallard, northern pintail and lesser scaup are all considered important species using non-riverine wetland sites, only **lesser scaup** maintains a moderate priority status ranking. The plan focuses on actions that benefit wetlands as a whole, rather than on individual species, thus population objectives are not provided. The plan further lists hydrologic modification and subsequent water level fluctuations during the breeding season as primary threats.

U.S. Shorebird Conservation Plan: Few direct specific habitat guidelines are provided by the USSCP, which instead, seeks to identify key shorebird regions throughout the continent, and allow regional committees to determine the best locations for shorebird restoration initiatives to be conducted. BLNWR and Oxford Slough WPA contain small, but significant populations of key shorebird species including American avocet, Wilson's phalarope, willet, and black-necked stilt. Both areas also serve as a secondary migration corridor for migrants traveling between National Priority Areas 27 and 28.

Intermountain West Regional Shorebird Plan: The IWRSP maintains a series of habitat restoration objectives centered around delineating regionally important sites, and incorporating restoration activities into a landscape scale design. Independent water management capabilities at BLNWR helps provide a critical breeding and stopover habitat for shorebirds in the larger landscape. This allows the wetlands to be managed as a complex of habitats which basically means that mud flat, perennial emergent, and breeding habitat can be simultaneously provided within the same area to help meet the needs of waterbirds with very different life history requirements.

North American Waterbird Conservation Plan: The ultimate goal of the plan is "To protect, restore, and manage sufficient high quality habitat and key sites for waterbirds throughout the year to meet species and population goals." Focusing primarily on colonial nesting waterbirds, the plan seeks to develop cross-cultural partnerships to encompass waterbird habitat across the America's. BLNWR and Oxford Slough WPA serve as primary nesting sites for several colonial nesting waterbird species, highlighted by the largest white-faced ibis colony in Idaho (3,000-5,000 nests).

Intermountain West Waterbird Conservation Plan: The IWWCP is the regional step-down plan, which provides more specific guidance for the Bear River Valley. As general habitat conservation objectives, target restoration areas should consider:

1. Areas rich in priority birds and habitats
2. Opportunities for conservation and partnerships
3. Threats to priority species and habitats
4. Areas large enough in scale to achieve meaningful conservation and small enough to capture local working groups.

The Bear Lake Valley contains colonial waterbird breeding habitat for one of two high concern species (snowy egret), and eight of 10 moderate concern species, and includes large nesting colonies of California gull, Forster's tern, Franklin's gull, black-crowned night heron, black tern, and eared grebe.

North American Waterfowl Management Plan: The NAWMP states that the goal is "to return waterfowl populations to their 1970s levels by conserving wetland and upland habitat." This will be accomplished through a combination of a solid "Biological Foundation, Landscape Approach, and Partnerships." As discussed in the introduction, BLNWR and Oxford Slough WPA lie between two National priority sites and maintain a nexus with each through provision of quality breeding and migration habitat for waterfowl (**Priority Area 27 – Great Salt Lake and Bear River Marsh)** and provision of quality breeding habitat for trumpeter swans and overwater nesting waterfowl species such as redhead and canvasback (**Priority Area 28 – Yellowstone-Intermountain Wetlands)**. National breeding population objectives for key waterfowl species include the northern pintail (5.6 million; decreasing), mallard (8.2 million; no trend), and greater and lesser scaup (6.3 million; decreasing) among which, only the mallard population has satisfied this objective (8.64 million). Current Bear Lake Valley populations for these species are relatively small compared to these National Objectives; however, they are regionally significant considering proximity to NAWMP high profile sites. The plan also lists breeding population objectives for **redhead** (640,000) and **canvasback** (540,000), both of which are currently above the population objective on a National basis, but, with insufficient data to estimate trend information. The remaining three plan-listed priority species, **wood duck** (200,000 western population), **American wigeon** (3.1 million total population), and **ring-necked duck** (2 million), are all considered to be either increasing or to have stable populations.

IWJV Habitat Conservation Objectives: The IWJV lists the following habitat objectives in their 1995 implementation plan.

1. To protect 1.5 million public and private acres through facilitation of conservation easements, management agreements, incentive programs, and stewardship programs.
2. To **restore and enhance 1 million acres of wetland habitat** through direct habitat improvement programs
3. To **enhance all bird habitat** through direct **habitat improvement programs**, **public education**, and **cooperation with our partners**.

More recently, the IWJV has developed a coordinated implementation plan to consolidate region specific information from each of the four National Plans. The 2005 update to the IWJV Coordinated Bird Conservation Implementation Plan describes goals and objectives for two priority habitat types, which occur at BLNWR and Oxford Slough WPA. The following sections include a synopsis of this plan, and subsequent plans used in the development of the IWJV Coordinated Implementation Plan for Bird Habitat in Idaho.

IWJV Coordinated Implementation Plan for Bird Habitat in Idaho (IWJVCIP): Prepared for the Intermountain West Joint Venture, the coordinated implementation plan seeks to address and consolidate National Plan habitat objectives, into one document. The plan lists the **Bear Lake Bird Habitat Conservation Area** (BHCA) as one of 23 priority sites in Idaho, primarily for its importance to meeting wetland and riparian habitat restoration objectives. Bear Lake NWR includes three of the five most critical habitat types (wetlands, riparian, and agricultural) and has been designated a priority A1 BHCA for its contributions to diving ducks, colonial nesting waterbirds, sandhill cranes, and trumpeter swans. The IWJVCIP further lists overall restoration or enhancement of 1.6 million acres of wetland habitat as a priority objective.

More specifically, the **Southeast Idaho Wetland Focus Area, Wetland Conservation Plan (IWJV),** lists the mallard and northern pintail as priority species. According to the plan, mallards are the most abundant duck species in Southeast Idaho, while northern pintail breeding populations continue to decline. Other important waterbird groups include colonial nesting waterbirds, of which five species are recognized as National species of low or moderate concern (**American white pelican**, **California gull**, **white-faced ibis**, **western grebe**, and **Clark's grebe**). Plan authors used a habitat based, as opposed to population objective approach, and described the desired future condition; *"wetlands should be protected/maintained/ enhanced/restored in such condition that the hydrology of a site remains intact."*

Concept Plan for Preservation of Redhead Breeding Habitat in Idaho: In response to declining population numbers, the U.S. Fish and Wildlife Service conducted an evaluation to document the extent of **redhead breeding habitat** in the Great Basin and formulate a strategy to maximize habitat restoration efforts. Private wetlands in **Bear Lake County ranked number one** in Idaho for their importance to redhead production based on a complex set of ranking factors. Primary among these factors were the contributions of perennial emergent marsh for redheads, the importance of these habitats for other waterfowl species, and the increasing threat of agricultural water distribution during the breeding season.

Conservation Strategy for Southeast Idaho Wetlands: Through funding provided by the Environmental Protection Agency (EPA), the Idaho Department of Fish and Game conducted a study to characterize and rank wetland importance in southeast Idaho. This initiative resulted in the Class I ranking of Bear Lake NWR (only one of four wetland areas), primarily for its "high quality, large expanses of emergent marsh." Oxford Slough WPA was given a Class II rating, one of 10 such sites in SE Idaho. The study further identified one State sensitive plant community (category S1; *Salicornia rubra*) and 10 sensitive waterbird species (categories S1 or S2).

Audubon Society Globally Important Bird Area: Both BLNWR and Oxford Slough WPA have been designated as Globally Important Bird Areas by the National Audubon Society. As two of 503 such sites, selection was based on the areas' contributions to colonial nesting waterbird habitat. At present, 13 species of concern have developed colonies on BLNWR and Oxford Slough WPA.

Other regional plans include **The Southeast Idaho Wetland Focus Area, Wetland Conservation Plan (IWJV)**, which recognizes Bear Lake NWR as an area that supports the largest emergent wetland area and largest waterbird breeding population in the Great Basin Habitat complex**. The Trumpeter Swan Implementation Plan** identified a habitat objective specifically for the proposed project's contribution to Rocky Mountain trumpeter swan nesting (*"Task 3, Subtask A, 2.* ***Develop a restoration proposal for the Bunn Lake wetland*** *enhancement project at Bear Lake NWR."*). And finally, the **U.S. Fish and Wildlife Service, Idaho Partners for Fish and Wildlife Program** recognizes the Bear River/Bear Lake region as **one of seven priority sites** for use of Partners funds, primarily focusing on benefits to Bonneville cutthroat trout and migratory birds.

Bear Lake NWR and Oxford Slough WPA are strategically situated between **National priority areas 27 and 28** as referenced under the **North American Waterfowl Management Plan** (NAWMP), **United States Shorebird Conservation Plan** (USSCP), and the **North American Waterbird Conservation Plan** (NAWCP), but are not included as a priority designation. All referenced regional plans identify the importance of the BLNWR and Oxford Slough WPA as high priority sites for restoration activities; however, only the National Partners in Flight Plan includes the project area as a National high priority site at present. Depending on how the biopolitical boundaries were drawn on the other plan maps, the Bear Lake Valley could have easily been included in:

> **Priority Area 27 – Great Salt Lake and Bear River Marsh** – the Bear Lake Valley serves as an important breeding area and migration corridor for key species using this priority area.

Priority Area 28 – Yellowstone-Intermountain Wetlands – Importance for trumpeter swan habitat expansion and reintroduction efforts. Important breeding area for key colonial nesting, shorebird, and in particular, overwater nesting waterfowl.

E.1.4 Comprehensive List of Refuge Resources of Concern

Table E-3. Comprehensive List of Bear Lake NWR Resources of Concern and their Conservation Status

Species	Refuge Purpose Species	Species Abundance	Breeds/Nests Locally	BIDEH	Federal T&E	Birds of Conservation Concern-USFWS R1& BCR 9 and 10	ID Partners in Flight High Priority Species	ID Partners in Flight Mod Priority Species	Idaho Comprehensive Wildlife Conservation Plan Species of Greatest Conservation Need	Intermountain West Regional Shorebird Plan Regionally Important Species	Intermountain West Waterbird Conservation Plan	Intermountain West Coordinated Implementation Plan	N.A. Waterbird Conservation Plan	N.A. Waterfowl Management Plan Breeding/Non-Breeding	USFWS Idaho Partners for Fish and Wildlife Program	Conservation Strategy for Southeastern Idaho Wetlands	BLM Sensitive Species	TNC Ecoregional Conservation Plan
FAUNA (WILDLIFE)																		
Birds																		
Swans																		
Trumpeter swan *Cygnus buccinator*		c	x				26 (ID)		G4/S1B, S2N BL-SW-OW			PA W		M/M	x	x	Type 3	
Tundra Swan *Cygnus columbianus*		oSp,F												/H				
Geese																		
Canada goose *Branta canadensis moffitti*	x	aSp, S,F; uW	x											H/MH				
Greater white-fronted goose *Anser albifrons*		rSp												/MH				
Snow goose *Chen caerulescens*		rS,F; rW																
Dabbling Waterbirds																		
American green-winged teal *Anas crecca*		c	x											ML/ML				
American wigeon *Anas americana*		cSp,F; uS	x											MH/ ML				
Blue-winged teal *Anas discors*		u	x															
Cinnamon teal *Anas cyanoptera*		aSp,S; cF	x				21 (80)							MH/				
Gadwall *Anas strepera*		c	x											ML/				
Mallard *Anas platyrhynchos*		a	x											ML/MH				

Species	Refuge Purpose Species	Species Abundance	Breeds/Nests Locally	BIDEH	Federal T&E	Birds of Conservation Concern-USFWS R1& BCR 9 and 10	ID Partners in Flight High Priority Species	ID Partners in Flight Mod Priority Species	Idaho Comprehensive Wildlife Conservation Plan Species of Greatest Conservation Need	Intermountain West Regional Shorebird Plan Regionally Important Species	Intermountain West Waterbird Conservation Plan	Intermountain West Coordinated Implementation Plan	N.A. Waterbird Conservation Plan	N.A. Waterfowl Management Plan Breeding/Non-Breeding	USFWS Idaho Partners for Fish and Wildlife Program	Conservation Strategy for Southeastern Idaho Wetlands	BLM Sensitive Species	TNC Ecoregional Conservation Plan
Northern pintail *Anas acuta*		aSp,F; cS	x						G5/S5B, S2N BL-A-SW-OW					ML/				
Northern shoveler *Anas clypeata*		c	x											ML/				
Wood duck *Aix sponsa*		r						19* (64)						ML/ML				
Diving Waterbirds																		
Barrow's goldeneye *Bucephala islandica*		rSp,W	x				24* (64)							H/MH			Type 5	
Bufflehead *Bucephala albeola*		u						18* (ID)						H/ML				
Canvasback *Aythya valisineria*		cSp; uS,F												ML/ML				
Common goldeneye *Bucephala clangula*		u												ML/ML				
Common loon *Gavia immeer*		oSP							G5/S1B, S2N		High	PAW						
Common Merganser *Mergus merganser*		c																
Hooded Merganser *Lophodytes cucullatus*		oSp; rF					22 (64)		G5/S2B, S3N					MH/				
Lesser scaup *Aythya affinis*		cSp; uS, F	x					17 (ID)	G5/S3					MH/ ML				
Greater Scaup *Aytha fuligula*		r												L/ML				
Red-breasted merganser *Mergus serrator*		r																
Redhead *Aythya americana*	x	c	x				22 (89)							ML/ML				
Ring-necked duck *Aythya collaris*		o	x					20 (64)						MH/				
Ruddy duck *Oxyura jamaicensis*		c	x											MH/ MH				
Grebes																		

Species	Refuge Purpose Species	Species Abundance	Breeds/Nests Locally	BIDEH	Federal T&E	Birds of Conservation Concern-USFWS R1& BCR 9 and 10	ID Partners in Flight High Priority Species	ID Partners in Flight Mod Priority Species	Idaho Comprehensive Wildlife Conservation Plan Species of Greatest Conservation Need	Intermountain West Regional Shorebird Plan Regionally Important Species	Intermountain West Waterbird Conservation Plan	Intermountain West Coordinated Implementation Plan	N.A. Waterbird Conservation Plan	N.A. Waterfowl Management Plan Breeding/Non-Breeding	USFWS Idaho Partners for Fish and Wildlife Program	Conservation Strategy for Southeastern Idaho Wetlands	BLM Sensitive Species	TNC Ecoregional Conservation Plan
Clark's grebe *Aechmophorus clarkii*		uS						20* (ID)	G5/S2B BL-SW-OW		Mod-10		Low-NA					
Eared grebe *Podiceps nigricollis*		cSu	x					15 (ID)			High-9 Staging		Mod-COS			x		X-BR
Horned grebe *Podiceps auritus*		oSP																
Pied-billed grebe *Podilymbus podiceps*		c	x															
Western grebe *Aechmorphus occidentalis*		c	x				22 (ID)		G5/S2B BL-SW-OW		Mod-10 High-9		Mod-NA			x		
Pelicans and Cormorants																		
American white pelican *Pelecanus erythroryhchus*		c	x				24 (ID)		G3/S1B BL-WS-OW		High	PAW	Mod-NA			x	Type 2	
Double crested cormorant *Phalacrocorax auritus*		c														x		
Wading Birds																		
American avocet *Recurvirostra americana*		c	x			9	23 (80)		G5/S5B BL-SW-OW	High 5/3/3								
American bittern *Botaurus lentiginosus*		c	x								Mod-10							
Black-crowned night heron *Nycticorax nycticorax*		u	x						G5/S2B BL-A-SW-OW		Mod-9		Mod-COS			x		X-BR
Black-necked stilt *Himantopus mexicanus*		c	x				18 (80)		G5/S3B BL-SW-OW	High 5/3/3								
Cattle egret *Bubulcus ibis*		oSP; rS							G5/S2B							x		X-BR
Great egret *Ardea alba*		rSP							G5/S1B									

Species	Refuge Purpose Species	Species Abundance	Breeds/Nests Locally	BIDEH	Federal T&E	Birds of Conservation Concern-USFWS R1& BCR 9 and 10	ID Partners in Flight High Priority Species	ID Partners in Flight Mod Priority Species	Idaho Comprehensive Wildlife Conservation Plan Species of Greatest Conservation Need	Intermountain West Regional Shorebird Plan Regionally Important Species	Intermountain West Waterbird Conservation Plan	Intermountain West Coordinated Implementation Plan	N.A. Waterbird Conservation Plan	N.A. Waterfowl Management Plan Breeding/Non-Breeding	USFWS Idaho Partners for Fish and Wildlife Program	Conservation Strategy for Southeastern Idaho Wetlands	BLM Sensitive Species	TNC Ecoregional Conservation Plan
Snowy egret *Egretta thula*		c						14 (80)	G5/S2B		Mod- 10 High- 9		High- WH			x		X- BR
Great Egret *Ardea alba*									G5/S1B BL									
Great blue heron *Ardea herodias*		u																
Sandhill crane (Greater) *Grus cadensis tabida*	x	Csp, su, fa	x				24 (ID)		G5/S3B		High- 9	PB Ag			x			
Marsh Birds																		
American coot *Fulica americana*		a	x															
Sora *Porzana Carolina*		c	x															
Virginia rail *Rallus limicola*		u	x															
White-faced ibis *Plegadis chihi*		Csu, fa	x				20 (89)		G5/S2B BL-A- SW-OW		Mod	PA W	Low- WH		x	x	Type 4	X- BR
Shorebirds																		
Black-bellied plover *Pluvialis squatarola*		r								Low 2/1/1								
Common snipe *Gallinago gallinago*		aSp,S; cF; rW	x							Mod 3/3/2								
Greater yellowlegs *Tringa melanoleuca*		uSP; oS,F								Mod 3/3/3								
Killdeer *Charadrius vociferus*		a	x				19 (ID)			Mod 3/2/1								
Long-billed curlew *Numenius americanus*		cSp,S; uF	x			R1; 9; 10	23 (80)		G5/S2B BL-A- SXS	Very High 5/4/3		PB G/Ag			x		Type 5	
Pectoral sandpiper *Calidris melanotos*		rSp,F								Low 1/1/1								
Red-necked phalarope *Phalaropus lobatus*		u								Mod 4/1/1								

Species	**Refuge Purpose Species**	**Species Abundance**	**Breeds/Nests Locally**	**BIDEH**	**Federal T&E**	**Birds of Conservation Concern-USFWS R1& BCR 9 and 10**	**ID Partners in Flight High Priority Species**	**ID Partners in Flight Mod Priority Species**	**Idaho Comprehensive Wildlife Conservation Plan Species of Greatest Conservation Need**	**Intermountain West Regional Shorebird Plan Regionally Important Species**	**Intermountain West Waterbird Conservation Plan**	**Intermountain West Coordinated Implementation Plan**	**N.A. Waterbird Conservation Plan**	**N.A. Waterfowl Management Plan Breeding/Non-Breeding**	**USFWS Idaho Partners for Fish and Wildlife Program**	**Conservation Strategy for Southeastern Idaho Wetlands**	**BLM Sensitive Species**	**TNC Ecoregional Conservation Plan**
Willet *Catoptrophorus semipalmatus*		cSp,S; uF	x							High 4/3/2								
Wilson's phalarope *Phalaropus tricolor*		cSp,S; uF	x			9; 10; 16		21 (69)	G5/S3B BL-SW-OW	High 5/3/1		PA W					Type 5	
Western sandpiper *Calidris mauri*		rS; oF								Mod 4/2/2								
Least sandpiper *Calidris minutilla*										Mod 4/2/2								
Spotted sandpiper *Actitis macularia*		u	x							Mod 3/3/3								
Long-billed dowitcher *Limnodromus scolopaceus*		uSp; rS; oF								Mod 5/2/2								
Marbled Godwit *Limosa fedoa*		oSp, Su, F; rS				9; 10; 16				High 4/1/1								
Solitary sandpiper *Tringa solitaria*		Unk				9, 10; 16				Mod 2/2/3								
Semipalmated plover *Charadrius semipalmatus*		Unk								Mod 3/1/1								
Stilt Sandpiper *Calidris himantopus*										Low 1/1/1								
Lesser yellowlegs *Tringa flavipes*		r								Low 2/2/2								
Ruddy turnstone *Arenaria interpres*		Accidental								Low 1/1/1								
Sanderling Calidris alpina		Accidental				9				Low 1/1/1								
Dunlin *Calidris alpina*		Accidental								Low 2/1/1								
Terns and Gulls																		
Black tern *Chlidonias niger*		uSP,F; cS	x					18* (ID)	G4/S1B BL-SW-OW		High	PA W	Mod-COS			x	Type 3	X-BR
Franklin's Gull *Larus pipixcan*		aSp,S; rF	x				24 (80)		G4G5/ S2B BL-A-SW-OW		High		Mod-WH			x		X-BR

Species	**Refuge Purpose Species**	**Species Abundance**	**Breeds/Nests Locally**	**BIDEH**	**Federal T&E**	**Birds of Conservation Concern-USFWS R1& BCR 9 and 10**	**ID Partners in Flight High Priority Species**	**ID Partners in Flight Mod Priority Species**	**Idaho Comprehensive Wildlife Conservation Plan Species of Greatest Conservation Need**	**Intermountain West Regional Shorebird Plan Regionally Important Species**	**Intermountain West Waterbird Conservation Plan**	**Intermountain West Coordinated Implementation Plan**	**N.A. Waterbird Conservation Plan**	**N.A. Waterfowl Management Plan Breeding/Non-Breeding**	**USFWS Idaho Partners for Fish and Wildlife Program**	**Conservation Strategy for Southeastern Idaho Wetlands**	**BLM Sensitive Species**	**TNC Ecoregional Conservation Plan**
Forster's tern *Sterna forsteri*		uSp,S; rF	x						G5/S1B BL-SW-OW		High-10 Mod-9		Mod-NA			x		X-BR
Ring-billed gull *Larus delawarensis*		u																
Herring gull *Larus argentatus*													Low-COS					
Caspian tern *Sterna caspia*		r							G5/S2B, S3NBL-SW-OW				Low-COS			x		
California gull *Larus californicus*		cSp,F; oS,						19 (ID)	G5/S2B, S3N BL-A-SW-OW		Mod-10		Mod-NA			x		
Raptors																		
American kestrel *Falco sparverius*		c	x															
Bald eagle *Haliaeetus leucocephalus*		o	x		F T				G4/S3B, S4N BL-SW			PA R					Type 1	
Burrowing owl *Speotyto cunicularia*		Unk				R1; 9; 16		19* (ID)	G4/S2B BL-A-SXS			PB Ag					Type 5	
Cooper's hawk *Accipiter cooperii*		o	x															
Golden eagle *Aquila chrysaetos*		u	x			9; 10; 16	19 (89)											
Great-horned owl *Bubo virginianus*		c	x															
Ferruginous hawk *Buteo regalis*		u	x			9; 10; 16	23 (ID)		G4/S3B								Type 3	
Long-eared owl *Asio oyus*		r																
Merlin *Falco columbarius*		Unk							G5/S2B, S2N BL-A-SXS-SW									

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Northern goshawk *Accipiter gentilis*		Unk	x				21 (64)										Type 3	
Northern harrier *Circus cyaneus*		c	x			16		18 (80)										
Osprey *Pandion haileatus*		r						17 (ID)										
Peregrine falcon *Falco peregrinus*		o	x		FCo	R1; 9; 10; 16		19 (ID)	G4T3/ S2B BL-SW-SXS							x	Type 3	
Prairie falcon *Falco mexicanus*		u	x			R1; 9; 10; 16	24 (80)					PBG					Type 3	
Red-tailed hawk *Buteo jamaicensis*		c	x															
Rough-legged hawk *Buteo lagopus*		u; cW																
Sharp-shinned hawk *Falco striatus*		o	x				18 (64)											
Short-eared owl *Asio flammeus*		u	x			16	23 (ID)		G5/S4								Type 5	
Swainson's hawk *Buteo swainsoni*		c	x			R1; 9; 10; 16	21 (89)		G5/S3B								Type 5	
Barn owl *Tyto alba*		r																
Western screetch owl *Otus kennicottii*		Accidental																
Turkey Vulture *Cathartes aura*		C Sp, Su																
Corvids																		
American crow *Corvus brachyrhynchos*		c	x															
Common raven *Corvus corax*		c	x															
Black-billed magpie *Pica pica*		cSp,S,F; oW	x				19 (ID)											
Upland Game Birds																		
Gray partridge (Exotic) *Perdix perdix*		o	x															

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Greater sage-grouse *Centrocerus urophasianus*		u	x			R1;9	25 (ID)		G4/S2 BL-A-SXS			PA SB/S DS			x		Type 2	
Sharp-tailed grouse *Centrocerus urophasianus*		u	x				20 (89)		G4T3/S1 BL-A-SXS						x		Type 3	
Chukar (Exotic) *Alectoris chukar*		r																
Ring-necked pheasant (Exotic) *Phasianus colchicus*		r																
Doves																		
Mourning dove *Zenaida macroura*		c Su	x															
Passerines and other Birds																		
(Goatsuckers)																		
Common night hawk *Chordeiles minor*		uSp,S; oF	x															
Common poorwill *Phalaenoptilus nuttalli*		Unk	x															
(Hummingbirds)																		
Black-chinned hummingbird *Archilocus alexandri*		r	x															
Calliope hummingbird *Stellula calliope*		Unk	x				23 (ID)					PA R					Type 3	
Broad-tailed hummingbird *Selasphorus platycercus*		Unk	x															
Rufous hummingbird *Selasphorus rufus*		r	x				22 (89)											
(Kingfishers)																		
Belted kingfisher *Ceryle alcyon*		o	x															
(Woodpeckers)																		
Lewis' woodpecker *Melanerpes lewis*		r				R1; 9; 10; 16	23 (ID)		G4/S3B								Type 3	
Downy woodpecker *Picoides pubescens*		r	x															
Hairy woodpecker *Picoides villosus*		r																

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Northern flicker *Colaptes auratus*		c	x					15 (ID)										
(Flycatchers)																		
Olive-sided flycatcher *Contopus cooperi*		o				R1;	21 (ID)										Type 3	
Western wood pewee *Contopus sordidulus*		u	x					17 (ID)										
Willow flycatcher *Empidonax traillii*		oSp; uS	x				21 (ID)					PA R					Type 3	
Hammond’s flycatcher *Empidonax hammondi*		oSp,F; uS					23 (ID)										Type 3	
Gray Flycatcher *Empidonax wrightii*							24 (80, 89)											
Dusky flycatcher *Empidonax oberholersi*		o					22 (64)											
Say’s phoebe *Saornis saya*		Unk																
Western kingbird *Tyrannus verticalis*		o																
Eastern kingbird *Tyrannus tyrannus*		o																
(Larks)																		
Horned lark *Eremophila alpestris*		c	x			R1						PA SB/S DS						
(Swallows)																		
Tree swallow *Tachycineta bicolor*		aSp,S; uF	x															
Violet-green swallow *Tachycineta thalassina*		o	x					17 (ID)										
Northern rough-winged swallow *Stelgidoptyerx serripennis*		o	x															
Bank swallow *Riparia riparia*		u	x															

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Cliff swallow *Petrochelidon pyrrhonota*		cSP; aS; uF	x															
Barn swallow *Hirundo rustica*		cSP,S; oF	x															
(Chickadees and Titmice)																		
Black-capped chickadee *Poecile atricapillus*		c	x					13 (ID)										
(Creepers and Nuthatches)																		
Brown creeper *Certhia americana*		o	x				18 (64)											
Red-breasted nuthatch *Sitta candensis*		oSp,F,W ; uS	x															
White-breasted nuthatch *Sitta carolinensis*		o																
(Wrens)																		
Rock wren *Salpinctes obsoletus*		Unk	x x				19 (89)											
House wren *Troglodytes aedon*		Unk					X2											
Marsh wren *Cistothorus palustris*		cSp, Su, F	x															
(Dippers)																		
American dipper *Cinculus mexicanus*		u					22 (ID)											
(Kinglets, Bluebirds, Thrushes)																		
Mountain bluebird *Sialia currucoides*		cSp,S; uF; oW	x															
Townsend's solitaire *Myadestes townsendi*		o						19 (ID)										
Veery *Catharus fuscesens*		Unk						19* (ID)										
Swainson's thrush *Catharus ustulata*		Unk	x															
American robin *Turdus migratorius*		a	x															
(Mockingbirds and Thrashers)																		

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Gray catbird *Dumetella carolinensis*		Unk	x															
Sage thrasher *Oreoscoptes montanus*		oSp,F; uS	x				22 (89)					PA SB/S DS					Type 5	
(Pipits)																		
American pipit *Anthus rubescens*		oSp,F																
(Waxwings)																		
Bohemian waxwing *Bombycilla garrulus*		rSp																
Cedar waxwing *Bombycilla cedrorum*		oSp,S																
(Shrikes)																		
Northern shrike *Lanius excubitor*		r																
Loggerhead shrike *Lanius ludovicianus*		oSP,S,F	x			R1; 9; 10	20 (80)										Type 3	
(Starlings)																		
European starling (Exotic) *Stumus vulgaris*		c	x															
(Vireos)																		
Warbling vireo *Vireo gilvus*		c						18 (ID)										
(Warblers)																		
Orange-crowned warbler *Vermivora celata*		Unk	x															
Yellow warbler *Demdoricha petechia*		cSp,S; oF	x				18 (64)											
Yellow-rumped warbler *Dendroica coronata*		cSp,S; aF	x					16 (64)										
Yellow-breasted chat *Icteria virens*		Unk																
American redstart *Setophaga ruticilla*		rSp																
MacGillivary's warbler *Oporornis tolmiei*		Unk	x				21 (ID)											

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Common yellowthroat *Geothlypis trichas*		uSp,S; oF	x															
(Tanagers)																		
Western tanager *Piranga ludoviciana*		uSp,S; cF	x				20 (ID)											
(Grossbeaks and Buntings)																		
Lazuli bunting *Passerina amoena*		Unk	x					19 (64)										
(Towhees and Sparrows)																		
Green-tailed towhee *Pipilo chlorurus*		oSp,F; uS	x					19 (ID)									Type 5	
Grasshopper sparrow *Ammodramus savannarum*		Unk					20 (64)		G5/S2B BL-SXS			PB G					Type 5	
House sparrow (Exotic) *Passer domesticus*		u	x															
Chi~~r~~pping sparrow *Spizella passerina*		oSp,F; uS	x															
Brewer's sparrow *Spizella breweri*		Unk	x			R1; 9; 10	24 (89)		G5/S3B			PA SB/S DS					Type 3	
Vesper sparrow *Pooecetes gramineus*		cSp,S; uF	x					16 (80)										
Lark sparrow X *Chondestes grammicus*		rSp					20 (89)											
Savannah sparrow *Passerculus sandwichensis*		cSp,S; uF	x															
Fox sparrow *Passerella iliaca*		uSp,S, oF	x															
Sage sparrow *Amphispiza belli*		Unk				9	25 (80 89)					PA SB/S DS					Type 3	
Song sparrow *Melospiza melodia*		cSp,S; uF	x															
Lincoln's sparrow *Melospiza lincolnii*		Unk	x															
White-crowned sparrow *Zonotrichia leucophys*		uSp,S; cF	x															

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American tree sparrow *Spizella arborea*		Unk																
Dark-eyed junco *Junco hyemalis*		cSp,S,F; uW	x					13 (ID)										
Lark bunting *Calamospiza melanocorys*		Unk																
Snow bunting *Plectrophenax nivalis*		oF,oW																
Bobolink *Dolichonyx oryzivorus*		oSp,F; uS	x															
(Blackbirds, Meadowlarks, and Orioles)																		
Brown-headed cowbird *Sitta pusilla*		cSp,S; uF	x															
Brewer’s blackbird *Euphagus cyanocephalus*		cSp,S; uF	x					15 (ID)									Type 3	
Red-winged blackbird *Agelaius phoeniceus*		cSp,S; uF; oW	x															
Western meadowlark *Sturnella neglecta*		cSp,S; uF; oW	x				18 (ID)											
Yellow-headed blackbird *Xanthocephalus xanthocephalus*		cSp,S; oF	x					18 (80)										
Common grackle *Quiscalus quiscala*		Unk																X-BR
Bullock’s Oriole *Leucosticte australis*		Unk	x					19* (ID)										
(Finches)																		
Black Rosy-finch *Lecosticte atrata*		Unk							G4/S3									
House finch *Carpodacus mexicanus*		Unk																
Pine siskin *Carduelis pinus*		uSp,S; cS	x					14 (ID)										
Lesser goldfinch *Carduelis psaltria*		Unk							G5/S2B BL-SW-SXS									
American goldfinch *Carduelis tristus*		uSp,S,F	x															

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Evening grosbeak *Coccothraustes vespertinus*		uSp,S,F																
Mammals																		
Masked shrew *Sorex cinereus*									G5/S4									
Vagrant shrew *Sorex vagrans*									G5/S4									
Water shrew *Sorex palustris*									G5/S4									
Merriam's shrew *Sorex merriami*									G5/S2 BL-SXS									
Little brown myotis *Myotis lucifugus*									G5/S5									
Yuma myotis *Myotis yumanensis*									G5/S3								Type 5	
Long-legged myotis *Myotis volans*									G5/S3								Type 5	
Long-eared Myotis *Myotis evotis*									G5/S3								Type 5	
Western small footed myotis *Myotis ciliolabrum*									G5/S4								Type 5	
Silver-haired bat *Lasionycteris noctivagans*									G5/S4									
Big brown bat *Eptesicus fuscus*									G5/S4									
Hoary bat *Lasiurus cinereus*									G5/S4									
Townsend's big-eared bat *Corynorhinus townsendii*									G4/S2 BL-SW- SXS-OW								Type 3	
Pallid bat *Antrozous pallidus*									G5/S1									
Townsend's ground squirrel *Spermophilus townsendii*									G5/S5									

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Uinta ground squirrel *Spermophilus armatus*									G5/S4									X- BL
Least chipmunk *Tamius minimus*									G5/S5									
Yellow-bellied marmot *Marmota flaviventris*		r							G5/S5									
Wyomong ground squirrel *Spermophilus elegans*									G5/S3 BL A-SXS									
Idaho Pocket gopher *Thomomys idahonoensis*									G4/S3 BL A-SXS									
Northern pocket gopher *Thomomys talpoides*		a	x						G5/S3									
Beaver *Castor canadensis*		u	x						G5/S5									
Great Basin pocket mouse *Perognathus parvus*									G5/S5									
Western harvest mouse *Reithrodontomys megalotis*									G5/S5									
Deer mouse *Peromyscus maniculatus*		c	x						G5/S5									
Northern grasshopper mouse *Onychomys leucogaster*									G5/S4									
Bushy-tailed wood rat *Neotoma cinerea*		r							G5/S5									
Meadow vole *Microtus pennsylvanicus*		c	x						G5/S5									
Montane vole *Microtus montanus*		c	x						G5/S5									
Long-tailed vole *Microtus longicaudus*									G5/S5									
Sagebrush vole *Lemmiscus curtatus*		r							G5/S4									
Muskrat *Ondatra zibethicus*		c	x						G5/S5									
Western jumping mouse *Zapus princeps*									G5/S5									

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Porcupine *Erithizon dorsatum*		r							G5/S5									
Mountain cottontail *Sylvilagus nuttalli*		u							G5/S5									
Black-tailed jackrabbit *Lepus californicus*		u							G5/S5									
Coyote *Canis latrans*		c	x						G5/S5									
Red fox *Vulpes vulpes*		c	x						G5/S5									
Ermine *Mustela erminea*		u							G5/S5									
Long-tailed weasel *Mustela frenata*									G5/S5									
Mink *Neovison vison*		u							G5/S5									
Raccoon *Procyon lotor*		c	x						G5/S4									
Badger *Taxidea taxus*		u	x						G5/S5									
Western spotted skunk *Spilogale gracilis*									G5/S5									
Striped skunk *Mephitis mephitis*		a	x						G5/S5									
River otter *Lontra canadensis*		r							G5/S4									
Puma *Puma concolor*		r							G5/S4									
Bobcat *Lynx rufus*		r							G5/S4									
Elk *Cervus elaphus*		u							G5/S5									
Mule deer *Odocoileous hemionus*		u							G5/S5									
Moose *Alces alces*		c	x						G5/S4									
Amphibians																		

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Tiger salamander *Ambyystoma tigrinum*									G5/S5									
Western toad *Bufo boreas*			x						G5/S4									
Striped chorus frog *Psudacris triseriata*									G5/S4									
Northern Leopard frog *Rana pipiens*									G5/S2 BL-SW- A-SXS								Type 2	
Reptiles																		
Sagebrush lizard *Sceloporus graciosus*									G5/S5									
Rubber boa *Charina bottae*									G5/S5									
Gopher snake *Pituophis melanole*									G5/S5									
Western terrestrial garter snake *Thamnophis elegans*									G5/S5									
Common garter snake *Thamnophis sirtalis*									G5/S5									
Western rattlesnake *Crotalus viridus*		r																
Ringneck snake *Diadophis pucctatus*									G5/S2								Type 5	
Racer *Coluber constrictor*									G5/S5									
Fish																		
Bonneville cutthroat trout *Oncorhychus clarki*	x	c	x						G4T4/S3 BL-SW- A						x		Type 2	
Rainbow trout *Oncorhychus mykiss*			x															
Brown Trout *Salmo trutta*			x															
Carp *Cyprinus carpio*		a	x															

Species	Refuge Purpose Species	Species Abundance	Breeds/Nests Locally	BIDEH	Federal T&E	Birds of Conservation Concern-USFWS R1& BCR 9 and 10	ID Partners in Flight High Priority Species	ID Partners in Flight Mod Priority Species	Idaho Comprehensive Wildlife Conservation Plan Species of Greatest Conservation Need	Intermountain West Regional Shorebird Plan Regionally Important Species	Intermountain West Waterbird Conservation Plan	Intermountain West Coordinated Implementation Plan	N.A. Waterbird Conservation Plan	N.A. Waterfowl Management Plan Breeding/Non-Breeding	USFWS Idaho Partners for Fish and Wildlife Program	Conservation Strategy for Southeastern Idaho Wetlands	BLM Sensitive Species	TNC Ecoregional Conservation Plan
Redside shiner *Richardsonius balteatus*																		
Dace *Rhinicthys* spp.																		
Leatherside chub *Snyderichthys copei*																	Type 3	
Mottled sculpin *Cottus bairdi*																		
Gastropods																		
Green River pebblesnail *Flumimicola coloradonensis*									G2/S2 BL									
Bear Lake springsnail *Pyrgulopsis pilsbryana*									G2/S2 BL									
FLORA																		
Plants																		
Red glasswort *Salicornia rubra*									G4/S1							x		
Purple Meadow-rue *Thalictrum dasycarpum*									G5/S2									

Table E-3 Key

Species Abundance:

Season
Sp = Spring
S = Summer
F = Fall
W = Winter

Occurs:
a = Abundant: a common species which is very numerous
c = Common: certain to be seen in suitable habitat
u = Uncommon: present, but not certain to be seen
o = Occasional: seen only a few times during season
r = Rare: known to be present, but not every year

BIDEH:
x= Species significantly contributes to refuge Biological Diversity, Integrity, and Environmental Health

Federal T&E Species:
FE = Fed. Endangered
FT = Fed. Threatened
FC = Fed. Candidate
FCo = Fed. Spec. of Concern

Birds of Conservation Concern
R1= USFWS Region 1(WA,OR,ID)
9= Great Basin Bird Conservation Region (BCR 9)
10)= Northern Rockies Bird Conservation Region (BCR 10)

ID Partners in Flight (PIF):
Number (e.g., 24): Total PIF species score
(ID)= Statewide
(80)= Basin and Range Physiographic Area
(64)= Central Rocky Mtns Physiographic Area
High Priority= Focal species whose total PIF score ≥ 22, or total score 18-21 and Area of Importance + Population Trend ≥ 8
*= Species that are habitat specialists

State Wildlife Action Plan: Identified by plan as Species of Greatest Conservation Needs.
GX or SX= Presumed extinct or extirpated: not located despite intensive searches and virtually no likelihood of rediscovery.
GH or SH= Possibly extinct or extirpated (historical): historically occurred, but may be rediscovered.
G1 or S= Critically imperiled: at high risk because of extreme rarity (often five or fewer occurrences), rapidly declining numbers, or other factors that make it particularly vulnerable to rangewide extinction or extirpation.
G2 or S2= Imperiled: at risk because of restricted range, few populations (often 20 or fewer), rapidly declining numbers, or other factors that make it vulnerable to rangewide extinction or extirpation.
G3 or S3= Vulnerable: at moderate risk because of restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors that make it vulnerable to rangewide extinction or extirpation.
G4 or S4= Apparently secure: uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 or S5 Secure= common, widespread, and abundant.
N= Nonbreeding Conservation status refers to the non-breeding population of the species.
B= Breeding population of the species
N= Non-breeding population of the species
M= Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention.

BL= Within Bear Lake Section of Idaho Comprehensive Wildlife Conservation Strategy

Priority species in priority habitat of the Bear Lake Section is indicated by:

A= Arable land (Agriculture)
- Seeded Perennial Grassland
- Disturbed and Invasive Grass and Forb

UDF= Upland Deciduous Forest
- Rocky Mountain Aspen Forest and Woodland (Key Ecological Section)
- Rocky Mountain Bigtooth Maple Ravine Woodland (Key Ecological Section)
- Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (Key Ecological Section)
- Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (Key Ecological Section)

SXS= Southern Xeric Shrubland and Steppe
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Columbia Plateau Low Sagebrush Steppe
- Columbia Plateau Steppe and Grassland
- Inter-Mountain Basins Big Sagebrush Steppe
- Inter-Mountain Basins Montane Sagebrush Steppe
- Inter-Mountain Basins Semi-Desert Shrub-Steppe
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland (Key Ecological Section)

SW= Southern Wetland
- Inter-Mountain Basins Greasewood Flat
- North American Arid West Emergent Marsh

OW= Open Water

Intermountain West Regional Shorebird Plan:
Regional Priorities= Very High, High, Moderate, Low, Non-Priority
First Number (i.e., x/)= Great Basin Bird Conservation Region (BCR 9)
Second Number (i.e., /x)= Northern Rockies Bird Conservation Region (BCR 10)
Third Number (i.e., / /x)= Southern Rockies Bird Conservation Region (BCR 16)

Intermountain Regional Shorebird Plan: 1 = no risk; 5 = highly imperiled
Moderate Priority= Not high priority species, but should be considered in habitat management or monitoring plans

Intermountain West Waterbird Conservation Plan:
Regional Priorities= High, Moderate
9= Great Basin Bird Conservation Region (BCR 9)
10= Northern Rockies Bird Conservation Region (BCR 10)

BLM Sensitive Species
The column titled “USDI Bureau of Land Management” indicates designations assigned by that agency. National policy directs State Directors to designate BLM sensitive species in cooperation with the State fish and wildlife agency (BLM manual 6840). The Idaho State BLM Office updated these designations in 2003. The sensitive species designation is normally used for species that occur on BLM public lands and for which BLM has the capability to significantly affect the conservation status of the species through management.

Type 1: Threatened, endangered, proposed, and candidate: species listed by the FWS or NMFS as threatened or endangered, or proposed or candidates for listing under the Endangered Species Act of 1973.

Type 2: Rangewide/Globally imperiled: species that are experiencing significant declines throughout their range with a high likelihood of being listed in the foreseeable future due to their rarity and/or significant endangerment factors. This includes species ranked by the NatureServe heritage program network with a Global rank of G1-G3 or T1-T3 or recent data indicate that the species is at significant rangewide risk and this is not currently reflected by heritage program global ranks.

Type 3: Regional/State imperiled: species that are experiencing significant declines in population or habitat and are in danger of regional or local extinctions in Idaho in the foreseeable future if factors contributing to their decline continues. This includes Idaho BLM sensitive species that (a) are not in Type 2, (b) have an S1 or S2 State rank (exception being a peripheral or disjunct species), or (c) score high (18 or greater) using the Criteria for Evaluating Animals for Sensitive Species Status or (d) other regional/national status evaluations (e.g., Partners in Flight scores) indicate significant declines.

Type 4: Peripheral: species that are generally rare in Idaho with the majority of their breeding range largely outside the State (Idaho Conservation Data Center 1994). This includes sensitive species that have an S1 or S2 state ranking, but are peripheral species to Idaho.

Type 5: Watch list: these species are not considered BLM sensitive species and associated sensitive species policy guidance does not apply. Watch list species include species that may be added to the sensitive species list depending on new information concerning threats, species' biology or Statewide trends. The Watch List include species with insufficient data on population or habitat trends or the threats are poorly understood. However, there are indications that these species may warrant special status species designation and appropriate inventory or research efforts should be a management priority.

TNC Utah and Wyoming Ecoregional Conservation Plan
x = Priority species
BR = Priority species for Bear River Megasite

E.2 Habitat and Ecosystem Associations at Bear Lake NWR

Table E-4. Habitat and Ecosystem Associations at Bear Lake NWR

Habitats	Habitat Attributes and Functions	Natural Processes	Limiting Factors
Open Water Habitat sub-types • Low water clarity (NTU <10) • High water clarity (NTU >50)	Open water habitat is vital to providing piscivore access to refuge fisheries in wetland habitats and maintaining open stream channels for sensitive fish spawning access (e.g., Bonneville cutthroat trout). While not as essential as Submergent habitat to a wide diversity of wetland dependent wildlife, it is important to maintain for a select few species which require open water habitat for their existence. High Clarity open water habitat is only present in impounded wetland units on Bear Lake NWR, Thomas Fork Unit, and Oxford Slough WPA. Low Clarity open water habitat is currently found on Mud Lake and impounded units that have not recently received carp control.	Located very low in the landscape with a perennially flooded hydroperiod, deep flooding depths (>35 inches) through the winter. Naturally occurring open water habitat within the marsh is a primary byproduct of hydroperiod and herbivory. Sustained high water increases sedimentation and decreases water clarity and submerged aquatic vegetation germination rates, thereby increasing open water habitat, with muskrat herbivory maintaining open water habitats in shallow deep emergent depressions. Inversely, natural drought decreases inundation of deep water habitats, stimulating increases in submerged aquatic germination and decreasing the availability of open water areas. The introduction of carp in the system is an unnatural factor leading to increased herbivory of submerged aquatic vegetation, low water clarity, and a higher proportion of open water habitat than would occur under natural processes.	Improperly sustained low hydroperiod in carp controlled units create significant sediment or peat accumulation, encroachment and expansion of bulrush/cattail, or annual winter freezing to marsh substrate, and lead to reduced over-winter muskrat survival. Adequate infrastructure (impoundment levees and carp screens) required to reduce carp ingress in the Mud Lake Unit.

Habitats	Habitat Attributes and Functions	Natural Processes	Limiting Factors
Submerged <u>Habitat sub-types</u> • Early Successional: Submerged habitat comprised of seed and tuber producing submerged vegetation such as pondweeds and chara. • Late Successional: Submerged habitat comprised primarily of leafy vegetation such as water milfoil, coontail, and mare's tail.	Submergent vegetation is the most widely used, yet least abundant palustrine emergent habitat type on the Refuge. Providing leafy browse for grazing species, seeds for granivorous species, and invertebrate resources for molting, nesting, and young waterbirds, it provides the food reserve function within the hemi-marsh system. At present, <60% of refuge submergent habitat is comprised of early successional seed producing species while >40% of refuge submergent habitat is comprised of late successional leafy browse species.	Permanently flooded wetlands >6" and <36" deep. Requires high water clarity for germination and photosynthesis.	Sedimentation and reduced germination, excessive natural herbivory (waterbirds), unnatural herbivory and disturbance (carp); disturbance and trampling from administrative or recreational boating and/or hunting; invasive species introductions (Eurasian milfoil). Carp control is required to reach a desired future condition of approximately 50% of baseline open water habitat converted to submergent habitat.
Deep Emergent Comprised primarily of hardstem bulrush, but also containing cattail. <u>Habitat sub-types</u> • Early Successional (Deep emergent habitat comprised of <30% residual vegetation coverage from previous years growth) • Mid Successional (Deep emergent habitat comprised of 30%-90% residual vegetation coverage) • Late Successional (Deep emergent habitat comprised	Different levels of residual vegetation are desirable to different resources of concern based on seasonal life history requirements. Emergent vegetation at varying levels of residual coverage provides nesting habitat and cover for a variety of wetland dependent wildlife species. Providing overwater nesting sites for wetland dependent bird species; invertebrate substrate for foraging waterbirds and fish; lodge materials and loafing sites for aquatic mammals, as well as providing shade and cover for all species, emergent vegetation forms the "housing" requirement within the hemi-marsh environment. Early Successional deep emergent habitat is a direct result of non-hydrologic disturbance (drought induced fire) and typically lasts <2 years following burn.	Permanent hydroperiod deep flooding depth (60-39 inches), standing water or saturated soils typically year-round, with increased muskrat herbivory ("Eat-outs") creating openings during periods of sustained high water years through the winter. During periods of severe drought, deep marsh fires occurred and temporarily (<2 years) decreased emergent stem density. Tall emergent vegetation efficiently removes nitrates by providing higher amounts of organic substrate for denitrifying bacteria and limiting sunlight from the water column, promoting anaerobic conditions for denitrification.	

Habitats	Habitat Attributes and Functions	Natural Processes	Limiting Factors
of >90% residual vegetation coverage).	Mid Successional Deep emergent habitat falling within 30%-90% residual cover is a typical mid-successional response to hydrologic or fire disturbance. Late Successional Deep Emergent Habitat has greater than 90% residual cover and typically occurs under a static hydroperiod >7 years post disturbance.		
Shallow Emergent Habitat sub-types • Freshwater shallow emergent habitat comprised primarily of hardstem bulrush • Alkali shallow emergent comprised primarily of alkali bulrush and established in water typically >1,000 ppm Total Dissolved Solids (TDS)	Shallow emergent habitat type contains plant species such as alkali bulrush and annual weedy plants which provide an additional food reserve function within the hemi-marsh complex. Typically, deep emergent vegetation forms as a concentric ring around open water/submergent habitats, while shallow emergent vegetation provides the interface with the ephemeral wet meadow zone. As such, the shallow emergent zone functions similarly to the deep emergent zone for those wetland dependent wildlife species that require wet meadow and adjacent uplands to fulfill their life history strategies. Significant stands of alkali dominant (e.g., alkali bulrush) shallow emergent marsh currently exist only in the Rainbow Complex (Bear Lake NWR) and Oxford Slough WPA. Approximately 90% of the shallow emergent community is currently dominated by hardstem bulrush which covers approximately 30% of all refuge units. With the exception of having numerous small open water and/or submergent habitat pools intermixed within this habitat type, the current condition is desirable.	Semi-permanently to ephemerally flooded habitat typically flooded to a depth of 3"-24". The primary difference in processes between deep and shallow emergent habitat is water permanence. Shallow emergent vegetation is similar to deep emergent vegetation except that depths within this zone are typically shallower resulting in less permanency. Shallow emergent habitats are occasionally dewatered during summer months (semi-permanent), while deep emergent habitats are permanently flooded year-long.	

Habitats	Habitat Attributes and Functions	Natural Processes	Limiting Factors
Wet-Meadow Habitat sub-types • Early successional (low residual) wet meadow class occurs where <20% of the community contains dense residual cover. • Late successional (high residual) wet meadow class occurs where >90% of the community contains dense residual cover and/or >20% of the community is forb dominant	Ranging from moist soil during late summer to as much as 2 feet of water during spring, it is this seasonal fluctuation that produces and then concentrates food reserves for most wetland dependent wildlife species. The diversity and complexity of plant species within ephemeral marsh habitats provides ideal substrate for invertebrates, which comprise 90% of most waterbird diets during summer months; however, with fall flooding during migration, the annual seeds produced by these plants additionally provide forage for migratory waterbirds as well.	Ephemeral hydroperiod (April-July/August) with a moderate flooding depth (6-30"). Located in soils that are moist to saturated during the growing season. Typically holds surface water through late summer, with only isolated micro-depressions or sloughs holding water into the early fall. Typically only holds surface water till late Spring, but may be receive no surface flooding in very dry years. Wet meadow habitats are distinct from alkali meadows primarily by the quality of water typically hydrating the marsh. Where freshwater (<1,000 ppm TDS) input is the norm, wet meadow plants become established.	Conversion to haying or agriculture, diverted waters and modified (shortened) seasonal hydroperiods; invasive species.
Alkali Meadow Habitat sub-types • Early successional (high heterogeneous diversity) alkali meadow class occurs where alkali meadow contains >1 halophytic plant species sharing dominance within the plant community. • Late successional (low homogenous diversity) alkali wet meadow class occurs where red glasswort is	Less diverse than wet meadow habitats and typically less canopy coverage, the low stature, open nature of this habitat type lends itself to migration use by waterfowl and shorebirds, as well as nesting/brood rearing habitat for shorebird species such as the American avocet and long-billed curlew. Approximately 60% of all refuge alkali meadow is currently in early successional status. Typical species include pickelweed, red goosefoot, oakleaf goosefoot and flood/alkali tolerant saltgrass. Late successional status includes a relatively homogenous alkali meadow habitat where red glasswort is dominant within the plant community.	Ephemeral to semi-permanently flooded alkali marsh (>1,000 ppm TDS) dominated by low stature, flood tolerant, annual and perennial plants. Alkali meadow is similar to wet meadow except that concentrated water is typically greater than 1,000 ppm TDS, thus, a specialized group of plants known as halophytes become established through successive years. Late successional alkali meadow communities are dominant where water quality input is >1,000 ppm TDS or where hydrology has favored natural evaporative areas over time.	Climate change, Extreme drought or flood conditions; groundwater depletion; grazing; development; conversion to agriculture; invasive species;

Habitats	Habitat Attributes and Functions	Natural Processes	Limiting Factors
dominant within the plant community.			
Alkali Upland Meadow Habitat sub-types • Early successional Alkali Upland comprised of <10% forbs and <90% residual vegetation. • Late successional Alkali Upland comprised of >10% forbs and/or >90% residual vegetation.	An uncommon habitat located in isolated shallow pans; probably flooded in spring. Often has a salt crust in summer, sparsely vegetated with patches of bare soil Alkali Upland Meadows provide a vital nesting area for sensitive species such as American avocet and long-billed curlew. Without the close juxtaposition of alkali uplands to alkali wet meadows, these sensitive species would no longer frequent refuge habitat because these habitats in combination provide the components necessary to fulfill their life history strategy.	Upland habitat differs from wetland habitat processes based on the seasonal periodicity of hydration. Upland habitats can be seasonally flooded to as much as three but usually for less than 10 days in the spring. Similar to the relationship between wet and alkali meadows, alkali and meadow grass upland distribution vary by soil pH and conductivity as influenced by site specific evaporation rates.	Extreme drought or flood conditions; groundwater depletion; grazing; development; conversion to agriculture; invasive species;
Meadow Grass Upland Habitat sub-types • Early successional Meadow Grass habitat comprised of <10% forbs and <90% residual vegetation. • Late successional Meadow Grass comprised of >10% forbs and/or >90% residual vegetation.	Meadow grasslands are comprised of native grass species such as Great Basin wildrye and tall wheatgrass. Typically, meadow grass species are taller in stature and have considerably more structural complexity than alkali uplands and is, therefore, used by a wider range of wildlife species. Similar to the juxtaposition of alkali uplands with alkali meadows, meadow grass in close proximity to wet meadow is also vitally important to a different complement of wildlife species. Upland nesting waterfowl and shorebird species such as Wilson's phalarope are just a few of the examples.	Meadow grass upland sites are >2' higher than average spring high water level and are more common in higher elevations on the north side of Bear Lake Characterized by pH neutral soils and less dissolved salt, thus, a wider range of plant species can grow within this habitat type.	Conversion to refuge croplands, invasive species, fire, grazing, haying, disturbance, development

Habitats	**Habitat Attributes and Functions**	**Natural Processes**	**Limiting Factors**
Shrub Upland <u>Habitat sub-types</u> • Early successional Shrub habitat comprised primarily of rubber rabbitbrush • Late successional Shrub comprised primarily of alkali big greasewood • Lake successional climax Shrub comprised primarily of big sagebrush, with dominant overstory canopy coverage >50%	Shrub habitat is the least variable of all refuge habitat types but serves a complementary function in the wetland complex by providing additional habitat for upland nesting wildlife. Additionally, shrub habitats provide winter cover for big game species such as elk and mule deer, while serving as the primary habitat type used by specialists such as sage grouse. Shrub habitat on refuge lands has been identified as a potential reintroduction site for sage grouse. Compared to sagebrush habitat surrounding refuge lands, the proportional distribution on the Refuge is quite low; however, the quality of refuge shrub habitat is far superior to any adjacent shrub habitat.		Not on the Refuge, but in the area: Residential and resort development; grazing; conversion to agriculture?
Riparian <u>Habitat sub-types</u> • Willow woodland • In-stream Aquatic	A locally uncommon and nationally decreasing habitat type found in small but important acreages at all three refuge units. Riparian rivals the diversity found in wet meadow habitats. Willow overstory and a diverse mix of wet meadow related plant understory make palustrine forested habitats critically important for a variety of migratory and breeding landbird species. Additionally, stream courses such as St. Charles Creek (Bear Lake NWR) and Thomas Fork Creek provide critical spawning access for the State threatened Bonneville cutthroat trout (BCT). Both of these spawning tributaries have been identified as critical to the long-term survival of BCT.	. Typically subject to an ephemeral, spring flooding regime (>0"-12" in depth).	Hydroperiod, grazing, water quality, water quality, beaver removal, seed source, grazing, legal and illegal diversions, altered channel morphology,

Habitats	Habitat Attributes and Functions	Natural Processes	Limiting Factors
Agriculture Habitat sub-types • Small Grain (wheat or spring barley) • Summer Fallow • Legumes (Annual Clover) • Legumes (Alfalfa)	Agricultural habitats (crop fields) comprise a small percentage of refuge lands but serve a critical function for fall migratory waterfowl and landbirds. At a point where carbohydrates are required for migration, species such as Canada geese, greater sandhill cranes, and dabbling ducks can find abundant grain to fulfill this life history requirement. Additional benefits are provided for spring/summer grazing by geese and cranes as new growth shoots become available.	N/A	Funding, shortened growing season, and low precipitation, weeds, non-refuge crop depredation, promises to local ranchers for hay.

E.3 Priority Refuge Resources of Concern and Focal Resources

Focal resources (Table E-6) are a prioritized subset of the Bear Lake NWR Priority Resources of Concern from (Table E-5) and represent legally mandated species and natural communities for management of Bear Lake NWR.

The species selected as priority resources of concern from these plans support the following NWRS mandates:

- Support refuge purposes and the NWRS mission;
- Conserve biological integrity, diversity, and environmental health
- Fulfill FWS trust resource responsibilities (migratory birds, threatened and endangered species, interjurisidicational fish, and marine mammals
- High regional conservation priority

Achieving healthy, functional ecosystems for native fish, wildlife, and plants on the Refuge can be described through the habitat requirements of "focal species" highly associated with important attributes or conditions within habitat types. As described by Altman (2000), the rationale for using focal species is to emphasize habitat attributes most in need of conservation or most essential for functional ecosystems. By managing for a group of species (guild) representative of important components in a functioning ecosystem, the elements of biological integrity, diversity, and environmental health will also be addressed.

E.3.1 Selection of Priority Refuge Resources of Concern

Refuge staff extensively documented and reviewed 13 regional, flyway, and State plans or lists to classify the conservation status and management priority of Bear Lake NWR fish, wildlife, and plant species (Appendix A: Resources of Concern). Seven of these plans predominately center on avian species (e.g., birds, shorebirds, waterbirds, waterfowl). Four plans or lists prioritized not only avian species, but all species of great conservation need. Of these four plans, the Idaho Conservation Strategy for Southeast

Idaho Wetlands is the narrowest in scope, focusing singularly on wetland habitats. The Idaho Fish and Game Idaho Comprehensive Wildlife Conservation Strategy, priority species list of the USFWS Partners for Fish and Wildlife program, and The Nature Conservancy (TNC) Ecoregional Assessments for the Rocky Mountains and Wyoming Basin, each identified and ranked the conservation need for a suite of species across multiple habitats.

Resources of Concern

The Comprehensive List of Bear Lake NWR Resources of Concern (Table E-3) contains the full array of species and plant communities addressing a broad range of conservation needs. Refuge staff selectively reduced this list to those species and plant communities that will be managed to fulfill obligations to refuge purposes, Refuge System resources of concern, and biological integrity, diversity, and environmental health. This resulted in a subset of Bear Lake NWR Resources of Concern (Table E-5) containing 141 species of the greatest conservation need, including all four implicitly mentioned refuge purposes species (e.g., Canada goose, redhead, sandhill crane, and Bonneville cutthroat trout) and all 33 species identified in the Bear Lake Section of the Idaho Comprehensive Wildlife Conservation Strategy (ICWCS). An additional 20 ICWCS species, not identified as Bear Lake Section species of the greatest conservation need, but known to inhabit Bear Lake NWR with State rankings of S1 (Critically Imperiled), S2 (Imperiled), or S3 (Vulnerable), were added to the refuge subset of Resources of Concern list. Ten species identified in the TNC Ecoregional Assessments were included in the subset list, as were 21 USFWS Birds of Conservation Concern from Region 1 (n=11), BCR 9-Great Basin (n=16), BCR 10-Northern Rockies (n=12), and BCR 16-Southern Rockies (n=12). A total of 45 high priority and 30 moderate priority birds from the Idaho Partners in Flight Plan and nine high priority and six moderate priority birds from the Intermountain West Regional Shorebird Plan, were identified as refuge Focal Species. The Focal Species list also includes 37 BLM sensitive species known to inhabit the Refuge and 12 waterfowl species of moderately high or greater breeding or non-breeding priority, as identified in the North America Waterfowl Management Plan. The Conservation Strategy for Southeastern Idaho Wetlands identified 15 species-of-concern, including one plant (red glasswort) and one bird (double-crested cormorant) not found in any other plan or list reviewed. The North America Waterbird Conservation Plan identified one high, nine moderate, and four low priority species of conservation concern that inhabit Bear Lake NWR, including one species (herring gull) unidentified as a priority in any other conservation plan. Refuge staff also performed an internal assessment of refuge species that contribute significantly to impacting (positively or negatively) the biological integrity, diversity, and environmental health of the Refuge, but are not found in any other conservation plan or list. This assessment yielded three additional species (e.g., canvasback, muskrat, and European carp) for the subset list of Resources of Concern for Bear Lake NWR.

Focal Resources

Refuge staff selectively filtered the list of 141 Priority Refuge Resources of Concern for Bear Lake NWR from Table E-5 and developed a Resources of Concern list of species which represent the collective needs of the larger groups of species or communities on the Refuge. In total, 63 representative Focal species were identified for Bear Lake NWR (Table E-6). Collectively, these 63 focal species are representative of the guilds of species within the broad wetland and upland habitats of both Bear Lake NWR and Oxford Slough WP.

Comparison of Focal Resources

Table E-7 was developed to aid refuge staff in the selection of Conservation Targets, by assessing species, breeding, and foraging guilds and the breeding and foraging life history of the 63 Refuge Focal Species.

Priority Habitats of Focal Species

Table E-8 compares the primary breeding and foraging strategies of each of the 63 Focal Species at Bear Lake NWR within each refuge habitat.

Table E-5. Priority Refuge Resources of Concern (n=141) representing the species of the greatest conservation need, refuge purposes, and the biological integrity of Bear Lake NWR

Swans
Trumpeter swan
Tundra swan
Geese
Canada goose
Greater white-fronted goose
Dabbling Ducks
American widgeon
Cinnamon teal
Mallard
Northern pintail
Wood duck x
Diving Waterbirds
Barrow’s goldeneye
Bufflehead
Common loon
Hooded merganser
Lesser scaup
Canvasback
Redhead
Ring-necked duck
Ruddy duck
Grebes
Eared grebe
Clarks/Western grebe
Pelicans and Cormorants
Double crested cormorant
American white pelican
Wading Birds
American avocet
American bittern
Black-crowned night heron
Black-necked stilt
Cattle egret
Great egret
Snowy egret
Sandhill crane
Marsh Birds
White-faced ibis
Shorebirds
Common snipe
Greater yellowlegs
Killdeer
Long-billed curlew
Willet
Wilson’s phalarope
Western sandpiper
Least sandpiper
Spotted sandpiper
Long-billed dowitcher
Red-necked phalarope
Marbled godwit
Solitary sandpiper
Semipalmated plover
Sanderling
Terns and Gulls
Black tern
Franklin’s gull
Forster’s tern
Caspian tern
California gull
Herring gull
Raptors
Bald eagle
Burrowing owl
Golden eagle
Ferruginous hawk
Merlin
Northern goshawk
Northern Harrier
Osprey
Peregrine falcon
Prairie falcon
Sharp-shinned hawk
Short-eared owl
Swainson’s hawk
Corvids
Black-billed magpie
Upland Game Birds
Sharp-tailed grouse
Sage grouse
Hummingbirds
Rufous hummingbird
Calliope hummingbird
Woodpeckers
Lewis woodpecker
Northern flicker
Flycatchers
Olive-sided flycatcher
Western wood pewee
Willow flycatcher
Hammond’s flycatcher
Gray flycatcher
Dusky flycatcher
Larks
Horned lark
Swallows
Violet-green swallow
Chickadees and Titmice
Black-capped chickadee
Creepers and Nuthatches
Brown creeper
Wrens
Rock wren
Dippers
American dipper
Kinglets, Bluebirds, Thrushes
Townsend’s solitaire
Veery
Mockingbirds and Thrashers
Sage thrasher
Shrikes
Loggerhead shrike
Vireos
Warbling vireo
Warblers
Yellow warbler
Yellow-rumped warbler
MacGillivary’s warbler
Tanagers
Western tanager
Grosbeaks, Buntings
Lazuli bunting
Towhees and Sparrows
Green-tailed towhee
Grasshopper sparrow
Brewer’s sparrow
Vesper sparrow
Lark sparrow
Sage sparrow
Dark-eyed junco
Blackbirds, Meadowlarks, Orioles
Brewer’s blackbird
Yellow-headed blackbird
Common grackle
Bullock’s oriole
Western meadow lark
Finches
Black-rosy finch
Lesser goldfinch
Pine siskin
Mammals
Gray wolf
Merriam’s shrew
Yuma myotis
Long-legged myotis
Long-eared myotis
Western small-footed myotis
Townsend’s big-eared bat
Palid bat
Uinta ground squirrel
Wyoming ground squirrel
Idaho pocket gopher
Northern pocket gopher
Muskrat
Amphibians
Northern leopard frog
Reptiles
Ringneck snake
Fish
Northern leatherside chub
European carp
Bonneville cutthroat trout
Gastropods
Green river pebblesnail
Bear river springsnail
Plants
Purple meadow-rue
Red galsswort

Table E-6. Focal Resources (n=63) for Bear Lake NWR

Swans
Trumpeter swan
Geese
Canada goose(*)
Dabbling Ducks
American widgeon
Mallard
Northern pintail
Diving Waterbirds
Canvasback
Redhead (*)
Grebes
Eared grebe
Clarks/Western grebe
Pelicans and Cormorants
Double crested cormorant
American white pelican
Wading Birds
American avocet
American bittern
Black-crowned night heron
Black-necked stilt
Great egret
Cattle egret
Snowy egret
Sandhill crane (*)
Marsh Birds
White-faced ibis
Shorebirds
Long-billed curlew
Wilson's phalarope
Willett
Long-billed dowitcher
Red-necked phalarope
Marbled godwit
Solitary sandpiper
Semipalmated plover
Sanderling
Terns and Gulls
Black tern
Franklin's gull
Forster's tern
Caspian tern
California gull
Raptors
Bald eagle
Burrowing owl
Merlin
Swainson's hawk
Short-eared owl
Ferruginous hawk
Peregrine falcon
Corvids
Black-billed magpie
Upland Game Birds
Sharp-tailed grouse
Sage grouse
Finches
Lesser goldfinch
Blackbirds
Yellow-headed blackbird
Common grackle
Sparrows
Brewer's sparrow
Shrikes
Loggerhead shrike
Towhees and Sparrows
Grasshopper sparrow
Mammals
Merriam's shrew
Townsend's big-eared bat
Idaho pocket gopher
Wyoming ground squirrel
Uinta ground squirrel
Muskrat
Amphibians
Northern leopard frog
Fish
European carp
Bonneville cutthroat trout (*)
Gastropods
Green river pebblesnail
Bear river springsnail
Plants
Purple meadow-rue
Red glasswort

(*): Implicit refuge purpose species

Table E-7. Comparison of Focal Resources (n=63) Life-history, Breeding and Foraging Strategies, and Guilds of Bear Lake NWR

				Life History Characteristics						
	Guilds			Breeding		Foraging				
Species	**Species Guild**	**Breeding Guild**	**Foraging Guild**	**Breeding Strategy**	**Primary Breeding Habitat**	**Primary Foraging Habitat**	**Foragin g Depth**	**Spring Migration**	**Summer Brood Rearing**	**Fall Migration**
Trumpeter swan	Waterfowl	Independent-Specialist	Deep Grazing Herbivore	I	Open Water, Hemi Marsh	Submergent	6"-36"	Leaves; Seeds; Tubers and Small grain, Insects	Leaves, Insects	Leaves, Seeds, Tubers, Small Grain
Western Canada goose	Waterfowl	Independent-Generalist	Grazing Herbivore	I	Wet Meadow, Meadow Grass, Deep Emergent	Meadow Grass, Agriculture	0"-24"	Browse, Small Grain	Browse, Invertebrates, Leaves	Seeds, Small Grain
Canvasback	Waterfowl	Independent-Specialist	Deep Diving Omnivore	II	Deep Emergent, Hemi Marsh	Submergent, Hemi Marsh	12"-36"	Leaves, Insects, Gastropods	Insects, Gastropods	Leaves, Seeds
Redhead	Waterfowl	Independent-Specialist	Deep Diving Omnivore	II	Deep Emergent, Hemi Marsh	Submergent, Hemi Marsh	12"-36"	Leaves, Insects	Invertebrates	Leaves, Seeds
Northern pintail	Waterfowl	Independent-Generalist	Shallow Omnivore	II	Shrub	Shallow Marsh, Submergent	0"-12"	Leaves, Small Grain, Invertebrates	Invertebrates, Leaves	Leaves, Seeds, Annual Seeds, Small Grain,
Mallard	Waterfowl	Independent-Generalist	Shallow Omnivore	II	Meadow Grass	Shallow Marsh, Submergent	0"-18"	Leaves, Small Grain, Invertebrates, Fish	Invertebrates, Leaves, Fish	Leaves, Seeds, Annual Seeds, Small Grain,
American widgeon	Waterfowl	x	Grazing Herbivore	II	x	Meadow Grass	0"-18"	Leaves, Insects	Leaves, Insects	Leaves, Seeds, Annual Seeds
Greater Sandhill crane	Wading Bird	Independent-Generalist	Foraging/ Probing Omnivore	I	Shallow Marsh, Wet Meadow	Wet Meadow, Agriculture	0"-18"	Browse	Browse, Invertebrates, Amphibians	Small Grain

	Guilds			Life History Characteristics						
				Breeding		Foraging				
Species	**Species Guild**	**Breeding Guild**	**Foraging Guild**	**Breeding Strategy**	**Primary Breeding Habitat**	**Primary Foraging Habitat**	**Foragin g Depth**	**Spring Migration**	**Summer Brood Rearing**	**Fall Migration**
American avocet	Wading Bird	Semicolonial-Specialist	Gleaning/ Probing Insectivore	II	Alkaline Meadow	Wet Meadow, Alkaline Meadow	Wade: 0-8" Swim: <10"			
Black-necked stilt	Wading Bird	Semicolonial-Generalist	Gleaning/ Probing Insectivore	II	Wet Meadow	Wet Meadow, Alkaline Meadow	0"-8"			
Black-crowned night heron	Wading Bird	Semicolonial-Generalist	Stalking Carnivore	III	Riparian	Shallow Marsh				
Great egret	Wading Bird	x	Stalking Carnivore	III	x	Shallow Emergent, Wet Meadow	0"-11"			
Cattle egret	Wading Bird	x	Gleaning/ Probing Insectivore	III	x	Shallow Emergent, Wet Meadow				
Snowy egret	Wading Bird	x	Gleaning/ Probing Insectivore	III	x	Shallow Emergent, Wet Meadow				
Wilson's phalarope	Breeding Shorebird	Independent/ Semicolonial	Gleaning/ Probing Insectivore	II	Wet Meadow, Alkaline Meadow	Wet Meadow, Alkaline Meadow	0"-12"	Invertebrates	Invertebrates	Invertebrates
Willet	Breeding Shorebird	Independent	Gleaning/ Probing Insectivore	II	Wet Meadow, Alkaline Meadow	Wet Meadow				
Long-billed curlew	Breeding Shorebird	Independent/ Loosely Colonial	Foraging/ Probing Carnivore	II	Meadow Grass, Shrub	Meadow Grass, Wet Meadow				
Long-billed dowitcher	Migratory Shorebird	x	Gleaning/ Probing Insectivore	x	x	Wet Meadow	0"-4"	Invertebrates	Invertebrates	Invertebrates

	Guilds			Life History Characteristics						
				Breeding		Foraging				
Species	**Species Guild**	**Breeding Guild**	**Foraging Guild**	**Breeding Strategy**	**Primary Breeding Habitat**	**Primary Foraging Habitat**	**Foragin g Depth**	**Spring Migration**	**Summer Brood Rearing**	**Fall Migration**
Red-necked phalarope	Migratory Shorebird	x	Gleaning/ Probing Insectivore	x	x	Wet Meadow, Alkaline Meadow				
Marbled godwit	Migratory Shorebird	x	Probing Crustaceovor e	x	x	Shallow Emergent, Wet Meadow, Alkaline Meadow				
Solitary sandpiper	Migratory Shorebird	x	Gleaning Crustaceovor e	x	x	Wet Meadow				
Semipalmated plover	Migratory Shorebird	x	Gleaning Crustaceovor e	x	x	Wet Meadow, Alkaline Meadow				
Sanderling	Migratory Shorebird	x	Gleaning Crustaceovor e	x	x	Alkaline Meadow				
American bittern	Marsh Bird	Independent-Specialist	Shallow Stalking Carnivore	I	Deep Emergent, Shallow Emergent	Shallow Emergent	0"-6"	Invertebrates, Amphibians	Invertebrates, Amphibians	Invertebrates
Western/Clark's grebe	Marsh Bird	Independent	Diving Omnivore	II	Deep Emergent	Open Water, Submergent	12"-36"	Invertebrates, Fish	Invertebrates.F ish	Invertebrates,Fis h
Double-crested cormorant	Marsh Bird	Colonial-Specialist	Diving Piscovore	II	Islands	Open Water	12"-72"	Fish	Fish	Fish
American white pelican	Marsh Bird	x	Surface Gleaning Piscovore	x	x	Open Water	12"-36"	Fish	Fish	Fish
White-faced ibis	Marsh Bird	Colonial-Specialist	Probing Insectivore/ Crustaceovor e	III	Deep Emergent	Wet Meadow, Shallow Marsh	0"-8"	Invertebrates	Invertebrates	Invertebrates
Eared grebe	Marsh Bird	Semicolonial	Diving Carnivore	III	Deep Emergent,	Shallow Emergent,	0"-36"			

Species	Guilds			Life History Characteristics						
				Breeding		Foraging				
	Species Guild	Breeding Guild	Foraging Guild	Breeding Strategy	Primary Breeding Habitat	Primary Foraging Habitat	Foragin g Depth	Spring Migration	Summer Brood Rearing	Fall Migration
					Hemi Marsh	Hemi-Marsh				
Black Tern	Marsh Bird	Semicolonial	Aerial Surface Insectivore	III	Deep Emergent	Open Water	Aerial	Insects	Insects	Insects
Franklin's gull	Marsh Bird	Colonial-Specialist	Aerial Surface Insectivore	III	Deep Emergent	Wet Meadow, Meadow Grass	Surface			
Forster's tern	Marsh Bird	Semicolonial	Water Surface Gleaning Insectivore	III	Deep Emergent	Open Water	Surface			
Caspian tern	Marsh Bird	Colonial	Plunging Piscovore	III	Deep Emergent	Open Water	Surface-12"			
California gull	Marsh Bird	Colonial	Gleaning Insectivore	III	Islands	Wet Meadow. Meadow Grass	0"-2"			
Bald eagle	Raptor	x	Scavenging Carnivore; Plunging Piscovore	I	x	Open Water				
Burrowing owl	Raptor	Independent-Specialist	Aerial Carnivore	I	Shrub	Meadow Grass, Shrub				
Swainson's hawk	Raptor	Independent-Generalist	Aerial Carnivore	I	Riparian, Shrub	Meadow Grass, Agriculture				
Ferruginous hawk	Raptor	Independent-Generalist	Aerial Carnivore	I	Shrub	Shrub, Meadow Grass				
Short-eared owl	Raptor	Independent/ Loosely Colonial	Aerial Carnivore	I	Shrub, Agricultur e, Meadows	Shrub, Agriculture, Meadows				

	Guilds			Life History Characteristics						
				Breeding		Foraging				
Species	**Species Guild**	**Breeding Guild**	**Foraging Guild**	**Breeding Strategy**	**Primary Breeding Habitat**	**Primary Foraging Habitat**	**Foragin g Depth**	**Spring Migration**	**Summer Brood Rearing**	**Fall Migration**
Merlin	Raptor	Independent-Specialist	Aerial Carnivore	I	Shrub	Meadow Grass, Shrub				
Peregrine falcon	Raptor	x	Aerial Carnivore	I	x	Highly Variable				
Black-billed magpie	Corvid	Independent-Generalist	Gleaning Insectivore	I	Uplands	Uplands				
Sharp-tailed grouse	Game Bird	Independent-Obligate	Foraging Herbivore	III	Shrub	Shrub, Riparian				
Sage grouse	Game Bird	Independent-Obligate	Foraging Herbivore	III	Shrub	Shrub, Riparian				
Loggerhead shrike	Shrike	Independent-Generalist	Aerial/ Ground Insectivore	II	Shrub	Shrub	Aerial	Insects	Insects	Insects
Lesser goldfinch	Finch	Independent-Generalist	Gleaning Gramnavore	III	Uplands	Uplands				
Brewer's sparrow	Sparrow	Independent-Obligate	Gleaning Insectivore	III	Shrub	Shrub				
Common grackle	Blackbird	Independent-Generalist	Foraging Omnivore	III	Uplands	Uplands				
Yellow-headed blackbird	Blackbird	Independent-Generalist	Foraging Omnivore	III	Deep Emergent	Deep Emergent				
Grasshopper sparrow	Sparrow	Independent-Generalist	Foraging Omnivore	III	Meadow Grass	Meadow Grass				
Merriam's shrew	Mammal	Burrower	Foraging Insectivore	x	Shrub	Shrub				

	Guilds			Life History Characteristics						
				Breeding		Foraging				
Species	**Species Guild**	**Breeding Guild**	**Foraging Guild**	**Breeding Strategy**	**Primary Breeding Habitat**	**Primary Foraging Habitat**	**Foragin g Depth**	**Spring Migration**	**Summer Brood Rearing**	**Fall Migration**
Townsend's big-eared bat	Mammal	x	Aerial Insectivore	x	x	Riparian	x			
Wyoming ground squirrel	Mammal	Burrower	Foraging Herbivore	x	Shrub, Meadow Grass	Shrub, Meadow Grass	x			
Idaho pocket gopher	Mammal	Burrower	Foraging Herbivore	x	Shrub, Meadow Grass	Shrub, Meadow Grass	x			
Uinta ground squirrel	Mammal	Burrower	Foraging Omnivore	x	Shrub, Meadow Grass	Shrub, Meadow Grass	x			
Muskrat	Mammal	Lodge Builder	Aquatic Herbivore	x	Emergent, Hemi Marsh	Hemi-Marsh	3"-12"	Emergent	Emergent	Emergent
Northern leopard frog	Amphibia n	Spawn	Surface Insectivore	Spawn	Shallow Marsh	Shallow Marsh	Surface			
Bonneville cutthroat trout	Fish	Spawner	Aquatic Insectivore	Spawn	Riparian	Riparian	12"-72"	Invertebrates	Invertebrates	Invertebrates
European Carp	Fish	Spawner	Shallow Herbivore	Spawn	Shallow Emergent, Canals	Submergent, Shallow Emergent	6"-72"	Invertebrates, Leaves	Invertebrates, Leaves	Invertebrates, Leaves
Green river pebblesnail	Invertebra te	Spawner	Herbivore	Spawn	Riparian	Riparian	x	x	x	x
Bear river springsnail	Invertebra te	Spawner	Herbivore	Spawn	Riparian	Riparian	x	x	x	x
Purple meadow-rue	Plant	x	x	Seed	Wet Meadow	x	x	x	x	x
Red Glaswort	Plant	x	x	Seed	Alkali Meadow	x	x	x	x	x

Table E-8. Priority Habitats of Focal Species by Breeding and Foraging Habitats of Bear Lake NWR

<table>
<tr><th>Habitat Type</th><th>Breeding</th><th>Foraging</th><th>Other</th></tr>
<tr><td>Open Water</td><td>Trumpeter swan</td><td>Western grebe
American Pelican
Bald eagle
Forster’s tern
Black tern
Caspian tern
Double-crested cormorant</td><td>Mallard (Molting)
Muskrat (Winter)</td></tr>
<tr><td>Submergent

(Pondweed; milfoil; coonweed)</td><td></td><td>Trumpeter swan
Canvasback
Redhead*
Northern pintail
Western/Clark’s grebe
Carp
Muskrat</td><td></td></tr>
<tr><td rowspan="2">Deep Emergent

(Hardsten bulrush)</td><td colspan="2">Yellow-headed blackbird</td><td rowspan="2"></td></tr>
<tr><td>Franklin’s gull
Forster’s tern
White-faced ibis
Canvasback
Redhead*
Western/Clark’s grebe
American Bittern
Black tern
Caspian tern
Canada goose*</td><td>Muskrat
Eared grebe</td></tr>
<tr><td>Hemi-Marsh

(50:50-Open water/ Submerged: Deep Emergent)</td><td colspan="2">Muskrat
Eared grebe
Canvasback
Redhead*
Trumpeter swan</td><td></td></tr>
<tr><td rowspan="2">Shallow Emergent

(Hardstem bulrush, cattail, alkali bulrush; sedge)</td><td colspan="2">Northern leopard frog
American bittern
European Carp</td><td rowspan="2">Northern leopard frog-Winter</td></tr>
<tr><td></td><td>White-faced ibis
Eared grebe
Northern pintail
Mallard
Black-crowned night heron
Marbled godwit</td></tr>
</table>

Habitat Type	Breeding	Foraging	Other
Wet Meadow (Baltic rush/grasses)	Greater sandhill crane* Wilson's phalarope Willet		Purple meadow rue
	Canada goose* Black-necked stilt	Long-billed curlew Franklin's gull White-faced ibis California gull Great egret Cattle egret Snowy egret Long-billed dowitcher Red-necked phalarope Marbled godwit Solitary sandpiper Semipalmated plover	
Alkaline Meadow (Pickleweed, saltgrass, goosefoot)	American avocet Wilson's phalarope		Red glasswort
	Willet	Black-necked stilt Red-necked phalarope Marbled godwit Semipalmated plover Sanderling	
Alkali Upland Meadow (Sacaton, saltgrass)	American avocet		
		Snowy egret	
Meadow Grass (Wildrye wheatgrass)	Grasshopper sparrow Long-billed curlew Canada goose* Wyoming ground squirrel Uinta ground squirrel Idaho pocket gopher		
	Short-eared owl Mallard	American widgeon California gull Burrowing owl Swainson's hawk Ferruginous hawk Merlin Franklin's gull	

<table>
<tr><th>Habitat Type</th><th>Breeding</th><th>Foraging</th><th>Other</th></tr>
<tr><td rowspan="2">Shrub

(Rabbitbrush, greasewood, sagebrush, bunchgrass, forbs)</td><td colspan="2">Greater sage-grouse
Merriam’s shrew
Brewer’s sparrow
Wyoming ground squirrel Uinta ground squirrel
Idaho pocket gopher
Ferruginous hawk
Loggerhead shrike
Sharp-tailed grouse
Merlin
Burrowing owl</td><td rowspan="2"></td></tr>
<tr><td>Swainson’s hawk
Northern pintail
Long-billed curlew</td><td></td></tr>
<tr><td rowspan="2">Riparian

(Willow, grasses)</td><td colspan="2">Bonneville cutthroat trout*
Green River pebblesnail
Bear River spring snail</td><td rowspan="2">Greater sage-grouse-brood
Sharp-tailed grouse-brood</td></tr>
<tr><td>Black-crowned night heron
Swainson’s hawk</td><td>Greater sage-grouse
Sharp-tailed grouse
Townsend’s big-eared bat</td></tr>
<tr><td>Agriculture

(Small grains, legumes, fallow)</td><td></td><td>Sandhill crane*
Canada goose*
Swainson’s hawk
Short-eared owl</td><td></td></tr>
</table>

E.4 Conservation Targets

For planning purposes, the Service uses priority conservation targets as surrogates to represent the diverse realm of wildlife, plants, and habitats to be managed at Bear Lake NWR. The conservation targets identified for Bear Lake NWR are the result of sequentially aggregating 267 wildlife species or resources of concern (Table E-3) and stepping those down to a subset of 141 resources of concern of the greatest conservation need (Table E-5). Subsequently, 27 different foraging and breeding guilds were classified for 63 focal wildlife species (Table E-7). The 63 focal species life history strategies were used to identify characteristic plant communities, natural ecological processes, and limiting factors for 11 predominant Priority Habitats (Table E-8).

Ultimately, 40 representative habitat-based conservation targets were developed from 63 focal wildlife species with life history requirements representative of the habitats structure and function required to maintain or improve the ecological integrity of refuge habitats (Table E-9). All management objectives and strategies developed in the CCP are subsequently designed to abate threats or to enhance the viability of a conservation target's contribution to the ecological integrity of Bear Lake NWR.

E.5 Desired Future Conditions

The description of habitat structure within Table E-9 for a given conservation target defines the targets desired future condition and the key ecological attributes and critical components of a conservation target's life history, habitat, physical processes, or community interaction. While the desired future condition may not be achievable in all situations due to the degree of change of ecological attributes from historic conditions, threats to diversity and opportunities to enhance desired future conditions are more clearly identified through comparison of potential natural condition and the range of natural variability, with existing conditions. In other words, if the characteristics described were degraded or missing, it would seriously jeopardize the target's, and possibly the Refuge's, ecological integrity.

Table E-9. Conservation Targets for Bear Lake National Wildlife Refuge

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Western/Clark's grebe *Aechmophorus* spp.	Open Water	Wetlands >20ha (49 ac), <2 m (6.5 ft) deep, clear water, abundant small (<3.5-20 cm [1.3-7.8 in] long) fish, (esp. cyprinids) and large (>2 cm [0.8 in]) aquatic invertebrates, and narrow bands emergent *Shoenoplectus* or *Typha* in water <25 cm [9.8 in] deep for nest sites (Johnsgard 1987, Terres 1991).	Foraging -fish	American white Pelican
Double-crested cormorant *Phalacrocorax auritus*		Waters < 8m deep, near rocks sandbars pilings for roosts (Hatch and Weseloh 1999) < 10 km (6 mi) from nesting sites, wherever prey (fish 3-15 cm [1-6 in] long) is abundant. Nesting often on island (as at Bear Lake NWR) or on mats of emergent vegetation, sometimes in trees, always at site safe from ground predators (Hatch and Weseloh 1999).	Foraging -small fish	California Gull, Forster's tern, Black tern, American white pelican, Western/Clark's grebe.
Black Tern *Chlidonias niger*		Various waters that produce or host small fish (i.e. 2.5-3 cm [0.9-1.1 in], <3 g [0.1 oz]) or large insects [e.g. (Odonata) and dragonflies, but also mayflies (Ephemeroptera), caddisflies (Trichoptera), beetles (Coleoptera), moths (Lepidoptera), dipterans, grasshoppers, crickets, and locusts (Orthoptera), water scorpions (Hemiptera), spiders (Araneida), grubs and larvae, amphipods, crayfish, and small mollusks] (Heath et al. 2009).	Foraging	California Gull, Forster's tern, American white pelican, Western/Clark's grebe, barn and cliff swallows.
White-faced ibis *Plegadis chihi*	Dense Marsh- w/Tall Emergent Plants (Permanent to Semi-Permanent wetlands	Dense, tall (>0.5-1 m [1.6-3.2 ft]) emergent vegetation (*Schoenoplectus, Typha* or *Scirpus*), in shallow water 0.25-0.5 m (0.8-1.6 ft) deep (Ryder and Manty 1994).	Breeding (Colonial)	Franklin's gull, Forster's tern, marsh wren, sora rail.

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Black tern *Chidonias niger*		Shallow freshwater marshes with emergent vegetation. Prefers marshes or marsh complexes of 5.3-20+ ha (13-49+ mi) (Heath et al. 2009). Main clusters of nests are in areas of still water, with 25-75% surface coverage emergent vegetation. Floating, dead vegetation is abundant at most sites. Water depth at nests typically is 0.5-1.2 m (1.6-3.9 ft) but can be less (Heath et al. 2009). Black terns select habitats closer to open water and in deeper water relative to random sites, usually adjacent to or within 0.5-2 m (1.6 to 6.5 ft) of small to large expanses of open water. Emergent vegetation <0.25-0.50 m (0.8-1.6 ft) high when nest site is chosen. Snags and posts may figure into choice of nest site. Nest usually built on floating substrate of matted dead marsh vegetation, detached root masses of predominant vegetation, boards, or muskrat-built feeding platforms of fresh-cut vegetation. Size of vegetation mats used as nest platforms varies widely among sites, from 28 cm to 2.8 m (11 in to 9.1 ft) across (Heath et al. 2009).	Breeding	Franklin's gull, Forster's tern, red-winged and yellow-headed blackbird, marsh wren, sora rail, muskrat, mink.
Canada goose *Branta canadensis moffitti*	Dense Marsh- w/Tall Emergent Plants (Permanent to Semi-Permanent wetlands)	Use diverse nest sites, including mats of dense emergent vegetation, platforms, islands, muskrat houses, dikes, etc. close to water (<50 m [164 ft]), cover for the nest proper, and a view for the goose (Bellrose 1976, Mowbray et al. 2002) in a wide variety of wetland types.	Breeding	Canvasback, redhead, mallard, marsh wren, red-winged and yellow-headed blackbirds, muskrat, mink.
American Bittern *Botaurus lentiginosus*		Shallow water <4 cm (1.5 in) in dense, emergent graminoids, *Scirpus*, *Typha* or *Schoenoplectus* with wide variety of macroinvertebrates and small vertebrates (Terres 1991).	Breeding and Foraging	Sora rail, red-winged blackbird.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*		Wetlands of any size with tall emergent vegetation (*Schoenoplectus* or *Typha*) over open water to 1 m (3.2 ft) deep for nesting; invertebrate rich, saturated substrates or open fields for foraging (Terres 1991).	Breeding and Foraging	Red-winged blackbird, marsh wren.

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Muskrat *Ondatra zibethicus*	Hemi-Marsh- Open Water /Dense Marsh (Permanent and Semi-Permanent wetlands	Lentic-lotic wetlands with humus-peaty soils, having current or depth sufficient to prevent freezing to bottom. Ponds > 0.5 ha (1.2 ac), but too large may have wave action sufficient to destroy vegetation. Emergent vegetation beds containing *Schoenoplectus*, *Typha* or *Scirpus*. Abundant submergent aquatic vegetation (Errington 1961, 1963; Erb and Perry 2003).	Breeding; Foraging Over-Winter Survival	Mink
Trumpeter swan *Cygnus buccinator*		Wetlands 1->500 ha (1,235 ac), 0.3-1 m (0.9-3.2 ft) deep, open water: emergent vegetation ratios 30:70 to 70:30, with abundant, diverse submerged aquatic vegetation and invertebrate populations, with emergent beds of Schoenoplectus or Typha, with muskrat or beaver houses, hummocks or islands for nesting, and with little to no human disturbance (Banko 1960, Mitchell 1994).	Breeding; Foraging (Vegetative)	Canada goose (on muskrat houses or floating platforms), canvasback, redhead, lesser scaup.
Canvasback *Aythya valisneria*	Hemi-Marsh- Open Water /Dense Marsh (Permanent and Semi-Permanent wetlands	Wetland size variable, with emergent Schoenoplectus or Typha in water <1.3 m (4.2 ft) deep preferred for nesting. Requires open water and dense submerged aquatic plants producing seeds, buds, leaves and supporting abundant invertebrates for foraging (Hochbaum 1944, Mowbray 2002).	Breeding / Foraging - (Vegetative)	American coot, mallard, muskrat, mink, western grebe, american widgeon, cinnamon teal, gadwall, Northern shoveler
Redhead *Aythya americana*		Uses wide range of wetlands. Most commonly uses larger (>4.0 ha [9.8 ac]) seasonally and semi-permanently flooded wetlands but will use smaller wetlands with adequate water (Woodin and Michot 2002), generally nests over or near (<13 m [42 ft]) water in emergent vegetation, preferably *Schoenoplectus* spp. (Bellrose 1976). Feeds primarily (~90%) on a wide variety of submerged aquatic plants and plant parts (Bellrose 1976, Woodin and Michot 2002) in waters 1-3 m (3.2-9.8 ft) deep.	Breeding; Foraging	American coot, mallard, muskrat, mink, western grebe american wigeon, cinnamon teal, gadwall, Northern shoveler.
Greater sandhill crane *Grus cadensis tabida*	Shallow Marsh (Seasonal wetlands)	Marshes with adequate water levels during the nesting period, averaging 22.8-25.4 cm (9-10 in) deep (Littlefield and Ivey 2002). Fully structured emergent marsh vegetation stands capable of supporting substantial nest platforms (e.g., hardstem bulrush, common cattail; >30% but <90% residual vegetation) (Littlefield 1995). Adjacent wet meadow habitat to enhance foraging by colts.	Breeding	Virginia rail, sora rail, yellow-headed and red-winged blackbirds, American bitterns,

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Northern Leopard frog *Rana pipiens*		Use wide variety of wetland sizes, especially <4 ha (9.8 ac), and types with variable hydroperiods (>30 days and < 365 days), in complexes <300 m (984 ft) apart with good water quality (no pollutants), moderate emergent vegetation cover, with high invertebrate densities, and substrates suitable for burrowing (hibernation), without predatory fish, and associated wet meadows (Black 1970, Nussbaum et al. 1983, Semlitsch 2000, Burton 2006).	Breeding; Foraging -(Insects)	Red-headed blackbird, muskrat
American Bittern *Botaurus lentiginosus*		Shallow water <4 cm (1.5 inches) in dense, emergent graminoids, *Scirpus*, *Typha* or *Schoenoplectus* with wide variety of macroinvertebrates and small vertebrates (Terres 1991).	Breeding; foraging	Sora rail, red-winged blackbird.
European carp *Cyprinus carpio*	Shallow Marsh (Seasonal wetlands)	Warm(20-26° C [68-78° F]), shallow (<0.5-1.8 m [1.6-5.9 ft]), sluggish (<60 cm/sec [23.6 in]), well-vegetated waters with silty/muddy bottoms for foraging and spawning (Edwards and Twomey 1982). Can tolerate DO to <2mg/l, wide range pH and salinity (Edwards and Twomey 1982). Need deeper water to winter.	Breeding; foraging.	No other species benefit form large, spawning carp, although piscivores (Western grebe, Clark's grebe, White pelican, double-crested cormorants and mink) benefit from eating carp fry.
Mallard *Anas platyrhynchos*		Submerged aquatic vegetation as a source of seeds and invertebrate habitat, especially gastropods and mollusks during pre-breeding. Nests in tall emergent vegetation or upland sites with persistent upright vegetation.	Migration; Breeding; Molting	Canada goose, Northern pintail, American wigeon, Canvasback, Redhead, Cinnamon and Green-winged teal.
Wilson's phalarope *Phalaropus tricolor*	Wet Meadow (Temporary Wetlands)	Species nests in sparse to dense vegetation of uplands (e.g., *Poa* spp.) and marshes (e.g., *Juncus balticus*, *Triglochin maritima*), roadside ditches (*Hordeum jubatum*), and stage for migration mainly in open, shallow-water habitats (Colwell and Jehl 1994). Forages on arthropods, Diptera, Heteroptera, Coleoptera, Crustacea, seeds of aquatic plants in open-water and flooded meadows, less frequently in upland habitats and along beaches (Colwell and Jehl 1994).	Breeding and Foraging	Canada goose, mallard, Northern Shoveler, American Avocet

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Greater sandhill crane *Grus Canadensis tabida*	Wet Meadow (Temporary Wetlands)	Tall to short emergent graminoids, *Carex*, *Juncus* usually surrounded by shallow (0.25 m [0.8 ft]) to deep (0.65 m [2.1 ft]) open water (Austin et al 2007).	Breeding	Canada goose, long-billed curlew (Foraging)
Canada goose *Branta canadensis moffitti*		Use diverse nest sites, including mats of dense emergent vegetation, platforms, islands, muskrat houses, dikes, etc. close to water (<50 m [164 ft]), cover for the nest proper, and a view for the goose (Bellrose 1976, Mowbray et al. 2002) in a wide variety of wetland types. Forages on grasses, sedges and monocots during spring migration and summer breeding periods (Mowbray et al. 2002).	Breeding and Foraging	Long-billed curlew, Marbled godwit, American coot, mallard, gadwall, widgeon.
Marbled godwit *Limosa fedoa*		Uses a variety of wetland types, temporary wetlands, muddy margins of large, drying reservoirs, shallow ponds with little or no emergent vegetation (Skagen et al. 1999, Gratto-Trevor 2000), also native grasslands and tame hay fields to probing for earthworms, aquatic insects, aquatic plant tubers, leeches, also Orthoptera and small fish. Most often seen in smaller marsh habitats with bulrush *Schoenoplectus* spp., spike-rushes *Eleocharis* spp. rush *Juncus* spp., whitetop *Scolochloa festucacea*, and cattail *Typha* spp.) Gratto-Trevor 2000).	Migratory Spring and Fall Foraging	Long-billed dowitcher, Wilson's phalarope
Purple meadow-rue *Thalictrum dasycarpum*		Rare and local distribution. Habitat includes wet meadows and stream banks with wet or moist rich, sandy or calcareous loams. Prefers partly shaded sites. (http://www.wildflower.org/plants/result.php?id_plant=THDA).	Plant	

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Long-billed dowitcher *Limnodromus scolopaceus*	Wet Meadow (Temporary Wetlands)	Forage in shallow, saline lakes, complex wetlands, lakes and reservoirs (Takekawa and Warnock 2000). Probes and gleans for insects (e.g. midge fly and larvae), aquatic or moist soil worms, and small crustaceans on large mudflats (>500 m [1,640 ft]), on moist shoreline and water up to 10 cm (3.9 in) depth in bare to sparse vegetation (Skagen et al. 1999, Takekawa and Warnock 2000).	Migratory Spring and Fall Foraging	Marbled godwit, Wilson's phalarope
Long-billed curlew *Numenius americanus*		Shallow wetlands, short meadows and grasslands with soft, deep (2-15 cm [0.7-5.9 in]) soils (Jenni et al. 1981, Dugger and Digger 2002) with invertebrates.	Foraging (insects).	Willet, yellow-legs.
White-faced ibis *Plegadis chihi*		Shallow open water (<12 cm [4.7 in]) to scattered emergent *Carex, Juncus* stands with variable hydroperiod and abundant macroinvertebrates through late August (Perkins 2003).	Foraging -(Insects)	Snowy egret, Franklin's gull; Virginia rail, Greater yellow-legs (migration)
Red glasswort *Salicornia rubra*	Alkaline Meadow and Alkali Upland Meadow (Seasonal and Temporary wetland and Upland)	Alkaline, borders alkaline ponds, or saline flooded soils (Muenscher 1944, Mason 1957, Mohlenbrock n.d.) on flats, seepages, and along shores and ditches (Larson 1993).	Total life cycle.	Wilson's phalarope, black-necked stilt, willet.
American Avocet *Recurvirostra americana*		Sparsely vegetated salt flats or mudflats adjacent (< 0.3 km [0.2 mi]) to shallow (< 0.9 m [3 ft] deep) alkaline or brackish water (Dechant et al. 2002, Floyd et al. 2007). Short, sparse vegetation (< 7.3 m [24 in]) that provides an unobstructed view from the nest (Dechant et al. 2002). Water permanence through July to ensure brood habitat for fledgling shorebirds.	Foraging / Migration/ Nesting	Wilson's phalarope, black-necked stilt, willet.

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Long-billed curlew *Numenius americanus*	Meadow Grass (Uplands)	Open short-grass or mixed grass-forb habitat with level to slightly rolling topography (Dugger and Dugger 2002) with intermittent patchy vegetation (< 1.0 ha [2.5 acres], <5% of total area) of tall, dense foliage (> 17.7 cm [7 in] high) (Pampush and Anthony 1993, Neel 1999), void of trees, high-density shrubs, and tall, dense grasses (Pampush and Anthony 1993). Buffer zones 297-4,978 m [325-5,445 yards] around a territory that is unoccupied by other curlews (Paige and Ritter 1999). Contiguous suitable habitat > 40.4 hec [100 ac] (capable of supporting at least one breeding pair) protected from ~~detrimental~~ human disturbance (Redmond et al. 1981 and Dechant et al. 2003)	Breeding / Foraging	Greater sandhill crane, vesper sparrow, killdeer, Swainson's hawk, short-eared owl.
American widgeon *Anas americana*		Nests in mixed hayfields, grasslands, sometimes near low shrubs (< 3 m [9.8 ft] tall), < 400 m [1,312 ft] from wetlands (Bellrose 1976, Mowbray 1999).	Nesting	Mallard, Long-billed curlew, Lesser scaup, short-eared owl, Swainson's hawk.
Mallard *Anas platyrhynchos*		Nets in a wide variety of habitats with sufficient cover (>50 cm [19.6 in]), <1 km [0.6 mi] from water (most <150 m [492 ft]) (Bellrose 1976, Drilling et al. 2002).	Nesting	American widgeon, Greater sandhill crane, short-eared owl, Swainson's hawk.
Canada goose *Branta canadensis moffitti*		Lightly grazed areas with taller (>0.3 m [0.9 ft]) graminoids, *Carex*, *Juncus*, etc. near water. (Austin and Pyle 2004, Austin 2002)	Nesting	Horned lark, bobolink
Grasshopper sparrow *Ammodramus savannarum*		Low grass or forbs, with taller stems or shrubs for display and singing, with abundant seeds, insects, especially grasshoppers and beetles (Byers et al. 1997).	Nesting/ Foraging	Lesser scaup (nesting), short eared owl (nesting)

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Greater Sage-grouse (*Centrocercus urophasianus*)	Sagebrush Steppe (Uplands)	Habitats dominated by low sagebrush (< 38 cm [15 in] high; 10-25% cover) with native forbs (10-20% cover), native perennial grasses (10-15% cover) (Connelly et al. 2000), and western juniper densities of <4 trees/acre. Late-seral sagebrush 25.4-35.5 cm (10-14 in) tall and 10-20% canopy cover above snow during winter (Connelly et al. 2000). Mid-seral sagebrush 30.4-78.7 cm (12-31 in) tall and 15-20% canopy cover. Native bunchgrasses and forbs > 17.7 cm (7 in) tall and >15% cover (Connelley et al. 2000).	Pre-nesting, Brood-rearing	Sharp-tailed grouse, sage sparrow, ferruginous hawk, merlin, Swainson's hawk, golden eagle, prairie falcon, Brewers sparrow. Merriam's shrew, Idaho pocket gopher, Wyoming ground squirrel, burrowing owl.
Loggerhead shrike *Lanius ludovicianus*		Forages in mixed shrub-steppe and grasslands often with bare ground, where grasshoppers, small reptiles, and small mammals are abundant; nesting in tall (>2 m [6.5 ft]), isolated shrubs (Yosef 1996).	Nesting, foraging.	Sage sparrow, Brewer's sparrow, Sage grouse, golden eagle, Wyoming ground squirrel.
Northern pintail *Anas acuta*		Brush and shrubs provide attractive nesting habitat. An early nester, pintails rely on residual cover for nest concealment and are more likely to be negatively affected by grazing or other management techniques that reduce residual cover than are later-nesting species. (Kruse and Bowen 1996, Austin and Pyle 2004).	Nesting	White-crowned sparrow, Lazuli bunting
Bonneville cutthroat trout *Oncorhychus clarki*	Riparian	Cold (9-12 max 22° C 48-53, max 71° F), clear (turbidity <35 ppm), oxygenated water (7-9+ mg/l), pH ~6.5-8.0, no barriers, pool:riffle ratios 1:1, with sufficient flows (10-22 cm/sec [3.9-8.6 in/sec]) and depth (15-45 cm [5.9-17.7 in]), and boulders, woody debris, undercut banks and/or over-hanging surface vegetation >25% total area to reduce predation by piscivores (Hickman and Raleigh 1982, Machtinger 2007). Cutthroat trout pass through St. Charles Creek which provides a critical corridor between Bear Lake winter and upper headwater spawning habitats.	Migration between wintering and spawning areas.	Mink, muskrat, beaver, mallard, yellow-rumped and orange-crowned warblers, yellowthroats, *Empidonax* flycatchers.
Swainson's hawk	Riparian	Nests in scattered trees, small trees, willows, rarely on ground, within grassland, shrub-steppe or agricultural habitats, often near wetlands (England et al. 1997).	Nesting, roosting, hunting perches.	Great horned owl, yellow-rumped warblers,

Focal Species	Habitat Type	Desired Future Conditions of Habitat Structure	Life History	Other Benefiting Focal Species
Bear River springsnail *Pyrgulopsis pilsbryana*		One of 10 *Pyrgulopsis* species (Lysne 2009). All Utah localities (N=3) described for this species are, springs flowing from the ground as streams (rheocrenes), with low temperatures (10 to 14° C [50-57° F]), and conductivity 508 micromhos/cm (Oliver and Bosworth 1999). Status on Refuge uncertain.	Total life cycle.	
Greater sandhill crane *Grus cadensis tabida*	Agricult ure	Open fields away from dense grassland, shrub or riparian cover with low (<.5 m [1.6 ft]) grain height, preferably with two-row awn-less barley in fall. Bare fields also provide important foraging for waste grain, earthworms and other invertebrates in early spring immediately after arrival when fields are typically melted off but before snow cover is completely gone from grasslands (Drewein 1973, Littlefield 1995, Austin 2002, Austin et al 2007).	Foraging -Fall Migratio n	Canada goose, mallard, red-winged and Brewer’s blackbirds, Swainson’s hawk.
Canada goose *Branta canadensis moffitti*		Open fields away from dense grassland, shrub or riparian cover with low (<.5 m [1.6 ft]) grain height in fall. Bare fields also provide important foraging for waste grain, earthworms and other invertebrates in early spring immediately after arrival when fields are typically melted off but before snow cover is completely gone from grasslands.	Foraging -Spring and fall migratio n	Sandhill cranes, mallards, red-winged and Brewer’s blackbirds.

Appendix F. Integrated Pest Management Plan

F.1 Background

IPM is an interdisciplinary approach using methods to prevent, eliminate, contain, and/or control pest species in concert with other management activities on refuge lands and waters to achieve wildlife and habitat management goals and objectives. IPM is also a scientifically based, adaptive management process where available scientific information and best professional judgment of the refuge staff as well as other resource experts will be used to identify and implement appropriate management strategies that can be modified and/or changed over time to ensure effective, site-specific management of pest species to achieve desired outcomes. In accordance with 43 CFR 46.145, adaptive management will be particularly relevant where long-term impacts may be uncertain and future monitoring will be needed to make adjustments in subsequent implementation decisions. After a tolerable pest population (threshold) is determined considering achievement of refuge resource objectives and the ecology of pest species, one or more methods, or combinations thereof, will be selected that are feasible, efficacious, and most protective of non-target resources, including native species (fish, wildlife, and plants), and Service personnel, Service authorized agents, volunteers, and the public. Staff time and available funding will be considered when determining feasibility/practicality of various treatments.

IPM techniques to address pests are presented as CCP strategies or HMP prescriptions (see Chapter 2) in an adaptive management context to achieve refuge resource objectives. In order to satisfy requirements for IPM planning as identified in the Director's Memo (dated September 9, 2004) entitled *Integrated Pest Management Plans and Pesticide Use Proposals: Updates, Guidance, and an Online Database*, the following elements of an IPM program have been incorporated into this CCP.

- Habitat and/or wildlife objectives that identify pest species and appropriate thresholds to indicate the need for and successful implementation of IPM techniques; and
- Monitoring before and/or after treatment to assess progress toward achieving objectives including pest thresholds.

Where pesticides would be necessary to address pests, this Appendix provides a structured procedure to evaluate potential effects of proposed uses involving ground-based applications to refuge biological resources and environmental quality in accordance with effects analyses presented in Chapter 6 (Environmental Effects) of the Draft CCP/EA. Only pesticide uses that likely would cause minor, temporary, or localized effects to refuge biological resources and environmental quality with appropriate BMPs, where necessary, will be allowed for use on the Refuge.

This Appendix does not describe the more detailed process to evaluate potential effects associated with aerial applications of pesticides. However, the basic framework to assess potential effects to refuge biological resources and environmental quality from aerial application of pesticides would be similar to the process described in this Appendix for ground-based treatments of other pesticides.

F.2 Pest Management Laws and Policies

In accordance with Service policy 569 FW 1 (Integrated Pest Management), plant, invertebrate, and vertebrate pests on units of the National Wildlife Refuge System can be controlled to ensure balanced wildlife and fish populations in support of refuge-specific wildlife and habitat management objectives. Pest control on Federal (refuge) lands and waters also is authorized under the following legal mandates:

- National Wildlife Refuge System Administration Act of 1966, as amended (16 USC 668dd-668ee);
- Plant Protection Act of 2000 (7 USC 7701 *et seq*.);
- Noxious Weed Control and Eradication Act of 2004 (7 USC 7781-7786, Subtitle E);
- Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (7 USC 136-136y);
- National Invasive Species Act of 1996 (16 USC 4701);
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 USC 4701);
- Food Quality Protection Act of 1996 (7 USC 136);
- Executive Order 13148, Section 601(a);
- Executive Order 13112; and
- Animal Damage Control Act of 1931 (7 USC 426-426c, 46 Stat. 1468).

Pests are defined as "…living organisms that may interfere with the site-specific purposes, operations, or management objectives or that jeopardize human health or safety" from Department policy 517 DM 1 (Integrated Pest Management Policy). Similarly, 569 FW 1 defines pests as "…invasive plants and introduced or native organisms, that may interfere with achieving our management goals and objectives on or off our lands, or that jeopardize human health or safety." 517 DM 1 also defines an invasive species as "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health." Throughout the remainder of this CCP the terms pest and invasive species are used interchangeably because both can prevent/impede achievement of refuge wildlife and habitat objectives and/or degrade environmental quality.

In general, control of pests (vertebrate or invertebrate) on the Refuge would conserve and protect the nation's fish, wildlife, and plant resources as well as maintain environmental quality. From 569 FW 1, animal or plant species, which are considered pests, may be managed if the following criteria are met:

- Threat to human health and well being or private property, the acceptable level of damage by the pest has been exceeded, or State or local government has designated the pest as noxious;
- Detrimental to resource objectives as specified in a refuge resource management plan (e.g., comprehensive conservation plan, habitat management plan), if available; and
- Control would not conflict with attainment of resource objectives or the purposes for which the Refuge was established.

The specific justifications for pest management activities on the Refuge are the following:

- Protect human health and well being;
- Prevent substantial damage to important to refuge resources;
- Protect newly introduced or re-establish native species;
- Control non-native (exotic) species in order to support existence for populations of native species;
- Prevent damage to private property; and
- Provide the public with quality, compatible wildlife-dependent recreational opportunities.

In accordance with Service policy 620 FW 1 (Habitat Management Plans), there are additional management directives regarding invasive species found on the Refuge:

- "We are prohibited by Executive Order, law, and policy from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere."
- "Manage invasive species to improve or stabilize biotic communities to minimize unacceptable change to ecosystem structure and function and prevent new and expanded infestations of invasive species. Conduct refuge habitat management activities to prevent, control, or eradicate invasive species ..."

Animal species damaging/destroying Federal property and/or detrimental to the management program of a refuge may be controlled as described in 50 CFR 31.14 (Official Animal Control Operations)**.** For example, the incidental removal of beaver damaging refuge infrastructure (e.g., clogging with subsequent damaging of water control structures) and/or negatively affecting habitats (e.g., removing woody species from existing or restored riparian) managed on refuge lands may be conducted without a pest control proposal. We recognize beavers are native species and most of their activities or refuge lands represent a natural process beneficial for maintaining wetland habitats. Exotic nutria, whose denning and burrowing activities in wetland dikes causes cave-ins and breaches, can be controlled using the most effective techniques considering site-specific factors without a pest control proposal. Along with the loss of quality wetland habitats associated with breaching of impoundments, the safety of refuge staffs and public (e.g., auto tour routes) driving on structurally compromised levees and dikes can be threaten by sudden and unexpected cave-ins.

Trespass and feral animals also may be controlled on refuge lands. Based upon 50 CFR 28.43 (Destruction of Dogs and Cats), dogs and cats running at large on a national wildlife refuge and observed in the act of killing, injuring, harassing or molesting humans or wildlife may be disposed of in the interest of public safety and protection of the wildlife. Feral animals should be disposed by the most humane method(s) available and in accordance with relevant Service directives (including Executive Order 11643). Disposed wildlife specimens may be donated or loaned to public institutions. Donation or loans of resident wildlife species would only be made after securing State approval (50 CFR 30.11 [Donation and Loan of Wildlife Specimens]). Surplus wildlife specimens may be sold alive or butchered, dressed and processed subject to Federal and State laws and regulations (50 CFR 30.12 [Sale of Wildlife Specimens]).

F.3 Strategies

To fully embrace IPM as identified in 569 FW 1, the following strategies, where applicable, would be carefully considered on the Refuge for each pest species:

- **Prevention.** This would be the most effective and least expensive long-term management option for pests. It encompasses methods to prevent new introductions or the spread of the established pests to un-infested areas. It requires identifying potential routes of invasion to reduce the likelihood of infestation. Hazard Analysis and Critical Control Points (HACCP) planning can be used determine if current management activities on a refuge may introduce and/or spread invasive species in order to identify appropriate BMPs for prevention. See http://www.haccp-nrm.org/for more information about HACCP planning.

Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers) and/or sanitation methods (e.g., wash stations) to prevent re-introductions by various mechanisms including vehicles, personnel, livestock, and horses. Because invasive species are frequently the first to establish newly disturbed sites, prevention would require a reporting mechanism for early detection of new pest occurrences with quick response to eliminate any new satellite pest populations. Prevention would require consideration of the scale and scope of land management activities that may promote pest establishment within un-infested areas or promote reproduction and spread of existing populations. Along with preventing initial introduction, prevention would involve halting the spread of existing infestations to new sites (Mullin et al. 2000). The primary reason for prevention would be to keep pest-free lands or waters from becoming infested. Executive Order 11312 emphasizes the priority for prevention with respect to managing pests.

The following would be methods to prevent the introduction and/or spread of pests on refuge lands:

- Before beginning ground-disturbing activities (e.g., disking, scraping), inventory and prioritize pest infestations in project operating areas and along access routes. Refuge staff would identify pest species on-site or within reasonably expected potential invasion vicinity. Where possible, the refuge staff would begin project activities in un-infested areas before working in pest-infested areas.
- The refuge staff would locate and use pest-free project staging areas. They would avoid or minimize travel through pest-infested areas, or restrict to those periods when spread of seed or propagules of invasive plants would be least likely.
- The refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned of pests. Where possible, the refuge staff would clean equipment before entering lands at on-refuge approved cleaning site(s). This practice does not pertain to vehicles traveling frequently in and out of the project area that would remain on roadways. Seeds and plant parts of pest plants would need to be collected, where practical. The refuge staff would remove mud, dirt, and plant parts from project equipment before moving it into a project area.
- The refuge staff would clean all equipment, before leaving the project site, if operating in areas infested with pests. The refuge staff would determine the need for, and when appropriate, identify sanitation sites where equipment can be cleaned.
- Refuge staffs, their authorized agents, and refuge volunteers would, where possible, inspect, remove, and properly dispose of seed and parts of invasive plants found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and then properly discarding of them (e.g., incinerating).
- The refuge staff would evaluate options, including closure, to restrict the traffic on sites with on-going restoration of desired vegetation. The refuge staff would revegetate disturbed soil (except travel ways on surfaced projects) to optimize plant establishment for each specific site. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. The refuge staff would use native material, where appropriate and feasible. The refuge staff would use certified weed-free or weed-seed-free hay or straw where certified materials are reasonably available.
- The refuge staff would provide information, training, and appropriate pest identification materials to permit holders and recreational visitors. The refuge staff would educate them about pest identification, biology, impacts, and effective prevention measures.
- The refuge staff would require grazing permittees to use preventative measures for their livestock while on refuge lands.

- The refuge staff would inspect borrow material for invasive plants prior to use and transport onto and/or within refuge lands.
- The refuge staff would consider invasive plants in planning for road maintenance activities.
- The refuge staff would restrict off-road travel to designated routes.

The following would be methods to prevent the introduction and/or spread of pests into refuge waters:

- The refuge staff would inspect boats (including air boats), trailers, and other boating equipment. Where possible, the refuge staff would remove any visible plants, animals, or mud before leaving any waters or boat launching facilities. Where possible, the refuge staff would drain water from motor, live well, bilge, and transom wells while on land before leaving the site. If possible, the refuge staff would wash and dry boats, downriggers, anchors, nets, floors of boats, propellers, axles, trailers, and other boating equipment to kill pests not visible at the boat launch.
    - Where feasible, the refuge staff would maintain a 100-foot buffer of aquatic pest-free clearance around boat launches and docks or quarantine areas when cleaning around culverts, canals, or irrigation sites. Where possible, the refuge staff would inspect and clean equipment before moving to new sites or one project area to another.

  These prevention methods to minimize/eliminate the introduction and/or spread of pests were taken verbatim or slightly modified from Appendix E of U.S. Forest Service (2005).

- **Mechanical/Physical Methods.** These methods would remove and destroy, disrupt the growth of, or interfere with the reproduction of pest species. For plants species, these treatments can be accomplished by hand, hand tool (manual), or power tools (mechanical) and include pulling, grubbing, digging, tilling/disking, cutting, swathing, grinding, sheering, girdling, mowing, and mulching of the pest plants.

  For animal species, Service employees or their authorized agents could use mechanical/physical methods (including trapping) to control pests as a refuge management activity. Based upon 50 CFR 31.2, trapping can be used on a refuge to reduce surplus wildlife populations for a “balanced conservation program” in accordance with Federal or State laws and regulations. In some cases, non-lethally trapped animals would be relocated to off-refuge sites with prior approval from the State.

  Each of these tools would be efficacious to some degree and applicable to specific situations. In general, mechanical controls can effectively control annual and biennial pest plants. However, to control perennial plants, the root system has to be destroyed or it would resprout and continue to grow and develop. Mechanical controls are typically not capable of destroying a perennial plant’s root system. Although some mechanical tools (e.g., disking, plowing) may damage root systems, they may stimulate regrowth producing a denser plant population that may aid in the spread depending upon the target species (e.g., Canada thistle). In addition, steep terrain and soil conditions would be major factors that can limit the use of many mechanical control methods.

  Some mechanical control methods (e.g., mowing), which would be used in combination with herbicides, can be a very effective technique to control perennial species. For example, mowing perennial plants followed sequentially by treating the plant regrowth with a systemic herbicide often would improve the efficacy of the herbicide compared to herbicide treatment only.

- **Cultural Methods.** These methods would involve manipulating habitat to increase pest mortality by reducing its suitability to the pest. Cultural methods would include water-level manipulation, mulching, winter cover crops, changing planting dates to minimize pest impact, prescribed burning (facilitate revegetation, increase herbicide efficacy, and remove litter to assist in emergence of desirable species), flaming with propane torches, trap crops, crop rotations that would include non-susceptible crops, moisture management, addition of beneficial insect habitat, reducing clutter, proper trash disposal, planting or seeding desirable species to shade or out-compete invasive plants, applying fertilizer to enhance desirable vegetation, prescriptive grazing, and other habitat alterations.

- **Biological Control Agents.** Classical biological control would involve the deliberate introduction and management of natural enemies (parasites, predators, or pathogens) to reduce pest populations. Many of the most ecologically or economically damaging pest species in the United States originated in foreign countries. These newly introduced pests, which are free from natural enemies found in their country or region of origin, may have a competitive advantage over cultivated and native species. This competitive advantage often allows introduced species to flourish, and they may cause widespread economic damage to crops or out compete and displace native vegetation. Once the introduced pest species population reaches a certain level, traditional methods of pest management may be cost prohibitive or impractical. Biological controls typically are used when these pest populations have become so widespread that eradication or effective control would be difficult or no longer practical.

  Biological control has advantages as well as disadvantages. Benefits would include reducing pesticide usage, host specificity for target pests, long-term self-perpetuating control, low cost/acre, capacity for searching and locating hosts, synchronizing biological control agents to hosts' life cycles, and the unlikelihood that hosts would develop resistance to agents. Disadvantages would include the following: limited availability of agents from their native lands, the dependence of control on target species density, slow rate at which control occurs, biotype matching, the difficulty and expense of conflicts over control of the target pest, and host specificity when host populations are low.

  A reduction in target species populations from biological controls is typically a slow process, and efficacy can be highly variable. It may not work well in a particular area although it does work well in other areas. Biological control agents would require specific environmental conditions to survive over time. Some of these conditions are understood; whereas, others are only partially understood or not at all.

  Biological control agents would not eradicate a target pest. When using biological control agents, residual levels of the target pest typically are expected; the agent population level or survival would be dependent upon the density of its host. After the pest population decreases, the population of the biological control agent would decrease correspondingly. This is a natural cycle. Some pest populations (e.g., invasive plants) would tend to persist for several years after a biological control agent becomes established due to seed reserves in the soil, inefficiencies in the agents search behavior, and the natural lag in population buildup of the agent.
  The full range of pest groups potentially found on refuge lands and waters would include diseases, invertebrates (insects, mollusks), vertebrates, and invasive plants (the most common group). Often it is assumed that biological control would address many if not most of these pest problems. There are several well-documented success stories of biological control of invasive

weed species in the Pacific Northwest including Mediterranean sage, St. Johnswort (Klamath weed) and tansy ragwort. Emerging success stories include Dalmatian toadflax, diffuse knapweed, leafy spurge, purple loosestrife, and yellow star thistle. However, historically, each new introduction of a biological control agent in the United States has only about a 30 percent success rate (Coombs et al. 2004). Refer to Coombs et al. (2004) for the status of biological control agents for invasive plants in the Pacific Northwest.

Introduced species without desirable close relatives in the United States would generally be selected as biological controls. Natural enemies that are restricted to one or a few closely related plants in their country of origin are targeted as biological controls (Center et al. 1997, Hasan and Ayres 1990).

The refuge staff would ensure introduced agents are approved by the applicable authorities. Except for a small number of formulated biological control products registered by USEPA under FIFRA, most biological control agents are regulated by the U.S. Department of Agriculture (USDA)-Animal Plant Health Inspection Service, Plant Protection and Quarantine (APHIS-PPQ). State departments of agriculture and, in some cases, county agricultural commissioners or weed districts, have additional approval authority.

Federal permits (USDA-APHIS-PPQ Form 526) are required to import biocontrols agents from another state. Form 526 may be obtained by writing:

> USDA-APHIS-PPQ
> Biological Assessment and Taxonomic Support
> 4700 River Road, Unit 113
> Riverdale, MD 20737

or

> through the internet at:
> http://www.aphis.usda.gov/ppq/permits/bioligical/weedbio.html.

The Service strongly supports the development, and legal and responsible use of appropriate, safe, and effective biological control agents for nuisance and non-indigenous or pest species.

State and county agriculture departments may also be sources for biological control agents or they may have information about where biological control agents may be obtained. Commercial sources should have an Application and Permit to Move Live Plant Pests and Noxious Weeds (USDA-PPQ Form 226 USDA-APHIS-PPQ, Biological Assessment and Taxonomic Support, 4700 River Road, Unit 113, Riverdale, MD 20737) to release specific biological control agents in a state and/or county. Furthermore, certification regarding the biological control agent's identity (genus, specific epithet, sub-species and variety) and purity (e.g., parasite free, pathogen free, and biotic and abiotic contaminants) should be specified in purchase orders.

Biological control agents are subject to 7 RM 8 (Exotic Species Introduction and Management). In addition, the refuge staff would follow the International Code of Best Practice for Classical Biological Control of Weeds (http://sric.ucdavis.edu/exotic/exotic.htm) as ratified by delegates to the X International Symposium on Biological Control of Weeds, Bozeman, MT, July 9, 1999. This code identifies the following:

- Release only approved biological control agents,
- Use the most effective agents,

- Document releases, and
- Monitor for impact to the target pest, non-target species, and the environment.

Biological control agents formulated as pesticide products and registered by the USEPA (e.g., *Bti*) are also subject to PUP review and approval (see below).

A record of all releases would be maintained with date(s), location(s), and environmental conditions of the release site(s); the identity, quantity, and condition of the biological control agents released; and other relevant data and comments such as weather conditions. Systematic monitoring to determine the establishment and effectiveness of the release is also recommended.

NEPA documents regarding biological and other environmental effects of biological control agents prepared by another Federal agency, where the scope is relevant to evaluation of releases on refuge lands, would be reviewed. Possible source agencies for such NEPA documents include the Bureau of Land Management, U.S. Forest Service, National Park Service, U.S. Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s) from the review. Incorporating by reference (43 CFR 46.135) is a technique used to avoid redundancies in analysis. It also can reduce the bulk of a Service NEPA document, which only must identify the documents that are incorporated by reference. In addition, relevant portions must be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

- **Pesticides.** The selective use of pesticides would be based upon pest ecology (including mode of reproduction), the size and distribution of its populations, site-specific conditions (e.g., soils, topography), known efficacy under similar site conditions, and the capability to use best management practices (BMPs) to reduce/eliminate potential effects to non-target species, sensitive habitats, and potential to contaminate surface and groundwater. All pesticide usage (pesticide, target species, application rate, and method of application) would comply with the applicable Federal (FIFRA) and State regulations pertaining to pesticide use, safety, storage, disposal, and reporting. Before pesticides can be used to eradicate, control, or contain pests on refuge lands and waters, pesticide use proposals (PUPs) would be prepared and approved in accordance with 569 FW 1. PUP records would provide a detailed, time-, site-, and target-specific description of the proposed use of pesticides on the Refuge. All PUPs would be created, approved or disapproved, and stored in the Pesticide Use Proposal System (PUPS), which is a centralized database only accessible on the Service's intranet (https://systems.fws.gov/pups). Only Service employees would be authorized to access PUP records for a refuge in this database.

  Application equipment would be selected to provide site-specific delivery to target pests while minimizing/eliminating direct or indirect (e.g., drift) exposure to non-target areas and degradation of surface and groundwater quality. Where possible, target-specific equipment (e.g., backpack sprayer, wiper) would be used to treat target pests. Other target-specific equipment to apply pesticides would include soaked wicks or paint brushes for wiping vegetation and lances, hatchets, or syringes for direct injection into stems. Granular pesticides may be applied using seeders or other specialized dispensers. In contrast, aerial spraying (e.g., fixed wing or helicopter) would only be used where access is difficult (remoteness) and/or the size/distribution of infestations precludes practical use of ground-based methods.

Because repeated use of one pesticide may allow resistant organisms to survive and reproduce, multiple pesticides with variable modes of action would be considered for treatments on refuge lands and waters. This is especially important if multiple applications within years and/or over a growing season likely would be necessary for habitat maintenance and restoration activities to achieve resource objectives. Integrated chemical and non-chemical controls also are highly effective, where practical, because pesticide-resistant organisms can be removed from the site.

Cost may not be the primary factor in selecting a pesticide for use on a refuge. If the least expensive pesticide would potentially harm natural resources or people, then a different product would be selected, if available. The most efficacious pesticide available with the least potential to degrade environment quality (soils, surface water, and groundwater) as well as least potential effect to native species and communities of fish, wildlife, plants, and their habitats would be acceptable for use on refuge lands in the context of an IPM approach.

- **Habitat Restoration/Maintenance.** Restoration and/or proper maintenance of refuge habitats associated with achieving wildlife and habitat objectives would be essential for long-term prevention, eradication, or control (at or below threshold levels) of pests. Promoting desirable plant communities through the manipulation of species composition, plant density, and growth rate is an essential component of invasive plant management (Masters et al. 1996, Masters and Shelly 2001, Brooks et al. 2004). The following three components of succession could be manipulated through habitat maintenance and restoration: site availability, species availability, and species performance (Cox and Anderson 2004). Although a single method (e.g., herbicide treatment) may eliminate or suppress pest species in the short term, the resulting gaps and bare soil create niches that are conducive to further invasion by the species and/or other invasive plants. On degraded sites where desirable species are absent or in low abundance, revegetation with native/desirable grasses, forbs, and legumes may be necessary to direct and accelerate plant community recovery, and achieve site-specific objectives in a reasonable time frame. The selection of appropriate species for revegetation would be dependent on a number of factors including resource objectives and site-specific, abiotic factors (e.g., soil texture, precipitation/temperature regimes, and shade conditions). Seed availability and cost, ease of establishment, seed production, and competitive ability also would be important considerations.

F.4 Priorities for Treatments

For many refuges, the magnitude (number, distribution, and sizes of infestations) of pest problems is too extensive and beyond the available capital resources to effectively address during any single field season. To manage pests in the Refuge, it would be essential to prioritize treatment of infestations. Highest priority treatments would be focused on early detection and rapid response to eliminate infestations of new pests, if possible. This would be especially important for aggressive pests potentially impacting species, species groups, communities, and/or habitats associated refuge purpose(s), NWRS resources of concern (federally listed species, migratory birds, selected marine mammals, and interjurisdictional fish), and native species for maintaining/restoring biological integrity, diversity, and environmental health.

The next priority would be treating established pests that appear in one or more previously un-infested areas. Moody and Mack (1988) demonstrated through modeling that small, new outbreaks of invasive plants eventually would infest an area larger than the established, source population. They also found that control efforts focusing on the large, main infestation rather than the new, small satellites reduced the chances of overall success. The lowest priority would be treating large infestations (sometimes monotypic stands) of well-established pests. In this case, initial efforts would focus upon containment of the perimeter followed by work to control/eradicate the established infested area. If containment and/or control of a large infestation are not effective, then efforts would focus upon halting pest reproduction or managing source populations. Maxwell et al. (2009) found treating fewer populations that are sources represents an effective long-term strategy to reduce of total number of invasive populations and decreasing meta-population growth rates.

Although State-listed noxious weeds would always of high priority for management, other pest species known to cause substantial ecological impact would also be considered. For example, cheatgrass may not be listed by a state as noxious, but it can greatly alter fire regimes in shrub steppe habitats resulting in large monotypic stands that displace native bunch grasses, forbs, and shrubs. Pest control would likely require a multi-year commitment from the refuge staff. Essential to the long-term success of pest management would be pre- and post-treatment monitoring, assessment of the successes and failures of treatments, and development of new approaches when proposed methods do not achieve desired outcomes.

F.5 Best Management Practices (BMPs)

BMPs can minimize or eliminate possible effects associated with pesticide usage to non-target species and/or sensitive habitats as well as degradation of water quality from drift, surface runoff, or leaching. Based upon the Department of Interior Pesticide Use Policy (517 DM 1) and the Service Pest Management Policy and Responsibilities (30 AM 12), the use of applicable BMPs (where feasible) also would likely ensure that pesticide uses may not adversely affect federally listed species and/or their critical habitats through determinations made using the process described in 50 CFR part 402.

The following are BMPs pertaining to mixing/handling and applying pesticides for all ground-based treatments of pesticides, which would be considered and used, where feasible, based upon target- and site-specific factors and time-specific environmental conditions. Although not listed below, the most important BMP to eliminate/reduce potential impacts to non-target resources would be an IPM approach to prevent, control, eradicate, and contain pests.

F.5.1 Pesticide Handling and Mixing

- As a precaution against spilling, spray tanks would not be left unattended during filling.
- All pesticide containers would be triple rinsed and the rinsate would be used as water in the sprayer tank and applied to treatment areas.
- All pesticide spray equipment would be properly cleaned. Where possible, rinsate would be used as part of the make-up water in the sprayer tank and applied to treatment areas.
- The refuge staff would triple rinse and recycle (where feasible) pesticide containers.
- All unused pesticides would be properly discarded at a local “safe send” collection.
- Pesticides and pesticide containers would be lawfully stored, handled, and disposed of in accordance with the label and in a manner safeguarding human health, fish, and wildlife and prevent soil and water contaminant.
- The refuge staff would consider the water quality parameters (e.g., pH, hardness) that are important to ensure greatest efficacy where specified on the pesticide label.

- All pesticide spills would be addressed immediately using procedures identified in the refuge spill response plan.

F.6 Applying Pesticides

- Pesticide treatments would only be conducted by or under the supervision of Service personnel and non-Service applicators with the appropriate, State or BLM certification to safely and effectively conduct these activities on refuge lands and waters.
- The refuge staff would comply with all Federal, State, and local pesticide use laws and regulations as well as Departmental, Service, and NWRS pesticide-related policies. For example, the refuge staff would use application equipment and apply rates for the specific pest(s) identified on the pesticide label as required under FIFRA.
- Before each treatment season and prior to mixing or applying any product for the first time each season, all applicators would review the labels, MSDSs, and Pesticide Use Proposal (PUPs) for each pesticide, determining the target pest, appropriate mix rate(s), PPE, and other requirements listed on the pesticide label.
- A 1-foot no-spray buffer from the water's edge would be used, where applicable and where it does not detrimentally influence effective control of pest species.
- Use low-impact herbicide application techniques (e.g., spot treatment, cut stump, oil basal, Thinvert system applications) rather than broadcast foliar applications (e.g., boom sprayer, other larger tank wand applications), where practical.
- Use low-volume rather than high-volume foliar applications where low-impact methods above are not feasible or practical, to maximize herbicide effectiveness and ensure correct and uniform application rates.
- Applicators would use and adjust spray equipment to apply the coarsest droplet size spectrum with optimal coverage of the target species while reducing drift.
- Applicators would use the largest droplet size that results in uniform coverage.
- Applicators would use drift reduction technologies such as low-drift nozzles, where possible.
- Where possible, spraying would occur during low (average<7mph and preferably 3 to 5 mph) and consistent direction wind conditions with moderate temperatures (typically <85^{o}F).
- Where possible, applicators would avoid spraying during inversion conditions (often associated with calm and very low wind conditions) that can cause large-scale herbicide drift to non-target areas.
- Equipment would be calibrated regularly to ensure that the proper rate of pesticide is applied to the target area or species.
- Spray applications would be made at the lowest height for uniform coverage of target pests to minimize/eliminate potential drift.
- If windy conditions frequently occur during afternoons, spraying (especially boom treatments) would typically be conducted during early morning hours.
- Spray applications would not be conducted on days with >30 percent forecast for rain within six hours, except for pesticides that are rapidly rain fast (e.g., glyphosate in one hour) to minimize/eliminate potential runoff.
- Where possible, applicators would use drift retardant adjuvants during spray applications, especially adjacent to sensitive areas.
- Where possible, applicators would use a non-toxic dye to aid in identifying target area treated as well as potential over spray or drift. A dye can also aid in detecting equipment leaks. If a leak is discovered, the application would be stopped until repairs can be made to the sprayer.

- For pesticide uses associated with cropland and facilities management, buffers, as appropriate, would be used to protect sensitive habitats, especially wetlands and other aquatic habitats.
- When drift cannot be sufficiently reduced through altering equipment set up and application techniques, buffer zones may be identified to protect sensitive areas downwind of applications. The refuge staff would only apply adjacent to sensitive areas when the wind is blowing the opposite direction.
- Applicators would use scouting for early detection of pests to eliminate unnecessary pesticide applications.
- The refuge staff would consider timing of application so native plants are protected (e.g., senescence) while effectively treating invasive plants.
- Rinsate from cleaning spray equipment after application would be recaptured and reused or applied to an appropriate pest plant infestation.
- Application equipment (e.g., sprayer, ATV, tractor) would be thoroughly cleaned and PPE would be removed/disposed of on-site by applicators after treatments to eliminate the potential spread of pests to un-infested areas.

F.7 Safety

F.7.1 Personal Protective Equipment

All applicators would wear the specific personal protective equipment (PPE) identified on the pesticide label. The appropriate PPE would be worn at all times during handling, mixing, and applying. PPE can include the following: disposable (e.g., Tyvek) or laundered coveralls; gloves (latex, rubber, or nitrile); rubber boots; and/or an NIOSH-approved respirator. Because exposure to concentrated product is usually greatest during mixing, extra care should be taken while preparing pesticide solutions. Persons mixing these solutions can be best protected if they wear long gloves, an apron, footwear, and a face shield.

Coveralls and other protective clothing used during an application would be laundered separately from other laundry items. Transporting, storing, handling, mixing and disposing of pesticide containers would be consistent with label requirements, USEPA and OSHA requirements, and Service policy.

If a respirator is necessary for a pesticide use, then the following requirements would be met in accordance with Service safety policy: a written Respirator Program, fit testing, physical examination (including pulmonary function and blood work for contaminants), and proper storage of the respirator.

F.7.2 Notification

The restricted entry interval (REI) is the time period required after the application at which point someone may safely enter a treated area without PPE. Refuge staff, authorized management agents of the Service, volunteers, and members of the public who could be in or near a pesticide treated area within the stated re-entry time period on the label would be notified about treatment areas. Posting would occur at any site where individuals might inadvertently become exposed to a pesticide during other activities on the Refuge. Where required by the label and/or State-specific regulations, sites would also be posted on its perimeter and at other likely locations of entry. The refuge staff would also notify appropriate private property owners of an intended application, including any private individuals who have requested notification. Special efforts would be made to contact nearby individuals who are beekeepers or who have expressed chemical sensitivities.

F.7.3 Medical Surveillance

Medical surveillance may be required for Service personnel and approved volunteers who mix, apply, and/or monitor use of pesticides (see 242 FW 7 [Pesticide Users] and 242 FW 4 [Medical Surveillance]). In accordance with 242 FW 7.12A, Service personnel would be medically monitoring if one or more of the following criteria is met: exposed or may be exposed to concentrations at or above the published permissible exposure limits or threshold limit values (see 242 FW 4); use pesticides in a manner considered “frequent pesticide use”; or use pesticides in a manner that requires a respirator (see 242 FW 14 for respirator use requirements). In 242 FW 7.7A, “**Frequent Pesticide Use** means when a person applying pesticide handles, mixes, or applies pesticides, with a Health Hazard rating of 3 or higher, for eight or more hours in any week or sixteen or more hours in any 30-day period.” Under some circumstances, individuals may be medically monitored who use pesticides infrequently (see section 7.7), experience an acute exposure (sudden, short term), or use pesticides with a health hazard ranking of 1 or 2. This decision would consider the individual’s health and fitness level, the pesticide’s specific health risks, and the potential risks from other pesticide-related activities. Refuge cooperators (e.g., cooperative farmers) and other authorized agents (e.g., State and county employees) would be responsible for their own medical monitoring needs and costs.

Standard examinations (at refuge expense) of appropriate refuge staff would be provided by the nearest certified occupational health and safety physician as determined by Federal Occupational Health.

F.7.4 Certification and Supervision of Pesticide Applicators

Appropriate refuge staff or approved volunteers handling, mixing, and/or applying or directly supervising others engaged in pesticide use activities would be trained and State or federally (BLM) licensed to apply pesticides to refuge lands or waters. In accordance with 242 FW 7.18A and 569 FW 1.10B, certification is required to apply restricted use pesticides based upon USEPA regulations. For safety reasons, all individuals participating in pest management activities with general use pesticides also are encouraged to attend appropriate training or acquire pesticide applicator certification. The certification requirement would be for a commercial or private applicator depending upon the State. New staff unfamiliar with proper procedures for storing, mixing, handling, applying, and disposing of herbicides and containers would receive orientation and training before handling or using any products. Documentation of training would be kept in the files at the refuge office.

F.7.5 Record Keeping

F.7.5.1 Labels and material safety data sheets

Pesticide labels and material safety data sheets (MSDSs) would be maintained at the refuge shop and laminated copies in the mixing area. These documents also would be carried by field applicators, where possible. A written reference (e.g., note pad, chalk board, dry erase board) for each tank to be mixed would be kept in the mixing area for quick reference while mixing is in progress. In addition, approved PUPs stored in the PUPS database typically contain website links (URLs) to pesticide labels and MSDSs.

F.7.5.2 Pesticide use proposals (PUPs)

A PUP would be prepared for each proposed pesticide use associated with annual pest management on refuge lands and waters. A PUP would include specific information about the proposed pesticide use including the common and chemical names of the pesticide(s), target pest species, size and location of treatment site(s), application rate(s) and method(s), and federally listed species determinations, where applicable.

In accordance with Service guidelines (Director's memo [December 12, 2007]), a refuge staff may receive up to five-year approvals for Washington Office and field reviewed proposed pesticide uses based upon meeting identified criteria including an approved IPM plan, where necessary (see http://www.fws.gov/contaminants/Issues/IPM.cfm). For a refuge, an IPM plan (requirements described herein) can be completed independently or in association with a CCP or a habitat management plant (HMP) if IPM strategies and potential environmental effects are adequately addressed within appropriate NEPA documentation.

PUPs would be created, approved or disapproved, and stored as records in the Pesticide Use Proposal System (PUPS), which is centralized database on the Service's intranet (https://systems.fws.gov/pups). Only Service employees can access PUP records in this database.

F.7.5.3 Pesticide usage

In accordance with 569 FW 1, the refuge Project Leader would be required to maintain records of all pesticides annually applied on lands or waters under refuge jurisdiction. This would encompass pesticides applied by other Federal agencies, State and county governments, non-government applicators including cooperators and their pest management service providers with Service permission. For clarification, pesticide means all insecticides, insect and plant growth regulators, desiccants, herbicides, fungicides, rodenticides, acaricides, nematicides, fumigants, avicides, and piscicides.
The following usage information can be reported for approved PUPs in the PUPS database:

- Pesticide trade name(s)
- Active ingredient(s)
- Total acres treated
- Total amount of pesticides used (lbs or gallons)
- Total amount of active ingredient(s) used (lbs)
- Target pest(s)
- Efficacy (% control)

To determine whether treatments are efficacious (eradicating, controlling, or containing the target pest) and achieving resource objectives, habitat and/or wildlife response would be monitored both pre- and post-treatment, where possible. Considering available annual funding and staffing, appropriate monitoring data regarding characteristics (attributes) of pest infestations (e.g., area, perimeter, degree of infestation-density, % cover, density) as well as habitat and/or wildlife response to treatments may be collected and stored in a relational database (e.g., Refuge Habitat Management Database), preferably a geo-referenced data management system (e.g., Refuge Lands GIS) to facilitate data analyses and subsequent reporting. In accordance with adaptive management, data analysis and interpretation would allow treatments to be modified or changed over time, as necessary, to achieve resource objectives considering site-specific conditions in conjunction with habitat and/or wildlife responses. Monitoring could also identify short- and long-term impacts to natural resources and environmental quality associated with IPM treatments in accordance with adaptive management principles identified in 43 CFR 46.145.

F.8 Evaluating Pesticide Use Proposals

Pesticides would only be used on refuge lands for habitat management as well as croplands/facilities maintenance after approval of a PUP. In general, proposed pesticide uses on refuge lands would only be approved where there would likely be minor, temporary, or localized effects to fish and wildlife species as well as minimal potential to degrade environmental quality. Potential effects to listed and non-listed species would be evaluated with quantitative ecological risk assessments and other screening measures. Potential effects to environmental quality would be based upon pesticide characteristics of environmental fate (water solubility, soil mobility, soil persistence, and volatilization) and other quantitative screening tools. Ecological risk assessments as well as characteristics of environmental fate and potential to degrade environmental quality for pesticides would be documented in Chemical Profiles (see Section 7.5). These profiles would include threshold values for quantitative measures of ecological risk assessments and screening tools for environmental fate that represent minimal potential effects to species and environmental quality. In general, only pesticide uses with appropriate BMPs (see Section 4.0) for habitat management and cropland/facilities maintenance on refuge lands that would potentially have minor, temporary, or localized effects on refuge biological and environmental quality (threshold values not exceeded) would be approved.

F.8.1 Overview of Ecological Risk Assessment

An ecological risk assessment process would be used to evaluate potential adverse effects to biological resources as a result of a pesticide(s) proposed for use on refuge lands. It is an established quantitative and qualitative methodology for comparing and prioritizing risks of pesticides and conveying an estimate of the potential risk for an adverse effect. This quantitative methodology provides an efficient mechanism to integrate best available scientific information regarding hazard, patterns of use (exposure), and dose-response relationships in a manner that is useful for ecological risk decision-making. It would provide an effective way to evaluate potential effects where there is missing or unavailable scientific information (data gaps) to address reasonable, foreseeable adverse effects in the field as required under 40 CFR Part 1502.22. Protocols for ecological risk assessment of pesticide uses on the Refuge were developed through research and established by the U.S. Environmental Protection Agency (2004). Assumptions for these risk assessments are presented in Section 6.2.3.

The toxicological data used in ecological risk assessments are typically results of standardized laboratory studies provided by pesticide registrants to the USEPA to meet regulatory requirements under FIFRA. These studies assess the acute (lethality) and chronic (reproductive) effects associated with short- and long-term exposure to pesticides on representative species of birds, mammals, freshwater fish, aquatic invertebrates, and terrestrial and aquatic plants. Other effects data publicly available would also be used for risk assessment protocols described herein. Toxicity endpoint and environmental fate data are available from a variety of resources. Some of the more useful resources can be found in Section 7.5.

Table 1. Ecotoxicity tests used to evaluate potential effects to birds, fish, and mammals to establish toxicity endpoints for risk quotient calculations.

Species Group	Exposure	Measurement Endpoint
Bird	Acute	Median Lethal Concentration (LC_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[1]
Fish	Acute	Median Lethal Concentration (LC_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[2]
Mammal	Acute	Oral Lethal Dose (LD_{50})
	Chronic	No Observed Effect Concentration (NOEC) or No Observed Adverse Effect Concentration (NOAEC)[3]

[1]Measurement endpoints typically include a variety of reproductive parameters (e.g., number of eggs, number of offspring, eggshell thickness, and number of cracked eggs).
[2]Measurement endpoints for early life stage/life cycle typically include embryo hatch rates, time to hatch, growth, and time to swim-up.
[3]Measurement endpoints include maternal toxicity, teratogenic effects, or developmental anomalies, evidence of mutagenicity or genotoxicity, and interference with cellular mechanisms such as DNA synthesis and DNA repair.

F.8.2 Determining Ecological Risk to Fish and Wildlife

The potential for pesticides used on the Refuge to cause direct adverse effects to fish and wildlife would be evaluated using USEPA's Ecological Risk Assessment Process (USEPA 2004). This deterministic approach, which is based upon a two-phase process involving estimation of environmental concentrations and then characterization of risk, would be used for ecological risk assessments. This method integrates exposure estimates (estimated environmental concentration [EEC] and toxicological endpoints [e.g., LC_{50} and oral LD_{50}]) to evaluate the potential for adverse effects to species groups (birds, mammals, and fish) representative of legal mandates for managing units of the NWRS. This integration is achieved through risk quotients (RQs) calculated by dividing the EEC by acute and chronic toxicity values selected from standardized toxicological endpoints or published effect (Table 1).

$$RQ = EEC/Toxicological\ Endpoint$$

The level of risk associated with direct effects of pesticide use would be characterized by comparing calculated RQs to the appropriate Level of Concern (LOC) established by U.S. Environmental Protection Agency (1998 [Table 2]). The LOC represents a quantitative threshold value for screening potential adverse effects to fish and wildlife resources associated with pesticide use. The following are four exposure-species group scenarios that would be used to characterize ecological risk to fish and wildlife on the Refuge: acute-listed species, acute-nonlisted species, chronic-listed species, and chronic-nonlisted species.

Acute risk would indicate the potential for mortality associated with short-term dietary exposure to pesticides immediately after an application. For characterization of acute risks, median values from LC_{50} and LD_{50} tests would be used as toxicological endpoints for RQ calculations. In contrast, chronic risks would indicate the potential for adverse effects associated with long-term dietary exposure to pesticides from a single application or multiple applications over time (within a season and over years). For characterization of chronic risks, the no observed concentration (NOAEC) or no observed effect concentration (NOEC) for reproduction would be used as toxicological endpoints for RQ calculations. Where available, the NOAEC would be preferred over a NOEC value.

Listed species are those federally designated as threatened, endangered, or proposed in accordance with the Endangered Species Act of 1973 (16 USC 1531-1544, 87 Stat. 884, as amended-Public Law 93-205). For listed species, potential adverse effects would be assessed at the individual level because loss of individuals from a population could detrimentally impact a species. In contrast, risks to nonlisted species would consider effects at the population level. A RQ<LOC would indicate the proposed pesticide use “may affect, not likely to adversely affect” individuals (listed species) and it would not pose an unacceptable risk for adverse effects to populations (non-listed species) for each taxonomic group (Table 2). In contrast, an RQ>LOC would indicate a “may affect, likely to adversely affect” for listed species and it would also pose unacceptable ecological risk for adverse effects to nonlisted species.

Table 2. Presumption of unacceptable risk for birds, fish, and mammals (USEPA 1998).

Risk Presumption		**Level of Concern**	
		Listed Species	**Non-listed Species**
Acute	Birds	0.1	0.5
	Fish	0.05	0.5
	Mammals	0.1	0.5
Chronic	Birds	1.0	1.0
	Fish	1.0	1.0
	Mammals	1.0	1.0

F.8.2.1 Environmental exposure

Following release into the environment through application, pesticides would experience several different routes of environmental fate. Pesticides which would be sprayed can move through the air (e.g., particle or vapor drift) and may eventually end up in other parts of the environment such as non-target vegetation, soil, or water. Pesticides applied directly to the soil may be washed off the soil into nearby bodies of surface water (e.g., surface runoff) or may percolate through the soil to lower soil layers and groundwater (e.g., leaching) (Baker and Miller 1999, Pope et al. 1999, Butler et al. 1998, Ramsay et al. 1995, EXTOXNET 1993). Pesticides which would be injected into the soil may also be subject to the latter two fates. The aforementioned possibilities are by no means complete, but it does indicate movement of pesticides in the environment is very complex with transfers occurring continually among different environmental compartments. In some cases, these exchanges occur not only between areas that are close together, but it also may involve transportation of pesticides over long distances (Barry 2004, Woods 2004).

Terrestrial exposure

The ECC for exposure to terrestrial wildlife would be quantified using an USEPA screening-level approach (USEPA 2004). This screening-level approach is not affected by product formulation because it evaluates pesticide active ingredient(s). This approach would vary depending upon the proposed pesticide application method: spray or granular.

Terrestrial-spray application

For spray applications, exposure would be determined using the Kanaga nomogram method (USEPA 2005a, U.S. Environmental Protection Agency 2004, Pfleeger et al. 1996) through the USEPA’s

Terrestrial Residue Exposure model (T-REX) version 1.2.3 (USEPA 2005b). To estimate the maximum (initial) pesticide residue on short grass (<20 cm [7.8 inches] tall) as a general food item category for terrestrial vertebrate species, T-REX input variables would include the following from the pesticide label: maximum pesticide application rate (pounds active ingredient [acid equivalent]/acre) and pesticide half-life (days) in soil. Although there are other food item categories (tall grasses; broadleaf plants and small insects; and fruits, pods, seeds and large insects), short grass was selected because it would yield maximum EECs (240 ppm per lb ai/acre) for worst-case risk assessments. Short grass is not representative of forage for carnivorous species (e.g., raptors), but it would characterize the maximum potential exposure through the diet of avian and mammalian prey items. Consequently, this approach would provide a conservative screening tool for pesticides that do not biomagnify.

For RQ calculations in T-REX, the model would require the weight of surrogate species and Mineau scaling factors (Mineau et al. 1996). Body weights of bobwhite quail and mallard are included in T-REX by default, but body weights of other organisms (Table 3) would be entered manually. The Mineau scaling factor accounts for small-bodied bird species that may be more sensitive to pesticide exposure than would be predicted only by body weight. Mineau scaling factors would be entered manually with values ranging from 1 to 1.55 that are unique to a particular pesticide or group of pesticides. If specific information to select a scaling factor is not available, then a value of 1.15 would be used as a default. Alternatively, zero would be entered if it is known that body weight does not influence toxicity of pesticide(s) being assessed. The upper bound estimate output from the T-REX Kanaga nomogram would be used as an EEC for calculation of RQs. This approach would yield a conservative estimate of ecological risk.

Table 3. Average body weight of selected terrestrial wildlife species frequently used in research to establish toxicological endpoints (Dunning 1984).

Species	Body Weight (kg)
Mammal (15 g)	0.015
House sparrow	0.0277
Mammal (35 g)	0.035
Starling	0.0823
Red-winged blackbird	0.0526
Common grackle	0.114
Japanese quail	0.178
Bobwhite quail	0.178
Rat	0.200
Rock dove (aka pigeon)	0.542
Mammal (1000 g)	1.000
Mallard	1.082
Ring-necked pheasant	1.135

Terrestrial – granular application

Granular pesticide formulations and pesticide-treated seed would pose a unique route of exposure for avian and mammalian species. The pesticide is applied in discrete units which birds or mammals might ingest accidentally with food items or intentionally as in the case of some bird species actively seeking and picking up gravel or grit to aid digestion or seed as a food source. Granules may also be consumed by wildlife foraging on earthworms, slugs or other soft-bodied soil organisms to which the granules may adhere.

Terrestrial wildlife RQs for granular formulations or seed treatments would be calculated by dividing the maximum milligrams of active ingredient (a.i.) exposed (e.g., EEC) on the surface of an area equal to 1 square foot by the appropriate LD_{50} value multiplied by the surrogate's body weight (Table 3). An adjustment to surface area calculations would be made for broadcast, banded, and in-furrow applications. An adjustment also would be made for applications with and without incorporation of the granules. Without incorporation, it would be assumed that 100 percent of the granules remain on the soil surface available to foraging birds and mammals. Press wheels push granules flat with the soil surface, but they are not incorporated into the soil. If granules are incorporated in the soil during band or T-band applications or after broadcast applications, it would be assumed only 15 percent of the applied granules remain available to wildlife. It would be assumed that only 1 percent of the granules are available on the soil surface following in-furrow applications.

EECs for pesticides applied in granular form and as seed treatments would be determined considering potential ingestion rates of avian or mammalian species (e.g., 10-30 percent body weight/day). This would provide an estimate of maximum exposure that may occur as a result of granule or seed treatment spills such as those that commonly occur at end rows during application and planting. The availability of granules and seed treatments to terrestrial vertebrates would also be considered by calculating the loading per unit area (LD_{50}/ft^2) for comparison to USEPA Level of Concerns (USEPA 1998). The T-REX version 1.2.3 (USEPA 2005b) contains a submodel which automates Kanaga exposure calculations for granular pesticides and treated seed.

The following formulas would be used to calculate EECs depending upon the type of granular pesticide application:

- In-furrow applications assume a typical value of 1 percent granules, bait, or seed remain unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\%\ a.i.)(453{,}580\ mg/lbs)(1\ percent\ exposed))]/\{[(43{,}560\ ft.^2/acre)/(row\ spacing\ (ft.))]/(row\ spacing\ (ft.)\}$$

or

$$mg\ a.i./ft^2 = [(lbs\ product/1000\ ft.\ row)(\%\ a.i.)(1000\ ft\ row)(453{,}580\ mg/lb.)(1\ percent\ exposed)$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

- Incorporated banded treatments assume that 15 percent of granules, bait, and seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/1000\ row\ ft.)(\%\ a.i.)(453{,}580\ mg/lb.)(1\text{-}\%\ incorporated)]/(1{,}000\ ft.)(band\ width\ (ft.))$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

- Broadcast treatment without incorporation assumes 100 percent of granules, bait, seeds are unincorporated.

$$mg\ a.i./ft.^2 = [(lbs.\ product/acre)(\%\ a.i.)(453{,}590\ mg/lb.)]/(43{,}560\ ft.^2/acre)$$

$$EEC = [(mg\ a.i./ft.^2)(\%\ of\ pesticide\ biologically\ available)]$$

Where:

- *% of pesticide biologically available = 100 percent without species specific ingestion rates*

- *Conversion for calculating mg a.i./ft.*^{2} *using ounces: 453,580 mg/lb./16 = 28,349 mg/oz.*

The following equation would be used to calculate an RQ based on the EEC calculated by one of the above equations. The EEC would be divided by the surrogate LD_{50} toxicological endpoint multiplied by the body weight (Table 3) of the surrogate.

$$RQ = EEC/[LD_{50}\ (mg/kg) * body\ weight\ (kg)]$$

As with other risk assessments, an RQ>LOC would be a presumption of unacceptable ecological risk. An RQ<LOC would be a presumption of acceptable risk with only minor, temporary, or localized effects to species.

F.8.2.1.1 Aquatic exposure

Exposures to aquatic habitats (e.g., wetlands, meadows, ephemeral pools, water delivery ditches) would be evaluated separately for ground-based pesticide treatments of habitats managed for fish and wildlife compared with cropland/facilities maintenance. The primary exposure pathway for aquatic organisms from any ground-based treatments likely would be particle drift during the pesticide application. However, different exposure scenarios would be necessary as a result of contrasting application equipment and techniques as well as pesticides used to control pests on agricultural lands (especially those cultivated by cooperative farmers for economic return from crop yields) and facilities maintenance (e.g., roadsides, parking lots, trails) compared with other managed habitats on the Refuge. In addition, pesticide applications may be done <25 feet of the high water mark of aquatic habitats for habitat management treatments; whereas, no-spray buffers (≥25 feet) would be used for croplands/facilities maintenance treatments.

Habitat treatments

For the worst-case exposure scenario to non-target aquatic habitats, EECs (Table 4) would be would be derived from Urban and Cook (1986) that assumes an intentional overspray to an entire, non-target water body (1-foot depth) from a treatment <25 feet from the high water mark using the max application rate (acid basis [see above]). However, use of BMPs for applying pesticides (see Section 4.2) would likely minimize/eliminate potential drift to non-target aquatic habitats during actual treatments. If there would be unacceptable (acute or chronic) risk to fish and wildlife with the simulated 100 percent overspray (RQ>LOC), then the proposed pesticide use may be disapproved or the PUP would be approved at a lower application rate to minimize/eliminate unacceptable risk to aquatic organisms (RQ=LOC).

Table 4. Estimated Environmental Concentrations (ppb) of pesticides in aquatic habitats (1 foot depth) immediately after direct application (Urban and Cook 1986).

Lbs/acre	EEC (ppb)
0.10	36.7
0.20	73.5
0.25	91.9
0.30	110.2
0.40	147.0
0.50	183.7
0.75	275.6
1.00	367.5
1.25	459.7
1.50	551.6
1.75	643.5
2.00	735.7
2.25	827.6
2.50	919.4
3.00	1103.5
4.00	1471.4
5.00	1839
6.00	2207
7.00	2575
8.00	2943
9.00	3311
10.00	3678

Cropland/facilities maintenance treatments

Field drift studies conducted by the Spray Drift Task Force, which is a joint project of several agricultural chemical businesses, were used to develop a generic spray drift database. From this database, the AgDRIFT computer model was created to satisfy USEPA pesticide registration spray drift data requirements and as a scientific basis to evaluate off-target movement of pesticides from particle drift and assess potential effects of exposure to wildlife. Several versions of the computer model have been developed (i.e., v2.01 through v2.10). The Spray Drift Task Force AgDRIFT® model version 2.01 (SDTF 2003, AgDRIFT 2001) would be used to derive EECs resulting from drift of pesticides to refuge aquatic resources from ground-based pesticide applications >25 feet from the high water mark. The Spray Drift Task Force AgDRIFT model is publicly available at http://www.agdrift.com. At this website, click “AgDRIFT 2.0” and then click “Download Now” and follow the instructions to obtain the computer model.

The AgDRIFT model is composed of submodels called tiers. Tier I Ground submodel would be used to assess ground-based applications of pesticides. Tier outputs (EECs) would be calculated with AgDRIFT using the following input variables: max application rate (acid basis [see above]), low boom (20 inches), fine to medium droplet size, EPA-defined wetland, and a ≥25-foot distance (buffer) from treated area to water.

F.8.2.2 Use of information on effects of biological control agents, pesticides, degradates, and adjuvants

NEPA documents regarding biological and other environmental effects of biological control agents, pesticides, degradates, and adjuvants prepared by another Federal agency, where the scope would be relevant to evaluation of effects from pesticide uses on refuge lands, would be reviewed. Possible source agencies for such NEPA documents would include the Bureau of Land Management, U.S. Forest Service, National Park Service, U.S. Department of Agriculture-Animal and Plant Health Inspection Service, and the military services. It might be appropriate to incorporate by reference parts or all of existing document(s). Incorporating by reference (40 CFR 1502.21) is a technique used to avoid redundancies in analysis. It also would reduce the bulk of a Service NEPA document, which only would identify the documents that are incorporated by reference. In addition, relevant portions would be summarized in the Service NEPA document to the extent necessary to provide the decision maker and public with an understanding of relevance of the referenced material to the current analysis.

In accordance with the requirements set forth in 43 CFR 46.135, the Service would specifically incorporate through reference ecological risk assessments prepared by the U.S. Forest Service (http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm) and Bureau of Land Management (http://www.blm.gov/wo/st/en/prog/more/veg_eis.html). These risk assessments and associated documentation also are available in total with the administrative record for the Final Environmental Impact Statement entitled *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* (USFS 2005) and *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS (PEIS)* (BLM 2007). In accordance with 43 CRF 46.120(d), use of existing NEPA documents by supplementing, tiering to, incorporating by reference, or adopting previous NEPA environmental analyses would avoid redundancy and unnecessary paperwork.

As a basis for completing "Chemical Profiles" for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide and adjuvant uses prepared by the U.S. Forest Service would be incorporated by reference:

- 2,4-D
- Chlorosulfuron
- Clopyralid
- Dicamba
- Glyphosate
- Imazapic
- Imazapyr
- Metsulfuron methyl
- Picloram
- Sethoxydim
- Sulfometuron methyl
- Triclopyr
- Nonylphenol polyethylate (NPE) based surfactants

As a basis for completing "Chemical Profiles" for approving or disapproving refuge PUPs, ecological risk assessments for the following herbicide uses as well as evaluation of risks associated with pesticide degradates and adjuvants prepared by the Bureau of Land Management would be incorporated by reference:

- Bromacil
- Chlorsulfuron
- Diflufenzopyr
- Diquat
- Diuron
- Fluridone
- Imazapic
- Overdrive (diflufenzopyr and dicamba)
- Sulfometuron methyl
- Tebuthiuron
- Pesticide degradates and adjuvants (*Appendix D – Evaluation of risks from degradates, polyoxyethylene-amine (POEA) and R-11, and endocrine disrupting chemicals*)

F.8.2.3 Assumptions for ecological risk assessments

There are a number of assumptions involved with the ecological risk assessment process for terrestrial and aquatic organisms associated with use of the U.S. Environmental Protection Agency's (2004) process. These assumptions may be risk neutral or may lead to an over- or under-estimation of risk from pesticide exposure depending upon site-specific conditions. The following describes these assumptions, their application to the conditions typically encountered, and whether or not they may lead to recommendations that are risk neutral, underestimate, or overestimate ecological risk from potential pesticide exposure.

- Indirect effects would not be evaluated by ecological risk assessments. These effects include the mechanisms of indirect exposure to pesticides: consuming prey items (fish, birds, or small mammals), reductions in the availability of prey items, and disturbance associated with pesticide application activities.
- Exposure to a pesticide product can be assessed based upon the active ingredient. However, exposure to a chemical mixture (pesticide formulation) may result in effects that are similar or substantially different compared to only the active ingredient. Non-target organisms may be exposed directly to the pesticide formulation or only various constituents of the formulation as they dissipate and partition in the environment. If toxicological information for both the active ingredient and formulated product are available, then data representing the greatest potential toxicity would be selected for use in the risk assessment process (USEPA 2004). As a result, this conservative approach may lead to an overestimation of risk characterization from pesticide exposure.
- Because toxicity tests with listed or candidate species or closely related species are not available, data for surrogate species would be most often used for risk assessments. Specifically, bobwhite quail and mallard duck are the most frequently used surrogates for evaluating potential toxicity to federally listed avian species. Bluegill sunfish, rainbow trout, and fathead minnow are the most common surrogates for evaluating toxicity for freshwater fishes. However, sheep's head minnow can be an appropriate surrogate marine species for coastal environments. Rats and mice are the most common surrogates for evaluating toxicity for mammals. Interspecies sensitivity is a major source of uncertainty in pesticide assessments. As a result of this uncertainty, data is selected for the most sensitive species tested within a taxonomic group (birds, fish, and mammals) given the quality of the data is acceptable. If additional toxicity data for more species of organisms in a particular group are

available, the selected data would not be limited to the species previously listed as common surrogates.

- The Kanaga nomogram outputs maximum EEC values that may be used to calculate an average daily concentration over a specified interval of time, which is referred to as a time-weighted-average (TWA). The maximum EEC would be selected as the exposure input for both acute and chronic risk assessments in the screening-level evaluations. The initial or maximum EEC derived from the Kanaga nomogram represents the maximum expected instantaneous or acute exposure to a pesticide. Acute toxicity endpoints are determined using a single exposure to a known pesticide concentration typically for 48 to 96 hours. This value is assumed to represent ecological risk from acute exposure to a pesticide. On the other hand, chronic risk to pesticide exposure is a function of pesticide concentration and duration of exposure to the pesticide. An organism's response to chronic pesticide exposure may result from either the concentration of the pesticide, length of exposure, or some combination of both factors. Standardized tests for chronic toxicity typically involve exposing an organism to several different pesticide concentrations for a specified length of time (days, weeks, months, years, or generations). For example, avian reproduction tests include a ten-week exposure phase. Because a single length of time is used in the test, time response data is usually not available for inclusion into risk assessments. Without time response data it is difficult to determine the concentration which elicited a toxicological response.
- Using maximum EECs for chronic risk estimates may result in an overestimate of risk, particularly for compounds that dissipate rapidly. Conversely, using TWAs for chronic risk estimates may underestimate risk if it is the concentration rather than the duration of exposure that is primarily responsible for the observed adverse effect. The maximum EEC would be used for chronic risk assessments although it may result in an overestimate of risk. TWAs may be used for chronic risk assessments, but they would be applied judiciously considering the potential for an underestimate or overestimate of risk. For example, the number of days exposure exceeds a Level of Concern may influence the suitability of a pesticide use. The greater the number of days the EEC exceeds the Level of Concern translates into greater the ecological risk. This is a qualitative assessment, and is subject to reviewer's expertise in ecological risk assessment and tolerance for risk.
- The length of time used to calculate the TWA can have a substantial effect on the exposure estimates and there is no standard method for determining the appropriate duration for this estimate. The T-REX model assumes a 21-week exposure period, which is equivalent to avian reproductive studies designed to establish a steady-state concentration for bioaccumulative compounds. However, this does not necessarily define the true exposure duration needed to elicit a toxicological response. Pesticides, which do not bioaccumulate, may achieve a steady-state concentration earlier than 21 weeks. The duration of time for calculating TWAs would require justification and it would not exceed the duration of exposure in the chronic toxicity test (approximately 70 days for the standard avian reproduction study). An alternative to using the duration of the chronic toxicity study is to base the TWA on the application interval. In this case, increasing the application interval would suppress both the estimated peak pesticide concentration and the TWA. Another alternative to using TWAs would be to consider the number of days that a chemical is predicted to exceed the LOC.
- Pesticide dissipation is assumed to be first-order in the absence of data suggesting alternative dissipation patterns such as bi-phasic. Field dissipation data would generally be the most pertinent for assessing exposure in terrestrial species that forage on vegetation. However, these data are often not available and it can be misleading particularly if the compound is

prone to "wash-off". Soil half-life is the most common degradation data available. Dissipation or degradation data that would reflect the environmental conditions typical of refuge lands would be used, if available.

- For species found in the water column, it would be assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column.
- Actual habitat requirements of any particular terrestrial species are not considered, and it is assumed that species exclusively and permanently occupy the treated area, or adjacent areas receiving pesticide at rates commensurate with the treatment rate. This assumption would produce a maximum estimate of exposure for risk characterization. This assumption would likely lead to an overestimation of exposure for species that do not permanently and exclusively occupy the treated area (USEPA 2004).
- Exposure through incidental ingestion of pesticide contaminated soil is not considered in the USEPA risk assessment protocols. Research suggests <15 percent of the diet can consist of incidentally ingested soil depending upon species and feeding strategy (Beyer et al. 1994). An assessment of pesticide concentrations in soil compared to food item categories in the Kanaga nomogram indicates incidental soil ingestion would not likely increase dietary exposure to pesticides. Inclusion of soil into the diet would effectively reduce the overall dietary concentration compared to the present assumption that the entire diet consists a contaminated food source (Fletcher et al. 1994). An exception to this may be soil-applied pesticides in which exposure from incidental ingestion of soil may increase. Potential for pesticide exposure under this assumption may be underestimated for soil-applied pesticides and overestimated for foliar-applied pesticides. The concentration of a pesticide in soil would likely be less than predicted on food items.
- Exposure through inhalation of pesticides is not considered in the USEPA risk assessment protocols. Such exposure may occur through three potential sources: spray material in droplet form at time of application, vapor phase with the pesticide volatilizing from treated surfaces, and airborne particulates (soil, vegetative matter, and pesticide dusts). The USEPA (1990) reported exposure from inhaling spray droplets at the time of application is not an appreciable route of exposure for birds. According to research on mallards and bobwhite quail, respirable particle size (particles reaching the lung) in birds is limited to maximum diameter of 2 to 5 microns. The spray droplet spectra covering the majority of pesticide application scenarios indicate that less than 1 percent of the applied material is within the respirable particle size. This route of exposure is further limited because the permissible spray drop size distribution for ground pesticide applications is restricted to ASAE medium or coarser drop size distribution.
- Inhalation of a pesticide in the vapor phase may be another source of exposure for some pesticides under certain conditions. This mechanism of exposure to pesticides occurs post application, and it would pertain to those pesticides with a high vapor pressure. The USEPA is currently evaluating protocols for modeling inhalation exposure from pesticides including near-field and near-ground air concentrations based upon equilibrium and kinetics-based models. Risk characterization for exposure with this mechanism is unavailable.
- The effect from exposure to dusts contaminated with the pesticide cannot be assessed generically as partitioning issues related to application site soils and chemical properties of the applied pesticides render the exposure potential from this route highly situation specific.
- Dermal exposure may occur through three potential sources: direct application of spray to terrestrial wildlife in the treated area or within the drift footprint, incidental contact with contaminated vegetation, or contact with contaminated water or soil. Interception of spray

and incidental contact with treated substrates may pose risk to avian wildlife (Driver et al. 1991). However, available research related to wildlife dermal contact with pesticides is extremely limited, except dermal toxicity values are common for some mammals used as human surrogates (rats and mice). The USEPA is currently evaluating protocols for modeling dermal exposure. Risk characterization may be underestimated for this route of exposure, particularly with high risk pesticides such as some organophosphates or carbamate insecticides. If protocols are established by the USEPA for assessing dermal exposure to pesticides, they would be considered for incorporation into pesticide assessment protocols.

- Exposure to a pesticide may occur from consuming surface water, dew or other water on treated surfaces. Water soluble pesticides have the potential to dissolve in surface runoff and puddles in a treated area may contain pesticide residues. Similarly, pesticides with lower organic carbon partitioning characteristics and higher solubility in water have a greater potential to dissolve in dew and other water associated with plant surfaces. Estimating the extent to which such pesticide loadings to drinking water occurs is complex and would depend upon the partitioning characteristics of the active ingredient, soils types in the treatment area, and the meteorology of the treatment area. In addition, the use of various water sources by wildlife is highly species-specific. Currently, risk characterization for this exposure mechanism is not available. The USEPA is actively developing protocols to quantify drinking water exposures from puddles and dew. If and when protocols are formally established by the USEPA for assessing exposure to pesticides through drinking water, these protocols would be incorporated into pesticide risk assessment protocols.
- Risk assessments are based upon the assumption that the entire treatment area would be subject to pesticide application at the rates specified on the label. In most cases, there is potential for uneven application of pesticides through such plausible incidents such as changes in calibration of application equipment, spillage, and localized releases at specific areas in or near the treated field that are associated with mixing and handling and application equipment as well as applicator skill. Inappropriate use of pesticides and the occurrence of spills represent a potential underestimate of risk. It is likely not an important factor for risk characterization. All pesticide applicators are required to be certified by the state in which they apply pesticides. Certification training includes the safe storage, transport, handling, and mixing of pesticides; equipment calibration; and proper application with annual continuing education.
- The USEPA relies on Fletcher (1994) for setting the assumed pesticide residues in wildlife dietary items. The USEPA (2004) "believes that these residue assumptions reflect a realistic upper-bound residue estimate, although the degree to which this assumption reflects a specific percentile estimate is difficult to quantify". Fletcher's (1994) research suggests that the pesticide active ingredient residue assumptions used by the USEPA represent a 95th percentile estimate. However, research conducted by Pfleeger et al. (1996) indicates USEPA residue assumptions for short grass was not exceeded. Baehr and Habig (2000) compared USEPA residue assumptions with distributions of measured pesticide residues for the USEPA's UTAB database. Overall residue selection level would tend to overestimate risk characterization. This is particularly evident when wildlife individuals are likely to have selected a variety of food items acquired from multiple locations. Some food items may be contaminated with pesticide residues whereas others are not contaminated. However, it is important to recognize differences in species feeding behavior. Some species may consume whole above-ground plant material, but others would preferentially select different plant structures. Also, species may preferentially select a food item although multiple food items

may be present. Without species specific knowledge regarding foraging behavior characterizing ecological risk other than in general terms is not possible.

- Acute and chronic risk assessments rely on comparisons of wildlife dietary residues with LC_{50} or NOEC values expressed as concentrations of pesticides in laboratory feed. These comparisons assume that ingestion of food items in the field occurs at rates commensurate with those in the laboratory. Although the screening assessment process adjusts dry-weight estimates of food intake to reflect the increased mass in fresh-weight wildlife food intake estimates, it does not allow for gross energy and assimilative efficiency differences between wildlife food items and laboratory feed. Differences in assimilative efficiency between laboratory and wild diets suggest that current screening assessment methods are not accounting for a potentially important aspect of food requirements.
- There are several other assumptions that can affect non-target species not considered in the risk assessment process. These include possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic and biotic factors) and behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse effects to non-target species, but they are usually characterized in the published literature in only a general manner limiting their value in the risk assessment process.
- It is assumed that aquatic species exclusively and permanently occupy the water body being assessed. Actual habitat requirements of aquatic species are not considered. With the possible exception of scenarios where pesticides are directly applied to water, it is assumed that no habitat use considerations specific for any species would place the organisms in closer proximity to pesticide use sites. This assumption produces a maximum estimate of exposure or risk characterization. It would likely be realistic for many aquatic species that may be found in aquatic habitats within or in close proximity to treated terrestrial habitats. However, the spatial distribution of wildlife is usually not random because wildlife distributions are often related to habitat requirements of species. Clumped distributions of wildlife may result in an under- or over-estimation of risk depending upon where the initial pesticide concentration occurs relative to the species or species habitat.
- For species found in the water column, it would be assumed that the greatest bioavailable fraction of the pesticide active ingredient in surface waters is freely dissolved in the water column. Additional chemical exposure from materials associated with suspended solids or food items is not considered because partitioning onto sediments likely is minimal. Adsorption and bioconcentration occurs at lower levels for many newer pesticides compared with older more persistent bioaccumulative compounds. Pesticides with RQs close to the listed species level of concern, the potential for additional exposure from these routes may be a limitation of risk assessments, where potential pesticide exposure or risk may be underestimated.
- Mass transport losses of pesticide from a water body (except for losses by volatilization, degradation, and sediment partitioning) would not be considered for ecological risk assessment. The water body would be assumed to capture all pesticide active ingredients entering as runoff, drift, and adsorbed to eroded soil particles. It would also be assumed that pesticide active ingredient is not lost from the water body by overtopping or flow-through, nor is concentration reduced by dilution. In total, these assumptions would lead to a near maximum possible water-borne concentration. However, this assumption would not account for the potential to concentrate pesticide through the evaporative loss. This limitation may

have the greatest impact on water bodies with high surface-to-volume ratios such as ephemeral wetlands, where evaporative losses are accentuated and applied pesticides have low rates of degradation and volatilization.

- For acute risk assessments, there would be no averaging time for exposure. An instantaneous peak concentration would be assumed, where instantaneous exposure is sufficient in duration to elicit acute effects comparable to those observed over more protracted exposure periods (typically 48 to 96 hours) tested in the laboratory. In the absence of data regarding time-to-toxic event, analyses, and latent responses to instantaneous exposure, risk would likely be overestimated.
- For chronic exposure risk assessments, the averaging times considered for exposure are commensurate with the duration of invertebrate life-cycle or fish-early life stage tests (e.g., 21-28 days and 56-60 days, respectively). Response profiles (time to effect and latency of effect) to pesticides likely vary widely with mode of action and species and should be evaluated on a case-by-case basis as available data allow. Nevertheless, because the USEPA relies on chronic exposure toxicity endpoints based on a finding of no observed effect, the potential for any latent toxicity effects or averaging time assumptions to alter the results of an acceptable chronic risk assessment prediction is limited. The extent to which duration of exposure from water-borne concentrations overestimate or underestimate actual exposure depends on several factors. These include the following: localized meteorological conditions, runoff characteristics of the watershed (e.g., soils, topography), the hydrological characteristics of receiving waters, environmental fate of the pesticide active ingredient, and the method of pesticide application. It should also be understood that chronic effects studies are performed using a method that holds water concentration in a steady state. This method is not likely to reflect conditions associated with pesticide runoff. Pesticide concentrations in the field increase and decrease in surface water on a cycle influenced by rainfall, pesticide use patterns, and degradation rates. As a result of the dependency of this assumption on several undefined variables, risk associated with chronic exposure may in some situations underestimate risk and overestimate risk in others.
- There are several other factors that can affect non-target species not considered in the risk assessment process. These would include the following: possible additive or synergistic effects from applying two or more pesticides or additives in a single application, co-location of pesticides in the environment, cumulative effects from pesticides with the same mode of action, effects of multiple stressors (e.g., combination of pesticide exposure, adverse abiotic [not pesticides] and biotic factors), and sub-lethal effects such as behavioral changes induced by exposure to a pesticide. These factors may exist at some level contributing to adverse effects to non-target species, but they are not routinely assessed by regulatory agencies. Therefore, information on the factors is not extensive limiting their value for the risk assessment process. As this type of information becomes available, it would be included, either quantitatively or qualitatively, in this risk assessment process.
- USEPA is required by the Food Quality Protection Act to assess the cumulative risks of pesticides that share common mechanisms of toxicity, or act the same within an organism. Currently, USEPA has identified four groups of pesticides that have a common mechanism of toxicity requiring cumulative risk assessments. These four groups are: the organophosphate insecticides, N-methyl carbamate insecticides, triazine herbicides, and chloroacetanilide herbicides.

F.8.3 Pesticide Mixtures and Degradates

Pesticide products are usually a formulation of several components generally categorized as active ingredients and inert or other ingredients. The term active ingredient is defined by the FIFRA as preventing, destroying, repelling, or mitigating the effects of a pest, or it is a plant regulator, defoliant, desiccant, or nitrogen stabilizer. In accordance with FIFRA, the active ingredient(s) must be identified by name(s) on the pesticide label along with its relative composition expressed in percentage(s) by weight. In contrast, inert ingredient(s) are not intended to affect a target pest. Their role in the pesticide formulation is to act as a solvent (keep the active ingredient is a liquid phase), an emulsifying or suspending agent (keep the active ingredient from separating out of solution), or a carrier (such as clay in which the active ingredient is impregnated on the clay particle in dry formulations). For example, if isopropyl alcohol would be used as a solvent in a pesticide formulation, then it would be considered an inert ingredient. FIFRA only requires that inert ingredients identified as hazardous and associated percent composition, and the total percentage of all inert ingredients must be declared on a product label. Inert ingredients that are not classified as hazardous are not required to be identified.

The USEPA (September 1997) issued Pesticide Regulation Notice 97-6, which encouraged manufacturers, formulators, producers, and registrants of pesticide products to voluntarily substitute the term “other ingredients” for “inert ingredients” in the ingredient statement. This change recognized that all components in a pesticide formulation potentially could elicit or contribute to an adverse effect on non-target organisms and, therefore, are not necessarily inert. Whether referred to as “inerts” or “other ingredients,” these constituents within a pesticide product have the potential to affect species or environmental quality. The USEPA categorizes regulated inert ingredients into the following four lists (http://www.epa.gov/opprd001/inerts/index.html):

- List 1 – Inert Ingredients of Toxicological Concern
- List 2 – Potentially Toxic Inert Ingredients
- List 3 – Inerts of Unknown Toxicity
- List 4 – Inerts of Minimal Toxicity

Several of the List 4 compounds are naturally occurring earthen materials (e.g., clay materials, simple salts) that would not elicit toxicological response at applied concentrations. However, some of the inerts (particularly the List 3 compounds and unlisted compounds) may have moderate to high potential toxicity to aquatic species based on MSDSs or published data.

Comprehensively assessing potential effects to non-target fish, wildlife, plants, and/or their habitats from pesticide use is a complex task. It would be preferable to assess the cumulative effects from exposure to the active ingredient, its degradates, and inert ingredients as well as other active ingredients in the spray mixture. However, it would only be feasible to conduct deterministic risk assessments for each component in the spray mixture singly. Limited scientific information is available regarding ecological effects (additive or synergistic) from chemical mixtures that typically rely upon broadly encompassing assumptions. For example, the U.S. Forest Service (2005) found that mixtures of pesticides used in land (forest) management likely would not cause additive or synergistic effects to non-target species based upon a review of scientific literature regarding toxicological effects and interactions of agricultural chemicals (ATSDR 2004). Moreover, information on inert ingredients, adjuvants, and degradates is often limited by the availability of and access to reliable toxicological data for these constituents.

Toxicological information regarding “other ingredients” may be available from sources such as the following:

- TOMES (a proprietary toxicological database including USEPA’s IRIS, the Hazardous Substance Data Bank, the Registry of Toxic Effects of Chemical Substances [RTECS]).
- USEPA’s ECOTOX database, which includes AQUIRE (a database containing scientific papers published on the toxic effects of chemicals to aquatic organisms).
- TOXLINE (a literature searching tool).
- Material Safety Data Sheets (MSDSs) from pesticide suppliers.
- Other sources such as the Farm Chemicals Handbook.

Because there is a lack of specific inert toxicological data, inert(s) in a pesticide may cause adverse ecological effects. However, inert ingredients typically represent only a small percentage of the pesticide spray mixture, and it would be assumed that negligible effects would be expected to result from inert ingredient(s).

Although the potential effects of degradates should be considered when selecting a pesticide, it is beyond the scope of this assessment process to consider all possible breakdown chemicals of the various product formulations containing an active ingredient. Degradates may be more or less mobile and more or less hazardous in the environment than their parent pesticides (Battaglin et al. 2003). Differences in environmental behavior (e.g., mobility) and toxicity between parent pesticides and degradates would make assessing potential degradate effects extremely difficult. For example, a less toxic and more mobile, bioaccumulative, or persistent degradate may have potentially greater effects on species and/or degrade environmental quality. The lack of data on the toxicity of degradates for many pesticides would represent a source of uncertainty for assessing risk.

A USEPA-approved label specifies whether a product can be mixed with one or more pesticides. Without product-specific toxicological data, it would not possible to quantify the potential effects of these mixtures. In addition, a quantitative analysis could only be conducted if reliable scientific information allowed a determination of whether the joint action of a mixture would be additive, synergistic, or antagonistic. Such information would not likely exist unless the mode of action would be common among the chemicals and receptors. Moreover, the composition of and exposure to mixtures would be highly site- and/or time-specific and, therefore, it would be nearly impossible to assess potential effects to species and environmental quality.

To minimize or eliminate potential negative effects associated with applying two or more pesticides as a mixture, the use would be conducted in accordance with the labeling requirements. Labels for two or more pesticides applied as a mixture should be completely reviewed, where products with the least potential for negative effects would be selected for use on the Refuge. This is especially relevant when a mixture would be applied in a manner that may already have the potential for an effect(s) associated with an individual pesticide (e.g., runoff to ponds in sandy watersheds). Use of a tank mix under these conditions would increase the level of uncertainty in terms of risk to species or potential to degrade environmental quality.

Adjuvants generally function to enhance or prolong the activity of pesticide. For terrestrial herbicides, adjuvants aid in the absorption into plant tissue. Adjuvant is a broad term that generally applies to surfactants, selected oils, anti-foaming agents, buffering compounds, drift control agents, compatibility agents, stickers, and spreaders. Adjuvants are not under the same registration requirements as pesticides and the USEPA does not register or approve the labeling of spray adjuvants. Individual pesticide labels identify types of adjuvants approved for use with it. In general, adjuvants compose a relatively small portion of the volume of pesticides applied. Selection of adjuvants with limited toxicity and low volumes would be recommended to reduce the potential for the adjuvant to influence the toxicity of the pesticide.

F.8.4 Determining Effects to Soil and Water Quality

The approval process for pesticide uses would consider potential to degrade water quality on and off refuge lands. A pesticide can only affect water quality through movement away from the treatment site. After application, pesticide mobilization can be characterized by one or more of the following (Kerle et al. 1996):

- Attach (sorb) to soil, vegetation, or other surfaces and remain at or near the treated area;
- Attach to soil and move off-site through erosion from runoff or wind;
- Dissolve in water that can be subjected to runoff or leaching.

As an initial screening tool, selected chemical characteristics and rating criteria for a pesticide can be evaluated to assess potential to enter ground and/or surface waters. These would include the following: persistence, sorption coefficient (K_{oc}), groundwater ubiquity score (GUS), and solubility.

Persistence, which is expressed as half-life ($t_{½}$), represents the length of time required for 50 percent of the deposited pesticide to degrade (completely or partially). Persistence in the soil can be categorized as the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996). Half-life data is usually available for aquatic and terrestrial environments.

Another measure of pesticide persistence is dissipation time (DT_{50}). It represents the time required for 50 percent of the deposited pesticide to degrade and move from a treated site; whereas, half-life describes the rate for degradation only. As for half-life, units of dissipation time are usually expressed in days. Field or foliar dissipation time is the preferred data for use to estimate pesticide concentrations in the environment. However, soil half-life is the most common persistence data cited in published literature. If field or foliar dissipation data is not available, soil half-life data may be used. The average or representative half-life value of most important degradation mechanism would be selected for quantitative analysis for both terrestrial and aquatic environments.

Mobility of a pesticide is a function of how strongly it is adsorbed to soil particles and organic matter, its solubility in water, and its persistence in the environment. Pesticides strongly adsorbed to soil particles, relatively insoluble in water, and not environmentally persistent would be less likely to move across the soil surface into surface waters or to leach through the soil profile and contaminate groundwater. Conversely, pesticides that are not strongly adsorbed to soil particles, are highly water soluble, and are persistent in the environment would have greater potential to move from the application site (off-site movement).

The degree of pesticide adsorption to soil particles and organic matter (Kerle et al. 1996) is expressed as the soil adsorption coefficient (K_{oc}). The soil adsorption coefficient is measured as micrograms of pesticide per gram of soil (µg/g) that can range from near zero to the thousands. Pesticides with higher K_{oc} values are strongly sorbed to soil and, therefore, would be less subject to movement.

Water solubility describes the amount of pesticide that will dissolve in a known quantity of water. The water solubility of a pesticide is expressed as milligrams of pesticide dissolved in a liter of water (mg/L or parts per million [ppm]). Pesticide with solubility <0.1 ppm are virtually insoluble in water, 100-1000 ppm are moderately soluble, and >10,000 ppm highly soluble (USGS 2000). As pesticide solubility increases, there would be greater potential for off-site movement.

The Groundwater Ubiquity Score (GUS) is a quantitative screening tool to estimate a pesticide's potential to move in the environment. It uses soil persistence and adsorption coefficients in the following formula.

$$GUS = \log_{10}(t_{½}) \times [4 - \log_{10}(K_{oc})]$$

The potential pesticide movement rating would be based upon its GUS value. Pesticides with a GUS <0.1 would considered to have an extremely low potential to move toward groundwater. Values of 1.0-2.0 would be low, 2.0-3.0 would be moderate, 3.0-4.0 would be high, and >4.0 would have a very high potential to move toward groundwater.

Water solubility describes the amount of pesticide dissolving in a specific quantity of water, where it is usually measured as mg/L or ppm. Solubility is useful as a comparative measure because pesticides with higher values are more likely to move by runoff or leaching. GUS, water solubility, $t_{½}$, and K_{oc} values are available for selected pesticides from the OSU Extension Pesticide Properties Database at http://npic.orst.edu/ppdmove.htm. Many of the values in this database were derived from the SCS/ARS/CES Pesticide Properties Database for Environmental Decision Making (Wauchope et al. 1992).

Soil properties influence the fate of pesticides in the environment. The following six properties are mostly likely to affect pesticide degradation and the potential for pesticides to move off-site by leaching (vertical movement through the soil) or runoff (lateral movement across the soil surface).

- Permeability is the rate of water movement vertically through the soil. It is affected by soil texture and structure. Coarse textured soils (e.g., high sand content) have a larger pore size and they are generally more permeable than fine textured soils (i.e., high clay content). The more permeable soils would have a greater potential for pesticides to move vertically down through the soil profile. Soil permeability rates (inches/hour) are usually available in county soil survey reports.
- Soil texture describes the relative percentage of sand, silt, and clay. In general, greater clay content with smaller the pore size would lower the likelihood and rate water that would move through the soil profile. Clay also serves to adsorb (bind) pesticides to soil particles. Soils with high clay content would adsorb more pesticide than soils with relatively low clay content. In contrast, sandy soils with coarser texture and lower water holding capacity would have a greater potential for water to leach through them.
- Soil structure describes soil aggregation. Soils with a well-developed soil structure have looser, more aggregated, structure that would be less likely to be compacted. Both characteristics would allow for less restricted flow of water through the soil profile resulting in greater infiltration.
- Organic matter would be the single most important factor affecting pesticide adsorption in soils. Many pesticides are adsorbed to organic matter which would reduce their rate of downward movement through the soil profile. Also, soils high in organic matter would tend to hold more water, which may make less water available for leaching.
- Soil moisture affects how fast water would move through the soil. If soils are already wet or saturated before rainfall or irrigation, excess moisture would runoff rather than infiltrate into the soil profile. Soil moisture also would influence microbial and chemical activity in soil, which effects pesticide degradation.

- Soil pH would influence chemical reactions that occur in the soil, which in turn determines whether or not a pesticide will degrade, rate of degradation, and, in some instances, which degradation products are produced.

Based upon the aforementioned properties, soils most vulnerable to groundwater contamination would be sandy soils with low organic matter. In contrast, the least vulnerable soils would be well-drained clayey soils with high organic matter. Consequently, pesticides with the lowest potential for movement in conjunction with appropriate best management practices (see below) would be used in an IPM framework to treat pests while minimizing effects to non-target biota and protecting environmental quality.

Along with soil properties, the potential for a pesticide to affect water quality through runoff and leaching would consider site-specific environmental and abiotic conditions including rainfall, water table conditions, and topography (Huddleston 1996).

- Water is necessary to separate pesticides from soil. This can occur in two basic ways. Pesticides that are soluble move easily with runoff water. Pesticide-laden soil particles can be dislodged and transported from the application site in runoff. The concentration of pesticides in the surface runoff would be greatest for the first runoff event following treatment. The rainfall intensity and route of water infiltration into soil, to a large extent, determine pesticide concentrations and losses in surface runoff. The timing of the rainfall after application also would have an effect. Rainfall interacts with pesticides at a shallow soil depth (¼ to ½ inch), which is called the mixing zone (Baker and Miller 1999). The pesticide/water mixture in the mixing zone would tend to leach down into the soil or runoff depending upon how quickly the soil surface becomes saturated and how rapidly water can infiltrate into the soil. Leaching would decrease the amount of pesticide available near the soil surface (mixing zone) to runoff during the initial rainfall event following application and subsequent rainfall events.
- Terrain slope would affect the potential for surface runoff and the intensity of runoff. Steeper slopes would have greater potential for runoff following a rainfall event. In contrast, soils that are relatively flat would have little potential for runoff, except during intense rainfall events. In addition, soils in lower areas would be more susceptible to leaching as a result of receiving excessive water from surrounding higher elevations.
- Depth to groundwater would be an important factor affecting the potential for pesticides to leach into groundwater. If the distance from the soil surface to the top of the water table is shallow, pesticides would have less distance to travel to reach groundwater. Shallower water tables that persist for longer periods would be more likely to experience groundwater contamination. Soil survey reports are available for individual counties. These reports provide data in tabular format regarding the water table depths and the months during which it is persists. In some situations, a hard pan exists above the water table that would prevent pesticide contamination from leaching.

F.8.5 Determining Effects to Air Quality

Pesticides may volatilize from soil and plant surfaces and move from the treated area into the atmosphere. The potential for a pesticide to volatilize is determined by the pesticide's vapor pressure which would be affected by temperature, sorption, soil moisture, and the pesticide's water solubility. Vapor pressure is often expressed in mm Hg. To make these numbers easier to compare, vapor pressure may be expressed in exponent form ($I \times 10^{-7}$), where I represents a vapor pressure index. In general, pesticides with $I<10$ would have a low potential to volatilize; whereas, pesticides with $I>1,000$ would have a high potential to volatilize (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database.

F.8.6 Preparing a Chemical Profile

The following instructions would be used by Service personnel to complete Chemical Profiles for pesticides. Specifically, profiles would be prepared for pesticide active ingredients (e.g., glyphosate, imazapic) that would be contained in one or more trade name products that are registered and labeled with USEPA. All information fields under each category (e.g., Toxicological Endpoints, Environmental Fate) would be completed for a Chemical Profile. If no information is available for a specific field, then “No data is available in references” would be recorded in the profile. Available scientific information would be used to complete Chemical Profiles. Each entry of scientific information would be shown with applicable references.

Completed Chemical Profiles would provide a structured decision-making process using quantitative assessment/screening tools with threshold values (where appropriate) that would be used to evaluate potential biological and other environmental effects to refuge resources. For ecological risk assessments presented in these profiles, the “worst-case scenario” would be evaluated to determine whether a pesticide could be approved for use considering the maximum single application rate specified on pesticide labels for habitat management and croplands/facilities maintenance treatments pertaining to refuges. Where the “worst-case scenario” likely would only result in minor, temporary, and localized effects to listed and non-listed species with appropriate BMPs (see Section 5.0), the proposed pesticide’s use in a PUP would have a scientific basis for approval under any application rate specified on the label that is at or below rates evaluated in a Chemical Profile. In some cases, the Chemical Profile would include a lower application rate than the maximum labeled rate in order to protect refuge resources. As necessary, Chemical Profiles would be periodically updated with new scientific information or as pesticides with the same active ingredient are proposed for use on the refuge in PUPs.

Throughout this section, threshold values (to prevent or minimize potential biological and environmental effects) would be clearly identified for specific information presented in a completed Chemical Profile. Comparison with these threshold values provides an explicit scientific basis to approve or disapprove PUPs for habitat management and cropland/facilities maintenance on refuge lands. In general, PUPs would be approved for pesticides with Chemical Profiles where there would be no exceedances of threshold values. However, BMPs are identified for some screening tools that would minimize/eliminate potential effects (exceedance of the threshold value) as a basis for approving PUPs.

Date: Service personnel would record the date when the Chemical Profile is completed or updated. Chemical Profiles (e.g., currently approved pesticide use patterns) would be periodically reviewed and updated, as necessary. The most recent review date would be recorded on a profile to document when it was last updated.

Trade Name(s): Service personnel would accurately and completely record the trade name(s) from the pesticide label, which includes a suffix that describes the formulation (e.g., WP, DG, EC, L, SP, I, II or 64). The suffix often distinguishes a specific product among several pesticides with the same active ingredient. Service personnel would record a trade name for each pesticide product with the same active ingredient.

Common chemical name(s): Service personnel would record the common name(s) listed on the pesticide label or material safety data sheet (MSDS) for an active ingredient. The common name of a pesticide is listed as the active ingredient on the title page of the product label immediately following the trade name, and the MSDS, Section 2: Composition/Information on Ingredients. A Chemical Profile is completed for each active ingredient.

Pesticide Type: Service personnel would record the type of pesticide for an active ingredient as one of the following: herbicide, desiccant, fungicide, fumigant, growth regulator, insecticide, piscicide, or rodenticide.

EPA Registration Number(s): This number (EPA Reg. No.) appears on the title page of the label and MSDS, Section 1: Chemical Product and Company Description. It is not the EPA Establishment Number that is usually located near it. Service personnel would record the EPA Reg. No. for each trade name product with an active ingredient based upon PUPs.

Pesticide Class: Service personnel would list the general chemical class for the pesticide (active ingredient). For example, malathion is an organophosphate and carbaryl is a carbamate.

CAS (Chemical Abstract Service) Number: This number is often located in the second section (Composition/Information on Ingredients) of the MSDS. The MSDS table listing components usually contains this number immediately prior to or following the % composition.

Other Ingredients: From the most recent MSDS for the proposed pesticide product(s), Service personnel would include any chemicals in the pesticide formulation not listed as an active ingredient that are described as toxic or hazardous, or regulated under the Superfund Amendments and Reauthorization Act (SARA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA), State Right-to-Know, or other listed authorities. These are usually found in MSDS sections titled “Hazardous Identifications”, “Exposure Control/Personal Protection”, and “Regulatory Information”. If concentrations of other ingredients are available for any compounds identified as toxic or hazardous, then Service personnel would record this information in the Chemical Profile by trade name. MSDS(s) may be obtained from the manufacturer, manufacturer’s website or from an on-line database maintained by Crop Data Management Systems, Inc. (see list below).

Toxicological Endpoints

Toxicological endpoint data would be collected for acute and chronic tests with mammals, birds, and fish. Data would be recorded for species available in the scientific literature. If no data are found for a particular taxonomic group, then “No data available is references” would be recorded as the data entry. Throughout the Chemical Profile, references (including toxicological endpoint data) would be cited using parentheses (#) following the recorded data.

Mammalian LD_{50}: For test species in the scientific literature, Service personnel would record available data for oral lethal dose (LD_{50}) in mg/kg-bw (body weight) or ppm-bw. Most common test species in scientific literature are the rat and mouse. The lowest LD_{50} value found for a rat would be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk to mammals (see Table 1 in Section 7.1).

Mammalian LC_{50}: For test species in the scientific literature, Service personnel would record available data for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). Most common test species in scientific literature are the rat and mouse. The lowest LC_{50} value found for a rat would be used as a toxicological endpoint for diet-based RQ calculations to assess acute risk (see Table 1 in Section 7.1).

Mammalian Reproduction: For test species listed in the scientific literature, Service personnel would record the test results (e.g., Lowest Observed Effect Concentration [LOEC], Lowest Observed Effect Level [LOEL], No Observed Adverse Effect Level [NOAEL], No Observed Adverse Effect Concentration [NOAEC]) in mg/kg-bw or mg/kg-diet for reproductive test procedure(s) (e.g., generational studies [preferred], fertility, new born weight). Most common test species available in scientific literature are rats and mice. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for a rat would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.1).

Avian LD_{50}: For test species available in the scientific literature, Service personnel would record values for oral lethal dose (LD_{50}) in mg/kg-bw or ppm-bw. Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LD_{50} value found for an avian species would be used as a toxicological endpoint for dose-based RQ calculations to assess acute risk (see Table 1 in Section 7.1).

Avian LC_{50}: For test species available in the scientific literature, Service personnel would record values for dietary lethal concentration (LC_{50}) as reported (e.g., mg/kg-diet or ppm-diet). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest LC_{50} value found for an avian species would be used as a toxicological endpoint for dietary-based RQ calculations to assess acute risk (see Table 1 in Section 7.1).

Avian Reproduction: For test species available in the scientific literature, Service personnel would record test results (e.g., LOEC, LOEL, NOAEC, NOAEL) in mg/kg-bw or mg/kg-diet consumed for reproductive test procedure(s) (e.g., early life cycle, reproductive). Most common test species available in scientific literature are the bobwhite quail and mallard. The lowest NOEC, NOAEC, NOEL, or NOAEL test results found for an avian species would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.1).

Fish LC_{50}: For test freshwater or marine species listed in the scientific literature, Service personnel would record a LC_{50} in ppm or mg/L. Most common test species available in the scientific literature are the bluegill, rainbow trout, and fathead minnow (marine). Test results for many game species may also be available. The lowest LC_{50} value found for a freshwater fish species would be used as a toxicological endpoint for RQ calculations to assess acute risk (see Table 1 in Section 7.1).

Fish Early Life Stage (ELS)/Life Cycle: For test freshwater or marine species available in the scientific literature, Service personnel would record test results (e.g., LOEC, NOAEL, NOAEC, LOAEC) in ppm for test procedure(s) (e.g., early life cycle, life cycle). Most common test species available in the scientific literature are bluegill, rainbow trout, and fathead minnow. Test results for other game species may also be available. The lowest test value found for a fish species (preferably freshwater) would be used as a toxicological endpoint for RQ calculations to assess chronic risk (see Table 1 in Section 7.1).

Other: For test invertebrate as well as non-vascular and vascular plant species available in the scientific literature, Service personnel would record LC_{50}, LD_{50}, LOEC, LOEL, NOAEC, NOAEL, or EC_{50} (environmental concentration) values in ppm or mg/L. Most common test invertebrate species available in scientific literature are the honey bee and the water flea (*Daphnia magna*). Green algae (*Selenastrum capricornutum*) and pondweed (*Lemna minor*) are frequently available test species for aquatic non-vascular and vascular plants, respectively.

Ecological Incident Reports: After a site has been treated with pesticide(s), wildlife may be exposed to these chemical(s). When exposure is high relative to the toxicity of the pesticides, wildlife may be killed or visibly harmed (incapacitated). Such events are called ecological incidents. The USEPA maintains a database (Ecological Incident Information System) of ecological incidents. This database stores information extracted from incident reports submitted by various Federal and state agencies and non-government organizations. Information included in an incident report is date and location of the incident, type and magnitude of effects observed in various species, use(s) of pesticides known or suspected of contributing to the incident, and results of any chemical residue and cholinesterase activity analyses conducted during the investigation.

Incident reports can play an important role in evaluating the effects of pesticides by supplementing quantitative risk assessments. All incident reports for pesticide(s) with the active ingredient and associated information would be recorded.

Environmental Fate

Water Solubility: Service personnel would record values for water solubility (S_w), which describes the amount of pesticide that dissolves in a known quantity of water. S_w is expressed as mg/L (ppm). Pesticide S_w values would be categorized as one of the following: insoluble <0.1 ppm, moderately soluble = 100 to 1000 ppm, highly soluble >10,000 ppm (USGS 2000). As pesticide S_w increases, there would be greater potential to degrade water quality through runoff and leaching.

Sw would be used to evaluate potential for bioaccumulation in aquatic species [see **Octanol-Water Partition Coefficient (K_{ow})** below].

Soil Mobility: Service personnel would record available values for soil adsorption coefficient (K_{oc} [µg/g]). It provides a measure of a chemical's mobility and leaching potential in soil. K_{oc} values are directly proportional to organic content, clay content, and surface area of the soil. K_{oc} data for a pesticide may be available for a variety of soil types (e.g., clay, loam, sand).

K_{oc} values would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below).

Soil Persistence: Service personnel would record values for soil half-life ($t_{½}$), which represents the length of time (days) required for 50 percent of the deposited pesticide to degrade (completely or partially) in the soil. Based upon the $t_{½}$ value, soil persistence would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs:

If soil $t_{½} \leq 100$ days, then a PUP would be approved without additional BMPs to protect water quality.

If soil $t_{½}$ >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** *to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the groundwater table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Along with K_{oc}, soil $t_{½}$ values would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below).

Soil Dissipation: Dissipation time (DT_{50}) represents the time required for 50 percent of the deposited pesticide to degrade and move from a treated site; whereas, soil $t_{½}$ describes the rate for degradation only. As for $t_{½}$, units of dissipation time are usually expressed in days. Field dissipation time would be the preferred data for use to estimate pesticide concentrations in the environment because it is based upon field studies compared to soil $t_{½}$, which is derived in a laboratory. However, soil $t_{½}$ is the most common persistence data available in the published literature. If field dissipation data is not available, soil half-life data would be used in a Chemical Profile. The average or representative half-life value of most important degradation mechanism would be selected for quantitative analysis for both terrestrial and aquatic environments.

Based upon the DT_{50} value, environmental persistence in the soil also would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If soil DT_{50} ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.
If soil DT_{50} >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** *to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the groundwater table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Along with K_{oc}, soil DT_{50} values (preferred over soil $t_{½}$) would be used in evaluating the potential to degrade groundwater by leaching (see **Potential to Move to Groundwater** below), if available.

Aquatic Persistence: Service personnel would record values for aquatic $t_{½}$, which represents the length of time required for 50 percent of the deposited pesticide to degrade (completely or partially) in water. Based upon the $t_{½}$ value, aquatic persistence would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days (Kerle et al. 1996).

Threshold for Approving PUPs:

If aquatic $t_{½}$ ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.
If aquatic $t_{½}$ >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** *to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the groundwater table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Aquatic Dissipation: Dissipation time (DT_{50}) represents the time required for 50 percent of the deposited pesticide to degrade or move (dissipate); whereas, aquatic $t_{½}$ describes the rate for degradation only. As for $t_{½}$, units of dissipation time are usually expressed in days. Based upon the DT_{50} value, environmental persistence in aquatic habitats also would be categorized as one of the following: non-persistent <30 days, moderately persistent = 30 to 100 days, and persistent >100 days.

Threshold for Approving PUPs:

If aquatic DT_{50} ≤100 days, then a PUP would be approved without additional BMPs to protect water quality.
If aquatic DT_{50} >100 days, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** *to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the groundwater table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Potential to Move to Groundwater: Groundwater Ubiquity Score (GUS) = $\log_{10}$(soil $t_{½}$) x [4 – $\log_{10}(K_{oc})$]. If a DT_{50} value is available, it would be used rather than a $t_{½}$ value to calculate a GUS score. Based upon the GUS value, the potential to move toward groundwater would be recorded as one of the following categories: extremely low potential<1.0, low - 1.0 to 2.0, moderate - 2.0 to 3.0, high - 3.0 to 4.0, or very high>4.0.

Threshold for Approving PUPs:

If GUS ≤4.0, then a PUP would be approved without additional BMPs to protect water quality.
If GUS >4.0, then a PUP would only be approved with additional BMPs specifically to protect water quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** *to minimize potential surface runoff and leaching that can degrade water quality:*

- *Do not exceed one application per site per year.*
- *Do not use on coarse-textured soils where the groundwater table is <10 feet and average annual precipitation >12 inches.*
- *Do not use on steep slopes if substantial rainfall is expected within 24 hours or ground is saturated.*

Volatilization: Pesticides may volatilize (evaporate) from soil and plant surfaces and move off-target into the atmosphere. The potential for a pesticide to volatilize is a function of its vapor pressure that is affected by temperature, sorption, soil moisture, and the pesticide's water solubility. Vapor pressure is often expressed in mm Hg. To make these values easier to compare, vapor pressure would be recorded by Service personnel in exponential form ($I \times 10^{-7}$), where I represents a vapor pressure index. In general, pesticides with I<10 would have low potential to volatilize; whereas, pesticides with I >1,000 would have a high potential to volatilize (Oregon State University 1996). Vapor pressure values for pesticides are usually available in the pesticide product MSDS or the USDA Agricultural Research Service (ARS) pesticide database (see **References**).

Threshold for Approving PUPs:

If I ≤1,000, then a PUP would be approved without additional BMPs to minimize drift and protect air quality.
If I >1,000, then a PUP would only be approved with additional BMPs specifically to minimize drift and protect air quality. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** *to reduce volatilization and potential to drift and degrade air quality:*

- *Do not treat when wind velocities are <2 or >10 mph with existing or potential inversion conditions.*
- *Apply the large-diameter droplets possible for spray treatments.*
- *Avoid spraying when air temperatures >85^{o}F.*
- *Use the lowest spray height possible above target canopy.*
- *Where identified on the pesticide label, soil incorporate pesticide as soon as possible during or after application.*

Octanol-Water Partition Coefficient (K_{ow}): The octanol-water partition coefficient (K_{ow}) is the concentration of a pesticide in octanol and water at equilibrium at a specific temperature. Because octanol is an organic solvent, it is considered a surrogate for natural organic matter. Therefore, K_{ow} would be used to assess potential for a pesticide to bioaccumulate in tissues of aquatic species (e.g., fish). If K_{ow} >1,000 or S_w<1 mg/L and soil $t_{½}$>30 days, then there would be high potential for a pesticide to bioaccumulate in aquatic species such as fish (USGS 2000).

Threshold for Approving PUPs:

If there is not a high potential for a pesticide to bioaccumulate in aquatic species, then the PUP would be approved.
If there is a high potential to bioaccumulate in aquatic species (K_{ow}>1,000 or S_w<1 mg/L and soil $t_{½}$>30 days), then the PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Bioaccumulation/Bioconcentration: The physiological process where pesticide concentrations in tissue would increase in biota because they are taken and stored at a faster rate than they are metabolized or excreted. The potential for bioaccumulation would be evaluated through bioaccumulation factors (BAFs) or bioconcentration factors (BCFs). Based upon BAF or BCF values, the potential to bioaccumulate would be recorded as one of the following: low – 0 to 300, moderate – 300 to 1,000, or high >1,000 (Calabrese and Baldwin 1993).

Threshold for Approving PUPs:

If BAF or BCF≤1,000, then a PUP would be approved without additional BMPs.
If BAF or BCF>1,000, then a PUP would not approved, except under unusual circumstances where approval would only be granted by the Washington Office.

Worst-Case Ecological Risk Assessment

Max Application Rates (acid equivalent): Service personnel would record the highest application rate of an active ingredient (ae basis) for habitat management and cropland/facilities maintenance treatments in this data field of a Chemical Profile. These rates can be found in Table CP.1 under the column heading "Max Product Rate – Single Application (lbs/acre – AI on acid equiv basis)". This table would be prepared for a Chemical Profile from information specified in labels for trade name products identified in PUPs. If these data are not available in pesticide labels, then write "NS" for "not specified on label" in this table.

EECs: An estimated environmental concentration (ECC) represents potential exposure to fish and wildlife (birds and mammals) from using a pesticide. EECs would be derived by Service personnel using an USEPA screening-level approach (USEPA 2004). For each max application rate [see description under **Max Application Rates (acid equivalent)**], Service personnel would record two EEC values in a Chemical Profile; these would represent the worst-case terrestrial and aquatic exposures for habitat management and croplands/facilities maintenance treatments. For terrestrial and aquatic EEC calculations, see description for data entry under **Presumption of Unacceptable Risk/Risk Quotients**, which is the next field for a Chemical Profile.

Presumption of Unacceptable Risk/Risk Quotients: Service personnel would calculate and record acute and chronic risk quotients (RQs) for birds, mammals, and fish using the provided tabular formats for habitat management and/or cropland/facilities maintenance treatments. RQs recorded in a Chemical Profile would represent the worst-case assessment for ecological risk. See Section 7.2 for discussion regarding the calculations of RQs.

For aquatic assessments associated with habitat management treatments, RQ calculations would be based upon selected acute and chronic toxicological endpoints for fish and the EEC would be derived from Urban and Cook (1986) assuming 100 percent overspray to an entire 1-foot deep water body using the max application rate (ae basis [see above]).

For aquatic assessments associated with cropland/facilities maintenance treatments, RQ calculations would be done by Service personnel based upon selected acute and chronic toxicological endpoints for fish and an EEC would be derived from the aquatic assessment in AgDRIFT® model version 2.01 under Tier I ground-based application with the following input variables: max application rate (acid basis [see above]), low boom (20 inches), fine to medium/coarse droplet size, 20 swaths, EPA-defined wetland, and 25-foot distance (buffer) from treated area to water.

See Section 7.2.1.2 for more details regarding the calculation of EECs for aquatic habitats for habitat management and cropland/facilities maintenance treatments.

For terrestrial avian and mammalian assessments, RQ calculations would be done by Service personnel based upon dietary exposure, where the “short grass” food item category would represent the worst-case scenario. For terrestrial spray applications associated with habitat management and cropland/facilities maintenance treatments, exposure (EECs and RQs) would be determined using the Kanaga nomogram method through the USEPA’s T-REX version 1.2.3. T-REX input variables would include the following: max application rate (acid basis [see above]) and pesticide half-life (days) in soil to estimate the initial, maximum pesticide residue concentration on general food items for terrestrial vertebrate species in short (<20 cm [7.8 inches] tall) grass.

For granular pesticide formulations and pesticide-treated seed with a unique route of exposure for terrestrial avian and mammalian wildlife, see Section 7.2.1.1.2 for the procedure that would be used to calculate RQs.

All calculated RQs in both tables would be compared with Levels of Concern (LOCs) established by USEPA (see Table 2 in Section 7.2). If a calculated RQ exceeds an established LOC value (in brackets inside the table), then there would be a potential for an acute or chronic effect (unacceptable risk) to federally listed (T&E) species and nonlisted species. See Section 7.2 for detailed descriptions of acute and chronic RQ calculations and comparison to LOCs to assess risk.

Threshold for approving PUPs:

If RQs≤LOCs, then a PUP would be approved without additional BMPs.
If RQs>LOCs, then a PUP would only be approved with additional BMPs specifically to minimize exposure (ecological risk) to bird, mammal, and/or fish species. One or more BMPs such as the following would be included in the **Specific Best Management Practices (BMPs) section** *to reduce potential risk to non-listed or listed species:*

- *Lower application rate and/or fewer number of applications so RQs≤LOCs*
- *For aquatic assessments (fish) associated with cropland/facilities maintenance, increase the buffer distance beyond 25 feet so RQs≤LOCs.*

Justification for Use: Service personnel would describe the reason for using the pesticide based control of specific pests or groups of pests. In most cases, the pesticide label will provide the appropriate information regarding control of pests to describe in the section.

Specific Best Management Practices (BMPs): Service personnel would record specific BMPs necessary to minimize or eliminate potential effects to non-target species and/or degradation of environmental quality from drift, surface runoff, or leaching. These BMPs would be based upon scientific information documented in previous data fields of a Chemical Profile. Where necessary and feasible, these specific practices would be included in PUPs as a basis for approval.

If there are no specific BMPs that are appropriate, then Service personnel would describe why the potential effects to refuge resources and/or degradation of environmental quality is outweighed by the overall resource benefit(s) from the proposed pesticide use in the BMP section of the PUP. See Section 4.0 of this document for a complete list of BMPs associated with mixing and applying pesticides appropriate for all PUPs with ground-based treatments that would be additive to any necessary, chemical-specific BMPs.

References: Service personnel would record scientific resources used to provide data/information for a chemical profile. Use the number sequence to uniquely reference data in a chemical profile.

The following on-line data resources are readily available for toxicological endpoint and environmental fate data for pesticides:

1. California Product/Label Database. Department of Pesticide Regulation, California Environmental Protection Agency. (http://www.cdpr.ca.gov/docs/label/labelque.htm#regprods)

2. ECOTOX database. Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington, DC. (http://cfpub.epa.gov/ecotox/)

3. Extension Toxicology Network (EXTOXNET) Pesticide Information Profiles. Cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University and University of Idaho through Oregon State University, Corvallis, Oregon. (http://extoxnet.orst.edu/pips/ghindex.html)

4. FAO specifications and evaluations for plant protection products. Pesticide Management Unit, Plant Protection Services, Food and Agriculture Organization, United Nations. (http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/)

5. Human health and ecological risk assessments. Pesticide Management and Coordination, Forest Health Protection, U.S. Department of Agriculture, U.S. Forest Service. (http://www.fs.fed.us/foresthealth/pesticide/risk.htm)

6. Pesticide Chemical Fact Sheets. Clemson University Pesticide Information Center. (http://entweb.clemson.edu/pesticid/Document/Labels/factshee.htm)

7. Pesticide Fact Sheets. Published by Information Ventures, Inc. for Bureau of Land Management, Department of Interior; Bonneville Power Administration, U.S. Department of Energy; and Forest Service, U.S. Department of Agriculture. (http://infoventures.com/e-hlth/pesticide/pest-fac.html)

8. Pesticide Fact Sheets. National Pesticide Information Center. (http://npic.orst.edu/npicfact.htm)

9. Pesticide Fate Database. U.S. Environmental Protection Agency, Washington, DC. (http://cfpub.epa.gov/pfate/home.cfm).

10. Pesticide product labels and material safety data sheets. Crop Data Management Systems, Inc. (CDMS) (http://www.cdms.net/pfa/LUpdateMsg.asp) or multiple websites maintained by agrichemical companies.

11. Registered Pesticide Products (Oregon database). Oregon Department of Agriculture. (http://www.oda.state.or.us/dbs/pest_products/search.lasso)

12. Regulatory notes. Pest Management Regulatory Agency, Health Canada, Ontario, Canada. (http://www.hc-sc.gc.ca/pmra-arla/)

13. Reptile and Amphibian Toxicology Literature. Canadian Wildlife Service, Environment Canada, Ontario, Canada. (http://www.cws-scf.ec.gc.ca/nwrc-cnrf/ratl/index_e.cfm)

14. Specific Chemical Fact Sheet – New Active Ingredients, Biopesticide Fact Sheet and Registration Fact Sheet. U.S Environmental Protection Agency, Washington, DC. (http://www.epa.gov/pestidides/factsheets/chemical_fs.htm)

15. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Invasive Species Initiative. The Nature Conservancy. (http://tnsweeds.ucdavis.edu/handbook.html)

16. Wildlife Contaminants Online. U.S. Geological Survey, Department of Interior, Washington, D.C. (http://www.pwrc.usgs.gov/contaminants-online/)

17. One-liner database. 2000. U.S. Environmental Protection Agency, Office of Pesticide Programs, Washington, D.C.

Chemical Profile

Date:			
Trade Name(s):		**Common Chemical Name(s):**	
Pesticide Type:		**EPA Registration Number:**	
Pesticide Class:		**CAS Number:**	
Other Ingredients:			

Toxicological Endpoints

Mammalian LD_{50}:	
Mammalian LC_{50}:	
Mammalian Reproduction:	
Avian LD_{50}:	
Avian LC_{50}:	
Avian Reproduction:	
Fish LC_{50}:	
Fish ELS/Life Cycle:	
Other:	

Ecological Incident Reports

Environmental Fate

Water solubility (S_w):	
Soil Mobility (K_{oc}):	
Soil Persistence ($t_{½}$):	
Soil Dissipation (DT_{50}):	
Aquatic Persistence ($t_{½}$):	
Aquatic Dissipation (DT_{50}):	
Potential to Move to Groundwater (GUS score):	
Volatilization (mm Hg):	
Octanol-Water Partition Coefficient (K_{ow}):	
Bioaccumulation/Bioconcentration:	**BAF:`** **BCF:**

Worst Case Ecological Risk Assessment

Max Application Rate (ai lbs/acre – ae basis)	**Habitat Management:** **Croplands/Facilities Maintenance:**
EECs	**Terrestrial (Habitat Management):** **Terrestrial (Croplands/Facilities Maintenance):** **Aquatic (Habitat Management):** **Aquatic (Croplands/Facilities Maintenance):**

Habitat Management Treatments:

Presumption of Unacceptable Risk		Risk Quotient (RQ)	
		Listed (T&E) Species	Nonlisted Species
Acute	Birds	[0.1]	[0.5]
	Mammals	[0.1]	[0.5]
	Fish	[0.05]	[0.5]
Chronic	Birds	[1]	[1]
	Mammals	[1]	[1]
	Fish	[1]	[1]

Cropland/Facilities Maintenance Treatments:

Presumption of Unacceptable Risk		Risk Quotient (RQ)	
		Listed (T&E) Species	Nonlisted Species
Acute	Birds	[0.1]	[0.5]
	Mammals	[0.1]	[0.5]
	Fish	[0.05]	[0.5]
Chronic	Birds	[1]	[1]
	Mammals	[1]	[1]
	Fish	[1]	[1]

Justification for Use:	
Specific Best Management Practices (BMPs):	
References:	

Table CP.1 Pesticide Name

Trade Name[a]	Treatment Type[b]	Max Product Rate – Single Application (lbs/acre or gal/acre)	Max Product Rate - Single Application (lbs/acre - AI on acid equiv basis)	Max Number of Applications Per Season	Max Product Rate Per Season (lbs/acre/season or gal/acre/season)	Minimum Time Between Applications (Days)

[a]From each label for a pesticide identified in pesticide use proposals (PUPs), Service personnel would record application information associated with possible/known uses on Service lands.[b]Treatment type: H – habitat management or CF – cropland/facilities maintenance. If a pesticide is labeled for both types of treatments (uses), then record separate data for H and CF applications.

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Appendix G. Fire Management Plan

FIRE MANAGEMENT PLAN

SOUTHEAST IDAHO NATIONAL WILDLIFE REFUGE COMPLEX

Camas National Wildlife Refuge
Grays Lake National Wildlife Refuge
Bear Lake National Wildlife Refuge
Minidoka National Wildlife Refuge
Oxford Slough Waterfowl Production Area

Pacific Northwest Region

March 2009

United States Department of the Interior
FISH AND WILDLIFE SERVICE
911 NE 11th Avenue
Portland, Oregon 97232-4181

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
NWRS/NCR/Fire

Memorandum

To: Regional Director, Region 1
Portland, Oregon

From: Regional Chief, National Wildlife Refuge System Carolyn A. Bohan
Portland, Oregon

Subject: Approval of Updated Fire Management Plan for Southeast Idaho National Wildlife Refuge Complex (NWRC)

The Department of Interior policy (910 DM 1-3), and Fish, and Wildlife Service (Service) policy (621 FW 1.1) require that Service lands with burnable vegetation have an approved Fire Management Plan. Southeast Idaho NWRC has updated the fire management plans for all refuges within the Complex. The updated fire management plans continue the range and extent of activities described in previous plans, but has been updated to be consistent with new interagency formatting directives.

Consistent with the February 2009 Fire Management Handbook, the fire management plans have been forwarded for your review and approval.

Please contact Pam Ensley (503) 231-6174 or Brett Fay (503) 872-2756 if you require additional information on these fire management plans.

Attachment

Prepared by: ______________________________ 3-09-09
Lance Roberts, Fire Management Officer
Southeast Idaho National Wildlife Refuge Complex
Date

Submitted By: ______________________________ 3/9/2009
Annette de Knijf, (Acting) Project Leader
Southeast Idaho National Wildlife Refuge Complex
Date

Reviewed by ______________________________ 4/1/09
Pam Ensley, Regional Fire Management Coordinator
Pacific Region, U.S. Fish and Wildlife Service
Date

Reviewed by Ben Harrison ______________________________ 5/5/09
Ben Harrison, Division Chief Natural and Cultural Resources
Pacific Region, U.S. Fish and Wildlife Service
Date

Reviewed by ______________________________ 5/15/09
Forrest Cameron, Fish and Wildlife Administrator
Refuge Supervisor
Pacific Region, U.S. Fish and Wildlife Service
Date

Reviewed by Carolyn Bohan ______________________________ 5/15/09
Carolyn Bohan, Assistant Regional Director, Refuges
Pacific Region, U.S. Fish and Wildlife Service
Date

Approved: ______________________________ 5/18/09
FOR: Robyn Thorson, Regional Director
Pacific Region, U.S. Fish and Wildlife Service
Date

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Table of Contents

G.1 Introduction

G.1.1 Purpose of the Fire Management Plan (FMP)

This plan is written to meet Department and US Fish and Wildlife Service (FWS) requirements that every area with burnable vegetation must have an approved fire management plan (FMP). It complies with a FWS requirement that refuges review and/or revise FMPs at a minimum of five-year intervals or when significant changes are proposed, such as might occur if significant land use changes are made adjacent to FWS lands (621 FW 2).

The goal of wildland fire management is to plan and implement actions that help accomplish the mission of the National Wildlife Refuge System. That mission is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (095 FW 3.2).

Completion of a FMP enables the Southeast Idaho National Wildlife Refuge Complex to consider a full range of appropriate suppression strategies and to conduct prescribed fires; without it, prescribed fires cannot be conducted and only wildfire suppression strategies may be implemented.

This FMP identifies and integrates all wildland fire management and related activities. It defines a program to manage wildland fires and to assure that wildland fire management goals and components are coordinated.

G.1.2 General Description of the Area in the Fire Management Plan

The Southeast Idaho National Wildlife Refuge Complex is comprised of four wildlife refuges and one waterfowl production area. The Complex is located in the southeastern portion of Idaho ranging from Bear Lake NWR on the Utah border to Camas NWR near the Montana border, (Complex map in appendix A). Refuges included in this Fire Management Plan:

- Bear Lake National Wildlife Refuge (NWR)
- Camas NWR
- Grays Lake NWR
- Minidoka NWR and Oxford Slough Waterfowl Production Area (WPA).

The Complex is diverse both ecologically and geographically. Habitats range from low elevations of the Snake River Plain to the high elevation of the inter-montane habitats of the Rocky Mountains. The Complex office is located in Chubbuck, Idaho; each refuge also has an onsite office with the exception of Oxford Slough WPA.

The refuges in the Complex provide 71,331 acres of wetland, grassland, open water and shrub steppe habitats vital to waterfowl and other migratory and resident wildlife of the Inter Mountain West Region. In an area highly impacted by agricultural development, wetlands and shrub steppe habitats on the Complex are extremely significant. Each refuge has a unique component of wildlife depending upon the composition of various habitat types. A significant proportion of the available wetland habitat in Southeast Idaho is found within the boundaries of the Complex.

Management emphasis on the Complex is on biodiversity including migratory waterfowl (nesting Canada geese, ducks and cranes), colonial waterbirds (white-faced ibis, American white pelicans and Franklin gulls), trumpeter swans migratory land birds, and fish (Bonneville cutthroat trout).

G.1.3 Significant Values To Protect

Key critical values to protect:

- The Complex refuges provide significant waterfowl habitat on the Pacific Flyway.
- The refuges provide important breeding area for sandhill cranes, Canada geese, Franklin's gulls, white-faced ibis, and migratory land birds.
- Each refuge in the Complex is adjacent to a federally listed Community at Risk. This designation identifies wildland/urban interface (WUI) communities within the vicinity of federal lands that are at risk from wildfire. A list of specific Communities at Risk is located in each individual FMU description (3.2 FMU Characteristics).
- Refuge structures.
- The Complex refuges provide important opportunities for visitor use, (bird watching, hunting and fishing).

G.2 Policy, Land Management Planning, and Partnerships

G.2.1 Implementation of Fire Policy

Specific planning documents, legislation, organizations and associated policies provide guidance for fire management actions described in this FMP, summarized below.

G.2.1.1 Federal Interagency Wildland Fire Policy

This FMP meets the federal wildland fire management policy by implementing these guiding principles:

- Firefighter and public safety are the first priority in every fire management activity.
- The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the planning process. Federal agency land and resource management plans guiding documents that define the use and desired future condition on federal lands.
- Fire management plans programs, and activities support land and resource management plans and their implementation.
- Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities are understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity.
- Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives.
- Fire management plans and activities are based upon the best available science.
- Fire management plans and activities incorporate public health and environmental quality considerations.
- Federal, state, tribal, local, interagency, and international coordination and cooperation are essential.
- Standardization of policies and procedures among federal agencies is an ongoing objective supported in this FMP.

G.2.1.2 National Fire Plan

This FMP meets the policy and direction criteria in the 2001 National Fire Plan because it emphasizes the following primary goals of the 10 Year Comprehensive Strategy and Cohesive Strategy for Protecting People and Sustaining Natural Resources:

- Improving fire prevention and suppression.
- Reducing hazardous fuels.
- Restoring fire-adapted ecosystems.
- Promoting community assistance.

G.2.1.3 Department of Interior (DOI) Fire Policy

This FMP incorporates and adheres to DOI policy stated in 620 DM 1 by giving full consideration to use of wildland fire as a natural process and tool during the land management planning process and by providing for the following:

- Wildland fires, whether on or adjacent to lands administered by the Department, which threaten life, improvements, or are determined to be a threat to natural and cultural resources or improvements under the Department's jurisdiction, will be considered emergencies and their suppression given priority over other Departmental programs.
- Bureaus shall cooperate in the development of interagency preparedness plans to ensure timely recognition of approaching critical wildland fire situations; to establish processes for analyzing situations and establishing priorities, and for implementing appropriate management responses to these situations.
- Bureaus will enforce rules and regulations concerning the unauthorized ignition of wildland fires, and aggressively pursue violations.

G.2.1.4 U.S. Fish and Wildlife Service Fire Policy

By addressing the range of potential wildland fire occurrences and including a full range of appropriate management responses, this FMP meets FWS wildland fire policy. It is consistent with the FWS *Fire Management Handbook* and the *Interagency Standards for Fire and Fire Aviation Management Operations*, which are supplemental policy.

This plan affirms these key elements of FWS fire policy (621 FW 1):

- Firefighter and public safety are the first priority of the wildland fire management program and all associated activities.
- Only trained and qualified fire managers and agency administrators will be responsible for wildland fire management program activities.
- Only trained and certified employees will participate in the wildland fire management program activities, and noncertified employees will provide needed support as necessary.
- All interagency partners, to the extent practicable, should be involved with fire management planning, preparedness, wildfire and prescribed fire operations, monitoring, and research.
- The responsible agency administrator has coordinated, reviewed, and approved this FMP to ensure consistency with approved land management plans, values to protect, and natural and cultural resource management plans and that it addressed public health issues related to smoke and air quality.

- Fire, as an ecological process, has been integrated into resource management plans and activities on a landscape scale, across agency boundaries, based upon the best available science.
- Wildland fire is used to meet identified resource management objectives and benefits when appropriate.
- Prescribed fire and other treatments will be employed whenever they are the appropriate tool to reduce hazard fuels and the associated risk of wildfire to human life, property, and cultural and natural resources and to manage FWS lands for habitats as mandated by statute, treaty, and other authorities.
- Appropriate management response will consider firefighter and public safety, cost effectiveness, values to protect, and natural and cultural resource objectives.
- Staff members will work with local cooperators and the public to prevent unauthorized ignition of wildfires on our lands.

G.2.2 Land/Resource Management Policy

G.2.2.1 Agency Land Management Documents

The CCP process was started at Minidoka NWR in 2008; Camas, Grays Lake, Bear Lake, and Oxford Slough are scheduled to start in 2009. Until the CCP for Complex refuges is completed interim management guidance from existing land management documents will be used.

Habitat management direction from other Complex Land Management Documents was used to develop this FMP. Other documents include:

- 2007 draft Habitat Management Plan for Bear Lake NWR and Oxford Slough WPA.
- 2006 draft Habitat Management Plan for Minidoka NWR.
- 1982 Master Plan and 1996 Grassland Management Environmental Assessment for Grays Lake NWR.
- 1995 Refuge Management Plan for Camas NWR.

G.2.2.2 Compliance with Regulatory Acts

Threatened and Endangered Species Compliance

- A 2007 Intra-Service Section 7 Biological Evaluation for normal refuge operations including prescribed fire and mechanical fuels reduction projects has been signed by the Complex Project Leader for each of the refuges; copies are on file at the Complex headquarters.

Cultural Resource Compliance

- In order to comply with National Historic Preservation Act of 1966 and Archeological Resources Preservation Act of 1979 regulations, a Request for Cultural Resource Compliance will be completed on a project by project basis and submitted to the regional office. The completed Cultural Resource Compliance documents are on file at individual refuge headquarters.

NEPA Compliance

- A Categorical Exclusion for fire management operations (wildland fire suppression, prescribed fire, and mechanical fuels reduction) was signed by the Complex Project Leader and attached in Appendix C This Categorical Exclusion applies to all five Complex refuges and will be reviewed annually.

Smoke Management Compliance

- Referenced in section 4.2.1.5

G.2.3 Fire Management Partnerships

G.2.3.1 Internal Partnerships

An interdisciplinary team, comprised of Complex staff members, is responsible for reviewing this fire management plan and making recommendations concerning wildland fire management projects and issues.

G.2.3.2 External Partnerships

Federal Cooperators:

The Complex partners with the USDI Bureau of Land Management (BLM), USDA Forest Service (USFS) and the Bureau of Indian Affairs (BIA) to coordinate fire suppression activities, dispatch services, and implementation of prescribed fire projects. The Complex refuges fall into two different interagency fire dispatch zones in southern Idaho. Camas, Grays Lake, Bear Lake, and Oxford Slough fire operations are coordinated through the Eastern Idaho Interagency Fire Center, (EIIFC); Minidoka fire operations are coordinated with the South Central Idaho Interagency Dispatch Center, (SCIIDC). The Grays Lake NWR fire crew and Complex FMO are dispatched through EIIFC. Interagency Agreements with EIIFC and SCIIDC are attached in Appendix F

Fire Planning Analysis:

Federal land management agencies have been directed to implement Phase 2 of Fire Planning Analysis (FPA) beginning in fiscal years 2008 and 2009. FPA is a fire management workload analysis system that uses simulation and modeling tools to project fire workload for Fire Planning Units (FPUs). Interagency cooperation is fostered to meet National Fire Plan goals and specific agency fire program budget needs. The complex refuges (Camas, Grays Lake, Bear Lake, Oxford Slough) are included in the Southeast Idaho FPU; Minidoka NWR is in the South Central Idaho FPU. Federal partners, including the BLM, USFS, BIA work collaboratively with the Service to implement this plan and meet National Fire Plan goals for wildland fire protection, landscape restoration, and hazard fuel mitigation measures.

Idaho State Fire Plan Working Group:

The Idaho State Fire Plan Working Group (ISFPWG) is a multi-agency collaborative body charged with assisting counties with their County Wildfire Protection Plans and their associated countywide working groups, dissemination of information, and oversight and prioritization of grant assistance programs in order to facilitate the implementation of the National Fire Plan in Idaho. The Regional Fire Outreach Coordinator housed at Deer Flat represents the FWS as a part of this group. They participate in ISFPWG subcommittees as appropriate. Subcommittees include those focused on fire education, restoration, and communication to promote state-wide projects and emphasis items.

Idaho State Fire Plan Working Group:

The Complex coordinates with the Federal and State members of the Idaho State Fire Plan Working Group ISFPWG to identify, fund, and implements fuels reductions projects in Wildland Urban

Interface (WUI) areas. Each county in Idaho has developed a County Wildfire Protection Plan (CWPP) that identifies potential fuel reduction opportunities/area. The CWPP are posted at this website Idaho Department of Lands CWPP.

Bureau of Reclamation:

A memorandum of understanding exists between Minidoka NWR and the Bureau of Reclamation (BOR) to outline joint responsibilities for the operation and management of the lands and waters within Lake Walcott at the Refuge. This MOU is on file at the Complex office.

G.3 Fire Management Unit Characteristics

A fire management unit (FMU) is an area that shares common objectives, physiological/biological/social characteristics and constraints, that result in desired conditions as stated in land management plans (i.e., CCP, HMP), which set it apart from the characteristics of an adjacent FMU.

Considering fire history, occurrence, staff limitations, and the characteristics stated above, the wildland fire program complexity at the Complex is moderate. In the Complex, each refuge will be a separate Fire Management Unit.

G.3.1 Area Wide Management Considerations

The following sections addresses management considerations for the FMUs including fire management objectives, constraints, fuels, fire regime and condition classes, standards, fire potential of major vegetation types, and burned area rehabilitation.

G.3.1.1 Management Goals, Objectives and Constraints from CCPs and other planning documents

The planning process for the Complex CCPs is scheduled to start in 2009; management goals and objectives were obtained from existing refuge plans. The following general fire management goals and objectives have been identified from the pre-CCP process.

To the extent practicable, use prescribed fire in conjunction with water management, grazing, mowing, and/or other mechanical manipulations and chemical applications, on emergent wetland, woody riparian, herbaceous upland and/or wet meadow vegetation, in order to provide desirable vegetation species composition and/or structure, including, but not limited to:

- Use hazardous fuels treatments to reduce the threat of wildfire to adjacent communities and Refuge infrastructure.
- Decreasing noxious weeds.
- Decreasing dense emergent wetland plants.
- Increasing wetland water: vegetation interspersion ratios (20-60% open water).
- Restoring native shrub communities.
- Removing densely matted herbaceous vegetation and/or reducing dead or decadent woody vegetation so as to improve ecological conditions for native plants and native plant communities and the resident and migratory wildlife that depend on them.

G.3.1.2 Management Goals, Objectives, and Constraints from other Sources

The following operational standards are pertinent to the Complex, as found in the FWS manual (095 FW 3):

- Manage fire suppression to minimize risks to firefighter and public safety.
- An initial action and an appropriate management response are required for every wildfire on or threatening refuge lands.
- The range of appropriate management responses to wildfires may include direct or indirect attack of high and/or low intensities or surveillance and monitoring to ensure fire spread will be limited to a designated area.
- Reduce and maintain fuels in WUI areas to provide for public and firefighter health and safety.
- Reduce and maintain fuels in non-WUI areas to provide for firefighter health and safety and to protect habitats critical to endangered species, migratory birds, and ecosystem integrity.
- Use prescribed fire as a tool to restore ecosystem integrity and endangered species habitat.
- Prepare and implement an effective fire prevention plan to minimize unwanted fires.
- Investigate all unplanned human-caused fires.
- Retardants and foams will not be used within 300 feet of any waterway.
- Minimize and, where necessary, mitigate human-induced impacts to resources, natural processes, or improvements attributable to wildland fire activities.
- Ground disturbed by suppression activities will be rehabilitated.
- Heavy equipment use will be closely monitored in designated areas to minimize impacts on cultural resources.
- Heavy equipment use will be closely coordinated with the Refuge Manager or resource advisor to limit habitat damage. Due to soft ground conditions many areas of the Complex are unsuitable to heavy equipment usage.
- Prevent the further spread of invasive plants.
- Maintain close working relationship with interagency partners to accomplish wildland fire suppression and prescribed fire treatments.
- Maintain Intergovernmental Agreements with interagency partners for dispatch services.
- Promote public understanding of refuge fire management programs and objectives.

Cost Effectiveness

Maximizing the cost effectiveness of any fire operation is the responsibility of all involved, including those that authorize, direct, or implement those operations. Cost effectiveness is the most economical use of the resources necessary to accomplish project/incident objectives. Accomplishing these objectives safely and efficiently will not be sacrificed for the sole purpose of “cost saving”. Care will be taken to ensure that expenditures are commensurate with values to be protected. Many factors outside of the biophysical environment may influence spending decisions, including those of the social, political, and economic realms. The following tools will be used to provide information to make the most cost effective decision possible:

- Employ state-of-the-art decision support tools
- Provide a clear description of Refuge objectives in this Fire Management Plan to aid in alternative development
- Through cost-share agreements, distribute the decision process to all parties involved in wildland fire management

G.3.1.3 Common Characteristics of the Fire Management Units

Climate

The southeast Idaho climate can be described as semi-arid. The area climate varies between that of the Snake River Plain (SRP) and the higher elevation Eastern Mountain Region (EMR). Minidoka and Camas refuges are located in the SRP; Grays Lake, Bear Lake, and Oxford Slough are located in the EMR. The winter weather at the Complex refuges is characterized by below freezing temperatures and snow covered ground. Spring months are usually wet and windy; with weather conditions fluctuating quickly at times. Summer may begin suddenly with a rapid change to warm and dry weather. Thunderstorms are common from late spring through the summer months. These storms often produce very localized precipitation. Fall weather can be characterized by cooler/dry days. The yearly precipitation ranges from 9 inches in the SRP to over 15 inches in the EMR; average snow fall is 27 inches-SRP and 49-61 inches-EMR.

Information in the climate tables below was gathered from weather stations in Hamer and Soda Springs Idaho and BLM/USFS/FWS RAWS stations in eastern Idaho.

Snake River Plain Climate

	Spring	**Summer**	**Fall**
Average Max Temp (F)	59	87	62
Average Min Temp (F)	27	47	26
Average Mean Relative Humidity (%)	51	38	46
Average Min Relative Humidity (%)	16	11	14

Southeast Idaho Eastern Mountain Region Climate

	Spring	**Summer**	**Fall**
Average Max Temp (F)	54	83	59
Average Min Temp (F)	26	44	26
Average Mean Relative Humidity (%)	50	35	43
Average Min Relative Humidity (%)	22	12	15

See Appendix D for additional southeast Idaho climate charts and graphs.

Vegetation

The vegetation/habitat for the Complex refuges is described in the individual FMU Characteristics with acreage and percentages. The Complex vegetation types can be generally described as Marsh (FM 3), Grasslands (FM 1), and Shrub (FM 2/6).

Bulrush Marsh – FM 3

Grasslands – FM 1

Sagebrush Steppe - Shrub FM 2/6

Fire behavior outputs in the table below were from the BehavePlus 3.0.2 program. In this model, fires are assumed to be spreading as a series of steady state ignitions through uniform fuels under uniform weather conditions. Spread is also assumed to be from surface fire only. The fire behavior outputs are modeled to represent a potential summer fire (July/August). This fire behavior would be considered to be high to extreme. Weather data used in the modeling is 20 year data from BLM/USFS/FWS RAWS stations. Weather inputs to the BehavePlus runs: July, Temp 70-89, RH 11-38, 1-hr fuel moisture/FDFM 2/5%, 10-hr fuel moisture 7%, 100-hr fuel moisture 8%, live herbaceous moisture 65%, wind speed 5/15 mph, time of day 1400, slope 0-5%.

Fire Behavior Outputs by NFFL Fuel Models

Fuel Model	Rate of Spread (ch/hr)	Flame Length (ft)
1	99-665	5-13
2	42-388	7-21
3	129-741	14-35
6	37-207	6-15

Normal Fire Season

The normal fire season for the Complex refuges is March to October. The majority of the fires have occurred in July and August. The lower elevation refuges of Camas and Minidoka experience earlier season fires than higher elevation refuges (Grays Lake and Bear Lake). After snow melt in early spring Camas and Minidoka can experience a short potential for fire starts before the vegetation greens up, (during the drought year of 2007 Camas NWR vegetation did not green up staying cured all summer). The vegetation usually cures out at Camas and Minidoka by the end of June or early

July. Due to higher elevation and snow pack the grassland vegetation at Bear Lake and Grays Lake refuges usually does not cure out until the end of July or early August. The bulrush vegetation at all the Complex refuges does not cure out until the end of September unless drought influenced.

Wildfire History

From 1997 to 2007 the Complex refuges has experienced 24 wildfires. The majority and largest fires have occurred in the sagebrush steppe habitat at Minidoka NWR. Most of the fire starts have been from lightning. See fire history spreadsheet and bar graph in Appendix E

Prescribed Fire History

From 1997 to 2007 41 prescribed fire (RX) treatment units have been burned at the Complex refuges for 10,141 acres. The majority of the RX treatments have been accomplished at Grays Lake and Bear Lake refuges. Due to its smaller acreage the RX units at Camas NWR have been smaller in size. Minidoka is the only complex refuge where RX treatments have not been initiated, mainly due to the amount of sagebrush habitat that has been lost to wildfires. Most of the RX treatments have been in marsh habitat with a smaller amount in the Complex wet and dry meadows. See RX history spreadsheet in Appendix E

RX treatments 1997 to 2007

Refuge	RX Treatments	Acreage
Grays Lake NWR	14	3,447
Bear Lake NWR	13	5,272
Camas NWR	12	795
Oxford Slough WPA	2	117
Totals	**41**	**10,141**

Mechanical Fuel Reduction Treatments

31 mechanical fuel reductions treatments have been accomplished at the Complex refuges from 1997 to 2007. The treatments include a mixture of haying, grazing, mowing, chemical, and tree removal to reduce hazardous fuel loading adjacent to refuge boundaries. Most of the treatments have taken place in refuge grasslands. Mow lines adjacent to refuge roads are maintained yearly to enhance potential fire control lines.

Mechanical Fuel Reduction treatments 1997 to 2007

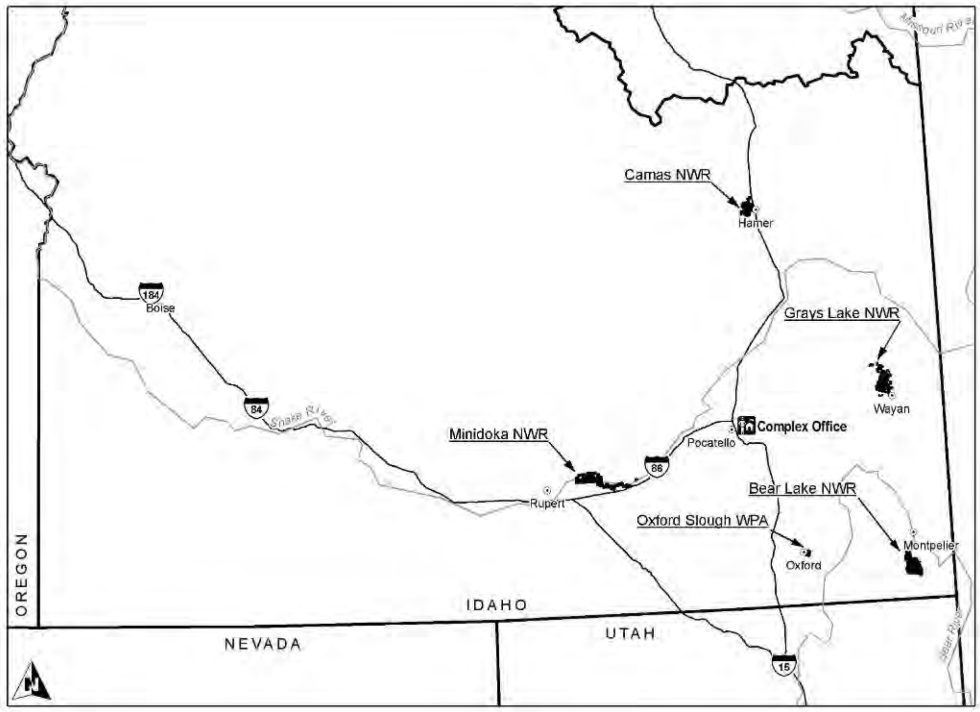
Refuge	Treatments	Acreage
Grays Lake NWR	8	2,654
Bear Lake NWR	6	2,749
Camas NWR	10	1,166
Oxford Slough WPA	2	725
Minidoka NWR	5	745
Totals	**31**	**8,039**

G.3.2 Fire Management Units

Fire Management Units (FMUs) are areas which have common wildland fire management objectives and strategies, are manageable units from a wildland fire standpoint, and can be based on natural or manmade fuel breaks. In the Southeast Idaho Complex, each of the five individual refuges will be a separate Fire Management Unit. All five refuges are located in southeast Idaho with similar vegetation, (bulrush marsh, grasslands, sagebrush steppe), mission, wildlife and terrain. The wildfire occurrence has been similar, (Camas and Minidoka refuges located in the Snake River Plains do experience more fires than the other three higher elevation refuges). The five refuges are managed as a Complex and are suited to be included in one Fire Management Plan, identified as separate FMUs.

Fire Management Units in the Southeast Idaho NWRC

FWS Fire Management Units within the FMP	Total Acres	Burnable Acres
Bear Lake NWR	18,051	13,026
Camas NWR	10,578	9,948
Grays Lake NWR	20,125	18,655
Minidoka NWR	20,699	9,399
Oxford Slough WPA	1,878	1,810
Totals	**71,331**	**52,838**



Southeast Idaho NWRC Location Map

G.3.2.1 Bear Lake FMU Characteristics

Bear Lake NWR includes the Bear Lake Unit and the Thomas Fork unit, (map in appendix A). The Bear Lake unit consists of 18,051 acres of open water, marsh, uplands, grasslands, low wet meadows, and steep shrub covered slopes located north of Bear Lake and about seven miles south of Montpelier. The refuge was established in 1968 by Public land Orders 4415 and 4545, which withdrew 16,960, acres from the public domain for the creation of the refuge. Land purchases have added an additional 1,091 acres. The land was withdrawn to protect and improve the habitat for the western Canada goose and other waterfowl as well as the greater sandhill crane. The mission of the refuge has not changed although greater emphasis is now on redhead and canvasback duck production. Trumpeter swans and colonial nesting species, particularly white-faced ibis are receiving more management attention.

The Thomas Fork unit, (TFU) consists of 1,015 acres of open water, marsh, and low meadows located adjacent to the Wyoming border in the Gentile Valley just above where the Thomas Fork joins the Bear River. This unit was acquired in fee title from the Farmers Services Administration in 1996. The land was added to the refuge because it represents excellent sandhill crane habitat and is especially important to cranes on their migrations through the area in the spring and fall. TFU provides important habitat for a variety of wildlife in an area dominated by agriculture. An active farming program is maintained on uplands for grains that are the main food source for sandhill cranes when occupying the refuge. The Thomas Fork River is used by Bonneville cutthroat trout.

A large percentage of the vegetation at Bear Lake NWR consists of emergent (primarily bulrush) residual cover in the large marsh. The main marsh area of the refuge is approximately 16,000 acres in size. The main marsh is by bordering wet meadows which consist of Juncus spp., Carex spp., and a variety of water tolerant grasses. Many of the wet meadows are hayed to short grass stubble during the summer reducing potential fire behavior. The dry meadow grass species include: saltgrass, alkali sacaton, several species of wheatgrass, and basin wildrye. The shrub species are comprised of sagebrush and greasewood; these are scattered in small areas throughout the refuge with the largest concentration located on the steep slopes of Merkley Ridge on the east side of the refuge. The riparian species is mostly comprised of willow; most of which is mainly located along the Rainbow Canal with a few other isolated pockets scattered across the refuge.

Fuel Model Composition Bear Lake NWR

Marsh	FM 3	11,303 acres	59%
Dry Meadow	FM 1	1,317 acres	7%
Wet Meadows	FM 1	943 acres	5%
Shrub	FM 2	376 acres	2%
Riparian	FM 4	90 acres	1%
Open Water		5,025 acres	26%

G.3.2.2 Bear Lake FMU Fire Environment

The biggest factor affecting fire management operations at the refuge is fire vehicle access to the marsh lands. The majority of the refuge lands consist of wetland marsh restricting conventional fire vehicles to dikes, roads and dry meadows. The Complex has three amphibious vehicles outfitted with slip-on tank/pump units which can provide limited fire suppression in the wetlands. The refuge has numerous open water areas and several roads which break up the vegetation continuity and provide opportunities for fire control lines.

The marshland vegetation is sub-irrigated and green most of the year; the emergent bulrush usually does not cure out until freezing temperatures in the fall top kill the plants. The fire potential and spread in the bulrush marsh can usually be considered low until vegetation cures out. The biggest factor in bulrush fire behavior is wind speed and direction.

The wet and dry hay meadows surrounding the marsh are also sub-irrigated. The drier meadows usually cure out in July; wet meadows may not cure out until August. Wind speed and direction are also a big factor in grassland fire behavior.

Private property borders most of the refuge, this property is mostly ranchland and hay fields which are grazed heavily during fall and winter months. The federally listed Communities at Risk bordering Bear Lake refuge include Dingle, Paris and Bloomington, Idaho. Forest Service lands border the southeast section of the refuge in the Merkley Ridge area. This section of the refuge is where the majority of human caused fire has started.

G.3.2.3 Bear Lake FMU Objectives and Constraints

- Use prescribed fire and mechanical manipulation to annually simulate natural environmental processes (return to early successional status) in emergent wetland and wet meadow habitats.
- Eliminate or control invasive plant species by using a combination of mechanical, prescribed fire, and chemical treatments.
- FMU Appropriate Management Response objectives include managing wildfires to meet fuels and habitat objectives and to benefit migratory bird habitat.
- The waterfowl nesting season at the refuges ranges from mid-April to late summer. Prescribed fire and mechanical fuel reduction treatments will not usually take place during this time to avoid disturbing nesting habitat.
- Due to constraints such as nesting season, water level fluctuation, and fire season the refuge will have two prescribed burn windows in spring and fall. As determined from past years burn experience the approximate burn windows will be; Spring - March 1 to April 15; Fall – September 20 to October 30. During these windows the above constraints can be mitigated and vegetation is cured out enough to meet prescribed burn objectives.
- General Appropriate Management Response strategy (AMR) – AMR strategy will range from full suppression to confine contain on isolated bulrush island surrounded by water. The majority of the refuge will use AMR full suppression, especially adjacent to private property. However there are some isolated pockets of bulrush in the Mud Lake area (southeast corner of the refuge) that are surrounded by water. These areas would be very difficult to access for fire suppression and a potential wildfire could provide a resource benefit.

G.3.2.4 Bear Lake FMU Values to Protect

- High priority will be given to any wildfire on the refuge threatening private property. The Federally designated Communities at Risk of Dingle, Paris, and Bloomington are adjacent to the refuge.
- The northeast Mud Lake colonial nesting areas used by white-faced ibis, Franklin’s gulls, other herons and egrets.
- Refuge structures are listed in Appendix XX.
- High voltage power lines running across the southwest corner of the refuge.

G.3.2.5 Camas FMU Characteristics

The refuge was established in 1937 by Executive Order 7720. The stated purpose for the refuge is to provide “a refuge and breeding ground for migratory birds and other wildlife”. Trumpeter swan nesting and sage grouse habitat have been receiving more attention in recent years.

Camas NWR consists of 10,578 acres of open water, marsh, upland grasslands and shrub steppe located in the Snake River Plain 24 miles north of Idaho Falls. About half of the refuge's 10,578 acres are lakes, ponds, and marshlands. The remainder consists of grass-sagebrush uplands and meadows. The management of sage grouse habitat has been receiving increased attention on the refuge in recent years. Camas Creek flows for 9 miles through the length of the refuge and is the source of water for many lakes and ponds. Several wells on the refuge also provide water for wildlife during the summer.

The vegetation/habitat types at Camas are broken down into the following:

- Sagebrush/grassland - in climax stage, the site is dominated by basin big sagebrush, arrowleaf balsamroot, Indian ricegrass and needle/thread grass. Approximately 1,200 acres has been seeded with crested wheatgrass; rabbitbrush, knapweed and various weed species are also present.
- Wet Meadow - dominated by Baltic rush and various sedges.
- Marsh - dominated by hardstem bulrush and broadleaf cattail.
- Semiwet Meadow – dominated by saline tolerant plants such as inland saltgrass, alkali bluegrass and alkali sacaton. This habitat appears as narrow strips between the Wet Meadow and Marsh sites.
- Riparian – dominated by willows and some cottonwoods; the majority of the willow are located in a 46 acre patch adjacent to Rays Lake in the southern portion of the refuge. A narrow band of willow grows along sections Camas Creek. The cottonwood trees mostly grow in the refuge headquarters area bordering Camas Creek.

Fuel Model Composition for Camas NWR

Sagebrush/grasslands	FM 2/6	3,633 acres	34%
Wet Meadow	FM 1	2,956 acres	28%
Marsh	FM 3	2,401 acres	23%
Semiwet Meadow	FM 1	853 acres	8%
Riparian	FM 4	105 acres	1%
Open water/mud flats		630 acres	6%

G.3.2.6 Camas FMU Fire Environment

The fire risk at Camas NWR is considered moderate to high due to its location amid ranches, private dwellings and the numerous refuge facilities. The Upper Snake River Plain has a history of large wind driven fires (5,000 to 10,000 acres). Private property borders two thirds of the refuge; BLM land borders the west side of the refuge. Numerous private residences are located on the refuge boundary in the northeast section. The federally listed Community at Risk of Hamer, Idaho, borders the refuge on the southeast side. The refuge has numerous gravel and two-track roads which break up the vegetation continuity.

The majority of the habitat at the refuge is grasslands which cure out in early to mid-summer. During the drought year of 2007 due to the lack of snow and spring rain fall the dryer portions of refuge grassland did not green-up remaining cured all season. The invasion of cheat grass to the sagebrush habitats has increased the fire frequency and intensity.

G.3.2.7 Camas FMU Objectives and Constraints

- Use prescribed fire and mechanical manipulation to annually simulate natural environmental processes (return to early successional status) in emergent wetland and wet meadow habitats.
- Eliminate or control invasive plant species by using a combination of mechanical, prescribed fire, and chemical treatments.

- FMU Appropriate Management Response objectives include managing wildfires to meet fuels and habitat objectives.
- The waterfowl nesting season at the refuge ranges from mid-April to late summer. Prescribed fire and mechanical fuel reduction treatments will not usually take place during this time to avoid disturbing nesting habitat.
- Due to constraints such as nesting season, water level fluctuation, and fire season the refuge will have two prescribed burn windows in spring and fall. As determined from past years burn experience the approximate burn windows will be; Spring - March 1 to April 15; Fall – September 20 to October 30. During these windows the above constraints can be mitigated and vegetation is cured out enough to meet prescribed burn objectives.
- AMR strategy – unplanned fire will be contained at the smallest size possible due to proximity to adjacent private property and structure. Some areas of the refuge (bulrush marsh) are not conducive to off road fire vehicle access; in these areas a refuge road may will be utilized for a containment line.

G.3.2.8 Camas FMU Values to Protect

- High priority will be given to any wildfire on the refuge threatening private property. The Federally designated Community at Risk of Hamer is adjacent to the refuge.
- Sagebrush/grassland habitats located on the north and west side of the refuge.
- Sensitive areas of the Refuge are the riparian habitat along Camas Creek associated with headquarters (old growth cottonwood and black willow trees).
- The peregrine hack tower; headquarters buildings; refuge residences; and the irrigation pumps.
- Numerous private residences along the northeast refuge border.
- Cultural resource sites (documented at refuge headquarters).

G.3.2.9 Grays Lake FMU Description

Grays Lake NWR was established in 1965 to protect and restore habitat for waterfowl production, sandhill cranes, and other wildlife. The total area within the proposed refuge boundary is 32,825 acres. Currently 20,125 acres are controlled by the Service through fee-title, use agreements and land purchases. Approximately 9,000 acres of land surrounding the marsh shore line is Unadjudicated land; the Service is currently negotiating with the adjacent private land owners and the State Of Idaho to get this issue resolved. Bear Island (approximately 401 acres) is located in the middle of the Grays Lake marsh; this land is controlled by the BIA.

The refuge’s goals are to enhance natural ecosystem functions to support a diversity of water fowl birds and other wildlife. The refuge provides significant breeding area for sandhill cranes, Canada geese, Franklin's gulls, and white-faced ibis.

Grays Lake NWR is located on the western edge of the Greater Yellowstone Ecosystem in Bonneville and Caribou Counties, Idaho. Grays Lake lies in a relatively remote and sparsely populated high altitude (6386 ft) mountain valley. Grays Lake is actually a 22,000 acre shallow marsh with dense vegetation (bulrush and cattail) and little open water. Caribou Mountain borders the refuge to the east, at 9803 feet it is the highest point within the watershed.

The refuge is located in a transitional zone between Great Basin vegetation (south) and Rocky Mountain vegetation (north). Vegetation within approved refuge boundary consists of:

- Marsh - dominated by hardstem bulrush and broadleaf cattail.
- Wet/Dry Meadow - consists of over 170 species of grasses, sedges and forbs.
- Shrub - 17 species of shrubs.
- Riparian - 7 species of trees.

Fuel Model Composition for Grays Lake NWR

Bulrush/Cattail	FM 3	13,951 acres	69%
Wet/Dry Meadow	FM 1	4,504 acres	23%
Riparian	FM 8	100 +/- acres	<1%
Shrub	FM 2	100 +/- acres	<1%
Open water/ mud flats		1,470	8%

G.3.2.10 Grays Lake FMU Fire Environment

The biggest factor affecting fire management operations at the refuge is fire vehicle access to the marsh lands. As mentioned above the majority of the refuge lands consists of a continuous wetland marsh with only a couple of short dikes and canals. The Complex has three amphibious vehicles outfitted with slip-on tank/pump units which can provided limited fire suppression in the wetlands. A large wind driven fire in the bulrush could not safely be suppressed by direct attack.

The marshland vegetation is sub-irrigated and green most of the year; the emergent bulrush usually does not cure out until freezing temperatures in the fall top kill the plants. The fire potential and spread in the bulrush marsh can usually be considered low until vegetation cures out. The biggest factor in bulrush fire behavior is wind speed and direction.

The wet and dry hay meadows surrounding the marsh are also sub-irrigated. The drier meadows usually cure out in August; wet meadows may not cure out until September. Wind speed and direction are also a big factor in grassland fire behavior.

Private property with numerous structures (residences, barns, and out buildings) border the east and south sections of the refuge. The federally listed Community at Risk of Wayan, Idaho, is southeast of the refuge.

G.3.2.11 Grays Lake FMU Objectives and Constraints

- Use prescribed fire and mechanical manipulation to annually simulate natural environmental processes (return to early successional status) in emergent wetland and wet meadow habitats.
- Eliminate or control invasive plant species by using a combination of mechanical, prescribed fire, and chemical treatments.
- FMU Appropriate Management Response objectives include managing wildfires to meet fuels and habitat objectives.
- The waterfowl nesting season at the refuge ranges from mid-April to late summer. Prescribed fire and mechanical fuel reduction treatments will not usually take place during this time to avoid disturbing nesting habitat.

- Due to constraints such as nesting season, water level fluctuation, and fire season the refuge will have one prescribed burn window in the fall. As determined from past years burn experiences the approximate burn window will be September 20 to October 30. During this window the above constraints can be mitigated and vegetation is cured out enough to meet prescribed burn objectives.
- AMR strategy for the refuge will range from full suppression to confine/contain and monitor. Unplanned fires adjacent to private property and structures will be contained at the smallest size possible if practical. As mentioned above the majority of the refuge lands consists of a continuous wetland marsh with only a couple of short dikes and canals. The Complex has three amphibious vehicles outfitted with slip-on tank/pump units which can provided limited fire suppression in the wetlands. A large fire wind driven fire in the bulrush could not safely be suppressed by direct attack. Depending on current weather and fuels conditions an AMR confine/contain/monitor strategy may be used for fires in the marsh.

G.3.2.12 Grays Lake FMU Values to Protect

- High priority will be given to any wildfire on the refuge threatening private property. The Federally designated Community at Risk of Wayan is adjacent to the refuge.
- Herman, Eagle and Gravel creeks contain limited riparian vegetation (primarily willows) that would be damaged by fire.
- A large mixed nesting colony of white-faced ibis and Franklin’s gulls exists in the south-central portion of Grays Lake marsh.
- Structures located at the refuge headquarters.

G.3.2.13 Minidoka FMU Description

Minidoka NWR was established as a refuge and breeding ground for migratory birds and other wildlife. Minidoka NWR has been designated as an Important Bird Area (IBA) of global importance for its colonial nesting bird populations and for the numbers of molting waterfowl. This program identifies areas that have high value for birds throughout the world.

Minidoka NWR is an overlay refuge on lands withdrawn by the Bureau of Reclamation located on the Snake River Plain in south-central Idaho, 12 miles northeast of the town of Rupert. The primary feature is Lake Walcott, the reservoir formed by the construction of the Minidoka Dam in 1906. The dam, power plant, irrigation canals, and lake water levels are all managed by the Bureau of Reclamation (BOR). Adjacent to the dam and refuge headquarters is Lake Walcott State Park which is administered by the Idaho Department of Parks and Recreation (IDP&R). The park provides the public with picnic, camping and boat launch facilities. The project land and water areas are managed as a refuge for wildlife by the FWS.

Minidoka Refuge extends upstream approximately 25 miles from the Minidoka Dam along both shores of the Snake River, encompassing a total of 20,699 acres, of which 11,300 acres are the open water of Lake Walcott, the Snake River, and some small marsh areas. The remaining 9,399 acres of upland are classified as sagebrush-grass (3,519 acres) and grassland (5,880 acres).

- Sagebrush-grasslands - Vegetative types are predominantly sagebrush-grass and short bunchgrass complexes. The overstory is composed primarily of sagebrush and rabbitbrush with the understory mainly cheatgrass, crested wheatgrass, and native grasses and forbs.

- Grasslands – include several large seedings of crested wheat grass; Native grasses commonly found include western wheatgrass, Indian ricegrass, Sandberg's bluegrass, bottlebrush squaretail, needle-and-thread, and green needlegrass.
- Riparian - there are a few areas with sizable patches of riparian habitat, but for the most part the riparian zone is narrow and linear, in most places only 1 tree wide where it goes from open water to basalt rock in only a few feet. Shrub species include skunkbush sumac, Wood's rose, and golden currant. Mid sized species is primarily coyote willow with some skunkush sumac. Taller species include eastern cottonwood, peachleaf and Pacific willows, Russian olive, green ash, and Chinese elm.
- Marsh – small pockets of bulrush and cattails located in shallow bays and coves, and in the two diked water units. In some areas it is a narrow fringe along the shoreline.

Fuel Model Composition for Grays Lake NWR

Grassland	FM 1	5,880 acres	28%
Sagebrush/Grass	FM 2/6	3,519 acres	18%
Marsh	FM 3	NA	<1%
Riparian	FM 4	NA	<1%
Open Water		11,300 acres	54%

G.3.2.14 Minidoka FMU Fire Environment

Minidoka NWR is located in the Snake River Plain which has a history of large wind driven fires. The majority of the large fires at the refuge have started from lightning. The invasion of cheat grass has increased the fire occurrence and fire size in the sagebrush habitat. BLM lands border most of the refuge, the majority of large fire experienced at the refuge have burned on both FWS and BLM lands. The refuge has experienced fires from spring to fall with the majority occurring in mid-summer.

G.3.2.15 Minidoka FMU Objectives and Constraints

- See general Complex goals and objectives in section 3.1.2.
- Due to developing sage grouse concerns and loss of sagebrush habitat wildfires in this FMU will be aggressively suppressed.
- AMR strategy – due to concerns with sagebrush habitat and close proximity to private and other federal lands unplanned fires will be contained at the smallest size possible. The only exception to this AMR strategy would be an unplanned fire on one of the refuge islands where direct attack suppression by fire vehicles is not possible; confine/monitoring may be utilized.

G.3.2.16 Minidoka FMU Values to Protect

- A large percentage of refuge uplands have been burned in the last 10 years; any remaining sagebrush habitat should be considered a critical protection area.
- Grove of cottonwood and willow tress at Water Unit 1 that supports a great blue heron nest colony.

- Structures located at the refuge headquarters.
- Cultural resource sites, (documented at refuge headquarters).

G.3.2.17 Oxford Slough FMU Description

Oxford Slough WPA (OSWPA) is located in the upper Cache Valley adjacent to the community of Oxford Idaho. The 1,853-acre WPA is mostly a hardstem bulrush marsh, interspersed with open water and surrounded by areas of playa, saltgrass flats, native wet meadow, and some cropland. The lower areas have visible alkali deposits. The marsh is fed on the north and drained at the south by Deep Creek. A smaller creek and several springs feed the marsh from the west. The water level in the marsh is allowed to fluctuate naturally; in drought years it dries out.

The main marsh area is primarily bulrush emergent, with some cattail. The WPA has expansive drier type grasslands with some wetlands along its east and southwest regions that are more alkali in nature (saltgrass, alkali sacaton, small alkali playas and some taller type grasses), within this area are also scattered patches of greasewood and sagebrush patches. The north end of OSWPA is dominated by hilly agricultural/cropland area. The west side vegetation consists of wet meadow grasslands, some brush, areas of reed canary grass, Juncus spp. and other water tolerant grasses.

The Union Pacific railroad has a track that runs from north-south along the east boundary of the WPA; train activity has caused at least two wildfires in past years. The wet meadow areas along the west side are hayed annually under a cooperative farming agreement. This significantly reduces potential fire behavior in the grassland vegetation next to Oxford.

Table 8: Fuel Model Composition for Oxford Slough WPA

Marsh	FM 3	721 acres	39%
Dry Meadow	FM 1	495 acres	27%
Wet Meadow	FM 1	495 acres	19%
Agricultural	FM 1	143 acres	8%
Shrub	FM 2	87 acres	4%
Open Water/Playa		43 acres	3%

G.3.2.18 Oxford Slough FMU Fire Environment

The fire behavior potential at Oxford Slough can be influenced by drought years. In dry years water flow into the WPA will stop by mid-summer, curing out the marsh and grassland vegetation. The federally listed Community at Risk of Oxford, Idaho, borders the west side of the WPA. The Complex annually hays approximately 400 acres of grassland adjacent to Oxford which reduces potential fire behavior. No interior roads are present in the WPA which would hamper fire vehicle access to an interior fire. Railroad tracks border the east side of the WPA; two fires have started from trains in past years.

G.3.2.19 Oxford Slough FMU Objectives and Constraints

- See general Complex goals and objectives in section 3.1.2.
- AMR strategy - due to the close proximity to the community of Oxford, Idaho, any unplanned wildfire will be aggressively suppressed.

G.3.2.20 Oxford Slough FMU Values to Protect

- The community of Oxford, Idaho.
- A white-faced ibis colony in center of the marsh.

G.4 Wildland Fire Operational Guidance

The procedures used to *implement* the fire management plan (FMP) for the Southeast Idaho National Refuge Complex are covered in this section. Information pertaining to this management is either directly provided or references are cited as to where it may be located.

USF&WS wildland fire management policy states that every wildland fire will be assessed following a decision support process that examines the full range of appropriate management responses (AMR).

This policy also provides that wildland fires may be managed for one or more objectives based on land and resource management plan direction. When two or more wildland fires burn together they will be managed as a single wildland fire and may also be managed for one or more objectives based on land and resource management plan direction as an event moves across the landscape and fuels and weather conditions change.

As stated before, the purpose of fire suppression is to put the fire out in a safe, effective, and efficient manner. Fires are easier and less expensive to suppress when they are contained to small areas on the Complex. Thus, the following procedures will be followed for all wildland fires to ensure optimum resource protection and firefighter safety.

G.4.1.1 Appropriate Management Response

Evaluation and selection of an appropriate management response to a wildfire will include.
- Consideration of risks to public and firefighter safety.
- Threats to the values to protect.
- Costs of various mitigation strategies and tactics.
- Potential resource benefits.

Wildfires will be staffed or monitored during active burning periods as needed to ensure that appropriate mitigation actions can be made to protect values threatened.

All wildfires will be supervised by a qualified incident commander (IC) responsible to
- Assess the fire situation and make a report to dispatch as soon as possible.
- Use guidance in this FMP or a delegation of Authority to determine and implement an appropriate management response.
- Determine organization, resource needs, strategy and tactics.

- Brief incoming and assigned resources on the organization, strategy and tactics, weather and fire behavior, LCES, and radio frequencies.
- Order resources needed for the AMR through the designated dispatch office.
- Manage the incident until relieved or the incident is under control.

The FMP and a Delegation of Authority can provide a general strategy to an IC, who has discretion to select and implement appropriate tactics within the limits described for the FMU(s), including when and where to use minimum impact suppression tactics (MIST) unless otherwise specified. All resources, including mutual aid resources, will report to the IC (in person or by radio) and receive an assignment prior to tactical deployment.

Critical protection areas, such as refuge headquarters, neighboring residences and ranches, and adjacent private croplands, will receive priority consideration in fire control planning efforts. In all cases, the primary concerns of fire suppression personnel shall be the safety, and if needed, all individuals not involved in the suppression effort may be evacuated.

General AMR Constraints

- Close proximity to private property and residences, (WUI and Communities at Risk).
- Lack of a cultural resource inventory. Limited cultural resource surveys have been completed at the Complex refuges, (completed surveys are on file at the Complex office)
- Soft ground/moist-soil conditions which preclude the use of conventional fire equipment.
- Tracts of continuous vegetation, lack of adequate fire/fuel breaks, and lack of interior and boundary refuge roads.

Interagency Operations

As mentioned in 2.3.2 the Complex coordinates with the BLM, USFS, and BIA in fire management operations. The Complex coordinates with these agencies for dispatch services through EIIFC and SCIDC. Any wildfire AMR actions would be coordinated through the appropriate dispatch centers with neighboring federal agencies.

G.4.1.2 Preparedness

The Complex is only funded to staff one Type 3 engine crew stationed at Grays Lake NWR. Due to the fact that the Complex refuges are spread across a large portion of eastern Idaho the Complex relies on its interagency partners (BLM and USFS) for initial attack fire response. The Complex fire crew is dispatched through EIIFC which uses a closest forces concept when dispatching fire crews to BLM, USFS, FWS, BIA, and State lands in the fire zone.

The Complex FMO meets with federal cooperators (BLM, USFS, EIIFC, SCIDC) annually prior to fire season, to review the respective agreements. This may include contact information and fire suppression policies and procedures.

The normal fire season for the Complex was discussed in section 3.1.3; prior to and during fire season the following tasks will be implemented and completed.

- The Complex FMO will work with each refuge Manger to update Delegations of Authority for each refuge with suppression constraints.

- Fire qualified personnel work with the Complex FMO to schedule annual medical examinations prior to start of fire season.
- Fire qualified personnel will complete fitness testing, complete the annual refresher, and are issued full personal protective equipment (PPE) prior to the start of fire season.
- A Type 3 engine will be staffed and available annually (June 15th – September 30$^{th)}$ at Grays Lake NWR.
- Prior to fire season the Complex step-up plan will be reviewed by the FMO; the plan will be implemented during fire season according to daily fire weather forecasts.

Annual Refuge Fire Readiness Activities

Activities – Complete before end of month	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Update Interagency Fire Agreements/AOP's		x										
Winterize Fire Management Equipment										x		
Inventory Fire Engine and Cache			x									
Update Delegation of Authority			x									
Completed Annual Fire Physical		x										
Annual Fitness Testing			x									
Annual Refresher Training			x									
Pre-Season Engine Preparation			x									
Prepare Temp Fire Crew hiring packet										x		
Review and Update Fire Management Plan			x									
Hire Temp Fire Crew		x										
Weather Station Maintenance and Calibration			x									
Coordinate with Refuge Managers on HFR planning										x		
Review Delegations of Authority with Refuge Managers			x									
Review Complex step-up plan and adjust if necessary			x									

Communications

The Complex utilizes BLM and USFS communications systems, including repeaters and radio frequencies for fire operations. The Complex has MOUs with both agencies for shared radio frequency use during fire operations. Both EIIFC and SCDIIC centers have a fire zone frequency plan, this plan and radio MOUs are attached in Appendix F. All communications equipment is analog.

G.4.1.3 Detection

Wildland fires on the Complex Refuges will normally be discovered and reported by local residents and the visiting public. These fires may or may not be reported directly to the refuge manager; it is expected that the reporting individual will contact 911, EIIFC or SCIIDC directly and refuge staff may not learn about the fire until after it has already been staffed. Regardless of how any fires are discovered they need to be reported to the Refuge Manager, FMO, and interagency fire dispatch center (EIIFC and SCIIDC) immediately so suppression actions can be started without delay. In situations where fire danger and staffing levels increase, refuge patrols will be an additional source of detection and reporting.

G.4.1.4 Dispatch, Initial Response and Initial Attack

Bear Lake, Camas, Grays Lake, and Oxford Slough refuges fall within the East Idaho Interagency Fire Center (EIIFC) dispatch zone. EIIFC will coordinate the initial attack response of federal fire crews to potential fires on these four refuges. The Refuge Manager or a representative from the Complex staff will serve as a Resource Advisor for the incoming Incident Commander (IC).

Minidoka NWR falls within the Southern Idaho Interagency Fire Center (SIIFC) dispatch zone. SIIFC will coordinate initial attack response of federal fire crews to fires at Minidoka.

Upon discovery of a fire, all subsequent actions will be based on the following:

- The Incident Commander (IC) will locate, size-up, and coordinate suppression actions. The IC will start the EIIFC Incident Organizer to document actions, fire behavior and weather conditions.
- Provide for firefighter and public safety.
- Considering the current and predicted fire conditions, the IC will assess the need for additional suppression resources and estimate the final size of the fire. The potential for spread outside of the refuge should be predicted, as well as the total suppression force required to initiate effective containment action at the beginning of each burning period.
- The IC will assess the need for law enforcement personnel for traffic control, investigations, evacuations, etc. and make the request to the dispatch center.
- Document decisions in the Incident Organizer and provide the FMO a copy after the incident is out.
- Should a wildland fire move into an extended attack the IC will coordinate with the Complex staff and EIIFC to complete a Wildland Fire Decision Support System
- The Refuge Manager or designee will provide the IC with a Delegation of Authority.

G.4.1.5 Extended Attack and Large Fire Management

The Wildland Fire Decision Support System (WFDSS) process will be used when a wildfire escapes initial attack. Due to the limited number of historic large fire occurrences on the Complex, for any potential fire needing a WFDSS the refuge staff would rely on Regional Office fire management staff and interagency partners to prepare the analysis.

Extended attack fires will be managed in accordance with the Interagency Standards for Fire and Aviation Operations (Redbook).

G.4.1.6 Aviation Operations

All fire-related aviation operations will follow applicable guidelines of the DOI National Business Center - Aviation Management Directorate and must adhere to all DOI aviation policy. Aviation operations at Camas, Grays Lake, Bear Lake, and Oxford Slough refuges will be coordinated through EIIFC. Aviation operations at Minidoka NWR will be coordinated through SCIIDC.

G.4.1.7 Reviews and Investigations

Reviews and investigations are used by wildland fire and aviation managers to assess and improve the effectiveness and safety of organizational operations. Brief descriptions of various reviews and associated procedures and requirements, including those for serious wildland fire accidents, entrapments, and fire trespass are listed in the Red Book Chapter 18.

Incident Commanders and Single Resource Bosses will ensure After Action Reviews take place in a timely manner and that any significant issues are brought to the attention of the Zone FMO or Refuge Manager.

G.4.1.8 Reports

The SE Idaho Zone FMO or designee will complete and file an Individual Fire Report (DI-1202) in the FWS Fire Management Information System (FMIS) for the following types of fires within 10 days of a fire being declared out:

- All wildfires on FWS and FWS-protected lands.
- Wildfires threatening our lands on which we take action.
- All escaped prescribed fires. When a fire exceeds prescription, treat must be declared a wildfire, and a separate new report filed to report acres burned by the wildfire from the time of declaration to the time of being declared out.
- All false alarms responded to by SEID fire staff.
- All support actions to interagency cooperators by SEID fire staff.

G.4.2 Hazardous Fuels Management

All prescribed fire treatments on the Refuges will follow guidance outlined in the Interagency Standards for Fire and Fire Aviation Operations (chapter 17) and the Interagency Fire Planning and Implementation Procedures Reference Guide. See 3.1 for specific prescribed fire objectives.

G.4.2.1 Prescribed Fire Program for Hazardous Fuels and Habitats

The overall objective in the use of prescribed fire in refuge resource management will be to reduce hazard fuels and to promote habitat diversity. Refuge staff will carefully analyze the needs of hazardous fuels reduction in each FMU in relation to habitat objectives on the refuge. Variables to be considered in each proposed treatment area include previous treatments, vegetation type, endangered species, and hazardous fuels reduction. The prescribed fire program at the Refuge is being conducted under the categorical exclusion directive, 516 DM 2, Appendix 1and 516 DM 6, Appendix 1.

Program Overview

Prescribed fire can be a useful tool for restoring and maintaining natural conditions and processes at the Complex refuges. Research burning may also be conducted when determined to be necessary for accomplishment of research project objectives. The goals of prescribed fire are for hazard fuel reduction and to meet resource management objectives. Specific management needs for the refuge will be determined annually. Burn objectives, fire frequency rotation, firing methodology, and prescriptions will vary from year to year. Burn plans will be updated to reflect any variations. The Project Leader will approve prescribed fire plans after review of the plan by the Zone Fire Management Officer.

The desired future of the program includes treating approximately 1000 acres per year in a variety of vegetation types. Prescribed fire activities include mechanical treatments (e.g., thinning), burning, and monitoring.

The prescribed burn window for the Complex is generally early-Spring (March-April) and late-fall (September-November). Specific FMU hazardous fuels objectives and history is described in chapter 3.

Some specific objectives for the refuge program include:

- Conduct a vigorous prescribed fire program with the highest professional and technological standards
- Identify the prescribed burn prescriptions most appropriate to specific situations and areas
- Efficiently accomplish resource management objectives through the application of prescribed fire
- Continually evaluate the prescribed fire program to better meet program goals by refining prescriptions treatments and monitoring methods, and by integrating applicable technical and scientific advancements

Effect of National and Regional Preparedness Levels

Prescribed fires may be ignited during National Preparedness Level 4 or 5 as specified in the National Interagency Mobilization Guide. The normal prescribed burn window for the Complex refuges is early spring and late fall; national and regional preparedness levels are low at this time of year.

Project Planning

All prescribed fire treatments on the Complex refuges will follow guidance outlined in the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide.

All prescribed fires will have prescribed burn plans. The prescribed burn plan is a site specific action plan describing the purpose, objectives, prescription, and operational procedures needed to prepare and safely conduct the burn. The treatment area, objectives, constraints, and alternatives will be clearly outlined. The required burn plan elements are outlined in the Interagency Fire Planning and Implementation Procedures Reference Guide and will be included in all refuge burn plans.

The Prescribed Fire Plan Preparer will conduct a field reconnaissance of the proposed burn location with the Complex Biologist, and/or Refuge Manager to discuss objectives, special concerns, and gather all necessary information to write the burn plan.

Every Prescribed Fire Plan must receive a technical review. The Technical Reviewer and Prescribed Fire Plan Preparer must be qualified or have been previously qualified as a Prescribed Fire Burn Boss at an experience level equal to or higher than the complexity being reviewed. The Technical Reviewer must be someone other than the primary preparer of the plan. An off-unit technical review is encouraged to provide an additional independent perspective. It is acceptable for other specialists to review certain portions of the plan however; a primary Technical Reviewer must be designated as technical review signatory. Either the Prescribed Fire Plan Preparer or Technical Reviewer must be currently qualified, less physical fitness requirement.

The Agency Administrator has final approval authority for all Prescribed Fire Plans, unless special circumstances warrant higher review and concurrence (such as may occur during higher Preparedness Levels or for extremely large, complex projects). Although the Agency Administrator has final approval authority for the Prescribed Fire Plan and the Agency Administrator "GO/NO-GO" checklist, the Prescribed Fire Burn Boss has the responsibility to make the on-site tactical "GO/NO-GO" decision. The Prescribed Fire Burn Boss ensures that all prescription, staffing, equipment, and other plan specifications are met before, during, and after the prescribed fire.

Project Implementation

Execution of prescribed burns will only be undertaken by qualified personnel. The Prescribed Burn Boss will fill all required positions to conduct the burn with qualified personnel. All personnel listed in the burn plan must be available for the duration of the burn or the burn will not be initiated.

When all prescription criteria are within the acceptable range, the Prescribed Burn Boss will select an ignition time based on current and predicted weather forecasts. The Burn Boss will ensure that the Agency Administrator GO/NO-GO Checklist is valid and complete and sign the Prescribed Fire GO/NO-GO Checklist the morning of planned ignition.

A thorough briefing will be given by the Prescribed Burn Boss and specific assignments and placement of personnel will be discussed, (using briefing outline in Prescribed Fire Plan). A spot weather forecast will be obtained on the day of ignition and all prescription elements will be rechecked to determine if all elements are still within the approved ranges. If all prescription elements are met, a test fire will be ignited to determine on-site fire behavior conditions as affected by current weather. If conditions are not satisfactory, the test fire will be suppressed and the burn will be rescheduled. If conditions are satisfactory the burn will continue as planned.

A prescribed fire must be declared a wildfire by those identified in the burn plan when that person(s) determines that the contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period. An escaped prescribed fire must be declared a wildfire when the fire has spread outside the project boundary, or is likely to do so, and cannot be contained by the end of the next burning period. A prescribed fire can be converted to a wildfire for reasons other than an escape. An appropriate management response will be made to such incidents and a formal analysis (WFSA) undertaken when needed. The Refuge Manager or Project Leader will be notified of an escaped prescribed fire.

The public will be informed of upcoming planned prescribed fires through press releases in local newspapers. Neighbors to the refuge will be called and local law enforcement agencies will be called and informed of the burn before planned ignition. Notification calls will be documented and saved in the Prescribed Plan file.

Smoke Management

According to Fish & Wildlife Service Fire Management Policies “ ... fire management activities which result in the discharge of air pollutants are subject to, and must comply with, all applicable Federal, state, interstate, and local air pollution control requirements as specified by Section 118 of the Clean Air Act.”

The US Fish and Wildlife Service in south Idaho participates in the Montana/Idaho Airshed Group. The group members include all of the federal agencies, state land management agencies, and private forest products companies. The intent of the Airshed Group is to limit negative impacts from controlled burns through scientific monitoring of weather conditions and formal coordination of burns.

Prior to the burn season the Fire Management Officer submits a list of planned burn projects to the Missoula Monitoring Unit via internet. This information creates a data base describing the type of burn, number of acres in each unit, and unit location and elevation. Each burn unit is assigned an identification number. The day before the planned ignition, the burn boss accesses the internet data base to submit a proposed prescribed burn for the following day. The program coordinator and a meteorologist provide timely restriction messages for airsheds with planned burning.

The Missoula Monitoring Unit issues daily decisions which can restrict burning when atmospheric conditions are not conducive to good smoke dispersion. Restrictions may be directed by airshed, elevation or by special impact zones around populated areas. The burn boss will access the daily decision notice from the monitoring unit via the internet. Prescribed burn projects will not be conducted if the Missoula Monitoring Unit posts a burning restriction for the airshed in which the refuge is located.

No non-attainment areas are located in or near the Complex; specific smoke sensitive areas area identified in individual burn plans and appropriate mitigation measures.

After Action and Escaped Fire Reviews

The Burn Boss will ensure an informal After Action Review (AAR) is conducted for each operational period on a prescribed fire, as in Red Book chapter 17.

All prescribed fires declared a wildfire will have an investigative review initiated by the Refuge Manager or Project Leader. The level and scope of the review will be determined by policy and procedures of the Interagency Standards for Fire and Fire Aviation Operations and the FWS Fire Management Handbook.

Reports

Burn Plans will specify information to be included in a project file. The Burn Boss will ensure this information is provided to the Refuge Manager and/or Zone Fire Management Officer as specified. This includes documenting conditions and fire behavior during the prescribed fire to assess how well actual fire characteristics fit those predicted, documenting any unanticipated difficulties encountered during implementation, and assessing how well the fire accomplished the intended objectives.

The Burn Boss will complete an Individual Fire Report (DI-1202) with the Zone FMO, who will file an Individual Fire Report (DI-1202) electronically within 10 days of it being declared out.

G.4.2.2 Non-fire Hazardous Fuels Treatment Program

Non-fire treatment strategies are those that do not involve the use of prescribed fire to meet stated objectives. For the Complex refuges, mechanical and chemical treatment strategies are available as non-fire management tools. The following objectives for non-fire treatments of hazardous fuels on the Complex include:

- Establish defensible space along wildland-urban interface boundary and around Complex improvements and structures.

- Protect habitat from wildfire trespass.
- Restore early successional habitats to promote native species while minimizing invasive species encroachment.
- Maintain fuel loadings within natural ranges of variability for major vegetation types.
- Aid in control of invasive plants and weeds that contribute to the fuel hazard.

Any work requiring heavy equipment, such as mowing, hydro-axe work, fuel break construction, or vegetation removal, should be done with low ground-pressure vehicles to the extent possible when the site is dry enough to prevent damage to soils. Non-fire treatments may be restricted during the nesting season from mid May to early August in areas that provide important habitat for trust wildlife resources.

G.4.2.3 Process to Identify Hazardous Fuels Treatments

The development of prescribed fire and non-fire hazardous fuel management priorities will be an ongoing process determined annually between the refuge staff and refuge manager based on changing habitat conditions on the refuge, changes in management objectives, and changes in management techniques or new information. The FMO and Complex staff will coordinate with federal and state partners and review existing CWPPs when developing potential hazardous fuels treatments in WUI areas.

G.4.3 Emergency Stabilization and Rehabilitation

Emergency stabilization (ES) and burned area rehabilitation (BAR) are part of a holistic approach to addressing post wildfire issues which also includes suppression activity damage repair and long-term (>3 years) restoration.

ES is planned actions performed by burned area emergency response (BAER) teams within one year of wildfire containment to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources.

BAR is efforts undertaken within three years of wildfire containment to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by fire. The process concludes with long-term restoration.

The incident management team, local fire resources, or refuge staff begins the process by repairing suppression activity damage. These actions are charged to the fire suppression accounting code. Fire suppression activity damage rehabilitation involves short-term actions to repair and rehabilitate damage to lands, resources, and facilities caused by the wildland fire suppression effort or activities. This includes dozer lines, camps, and staging areas; damaged facilities (fences, buildings, bridges, etc.); handlines; roads; etc. The project leader should ensure this work is complete before incident demobilization, or as soon thereafter as possible or practicable. Damage caused by backfires and burnouts to stop fire spread falls under fire damage restoration and does not qualify as damage caused by suppression action.

The Refuge Manager will coordinate with the Incident Commander, Zone FMO, and Regional Office fire staff to determine if an ES or BAR plan is needed for a Wildland fire incident. The Refuge

Manager will form an interdisciplinary team which could include fire and resource specialists to develop and write the ERS Plan. The ES or BAR plans must include provisions for monitoring and evaluation of treatments and techniques, and a procedure for collecting, archiving, and disseminating results. For multi-agency fires, we will do joint planning and implementation. Plans must ensure that the treatments proposed are environmentally, culturally, and socially acceptable, meet the objectives of Comprehensive Conservation and Habitat Management Plans, and comply with legal requirements. Each ES or BAR Plan will include a cost/risk analysis of proposed emergency rehabilitation treatment actions to assist agency administrators and reviewing authorities in assessing the proposed actions. The level and sophistication of the analysis should be commensurate with the scope and complexity of the plan.

ES plans should be submitted to the Regional Fire Management Coordinator (RFMC) within 7 calendar days of the wildfire containment. If additional time is needed, extensions may be negotiated with the (RFMC). BAR plans must be submitted before the end of the fiscal year in which the wildfire fire occurs.

Additional ES and BAR guidance may be found in the FWS Directives (095 FW3) and the Interagency Burned Area Emergency Response Guidebook.

G.4.4 Prevention, Mitigation and Education

The fire education program for the refuges making up the Southeast Idaho National Wildlife Refuge Complex will include fire prevention, mitigation, and information specific to the ecological aspects of fire and its interaction with refuge habitats. The program will be aimed at increasing public understanding of the complexities of the overall fire program and will seek to influence attitudes and behavior of adults and children. Attention will be given to social groups, elected officials, schools, and all other interested parties of any age.

Fire education messages will include how and why fire burns the way it does and the effects – both negative and positive – that fire has on plant, wildlife, and human populations. Focus will be given to the effect fuel, weather, and topography have on fire behavior clearly demonstrating the effect manipulation of fuels can have on the opportunity for a fire to burn through a given area.

All education efforts will be consistent with approved Service national and regional messaging. These efforts will be interagency when appropriate.

The fire prevention goal for the entire complex will be to prevent unwanted human-caused fires. High visitor use due to close proximity to large population areas increases the likelihood of careless human ignitions. Although campfires are not allowed on the refuges except in campgrounds, abandoned campfires are one of the concerns to be addressed in fire prevention efforts. Debris burning on neighboring private land, smoking, and fires ignited from vehicles also share some concern and will be addressed in conjunction with other agencies to protect human life and property, natural resources, and prevent damage to cultural resources or physical facilities.

During the typical fire season prevention efforts will be elevated commensurate with fire danger. Refuge employees must be kept informed about changes in the fire situation. Visitor contacts, signing, handouts and interpretive programs may be utilized to increase visitor and neighbor awareness of fire hazards. Due to lack of staffing on each individual refuge, collaboration with interagency partners such as local fire departments, the Bureau of Land Management, the Forest

Service, and the Idaho Department of Lands is critical for maintaining a fire prevention presence with the public. The complex will support interagency fire prevention efforts through use of severity funding, increased personnel presence, large scale campaigns, etc.

During periods of extreme or prolonged fire danger emergency restrictions regarding refuge operations or area closures may become necessary. Such restrictions will usually be consistent with those implemented by cooperators. The FMO will recommend when such restrictions may be necessary. Closures will be authorized by the Project Leader in consultation with Refuge Managers and the FMO.

All of the refuges are bordered by private property and have areas identified as at risk to wildfire should one start on the refuge. These areas will be addressed in County Wildfire Protection Plans and treated by chemical, mechanical or prescribed fire means as appropriate to reduce the risk. Refuge personnel will work with interagency partners to educate the community on fire mitigation techniques, consequences of doing or not doing the prescribed treatment, and issues related to any resulting smoke. A message of personal responsibility and Firewise principles will be included in any public contacts regarding fire mitigation.

Fire Investigation

Fire management personnel will attempt to locate and protect the probable point of origin and record pertinent information required to determine fire cause. They will be alert for possible evidence, protect the scene and report findings to the fireline supervisor.

Prompt and efficient investigation of all suspicious fires will be carried out. However, fire management personnel should not question suspects or pursue the fire investigation unless they are currently law enforcement commission qualified.

Personnel and services of other agencies may be utilized to investigate wildland fire arson or fire incidents involving structures. All fire investigations should follow the guidelines outlined in 4.1-2 of the Fire Management Handbook (2000).

For fires of suspicious origin the IC or refuge Manager may request a Fire Investigator through the appropriate dispatch center (EIIFC or SCIIDC).

Public Information and Education

People who live in this area are used to prescribed burning by the private ranch owners. The burning of ditches and farm fields is a common practice in Southeast Idaho.

The public will be notified of planned prescribed burning in advance of any actions via news releases and direct phone contact to neighboring residences. The role of wildland fire and prescribed fire may be incorporated into presentations that are given to various user groups and visiting public.

Educating the public on the value of fire as a natural process is important to increasing public understanding and support for the fire management program. The refuge will use the most appropriate and effective means to explain the overall fire and smoke management program. This may include supplemental handouts, signs, personal contacts, auto tour routes, or media releases. When necessary, interpretive presentations will address the fire management program and explain the role of fire in the environment.

G.5 Monitoring and Evaluation

Monitoring and evaluation are essential elements of the Complex's fire management program. They provide the means by which refuge personnel are able to determine if applicable sections of the fire management plan are being implemented as planned and if fire-related goals and objectives are being achieved.

G.5.1 Fire Management Plan

G.5.1.1 Annual FMP Review

This FMP will be reviewed annually and updated as needed, upon local agency administrator approval. Revisions of FMPs with Regional review and concurrence are required every five years and following completion of a new (or significantly revised) CCP or habitat management plan.

G.5.1.2 Fire Management Plan Terminology

Terms in the FMP are defined in the National Wildfire Coordinating Group glossary, located at http://www.nwcg.gov/pms/pubs/glossary. Any terms used not in the glossary are defined below.

G.5.2 Treatment Effectiveness

Basic monitoring to determine habitat response will generally use photo-points, which will be re-visited and photographed during subsequent seasons. Comparisons over time will aid in determining if burn objectives and resource objectives are being met. More complex monitoring efforts may be undertaken for research-related prescribed burns, or to answer questions about the effects of prescribed fire on specific wildlife or other habitat parameters. Such monitoring can require vegetation transects, breeding bird point counts, presence/absence of target species, etc. An excellent reference resource for monitoring procedures can be found within the Fire Monitoring Handbook, USDI, and National Park Service, 2007.

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Appendix H. Cultural Resource Management Plan

The Comprehensive Conservation Plan represents an opportunity to improve management for the Bear Lake National Wildlife Refuge, Oxford Slough WPA, and Thomas Fork Unit. Cultural resource management should be an integral part of habitat and people management, not just because the law mandates it but for the unique information it can bring to understanding our environment. The following issues are very important:

1. How do we maintain the integrity of the Refuge's cultural resources while managing and restoring wildlife habitat?
2. How do we work and consult with federally recognized tribes on the management of Native American cultural resources in a manner that facilitates the mission of the Refuge and addresses issues of importance to Tribes?
3. How do we work and consult with federally recognized tribes on the disposition of human remains, funerary objects, sacred objects, and objects of cultural patrimony as defined under the Native American Graves Protection and Repatriation Act?
4. How do we incorporate cultural resources into an interpretive and recreation program that illustrates humankind's interaction with the natural world?

These issues illustrate some of the Service's legally mandated responsibilities for cultural resources management. The management of cultural resources is an integral element of the process of meeting the Refuge's obligations, and consequently, of fulfilling its stated purpose. To this end, we recommend that the CCP includes the following goal:

Goal: ***Protect, preserve, evaluate, and interpret the cultural heritage and resources of the Refuge while consulting with appropriate Native American groups and preservation organizations, and complying with historic preservation legislation.***

With this goal in mind, we will implement the following objectives and strategies:

H.1 Objective CR1

Implement a proactive cultural resources management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources.

Achievement Strategies

A. Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites and structures for eligibility to the National Register of Historic Places. Prepare and implement activities to avoid and mitigate impacts to sites and structures as necessary.

B. Implement a proactive historic preservation program to evaluate eligibility to the National Register of Historic Places of those archaeological sites and historic-era structures that may be impacted by Service undertakings, management activities, erosion, or neglect.

C. Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information.

D. Develop partnerships with the Tribes for cultural resources inventory, evaluation, and project monitoring, consistent with the regulations of the National Historic Preservation Act.

E. Submit RONS proposal to the Refuge Operations Needs System Develop a cultural resource management plan as defined above.

F. Submit a proposal to obtain all of the Homestead Act land patent records for homesteads patented with the refuge boundaries.

Rationale: Various federal historic preservation laws and regulations require the Service to implement the kind of program described under this objective. Inattention to these responsibilities may obstruct the Refuge in its other land, habitat, and wildlife management efforts.

H.1 Objective CR2

Develop, in partnership with the Tribes and other preservation partners, a program for the education and interpretation of cultural resources of the Refuge.

Achievement Strategies

A. Prepare and implement activities to avoid and mitigate impacts to sites and structures as necessary.

B. Prepare environmental/cultural education materials for use in local schools and museums concerning cultural resources, the discipline of archaeology, the perspective of Native Americans, the history of the area, and conservation of natural and cultural resources. These materials could include an artifact replica kit with hands-on activities and curriculum prepared in consultation with the local school district, historical societies, and the Tribes.

C. Consult with the Tribes, historical societies, and other preservation partners to identify the type of cultural resources information appropriate for public interpretation.

D. Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including National Wildlife Refuge Week and appropriate local festivals.

E. Develop Museum Property Inventory. Create storage and use plans for museum property as part of the outreach program.

F. Submit a quarter of a full-time equivalent position for cultural resource interpretation and education be submitted to the Refuge Operations Needs System. A minimum of $5,000 should be allocated yearly for supplies and materials.

Rationale: Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them. The goals of the cultural resource education and interpretive program are fourfold: (1) translate the results of cultural research into media that can be understood and appreciated by a variety of people, (2) relate the connection between cultural resources and natural resources and the role of humans in the environment, (3) foster an awareness and appreciation of native cultures, and (4) instill an ethic for the conservation of our cultural heritage.

H.2 Objective CR3

Create and use a Memorandum of Understanding with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).

Achievement Strategies

A. Identify Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the refuge lands.

B. Open consultation process with affiliated Tribes, Groups, and direct lineal descendants.

C. Define funerary objects, sacred objects and objects of cultural patrimony.

D. Develop procedures to follow for intentional and inadvertent discoveries.

E. Identify persons to contact for the purposes of NAGPRA.

F. Submit a quarter of a full-time equivalent position for cultural resource interpretation and education be submitted to the Refuge Operations Needs System. A minimum of $5,000 should be allocated yearly for supplies and materials.

G. Submit to RONS a 1/8 full-time equivalent (FTE) position for two years to negotiate and complete an MOU, with $25,000 for travel expenses

Rationale: Development of a Memorandum of Understanding prior to an inadvertent discovery is strongly suggested by the NAGPRA implementing regulations. Such an agreement can greatly facilitate and speed up consultations as required by law after an inadvertent discovery.

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Appendix I. Glossary

I.1 Abbreviations

Act	National Wildlife Refuge System Improvement Act of 1997 (also Improvement Act or NWRSIA)
ABA	Architectural Barriers Act
ABC	American Bird Conservancy
ACEC	Area of Critical Environmental Concern (BLM)
ac.	Acres
ac/ft	Acre-Feet
ADA	Americans with Disabilities Act
AHPA	Archaeological and Historic Preservation Act
ARPA	Archaeological Resources Protection Act
ATR	Auto Tour Route
ATV	All-Terrain Vehicles
AWP	Annual Work Plan
AUD	Appropriate Use Determination
BCC	Birds of Conservation Concern
BCT	Bonneville Cutthroat Trout
BRWCA	Bear River Watershed Conservation Area
BHCA	Bird Habitat Conservation Area
BIDEH	Biological Diversity, Integrity, and Environmental Health
BLM	U.S. Bureau of Land Management
BRNWR	Bear Lake National Wildlife Refuge
BP	Before Present
°C	Degrees Celsius
CCP	Comprehensive Conservation Plan
CD	Compatibility Determination
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CLMA	Cooperative Land Management Agreement
CO2	Carbon Dioxide
COE	U. S. Army Corps of Engineers
cm	Centimeter
CWCS	Comprehensive Wildlife Conservation Strategy (State)
Csa	Mediterranean Climate
CY	Calendar Year
dbh	Diameter of a tree at breast height
DO	Dissolved oxygen, a measure of water quality
DEQ	Department of Environmental Quality
Dfb	Humid Continental, Mild Summer Climate
DM	Departmental Manual (USFWS)
DPS	Distinct Population Segment
EA	Environmental Assessment
EE	Environmental Education
EIS	Environmental Impact Assessment

ENSO	El Niño/La Nina Southern Oscillation
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	Degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FRO	Fisheries Resource Office (USFWS)
FSA	Farm Services Agency
FWS	U.S. Fish and Wildlife Service (also, Service, USFWS)
FY	Fiscal Year
GCM	Global Climate Model
GIS	Geographic Information System
GPS	Global positioning system
HCWMA	Highlands Cooperative Weed Management Area
HGM	Hydrogeomorphic
IAC	Interagency Committee for Outdoor Recreation
IBA	Important Bird Area
IBIS	Idaho Bird Inventory and Survey Program
IDDEQ	State of Idaho Department of Environmental Quality
IDFG	State of Idaho Department of Fish and Game
IDWR	State of Idaho Department of Water Resources
Improvement Act	National Wildlife Refuge System Improvement Act of 1997 (also Act, NWRSIA)
I&M	Inventory and Monitor
INFISH	Inland Native Fish Strategy
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
ISU	Idaho State University
kg	Kilogram
LDS	The Church of Jesus Christ of Latter-day Saints
IDT	State of Idaho Transportation Department
LE	Law Enforcement
m	Meter
MAPS	Monitoring Avian Productivity and Survivorship
MBCC	Migratory Bird Conservation Commission
MBMO	Migratory Bird Management Office
MMS	Maintenance Management System
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRMP	Middle Rocky Mountain Province
MSL	Mean Sea Level
NAGPRA	Native American Graves Repatriation Act
NAS	National Audubon Society
NAWMP	North American Waterfowl Management Plan
NCDC	National Climate Data Center
NEPA	National Environmental Policy Act
NGO	Nongovernmental Organization
NHPA	National Historic Preservation Act
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places

NTU	Nephelometric turbidity unit, a measure of water turbidity
NVCS	National Vegetation Classification Standard
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
NWRSIA	National Wildlife Refuge System Improvement Act of 1997
OC	Organochlorine Compounds
PDO	Pacific Decadal Oscillation
PIF	Partners in Flight
PFC	Pacific Flyway Council
pH	Potential Hydrogen
PPM	Parts Per Million
R1	Region 1 of the FWS (WA, OR, ID, HI and Pacific islands)
ROC	Resource of Concern
RONS	Refuge Operating Needs System
ROCO	Rocky Mountains and Columbia Basin
RV	Recreational Vehicle
SCA	Soil Conservation Service
SCBD	Secretariat for the Convention on Biodiversity
SCEP	Student Educational Employment Program
SCORPT	Statewide Comprehensive Outdoor Recreation and Transportation Plan
Service	U.S. Fish and Wildlife Service (also FWS, USFWS)
SGCN	Species of Greatest Conservation Need
SST	Sea Surface Temperatures
STEP	Student Temporary Employment Program
SUP	Special Use Permit
TDS	Total Dissolved Solids
TMDL	Total maximum daily load
TNC	The Nature Conservancy
TP	Total Phosphorous
TPY	Tons Per Year
TSS	Total Suspended Solids
UP&L	Utah Power and Light Company, now PacifiCorp
USDA	U.S Department of Agriculture
USDI	U.S. Department of Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USU	Utah State University
WILD	Project Wild
WPA	Waterfowl Production Area
WRCC	Western Regional Climate Center
WMA	Wildlife Management Area (State of Idaho)
XC	Cross Country
YACC	Young Adult Conservation Corps
YCC	Youth Conservation Corps

I.2 Glossary

303(d) listed water bodies. Section 303(d) of the Clean Water Act requires states, territories, and authorized tribes to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters (USEPA). For example, Deep Creek is 303(d) listed for sediment.

Alluvium. Sediment transported and deposited in a delta or riverbed by flowing water.

Adaptive Management. The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels. (Service Manual 602 FW 1.4)

Alternative. Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues. (Service Manual 602 FW 1.6). The “no action” alternative is current refuge management, while the “action” alternatives are all other alternatives.

Appropriate Use. A proposed or existing use on a refuge that meets at least one of the following four conditions:
(1) The use is a wildlife-dependent recreational use as identified in the Improvement Act.
(2) The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
(3) The use involves the take of fish and wildlife under State regulations.
(4) The use has been found to be appropriate as specified in section 1.11 of the USFWS Appropriate Use Policy (603 FW 1).

Approved Refuge Boundary. A National Wildlife Refuge boundary approved by the National or Regional Fish and Wildlife Service Director. Within this boundary, the Service may negotiate with landowners to acquire lands not already owned by the Service. (modified from Region 1 Landowner Guide, USFWS Division of Refuge Planning)

Archaeology. The scientific study of material evidence remaining from past human life and culture. (Webster’s II)

Association or Plant Association. The finest level of biological community organization in the US National Vegetation Classification (NVCS), defined as a plant community with a definite floristic composition, uniform habitat conditions, and uniform physiognomy. With the exception of a few associations that are restricted to specific and unusual environmental conditions, associations generally repeat across the landscape. They also occur at variable spatial scales depending on the steepness of environmental gradients and the patterns of disturbances. (The Nature Conservancy 2003).

B.P. (Before Present). Used as a designation following radiocarbon dates to express the point from which radiocarbon years are measured. This measuring point is arbitrarily taken to be 1950. A date of 5,200±200 B.P. means that it dates to 5,200 (plus or minus 200) years before 1950.

Benefiting Resources. Those species, species groups, or resources expected to benefit from actions taken for a Resource of Concern.

Biological Diversity: The variety of living organisms considered at all levels of organization including the genetic, species, and higher taxonomic levels. Biological diversity also includes the variety of habitats, ecosystems, and natural processes occurring therein. (The Nature Conservancy 2003)

Birds of Conservation Concern. A category assembled by the U.S. Fish and Wildlife Service Division of Migratory Birds identifying the migratory and non-migratory species (beyond those already designated as Federally threatened or endangered) that represent the Division's highest conservation priorities. (FWS, Division of Migratory Birds)

Biological Diversity (also Biodiversity). The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur (FWS Manual 601 FW 3). The System's focus is on indigenous species, biotic communities, and ecological processes.

Biological Integrity. Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities. (FWS Manual 601 FW 3)

Candidate Species. Plant or animal species for which FWS or NOAA Fisheries has on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened. (FWS, Endangered Species Glossary, http://www.fws.gov/endangered/glossary.html)

Categorical Exclusion. A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to the National Environmental Policy Act (40 CFR 1508.4).

Code of Federal Regulations (CFR). A codification of the regulations published in the Federal Register by the executive departments and agencies of the Federal government. The CFR is divided into 50 titles that represent broad areas subject to Federal regulation. Title 50 contains wildlife and fisheries regulations (NOAA Fisheries Glossary 2006).

Compatible Use. A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the Mission of the System or the purposes of the Refuge (Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

Composition (plant). The inventory of plant species found in any particular area.

Comprehensive Conservation Plan. A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purpose(s) of the Refuge; helps fulfill the mission of the System; maintains and, where appropriate, restores the biological integrity, diversity, and environmental health of each refuge and the System; helps achieve the goals of the National Wilderness Preservation System, if appropriate; and meets other mandates. (FWS Habitat Management Planning policy, 602 FW 1.4)

Connectivity. The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of **fragmentation.**

Conservation Target or Target (also see **Resources of Concern; Priority Species, Species Groups,** and **Communities).** Term used by land management agencies and conservation organizations to describe the resources (ecological systems, ecological communities, species, species groups, or other natural resources) selected as the focus of conservation planning or actions. (adapted from Low, Functional Landscapes, 2003)

Consumptive use. Recreational activities, such as hunting and fishing that involve harvest or removal of wildlife or fish, generally to be used as food by humans.

Contaminants or **Environmental contaminants.** Chemicals present at levels greater than those naturally occurring in the environment resulting from anthropogenic or natural processes that potentially result in changes to biota at any ecological level. (USGS, assessing EC threats to lands managed by USFWS) Pollutants that degrade other resources upon contact or mixing. (Adapted from Webster's II)

Cooperative Agreement. An official agreement between two parties.

Cover. The estimated percent of an area, projected onto a horizontal surface, occupied by a particular plant species.

Critical Habitat. Those areas that support rare, threatened or endangered species, or serve as sensitive spawning and rearing areas for aquatic life as designated by the U.S. Fish and Wildlife Service or NOAA Fisheries pursuant to the Endangered Species Act (16 USC 1531).

Cultural Resources. The physical remains, objects, historic records, and traditional lifeways that connect us to our nation's past. (USFWS, Considering Cultural Resources)

Cultural Resource Inventory. A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4. (Service Manual 614 FW 1.7)

Decadence. Marked by decay or decline. For plants, showing little or no new growth. (Adapted from Merriam-Webster online dictionary)

Deep “Hemi-Marsh.” Classified as the deeper portion of palustrine emergent wetlands. The habitat types within the “hemi-marsh” system include: permanently flooded open water; submergent aquatic vegetation habitats; and semi-permanently flooded deep emergent bulrush habitat. The Hemi-Marsh stage occurs when an equal 50:50 mix of deep emergent bulrush and open water/submergent habitat are present, and is considered critical to fulfilling the life history strategies of numerous wetland dependent wildlife species (Weller and Spatcher 1965).

Deciduous. Describes trees and shrubs which shed all of their leaves each year.

Distinct population segment (DPS). A subdivision of a vertebrate species that is treated as a species for purposes of listing under the Endangered Species Act. To be so recognized, a potential distinct population segment must satisfy standards specified in a FWS or NOAA Fisheries policy statement (See the February 7, 1996, Federal Register, pages 4722-4725). The standards require it to be separable from the remainder of and significant to the species to which it belongs. (FWS, Endangered Species Glossary, http://www.fws.gov/endangered/glossary.html)

Disturbance. Significant alteration of habitat structure or composition, or of the behavior or wildlife. May be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).

Drawdown. A lowering of the ground-water surface caused by pumping.

Ecosystem. A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.

Ecosystem Management. Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and basic ecosystem processes are perpetuated indefinitely.

Environmental Assessment. A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

Endangered Species (Federal). An animal or plant species in danger of extinction throughout all or a significant portion of its range. (FWS, Endangered Species Glossary)

Environmental Education Study Sites. Outdoor locations where groups of students engage in hands-on activities within an environmental education curriculum.

Environmental Health. Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment. (FWS Manual 601 FW 3)

Enhance. To improve the condition of an area or habitat, usually for the benefit of certain native species.

Extirpated Species. A species that no longer survives in regions that were once part of its range, but that still exists elsewhere in the wild or in captivity. (FWS, Endangered Species Glossary)

Finding of No Significant Impact (FONSI). A document prepared in compliance with the National Environmental Policy Act, supported by an environmental assessment, that briefly presents why a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

Fee Hunt (also reservation hunt; regulated hunt). Areas containing designated blinds for waterfowl hunting, which are allocated via a lottery system and available for a fee.

Floodplain. Mostly level land along rivers and streams that may be submerged by floodwater. A 100-year floodplain is an area which can be expected to flood once in every 100 years.

Fluvial processes. Referring to the physical interaction of flowing water and the natural channels of rivers and streams.

Global Positioning System (GPS). A location determination network that uses satellites to act as reference points for the calculation of position information. These man-made reference points can be viewed as aerial lighthouses that are visible to user equipment and can also transmit additional information that can provide extremely accurate location information to the GPS function within location determination devices. (The Wireless Dictionary)

Goal. Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units. (Service Manual 620 FW 1.6)

Habitat. The place or type of site where species and species assemblages are typically found and/or are successfully reproducing. They are named according to the features that provide the underlying structural basis for the community. (The Nature Conservancy 2003)

Habitat Management Plan. A plan that provides refuge managers a decision-making process; guidance for the management of refuge habitat; and long-term vision, continuity, and consistency for habitat management on refuge lands. (FWS Habitat Management Planning policy 620 FW 1.4)

Habitat Restoration. Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.

Historic Conditions. Composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape. (FWS Manual 601 FW 3). Also see Presettlement Conditions.

Hydrograph. The annual flow pattern of a river.

Hydrologic Regime. The normal pattern of precipitation (snow and/or rainfall) and runoff occurring in an area.

Important Bird Area (IBA). A site that provides essential habitat for one or more species of birds; program coordinated by The American Bird Conservancy and The National Audubon Society.

Indicator. A measurable characteristic of a key ecological attribute that strongly correlates with the status of the key ecological attribute.

Indicator Species. A species used as a gauge for the condition of a particular habitat, community, or ecosystem. A characteristic or surrogate species for a community or ecosystem (The Nature Conservancy 2003).

Inholding. Refers to lands within an Approved Refuge Boundary that are not owned by the U.S. Fish and Wildlife Service. These can be private lands or lands owned by city, county, State, or other Federal agencies.

Integrated Pest Management (IPM). The use of pest and environmental information in conjunction with available pest control technologies to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to persons, property, and the environment. (U.S. EPA Pesticide Glossary)

Interpretation. A teaching technique that combines factual information with stimulating explanation (yourdictionary.com). Frequently used to help people understand natural and cultural resources.

Introduced species. With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem. Introduced species often compete with and cause problems for native species. Introduced species are also called exotic, nonnative, and alien species. (see *Invasive Species*)

Invasive Species. An introduced species that out-competes native species for space and resources.

Inventory. A survey of the plants or animals inhabiting an area.

Issue. Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition. (Service Manual 620 FW 1.6)

Key Ecological Attribute. Those aspects of the environment, such as ecological processes or patterns of biological structure and composition that are critical to sustain the long-term viability of the target. These key ecological attributes are further divided into measurable indicators.

Keystone Species. A species whose impacts on its community or ecosystem are large; much larger than would be expected from its abundance (for example, cottonwoods, beavers, gray wolves). Their removal initiates changes in ecosystem structure and often loss of diversity. (Adapted from The Nature Conservancy 2003)

Lacustrine Wetlands. Those areas that are generally permanently flooded and lacking trees, shrubs, or emergent vegetation with greater than 30 percent areal coverage and measuring greater than 20 acres. Smaller areas than this can be included if the water depth in the deepest part of the basin exceeds 6.6 feet at low water. (National Wetlands Inventory)

Landform. A natural feature of a land surface. (yourdictionary.com)

Maintenance. The upkeep of constructed facilities, structure, and capitalized equipment necessary to realize the originally anticipated useful life of a fixed asset. Maintenance includes preventative maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment, periodic condition assessment; periodic inspections, adjustment, lubrication and cleaning (non-janitorial) of equipment; painting, resurfacing, rehabilitation; special safety inspections; and other actions to ensure continuing service and to prevent breakdown.

Maintenance Management System (MMS). A national database of refuge maintenance needs and deficiencies. It serves as a management tool for prioritizing, planning, and budgeting purposes. (RMIS descriptions)

Mesic. Habitats characterized by or requiring a moderate amount of moisture, as compared to hydric (wet) or xeric (dry) habitats. (Adapted from Merriam-Webster online).

Migration. The seasonal movement from one area to another and back.

Migratory birds. Those species of birds listed under 50 CFR section 10.13. (FWS Manual 720FW 1, Policies and Responsibilities of the Migratory Bird Program)

Monitoring. The process of collecting information to track changes of selected parameters over time.

National Environmental Policy Act of 1969 (NEPA). Requires all Federal agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making. (40 CFR 1500)

Native. With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem. (FWS Manual 601 FW 3)

National Register of Historic Places. The Nation’s master inventory of known historic properties administered by the National Park Service. Includes buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archeological, or cultural significance at the national, state, and local levels. (USFWS, Considering Cultural Resources)

National Vegetation Classification Standard (NVCS). A hierarchical list of vegetation types and their descriptions intended to produce uniform statistics about vegetation resources across the United States, based on data gathered at local, regional, or national levels. (Adapted from Federal Geographic Data Committee).

National Wildlife Refuge. A designated area of land, water, or an interest in land or water within the Refuge System, excluding coordination areas. (FWS Manual 601 FW 1.3)

National Wildlife Refuge System. Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management areas; or waterfowl production areas.

National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). A Federal law that amended and updated the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668).

Nephelometric turbidity unit (NTU). Unit of measure for the turbidity of water. Essentially, a measure of the cloudiness of water as measured by a nephelometer. Turbidity is based on the amount of light that is reflected off particles in the water. (USGS Water Science Glossary of Terms)

Nonconsumptive Recreation. Recreational activities that do not involve harvest, removal, or consumption of fish, wildlife, or other natural resources.

Noxious Weed. A plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States, according to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or had adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

Objective. A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Make objectives attainable, time-specific, and measurable. (Service Manual 620 FW 1.6)

Operations. Activities related to the normal performance of the functions for which a facility or item of equipment is intended to be used. Costs such as utilities (electricity, water, sewage) fuel, janitorial services, window cleaning, rodent and pest control, upkeep of grounds, vehicle rentals, waste management, and personnel costs for operating staff are generally included within the scope of operations.

Pacific Flyway. One of several major north-south travel corridors for migratory birds. The Pacific Flyway is west of the Rocky Mountains. Other flyways include the Central, Mississippi, and Atlantic.

Palatable Grass. Short (generally less than 6 inches tall) actively growing grass preferred by Canada geese and certain other waterfowl (e.g., American wigeon).

Palustrine Wetlands. Wetlands that may or may not be permanently flooded and typically recognized by the presence of trees, shrubs, or herbaceous emergent vegetation. May include non-vegetated areas measuring less than 20 acres in extent and with water depths shallower than 6.6 feet in the deepest part of the basin at low water (Cowardin et al. 1979).

Planning Team. The primary U.S. Fish and Wildlife staff and others who played a key role in developing and writing the CCP. Planning teams are interdisciplinary in membership and function. Teams generally consist of a Planning Team Leader, Refuge Manager and staff biologists, a State natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, and recreation specialist). Other Federal and Tribal natural resource agencies are asked to provide team members, as appropriate. The planning team prepares the CCP and appropriate NEPA documentation. (Service Manual 620 FW 1.6)

Plant Association. A classification of plant communities based on the similarity in dominants of all layers of vascular species in a climax community (e.g., black cottonwood/red-osier dogwood plant association).

Plant Community. An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community, e.g., Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (NVCS).

Preferred Alternative. This is the alternative determined [by the decision maker] to best achieve the refuge purpose, vision, and goals; to best contribute to the Refuge System mission; to best address the significant issues; and to be consistent with principles of sound fish and wildlife management.

Prescribed Fire. Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition (National Wildfire Coordinating Group Glossary of Wildland Fire Terminology)

Presettlement Conditions. The state of the environment at the time of European settlement or 1850 (Kootenai Tribe of Idaho and MT Dept of Fish, Wildlife and Parks 2004). Also see Historic Conditions.

Priority Public Uses. Hunting, fishing, wildlife observation and photography, environmental education and interpretation, where compatible, are identified under the National Wildlife Refuge System Improvement Act of 1997 as the six priority public uses of the National Wildlife Refuge System.

Public. Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the planning team. It includes those who may or may not have indicated an interest in Service issues and those who may be affected by Service decisions.

Refuge Operating Needs System (RONS). A national database of unfunded refuge operating needs required to meet and/or implement station goals, objectives, management plans, and legal mandates. It is used as a planning, budgeting, and communication tool describing funding and staffing needs of the Refuge System.

Refuge Purpose(s). The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the Refuge. (Service Manual 620 FW 1.6).

Residual Cover. In pastures or grasslands, tall decadent grass and/or forbs left standing through the fall and winter seasons.

Resource of Concern (ROC). All plant and/or animal species, species groups, or communities specifically identified in refuge purpose(s), System mission, or international, national, regional, State, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect “migrating waterfowl and shorebirds.” Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts. (FWS Habitat Management Planning policy, 620 FW 1.4).

Restore. To bring back to a former or original condition. (Webster's II).

Revenue Sharing. Service payments (government lands are exempt from taxation) made to counties in which national wildlife refuges reside. These payments may be used by the counties for any governmental purpose such as, but not limited to, roads and schools. (USFWS Revenue sharing pamphlet).

Riparian. Refers to an area or habitat that is transitional from terrestrial to aquatic ecosystems; including streams, lakes wet areas, and adjacent plant communities and their associated soils which have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, "riparian" describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes any and all plant life growing on the land adjoining a stream and directly influenced by the stream.

Shallow Emergent Marsh. Shallow emergent bulrush/cattail and alkali bulrush habitats are extensive semi-permanently to seasonally flooded habitats. While the shallow emergent is structurally similar to the deep bulrush emergent marsh, it is buffered by dense stands of deep emergent hardstem bulrush and therefore lacks immediate connectivity to open water/submerged aquatic habitats. Therefore, shallow emergent habitats are not considered a tall emergent component of the "hemi-marsh."

Shorebirds. Sandpipers, plovers, and their close relatives of similar size and ecology, often associated with coastal and inland wetlands. (Sibley Guide to Birds 2000).

Songbirds (Also **Passerines**). A category of medium to small, perching landbirds. Most are territorial singers and migratory.

Source. An extraneous factor that causes a stress (the most proximate cause). (TNC 2000)

Species of concern (Federal). An informal term referring to a species that might be in need of conservation action. This may range from a need for periodic monitoring of populations and threats to the species and its habitat, to the necessity for listing as threatened or endangered. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing. (FWS, Endangered Species Glossary).

Step-down Management Plan. A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives. (Service Manual 620 FW 1.6).

Strategy. A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives. (Service Manual 620 FW 1.6)

Stress. Something which impairs or degrades the size, condition, or landscape context of a conservation target, resulting in reduced viability. (The Nature Conservancy 2003)

Tall Emergent Wetland. Comprised of permanently flooded open and submerged aquatic vegetation immediately proximate to semi-permanently flooded deep emergent hardstem-bulrush vegetation and semi-permanent to seasonally flooded shallow emergent alkali-bulrush/cattail vegetation.

Target. See Conservation Target.

Thatch. The dense covering of cut grass that remains after mowing of haying. Thatch inhibits growth of new grass and also inhibits goose foraging.

Threat. The combined concept of ecological stresses to a target and the sources of that stress to the target. (The Nature Conservancy 2003)

Threatened Species (Federal). An animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. (FWS, Endangered Species Glossary)

Total Maximum Daily Load (TMDL). A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources (US EPA). Pollutants may include sediment, nutrients (e.g., nitrogen and phosphorus), pathogens (e.g., *E. coli* bacteria), pesticides, and heavy metals (e.g., mercury).

Turbidity. The amount of particulate matter that is suspended in water, measured in NTUs (nephelometric turbidity units). Clear water generally measures less than 10 NTU.

Vegetation Type (Also **Habitat Type**, **Forest Cover Type, Association, NVCS**). A land classification system based upon the concept of distinct plant associations.

Vision Statement. A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the Refuge System mission and specific refuge purposes, and other mandates. The vision statement for the Refuge is tied to the mission of the Refuge System; the purpose(s) of the Refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates. (Service Manual 620 FW 1.6)

Waterfowl. Resident and migratory ducks, geese, and swans.

Water quality. A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Watershed. The land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large watersheds, like the Mississippi River basin contain thousands of smaller watersheds.

Wetlands. Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water at some time during the growing season of each year. (Service Manual 660 FW 2; Cowardin et al. 1979)

Permanent Wetland. A wetland basin or portion of a basin that is covered with water throughout the year in all years except extreme drought.

Semi-permanent Wetland. A wetland basin or portion of a basin where surface water persists throughout the growing season of most years.

Seasonal Wetland. A wetland basin or portion of a basin where surface water is present in the early part of the growing season but is absent by the end of the season in most years.

Wet Meadows. Shallowly flooded wetland edges with little to no slope. Flooding is generally of short duration.

Wildfire. An unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out (National Wildfire Coordinating Group, Glossary of Wildland Fire Terminology)

Wildland Fire. Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use (allowing naturally ignited fires to burn to benefit natural resources) and prescribed fire (National Wildfire Coordinating Group Glossary of Wildland Fire Terminology)

Wildlife-dependent Recreational Use. A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. These are the six priority public uses of the Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. The Service will also consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence. (Service Manual 620 FW 1.6)

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Appendix J. Statement of Compliance

STATEMENT OF COMPLIANCE [1]
for Implementation of the
Bear Lake National Wildlife Refuge, Bear Lake County, Idaho
And
Oxford Slough Waterfowl Production Area, Franklin and Bannock Counties, Idaho
Comprehensive Conservation Plan

The following executive orders and legislative acts have been reviewed as they apply to implementation of the Bear Lake National Wildlife Refuge and Oxford Slough Waterfowl Production Area Comprehensive Conservation Plan.

1. **National Environmental Policy Act (1969) (42 U.S.C. 4321 et seq.).** The planning process has been conducted in accordance with National Environmental Policy Act (NEPA) Implementing Procedures and Department of the Interior and Service procedures, and has been performed in coordination with the affected public. The requirements of NEPA (42 U.S.C. 4321 et seq.) and its implementing regulations in 40 CFR Parts 1500-1508 have been satisfied in the procedures used to reach this decision. These procedures include: the development of a range of alternatives for the CCP; analysis of the likely effects of each alternative; and public involvement throughout the planning process. An environmental assessment (EA) was prepared for the project that integrated the Draft CCP management objectives and alternatives into the EA and NEPA process. The Draft CCP and EA was released for a 30-day public comment period. The affected public was notified of the availability of these documents through a Federal Register notice, news releases to local newspapers, the Service's refuge planning website, and a planning update. Copies of the Draft CCP/EA and/or planning updates were distributed to an extensive mailing list. The CCP was revised based on public comment received on the draft documents.

2. **National Historic Preservation Act (1966).** The implementation of the CCP should not affect cultural resources. The proposed action does not meet the criteria of an effect or adverse effect as an undertaking defined in 36 CFR 800.9 and Service Manual 614 FW 2. The Service will comply with the National Historic Preservation Act if any management actions have the potential to affect any historic properties that may be present.

3. **Executive Order 12372. Intergovernmental Review.** Coordination and consultation with affected Tribal, local and State governments, other Federal agencies, and the landowners has been completed through personal contact by Service Planners, refuge managers and Supervisors.

4. **Executive Order 13175. Consultation and Coordination with Indian Tribal Governments.** As required under Secretary of the Interior Order 3206 American Indian Tribal Rights, Federal-Tribal Responsibilities, and the Endangered Species Act, the Project Leader consulted and coordinated with the Shosone-Bannock Tribe and the Northwestern Band of the Shosone Tribe regarding the proposed action. Specifically, Project Leader Tracy Casselman sent invitational letters to Chairman Small of the Shosone-Bannock Tribes, and Tribal Council Chair Jason Walker of the Northwestern Band of the Shosone Tribe, explaining the NWRS planning process and inviting the department to participate in the CCP development process.

5. **Executive Order 12898. Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.** All Federal actions must address and identify, as appropriate, disproportionally high and adverse human health or environmental effects of its programs, policies, and activities on minority populations, low-income populations, and Indian Tribes in the United States. The CCP was evaluated and no adverse human health or environmental effects were identified for minority or low-income populations, Indian Tribes, or anyone else.

6. **Wilderness Act.** The Service has evaluated the suitability of the Refuge for wilderness designation and concluded that the Bear Lake National Wildlife Refuge, the Thomas Fork Unit, and the Oxford Slough WPA do not meet the basic criteria for inclusion into the National Wilderness Preservation System.

7. **National Wildlife Administration Act of 1966, as amended by The National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd-668ee).** The refuge manager determined that the following refuge use(s) are appropriate, and directed that compatibility determinations be completed for each use: research on the Bear Lake NWR, including the Thomas Fork Unit, and the Oxford Slough WPA; agriculture (farming and haying) on the Bear Lake NWR and Oxford Slough WPA; dog walking on the Bear Lake NWR and Oxford Slough WPA; canoeing and kayaking (nonmotorized boating) on the Bear Lake NWR and Oxford Slough WPA; and bicycling, cross-country skiing, and snowshoeing on the Bear Lake NWR and Oxford Slough WPA. The following uses were found to be compatible with stipulations: environmental education, interpretation, wildlife observation, and photography on Bear Lake NWR and Oxford Slough WPA; waterfowl hunting on Bear Lake NWR and Oxford Slough WPA; small upland game hunting on Bear Lake NWR; sport fishing on Bear Lake NWR; research on Bear Lake NWR (including Thomas Fork Unit) and the Oxford Slough WPA; agricultural practices (farming and haying) on Bear Lake NWR (including Thomas Fork Unit) and the Oxford Slough WPA; dog walking on Bear Lake NWR and the Oxford Slough WPA; canoeing and kayaking (nonmotorized boating) on Bear Lake NWR and the Oxford Slough WPA; bicycling, cross-country skiing, snowshoeing on Bear Lake NWR and Oxford Slough WPA; hunting of resident game and furbearers on Oxford Slough WPA; and trapping of furbearers on Oxford Slough WPA.

8. **EO 13186. Responsibilities of Federal Agencies to Protect Migratory Birds.** This order directs departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act. A provision of the order directs Federal agencies to consider the impacts of their activities, especially in reference to birds on the Fish and Wildlife Service's list of Birds of Conservation (Management) Concern (BCC). It also directs agencies to incorporate conservation recommendations and objectives in the North American Waterbird Conservation Plan and bird conservation plans developed by Partners in Flight into agency planning. The effects of all alternatives to refuge habitats used by migratory birds were assessed within the Chapter 6 of the Draft CCP/EA, which was incorporated by reference into this document.

9. **Endangered Species Act.** No Federally threatened or endangered species occur on the Bear Lake NWR, Thomas Fork Unit, or Oxford Slough WPA. Therefore, CCP implementation is expected to result in no impacts the threatened or endangered species.

10. **Executive Order 11990. Protection of Wetlands.** The CCP is consistent with Executive Order 11990 because CCP implementation will protect and enhance existing wetlands.

11. **Executive Order 11988. Floodplain Management.** Under this order Federal agencies "shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety,

health and welfare, and to restore and preserve the natural and beneficial values served by flood plains." The CCP is consistent with Executive Order 11988 because CCP implementation would protect floodplains from adverse impacts as a result of modification or destruction.

12. **Integrated Pest Management (IPM), 517 DM 1 and 7 RM 14.** In accordance with 517 DM 1 and 7 RM 14, an integrated pest management (IPM) approach has been adopted to eradicate, control, or contain pest and invasive species on the Refuge. In accordance with 517 DM 1, only pesticides registered with the US Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and as provided in regulations, orders, or permits issued by USEPA may be applied on lands and waters under refuge jurisdiction.

13. **Comprehensive Environmental Response, Compensation and Liability Act (1980) (CERCLA) and Secretarial Order 3127.** All acquisitions of real property, whether discretionary or nondiscretionary, would require a Level 1 pre-acquisition environmental site assessment. There are no Environmental Protection Agency, Region 9 Superfund sites within one mile of the project area.

14. **Uniform Relocation Assistance and Real Property Acquisition Policies Act.** The Service would conduct all realty actions in conformance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.

2/11/2013

Chief, Division of Refuge Planning | Date

[1] See 602 FW 3, Exhibit 2 for other potential compliance requirements

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Appendix K. CCP Team Members

The CCP was developed primarily by core team members. The core planning team consisted of persons responsible for the preparation and completion of the Comprehensive Conservation Plan. They are the primary strategists, analysts, and writers, and attended all team meetings. To avoid scheduling and logistical conflicts, the core team had a limited number of participants.

The extended team, which included professionals from several different Fish and Wildlife Service programs, played a supporting role to the core team. Extended team members provided input early in the alternatives development process, and continued to provide review and comment as the document evolved. They attended periodic planning meetings, compiled information for use in the plan, and/or provided comment on portions of the plan within their areas of expertise. Extended team members' varied responsibilities include providing technical expertise and assisting with development of objectives, strategies, and alternatives; analysis; writing; and reviewing. In addition, content specialists from other agencies or organizations were contacted as needed by members of the core and extended teams for specific planning needs.

Table K.1 Bear Lake NWR and Oxford Slough WPA CCP Core Team Members

Name	Title (Team Role)	Address
Tracy Casselman	Project Leader	U.S. Fish and Wildlife Service Southeast Idaho NWRC 4425 Burley Drive, Suite A Chubbuck, ID 83202 208-237-6617
Annette de Knijf	Refuge Manager	U.S. Fish and Wildlife Service Bear Lake NWR 370 Webster, PO Box 9, Montpelier, ID 83254 208-847-1757
Carl Mitchell	Wildlife Biologist (Retired)	U.S. Fish and Wildlife Service Grays Lake NWR 74 Grays Lake Road Wayan, ID 83285 208-574-2755
Bill Smith	Wildlife Biologist/Planner	U.S. Fish and Wildlife Service Grays Lake NWR 74 Grays Lake Road Wayan, ID 83285 208-574-2755
Ken Morris	Conservation Planner	U.S. Fish and Wildlife Service Division of Planning, Visitor Services and Transportation 911 NE 11th Ave Portland, OR 97213

Table K.2 Extended Team Members

Name	Title	Address
Kevin Kilbride	Regional IPM Coordinator	U.S. Fish and Wildlife Service 1211 SE Cardinal Ct., Suite 100 Vancouver, WA 98683
Joe Engler	Assistant Regional Biologist	U.S. Fish and Wildlife Service 1211 SE Cardinal Ct., Suite 100 Vancouver, WA 98683
Tom Miewald	Geographer	U.S. Fish and Wildlife Service 911 NE 11th Avenue Portland, OR 97232-4181 503-231-6840
Gary Ball	Hydrologist	U.S. Fish and Wildlife Service Water Resources Branch 911 NE 11th Avenue 2W-EN Portland, OR 97232-4181 503-736-4788
Lance Roberts	Fire Management Officer	U.S. Fish and Wildlife Service Southeast Idaho NWRC 4425 Burley Drive, Suite A Chubbuck, ID 83202
Kathi Stopher	Instructional Systems Specialist	U.S. Fish and Wildlife Service Bear River Migratory Bird Refuge 2155 West Forest St. Brigham City, UT 84302

Appendix L. Public Involvement

Public involvement was sought throughout the development of the Draft CCP, starting in March 2010 with the preparation of an Outreach and Communication Plan. The Refuge also held an open house and sent letters and planning updates to inform the public, Tribes, and agencies, invite discussion, and solicit feedback.

A mailing list of approximately 200 persons and organizations is maintained at the Refuge and was used to distribute planning updates and public meeting announcements. Below is a brief summary of the events, meetings, and outreach tools that were used in our public involvement efforts.

L.1 Agency Consultation and Coordination

The Idaho Department of Fish and Game (IDFG) was invited to the public scoping meeting and asked to submit comments during public scoping. On November 5, 2010, Project Leader Tracy Casselman sent invitational letters to IDFG Regional Supervisors Mark Gamblin (Southeast Region) and Steve Schimdt (Upper Snake Region) explaining the NWRS planning process and inviting the department to participate in the CCP development process. In addition Project Leader Casselman informed IDFG of progress on CCPs for the Southeast Idaho Refuges and other items of shared management interest on a regular basis (typically once per month). IDFG chose not to participate in the development of the CCP but reviewed and provided comments on the Draft CCP/environmental assessment (EA).

L.2 Native American Government Consultation

In accordance with Service and National Environmental Policy Act (NEPA) policy, the Service invited the two federally recognized Native American Tribes in the area, the Shoshone-Bannock Tribes and the Northwestern Band of the Shoshone Nation, to participate in the CCP process at the scoping or development phase. On November 5, 2010, Project Leader Tracy Casselman sent invitational letters to Chairman Small of the Shoshone-Bannock Tribes and Tribal Council Chair Jason Walker of the Northwestern Band of the Shoshone Nation explaining the NWRS planning process and inviting the Tribes to participate in the CCP development process. Neither Tribe chose to do so. With the release of the draft CCP the Service sent Planning Updates and the Draft CCP/EA (on CD) to the Tribes. Neither Tribe provided comment. Project Leader Casselman meets with the Shoshone-Bannock Tribe twice yearly to discuss ongoing projects in the Southeast Idaho Complex (including CCPs) and discuss items of shared management interest.

L.3 Formal Scoping

L.3.1 Notice of Intent

The Service began the public scoping period by publishing a Notice of Intent to prepare the CCP in the *Federal Register* on June 23, 2010. In addition to basic information about the CCP/EA project, the notice provided information on the planning process; public involvement opportunities; a history and description of Bear Lake NWR, the Thomas Fork Unit, and Oxford Slough WPA; and a description of the initial issues, concerns, and opportunities as developed by the Service. The 30-day comment period ended on July 23, 2010.

During scoping a total of 15 responses were received from individuals or organizations from June 23, 2010, through July 23, 2010. Six of these were comment forms returned by mail or hand delivered to the Refuge. Comments from five respondents were recorded at the open house. Three responses were sent by e-mail. One response was a letter sent by e-mail and mail. All comments gathered during the period were recorded and summarized in the Public Scoping Report, which is available on Bear Lake NWR's website.

L.3.2 Other Public Notices

- June 2010. Press releases notifying the public of the open house were sent to and published by *The News-Examiner*, a weekly newspaper for the Bear Lake Valley.
- June 2010. Press releases notifying the public of the open house were sent to and announced on the air by KVSI 1450 AM, a local radio station.

L.3.3 Public Scoping Open House

The Service held one public open house during the 30-day scoping/comment period on July 1, 2010, in Montpelier, Idaho at the Bear Lake County Senior Citizens Center, 115 S. 4th Street, Montpelier ID 83254 from 6:30 to 8:30 PM. The meeting was in an open house format. Refuge staff explained the CCP process; refuge purposes, vision, and management; and preliminary management issues, concerns, and opportunities that had been identified early in the planning process. The public was invited to submit comments either in writing or verbally. A total of five private citizens attended the open house and provided comments.

L.4 Other Meetings

- July 19-20, 2010. Representatives from the Service's Pacific Region updated the IDFG on the status of CCP efforts in Idaho, including Bear Lake NWR, at the annual conference of the Western Association of Fish and Wildlife Agencies.
- April 11, 2011. Preliminary draft alternatives briefing for Region 1 Refuges Chief and staff, Service Regional Office, Portland, OR.
- April 18, 2012. Internal draft CCP briefing for Region 1 Refuges Chief and staff, Service Regional Office, Portland, OR.
- November 6, 2012. Project Leader Tracy Casselman and Refuge Manager Annette de Knijf met with PacifiCorp to discuss their comments on the Draft CCP/EA.

L.5 Planning Updates

As noted above, the Service distributed a planning update (summarized below) to individuals, agencies, and organizations on a mailing list to initiate the scoping process. A second update was released upon conclusion of the formal scoping process, and a third update was released to announce the availability of the draft CCP and summarize management alternatives.

- June 2010. Planning Update 1 was distributed to a mailing list of approximately 200 individuals and organizations on the Bear Lake Refuge and Southeast Idaho NWR Complex mailing lists including Federal, state, Tribal, and local governments and land management agencies, non-governmental organizations, media contacts, and private citizens. Planning Update 1 provided an overview of the CCP process, announced the start of the planning process, and presented draft issues that might be addressed in the CCP. The planning update included a comment form. In addition, the Planning Update was posted on the refuge website, and copies were available at the CCP open house and at the refuge office.

- November 2010. Planning Update 2, summarizing the results of public scoping, was distributed to a mailing list of approximately 200 recipients. In addition, the Planning Update and a detailed report on the results of public scoping were posted on the refuge website.
- September 2012. Planning Update 3, announcing the availability of the Draft CCP/EA and the start of the public comment period, was distributed to a mailing list of approximately 200 recipients. Planning Update 3 included a summary comparison of the three alternatives presented in the Draft CCP/EA, and information on how the interested public could provide comments. CDs containing the complete Draft CCP/EA were mailed with the planning update. In addition, the Planning Update and the Draft CCP/EA were posted on the refuge website.

L.6 Other Tools

- June 2010. Comment forms were sent to approximately 200 people in conjunction with Planning Update 1. The comment form was also posted on refuge website, and distributed during the public scoping meeting.

L.7 Federal Register Notices

- June 23, 2010. Federal Register published Notice of Intent to Prepare a Draft Comprehensive Conservation Plan and Environmental Assessment (75 FR 35829).
- September 28, 2012. Federal Register published Notice of Availability of the Draft CCP/EA and request for comments (77 FR 59639).

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Appendix M. Refuge Decrees and Agreements

Readers please note: Utah Power and Light Company referred to in these documents is now PacifiCorp.

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Public Law 96-189
96th Congress

An Act

Feb 8, 1980
[H.R. 4320]

To consent to the amended Bear River Compact between the States of Utah, Idaho, and Wyoming.

Bear River Compact. Congressional consent.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is given to the amended Bear River Compact between the States of Idaho, Utah, and Wyoming. Such compact reads as follows:

"AMENDED BEAR RIVER COMPACT

Amended agreement by Idaho, Utah, and Wyoming.

"The State of Idaho, the State of Utah and the State of Wyoming, acting through their respective Commissioners after negotiations participated in by a representative of the United States of America appointed by the President, have agreed to an Amended Bear River Compact as follows:

"ARTICLE I

"A. The Major purposes of this Compact are to remove the causes of present and future controversy over the distribution and use of the waters of the Bear River; to provide for efficient use of water for multiple purposes; to permit additional development of the water resources of Bear River; to promote interstate comity; and to accomplish an equitable apportionment of the waters of the Bear River among the compacting States.

"B. The physical and all other conditions peculiar to the Bear River constitute the basis for this Compact. No general principle or precedent with respect to any other interstate stream is intended to be established.

"ARTICLE II

Definitions.

"As used in this Compact the term

"1. `Bear River' means the Bear River and its tributaries from its source in the Uinta Mountains to its mouth in Great Salt Lake;

"2. `Bear Lake' means Bear Lake and Mud Lake;

"3. `Upper Division' means the portion of Bear River from its source in the Uinta Mountains to and including Pixley Dam, a diversion dam in the Southeast Quarter of Section 25, Township 23 North, Range 120 West, Sixth Principal Meridian, Wyoming;

"4. `Central Division' means the portion of Bear River from Pixley Dam to and including Stewart Dam, a diversion dam in Section 34, Township 13 South, Range 44 East, Boise Base and Meridian, Idaho;

"5. `Lower Division' means the portion of the Bear River between Stewart Dam and Great Salt Lake, including Bear Lake and its tributary drainage;

"6. `Upper Utah Section Diversions' means the sum of all diversions in second-feet from the Bear River and the tributaries of the Bear River joining the Bear River upstream from the point where the Bear River crosses the Utah-Wyoming State line above Evanston, Wyoming; excluding the diversions by the Hilliard East Fork Canal, Lannon Canal, Lone Mountain Ditch, and Hilliard West Side Canal;

"7. `Upper Wyoming Section Diversions' means the sum of all diversions in second-feet from the Bear River main stem from the point where the Bear River crosses the Utah-Wyoming State line above Evanston, Wyoming, to the point where the Bear River crosses the Wyoming-Utah State line east of Woodruff, Utah, and including the diversions by the Hilliard East Fork Canal, Lannon Canal, Lone Mountain Ditch, and Hilliard West Side Canal;

"8. `Lower Utah Section Diversions' means the sum of all diversions in second-feet from the Bear River main stem from the point where the Bear River crosses the Wyoming-Utah State line east of Woodruff, Utah, to the point where the Bear River crosses the Utah-Wyoming State line northeast of Randolph, Utah;

"9. `Lower Wyoming Section Diversions' means the sum of all diversions in second-feet from the Bear River main stem from the point where the Bear River crosses the Utah-Wyoming State line northeast of Randolph to and including the diversion at Pixley Dam;

"10. `Commission' means the Bear River Commission, organized pursuant to Article III of this Compact;

"11. `Water user' means a person, corporation, or other entity having a right to divert water from the Bear River for beneficial use;

"12. `Second-foot' means a flow of one cubic foot of water per second of time passing a given point;

"13. `Acre-foot' means the quantity of water required to cover one acre to a depth of one foot, equivalent to 43,560 cubic feet;

"14. `Biennium' means the 2-year period commencing on October 1 of the first odd-numbered year after the effective date of this Compact and each 2-year period thereafter;

"15. `Water year' means the period beginning October 1 and ending September 30 of the following year;

"16. `Direct flow' means all water flowing in a natural watercourse except water released from storage or imported from a source other than the Bear River watershed;

"17. `Border Gaging Station' means the stream flow gaging station in Idaho on the Bear River above Thomas Fork near the Wyoming-Idaho boundary line in the Northeast Quarter of the Northeast Quarter of Section 15, Township 14 South, Range 46 East, Boise Base and Meridian, Idaho;

"18. `Smiths Fork' means a Bear River tributary which rises in Lincoln County, Wyoming, and flows in a general southwesterly direction to its confluence with Bear River near Cokeville, Wyoming;

"19. `Grade Creek' means a Smiths Fork tributary which rises in Lincoln County, Wyoming, and flows in a westerly direction and in its natural channel is tributary to Smiths Fork in Section 17, Township 25 North, Range 118 West, Sixth Principal Meridian, Wyoming;

"20. `Pine Creek' means a Smiths Fork tributary which rises in Lincoln County, Wyoming, emerging from its mountain canyon in Section 34, Township 25 North, Range 118 West, Sixth Principal Meridian, Wyoming, and in its natural channel is tributary to Smiths Fork in Section 36, Township 25 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"21. `Bruner Creek' and `Pine Creek Springs' means Smiths Fork tributaries which rise in Lincoln County, Wyoming, in Sections 31 and 32, Township 25 North, Range 118 West, Sixth Principal Meridian, and in their natural channels are tributary to Smiths Fork in Section 36, Township 25 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"22. `Spring Creek' means a Smiths Fork tributary which rises in Lincoln County, Wyoming, in Sections 1 and 2, Township 24, Range 119 West, Sixth Principal Meridian, Wyoming, and flows in a general westerly direction to its confluence with Smiths Fork in Section 4, Township 24 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"23. `Sublette Creek' means the Bear River tributary which rises in Lincoln County, Wyoming, and flows in a general westerly direction to its confluence with Bear River in Section 20, Township 24 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"24. `Hobble Creek' means the Smiths Fork tributary which rises in Lincoln County, Wyoming, and flows in a general southwesterly direction to its confluence with Smiths Fork in Section 35, Township 28 North, Range 118 West, Sixth Principal Meridian, Wyoming;

"25. `Hilliard East Fork Canal' means that irrigation canal which diverts water from the right bank of the East Fork of Bear River in Summit County, Utah, at a point West 1,310 feet and North 330 feet from the Southeast corner of Section 16, Township 2 North, Range 10 East, Salt Lake Base and Meridian, Utah, and runs in a northerly direction crossing the Utah-Wyoming State line into the Southwest Quarter of Section 21, Township 12 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"26. `Lannon Canal' means that irrigation canal which diverts water from the right bank of the Bear River in Summit County, Utah, East 1,480 feet from the West Quarter corner of Section 19, Township 3 North, Range 10 East, Salt Lake Base and Meridian, Utah, and runs in a northerly direction crossing the Utah-Wyoming State line into the South Half of Section 20, Township 12 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"27. `Lone Mountain Ditch' means that irrigation canal which diverts water from the right bank of the Bear River in Summit County, Utah, North 1,535 feet and East 1,120 feet from the West Quarter corner of Section 19, Township 3 North, Range 10 East, Salt Lake Base and Meridian, Utah, and runs in a northerly direction crossing the Utah-Wyoming State line into the South Half of Section 20, Township 12 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"28. `Hilliard West Side Canal' means that irrigation canal which diverts water from the right bank of the Bear River in Summit County, Utah, at a point North 2,190 feet and East 1,450 feet from the South Quarter corner of Section 13, Township 3 North, Range 9 East, Salt Lake Base and Meridian, Utah, and runs in a northerly direction crossing the Utah-Wyoming State line into the South Half of Section 20, Township 12 North, Range 119 West, Sixth Principal Meridian, Wyoming;

"29. `Francis Lee Canal' means that irrigation canal which diverts water from the left bank of the Bear River in Uinta County, Wyoming, in the Northeast Quarter corner of Section 30, Township 18 North, Range 120 West, Sixth Principal Meridian, Wyoming, and runs in a westerly direction across the Wyoming-Utah State line into Section 16, Township 9 North, Range 8 East, Salt Lake Base and Meridian, Utah;

"30. `Chapman Canal' means that irrigation canal which diverts water from the left bank of the Bear River in Uinta County, Wyoming, in the Northeast Quarter of Section 36, Township 16 North, Range 121 West, Sixth Principal Meridian, Wyoming, and runs in a northerly direction crossing over the low divided into the Saleratus drainage basin near the Southeast corner of Section 36, Township 17 North, Range 121 West, Sixth Principal Meridian, Wyoming, and then in a general westerly direction crossing the Wyoming-Utah State line;

"31. `Neponset Reservoir' means that reservoir located principally in Sections 34 and 35, Township 8 North, Range 7 East, Salt Lake Base and Meridian, Utah, having a capacity of 6,900 acre-feet.

"ARTICLE III

Bear River Commission, establishment and membership.

"A. There is hereby created an interstate administrative agency to be known as the `Bear River Commission' which is hereby constituted a legal entity and in such name shall exercise the powers hereinafter specified. The Commission shall be composed of nine Commissioners, three Commissioners representing each signatory State, and if appointed by the President, one additional Commissioner representing the United States of America who shall serve as chairman, without vote. Each Commissioner, except the chairman, shall have one vote. The State Commissioners shall be selected in accordance with State law. Six Commissioners who shall include two Commissioners from each State shall constitute a quorum. The vote of at least two-thirds of the Commissioners when a quorum is present shall be necessary for the action of the Commission.

Compensation and expenses.

"B. The compensation and expenses of each Commissioner and each adviser shall be paid by the government which he represents. All expenses incurred by the Commission in the administration of this Compact, except those paid by the United States of America, shall be paid by the signatory States on an equal basis.

Powers.

"C. The Commission shall have power to:

"1. Adopt bylaws, rules, and regulations not inconsistent with this Compact;

"2. Acquire, hold, convey or otherwise dispose of property;

"3. Employ such persons and contract for such services as may be necessary to carry out its duties under this Compact;

"4. Sue and be sued as a legal entity in any court of record of a signatory State, and in any court of the United States having jurisdiction of such action;

"5. Co-operate with State and Federal agencies in matters relating to water pollution of interstate significance;

"6. Perform all functions required of it by this Compact and do all things necessary, proper or convenient in the performance of its duties hereunder, independently or in co-operation with others, including State and Federal agencies.

"D. The Commission shall:

"1. Enforce this Compact and its order made hereunder by suit or other appropriate action;

Report, transmittal to President and Governors.

"2. Compile a report covering the work of the Commission and expenditures during the current biennium, and an estimate of expenditures for the following biennium and transmit it to the President of the United States and to the Governors of the signatory States on or before July 1 following each biennium.

"ARTICLE IV

Water rights, limitations.

"Rights to direct flow water shall be administered in each signatory State under State law, with the following limitations:

"A. When there is a water emergency, as hereinafter defined for each division, water shall be distributed therein as provided below.

"1. Upper Division

"a. When the divertible flow as defined below for the upper division is less than 1,250 second-feet, a water emergency shall be deemed to exist therein and such divertible flow is allocated for diversion in the river sections of the Division as follows:

"Upper Utah Section Diversions)0.6 percent
"Upper Wyoming Section Diversions)49.3 percent,
"Lower Utah Section Diversions)40.5 percent
"Lower Wyoming Section Diversions)9.6 percent.

"Such divertible flow shall be the total of the following five items:

"(1) Upper Utah Section Diversions in second-feet,
"(2) Upper Wyoming Section Diversions in second-feet,
"(3) Lower Utah Section Diversions in second-feet,
"(4) Lower Wyoming Section Diversion in second-feet,
"(5) The flow in second-feet passing Pixley Dam.

"b. The Hilliard East Fork Canal, Lannon Canal, Lone Mountain Ditch, and Hilliard West Side Canal, which divert water in Utah to irrigate lands in Wyoming, shall be supplied from the divertible flow allocated to the Upper Wyoming Section Diversions.

"c. The Chapman, Bear River, and Francis Lee Canals, which divert water from the main stem of Bear River in Wyoming to irrigate lands in both Wyoming and Utah, shall be supplied from the divertible flow allocated to the Upper Wyoming Section Diversions.

"d. The Beckwith Quinn West Side Canal, which diverts water from the main stem of Bear River in Utah to irrigate lands in both Utah and Wyoming, shall be supplied from the divertible flow allocated to the Lower Utah Section Diversions.

"e. If for any reason the aggregate of all diversions in a river section of the Upper Division does not equal the allocation of water thereto, the unused portion of such allocation shall be available for use in the other river sections in the Upper Division in the following order: (1) In the other river section of the same State in which the unused allocation occurs; and (2) in the river sections of the other State. No permanent right of use shall be established by the distribution of water pursuant to this paragraph e.

"f. Water allocated to the several sections shall be distributed in each section in accordance with State law.

"2. Central Division

"a. When either the divertible flow as hereinafter defined for the Central Division is less than 870 second-feet, or the flow of the Bear River at Border Gaging Station is less than 350 second-feet, whichever shall first occur, a water emergency shall be deemed to exist in the Central Division and the total of all diversions in Wyoming from Grade Creek, Pine Creek, Bruner Creek and Pine Creek Springs, Spring Creek, Sublette Creek, Smiths Fork, and all the tributaries of Smiths Fork above the mouth of Hobble Creek including Hobble Creek, and from the main stem of the Bear River between Pixley Dam and the point where the river crosses the Wyoming-Idaho State line near Border shall be limited for the benefit of the State of Idaho, to not exceed forty-three (43) percent of the divertible flow. The remaining fifty-seven (57) percent of the divertible flow shall be available for use in Idaho in the Central Division, but if any portion of such allocation is not used therein it shall be available for use in Idaho in the Lower Division.

"The divertible flow for the Central Division shall be the total of the following three items:

"(1) Diversions in second-feet in Wyoming consisting of the sum of all diversions from Grade Creek, Pine Creek, Bruner Creek and Pine Creek Springs, Spring Creek, Sublette Creek, and Smiths Fork and all the tributaries of Smiths Fork above the mouth of Hobble Creek including Hobble Creek, and the main stem of the Bear River between Pixley Dam and the point where the river crosses the Wyoming-Idaho State line near Border, Wyoming.

"(2) Diversions in second-feet in Idaho from the Bear River main stem from the point where the river crosses the Wyoming-Idaho State line near Border to Stewart Dam including West Fork Canal which diverts at Stewart Dam.

"(3) Flow in second-feet of the Rainbow Inlet Canal and of the Bear River passing downstream from Stewart Dam.

"b. The Cook Canal, which diverts water from the main stem of the Bear River in Wyoming to irrigate lands in both Wyoming and Idaho, shall be considered a Wyoming diversion and shall be supplied from the divertible flow allocated to Wyoming.

"c. Water allocated to each State shall be distributed in accordance with State law.

"3. Lower Division

"a. When the flow of water across the Idaho-Utah boundary line is insufficient to satisfy water rights in Utah, covering water applied to beneficial use prior to January 1, 1976, any water user in Utah may file a petition with the Commission alleging that by reason of diversions in Idaho he is being deprived of water to which he is justly entitled, and that by reason thereof, a water emergency exists, and requesting distribution of water under the direction of the Commission. If the Commission finds a water emergency exists, it shall put into effect water delivery schedules based on priority of rights and prepared by the Commission without regard to the boundary line for all or any part of the Division, and during such emergency, water shall be delivered in accordance with such schedules by the State official charged with the administration of public waters.

Emergency declaration authority.

"B. The Commission shall have authority upon its own motion (1) to declare a water emergency in any or all river divisions based upon its determination that there are diversions which violate this Compact and which encroach upon water rights in a lower State, (2) to make appropriate orders to prevent such encroachments, and (3) to enforce such orders by action before State administrative officials or by court proceedings.

User's water rights, petition filing.

Water delivery schedules.

Joint water commissioner.

"C. When the flow of water in an interstate tributary across a State boundary line is insufficient to satisfy water rights on such tributary in a lower State, any water user may file a petition with the Commission alleging that by reason of diversions in an upstream State he is being deprived of water to which he is justly entitled and that by reason thereof a water emergency exists, and requesting distribution of water under the direction of the Commission. If the Commission finds that a water emergency exists and that interstate control of water of such tributary is necessary, it shall put into effect water delivery schedules based on priority of rights and prepared without regard to the State boundary line. The State officials in charge of water distribution on interstate tributaries may appoint and fix the compensation and expenses of a joint water commissioner for each tributary. The proportion of the compensation and expenses to be paid by each State shall be determined by the ratio between the number of acres therein which are irrigated by diversions from such tributary, and the total number of acres irrigated from such tributary.

Interstate water delivery schedules, findings of fact.

Prima facie evidence.

"D. In preparing interstate water delivery schedules the Commission, upon notice and after public hearings, shall make findings of fact as to the nature, priority, and extent of water rights, rates of flow, duty of water, irrigated acreages, types of crops, time of use, and related matters; provided that such schedules shall recognize and incorporate therein priority of water rights as adjudicated in each of the signatory States. Such findings of fact shall, in any court or before any tribunal, constitute prima facie evidence of the facts found.

Emergency termination.

"E. Water emergencies provided for herein shall terminate on September 30 of each year unless terminated sooner or extended by the Commission.

"ARTICLE V

Lower Division water rights, Idaho and Utah.

"A. Water rights in the Lower Division acquired under the laws of Idaho and Utah covering water applied to beneficial use prior to January 1, 1976, are hereby recognized and shall be administered in accordance with State law based on priority of rights as provided in Article IV, paragraph A3. Rights to water first applied to beneficial use on or after January 1, 1976, shall be satisfied from the respective allocations made to Idaho and Utah in this paragraph and the water allocated to each State shall be administered in accordance with State law. Subject to the foregoing provisions, the remaining water in the Lower Division, including ground water tributary to the Bear River, is hereby apportioned for use in Idaho and Utah as follows:

"(1) Idaho shall have the first right to the use of such remaining water resulting in an annual depletion of not more than 125,000 acre-feet.

"(2) Utah shall have the second right to the use of such remaining water resulting in an annual depletion of not more than 275,000 acre-feet.

"(3) Idaho and Utah shall each have an additional right to deplete annually on an equal basis, 75,000 acre-feet of the remaining water after the rights provided by subparagraphs (1) and (2) above have been satisfied.

"(4) Any remaining water in the Lower Division after the allocations provided for in subparagraphs (1), (2), and (3) above have been satisfied shall be divided; thirty (30) percent to Idaho and seventy (70) percent to Utah.

Allocation charge.

"B. Water allocated under the above subparagraphs shall be charged against the State in which it is used regardless of the location of the point of diversion.

Depletions.

"C. Water depletions permitted under provisions of subparagraphs (1), (2), (3), and (4) above, shall be calculated and administered by a Commission-approved procedure.

"ARTICLE VI

Reservoir storage rights.

"A. Existing storage rights in reservoirs constructed above Stewart Dam prior to February 4, 1955, are as follows:

"Idaho....................... 324 acre-feet
"Utah........................ 11,850 acre-feet
"Wyoming.................... 2,150 acre-feet

"Additional rights are hereby granted to store in any water year above Stewart Dam, 35,500 acre-feet of Bear River water and no more under this paragraph for use in Utah and Wyoming; and to store in any water year in Idaho or Wyoming on Thomas Fork 1,000 acre-feet of water for use in Idaho. Such additional storage rights shall be subordinate to, and shall not be exercised when the effect thereof will be to impair or interfere with (1) existing direct flow rights for consumptive use in any river division and (2) existing storage rights above Stewart Dam, but shall not be subordinate to any right to store water in Bear Lake or elsewhere below Stewart Dam. One-half of the 35,500 acre-feet of additional storage right above Stewart Dam so granted to Utah and Wyoming is hereby allocated to Utah, and the remaining one-half thereof is allocated to Wyoming.

Additional storage rights.

"B. In addition to the rights defined in Paragraph A of this Article, further storage entitlements above Stewart Dam are hereby granted. Wyoming and Utah are granted an additional right to store in any year 70,000 acre-feet of Bear River water for use in Utah and Wyoming to be divided equally; and Idaho is granted an additional right to store 4,500 acre-feet of Bear River water in Wyoming or Idaho for use in Idaho. Water rights granted under this paragraph and water appropriated, including ground water tributary to Bear River, which is applied to beneficial use on or after January 1, 1976, shall not result in an annual increase in depletion of the flow of the Bear River and its tributaries above Stewart Dam of more than 28,000 acre-feet in excess of the depletion as of January 1, 1976. Thirteen thousand (13,000) acre-feet of the additional depletion above Stewart Dam is allocated to each of Utah and Wyoming, and two thousand (2,000) acre-feet is allocated to Idaho.

Limitations.

"The additional storage rights provided for in this Paragraph shall be subordinate to, and shall not be exercised when the effect thereof will be to impair or interfere with (1) existing direct flow rights for consumptive use in any river division and (2) existing storage rights above Stewart Dam, but shall not be subordinate to any right to store water in Bear Lake or elsewhere below Stewart Dam; provided, however, there shall be no diversion of water to storage above Stewart Dam under this Paragraph B when the water surface elevation of Bear Lake is below 5,911.00 feet, Utah Power & Light Company datum (the equivalent of elevation 5,913.75 feet based on the sea level datum of 1929 through the Pacific Northwest Supplementary Adjustment of 1947). Water depletions permitted under this Paragraph B shall be calculated and administered by a Commission-approved procedure.

"C. In addition to the rights defined in Article VI, Paragraphs A and B, Idaho, Utah and Wyoming are granted the right to store and use water above Stewart Dam that otherwise would be bypassed or released from Bear Lake at times when all other direct flow and storage rights are satisfied. The availability of such water and the operation of reservoir space to store water above Bear Lake under this paragraph shall be determined by a Commission-approved procedure. The storage provided for in this Paragraph shall be subordinate to all other storage and direct flow rights in the Bear River. Storage rights under this Paragraph shall be exercised with equal priority on the following basis: six (6) percent thereof to Idaho; forty-seven (47) percent thereof to Utah; and forty-seven (47) percent thereof to Wyoming.

Irrigation reserve.

"D. The waters of Bear Lake below elevation 5,912.91 feet, Utah Power and Light Company Bear Lake datum (the equivalent of elevation 5,915.66 feet based on the sea level datum of 1929 through the Pacific Northwest Supplementary Adjustment of 1947) shall constitute a reserve for irrigation. The water of such reserve shall not be released solely for the generation of power, except in emergency, but after release for irrigation it may be used in generating power if not inconsistent with its use for irrigation. Any water in Bear Lake in excess of that constituting the irrigation reserve may be used for the generation of power or for other beneficial uses. As new reservoir capacity above the Stewart Dam is constructed to provide additional storage pursuant to Paragraph A of this Article, the Commission shall make a finding in writing as to the quantity of additional storage and shall thereupon make an order increasing the irrigation reserve in accordance with the following table:

"Additional Storage (Acre-feet)	Lake surface elevation, Utah Power and Light Company, Bear Lake datum
5,000	5,913.24
10,000	5,913.56
15,000	5,913.87
20,000	5,914.15
25,000	5,914.41
30,000	5,914.61
35,500	5,914.69
36,500	5,914.70

"E. Subject to existing rights, each State shall have the use of water, including ground water, for ordinary domestic, and stock watering purposes, as determined by State law and shall have the right to impound water for such proposes in reservoirs having storage capacities not in excess, in any case, of 20 acre-feet, without deduction from the allocation made by paragraphs A, B, and C of this Article.

"F. The storage rights in Bear Lake are hereby recognized and confirmed subject only to the restrictions hereinbefore recited.

"ARTICLE VII

Development projects.

"It is the policy of the signatory States to encourage additional projects for the development of the water resources of the Bear River to obtain the maximum beneficial use of water with a minimum of waste, and in furtherance of such policy, authority is granted within the limitations provided by this Compact, to investigate, plan, construct, and operate such projects without regard to State boundaries, provided that water rights for each such project shall, except as provided in Article Vi, paragraphs A and B, thereof, be subject to rights theretofore initiated and in good standing.

"ARTICLE VIII

Water rights, acquisition.

"A. No State shall deny the right of the United States of America, and subject to the conditions hereinafter contained, no State shall deny the right of another signatory State, any person or entity of another signatory State, to acquire rights to the use of water or to construct or to participate in the construction and use of diversion works and storage reservoirs with appurtenant works, canals, and conduits in one State for use of water in another State, either directly or by exchange. Water rights acquired for out-of-state use shall be appropriated in the State where the point of diversion is located in the manner provided by law for appropriation of water for use within such State.

Property rights, acquisition.

"B. Any signatory State, any person or any entity of any signatory State, shall have the right to acquire in any other signatory State such property rights as are necessary to the use of water in conformity with this Compact by donation, purchase, or, as hereinafter provided through the exercise of the power of eminent domain in accordance with the law of the State in which such property is located. Any signatory State, upon the written request of the Governor of any other signatory State for the benefit of whose water users property is to be acquired in the State to which such written request is made, shall proceed expeditiously to acquire the desired property either by purchase at a price acceptable to the requesting Governor, or if such purchase cannot be made, then through the exercise of its power of eminent domain and shall convey such property to the requesting State or to the person, or entity designated by its Governor provided, that all costs of acquisition and expenses of every kind and nature whatsoever incurred in obtaining such property shall be paid by the requesting State or the person or entity designated by its Governor.

Facilities, State authority.

"C. Should any facility be constructed in a signatory State by and for the benefit of another signatory State or persons or entities therein, as above provided, the construction, repair, replacement, maintenance and operation of such facility shall be subject to the laws of the State in which the facility is located.

Facilities, taxation.

"D. In the event lands or other taxable facilities are acquired by a signatory State in another signatory State for the use and benefit of the former, the users of the water made available by such facilities, as a condition precedent to the use thereof, shall pay to the political subdivisions of the State in which such facilities are located, each and every year during which such rights are enjoyed for such proposes, a sum of money equivalent to the average of the amount of taxes annually levied and assessed against the land and improvements thereon during the ten years preceding the acquisition of such land. Said payments shall be in full reimbursement for the loss of taxes in such political subdivision of the State.

"E. Rights to the use of water acquired under this Article shall in all respects be subject to this Compact.

"ARTICLE IX

Water exchanges.

"Stored water, or water from another watershed may be turned into the channel of the Bear River in one State and a like quantity, with allowance for loss by evaporation, transpiration, and seepage, may be taken out of the Bear River in another State either above or below the point where the water is turned into the channel, but in making such exchange the replacement water shall not be inferior in quality for the purpose used or diminished in quantity. Exchanges shall not be permitted if the effect thereof is to impair vested rights or to cause damage for which no compensation is paid. Water from another watershed or source which enters the Bear River by actions within a State may be claimed exclusively by that State and use thereof by that State shall not be subject to the depletion limitations of Articles IV, V and VI. Proof of any claimed increase in flow shall be the burden of the State making such claim, and it shall be approved only by the unanimous vote of the Commission.

"ARTICLE X

Interstate canals, water use.

"A. The following rights to the use of Bear River water carried in interstate canals are recognized and confirmed.

"Name of Canal	Date of priority	Primary right second-feet	Lands Irrigated Acres	State
Hilliard East Fork	1914	28.00	2,644	Wyoming
Chapman	8-13-86	16.46	1,155	Wyoming
	8-13-86	98.46	6,892	Utah
	4-12-12	.57	40	Wyoming
	5- 3-12	4.07	285	Utah
	5-21-12	10.17	712	Utah
	2- 6-13	.79	55	Wyoming
	8-28-05	[1]134.00		
Francis Lee	1879	2.20	154	Wyoming
	1879	7.41	519	Utah

"[1]Under the right as herein confirmed not to exceed 134 second-feet may be carried across the Wyoming-Utah State line in the Chapman Canal at any time for filling the Neponset Reservoir, for irrigation of land in Utah and for other purposes. The storage right in Neponset Reservoir is for 6,900 acre-feet, which is a component part of the irrigation right for the Utah lands listed above.

Administration.

"All other rights to the use of water carried in interstate canals and ditches, as adjudicated in the State in which the point of diversion is located, are recognized and confirmed.

"B. All interstate rights shall be administered by the State in which the point of diversion is located and during times of water emergency, such rights shall be filled from the allocations specified in Article IV hereof for the Section in which the point of diversion is located, with the exception that the diversion of water into the Hilliard East Fork Canal, Lannon Canal, Lone Mountain Ditch, and Hilliard West Side Canal shall be under the administration of Wyoming. During times of water emergency these canals and the Lone Mountain Ditch shall be supplied from the allocation specified in Article IV for the Upper Wyoming Section Diversions.

"ARTICLE XI

Applications.

"Applications for appropriation, for change of point of diversion, place and nature of use, and for exchange of Bear River water shall be considered and acted upon in accordance with the law of the State in which the point of diversion is located, but no such application shall be approved if the effect thereof will be to deprive any water user in another State of water to which he is entitled, nor shall any such application be approved if the effect thereof will be an increase in the depletion of the flow of the Bear River and its tributaries beyond the limits authorized in each State in Articles IV, V and VI of this Compact. The official of each State in charge of water administration shall, at intervals and in the format established by the Commission, report on the status of use of the respective allocations.

Allocation status report.

ARTICLE XII

"Nothing in this Compact shall be construed to prevent the United States, a signatory State or political subdivision thereof, person, corporation, or association, from instituting or maintaining any action or proceeding, legal or equitable, for the protection of any right under State or Federal law or under this Compact.

ARTICLE XIII

"Nothing contained in this Compact shall be deemed:

"1. To affect the obligations of the United States of America to the Indian tribes;

"2. To impair, extend or otherwise affect any right or power of the United States, its agencies or instrumentalities involved herein; nor the capacity of the United States to hold or acquire additional rights to the use of the water of the Bear River;

"3. To subject any property or rights of the United States to the laws of the States which were not subject thereto prior to the date of this Compact;

"4. To subject any property of the United States to taxation by the States or any subdivision thereof, nor to obligate the United States to pay any State or subdivision thereof for loss of taxes.

ARTICLE XIV

Commission review and proposed amendments.

"At intervals not exceeding twenty years, the Commission shall review the provisions hereof, and after notice and public hearing, may propose amendments to any such provision, provided, however, that the provisions contained herein shall remain in full force and effect until such proposed amendments have been ratified by the legislatures of the signatory States and consented to by Congress.

ARTICLE XV

Termination of Compact.

"This Compact may be terminated at any time by the unanimous agreement of the signatory States. In the event of such termination all rights established under it shall continue unimpaired.

ARTICLE XVI

Constitutionality of provision.

"Should a court of competent jurisdiction hold any part of this Compact to be contrary to the constitution of any signatory State or to the Constitution of the United States, all other severable provisions of this Compact shall continue in full force and effect.

ARTICLE XVII

Ratification and notice.

"This Compact shall be in effect when it shall have been ratified by the Legislature of each signatory State and consented to by the Congress of the United States of America. Notice of ratification by the legislatures of the signatory States shall be given by the Governor of each signatory State to the Governor of each of the other signatory States and to the President of the United States of America, and the President is hereby requested to give notice to the Governor of each of the signatory States of approval by the Congress of the United States of America.

"IN WITNESS WHEREOF, the Commissioners and their advisers have executed this Compact in five originals, one of which shall be deposited with the General Services Administration of the United States of America, one of which shall be forwarded to the Governor of each of the signatory States, and one of which shall be made a part of the permanent records of the Bear River Commission.

"Done at Salt Lake City, Utah, this 22nd day of December, 1978.
"For the State of Idaho:
"(s) Clifford J. Skinner
"(s) J. Daniel Roberts
"(s) Don W. Gilbert
"For the State of Utah:
"(s) S. Paul Holmgren
"(s) Simeon Weston
"(s) Daniel F. Lawrence
"For the State of Wyoming:
"(s) George L. Christopulos
"(s) J. W. Myers
"(s) John A. Teichert
"Approved:
"Wallace N. Jibson
"Representative of the United States of America
"Attest:
"Daniel F. Lawrence
"Secretary of the Bear River Commission."

Approved February 8, 1990.

STATE AMENDING LEGISLATION

WYOMING: Enrolled Act No. 41
Amended W.S. 41-12-101
March 6, 1979

UTAH: Enrolled Copy S.B. No. 255
Amended Section 73-16-2, Ut. Code Annot. 1953
May 8, 1979

IDAHO: Senate Bill No. 1162
Amended Section 42-3402, Idaho Code
April 5, 1979

LEGISLATIVE HISTORY:

HOUSE REPORT No. 96-524 (Comm. on Interior and Insular Affairs).
SENATE REPORT No. 96-526 accompanying S. 1489 (Comm. on the Judiciary).
CONGRESSIONAL RECORD:
Vol. 125 (1979): Nov. 27, considered and passed House.
Dec. 20, S. 1489 considered and passed Senate.
Vol. 126 (1980): Jan. 23, considered and passed Senate.

BYLAWS
OF
BEAR RIVER COMMISSION

ARTICLE I

THE COMMISSION

1. The Commission shall be composed of nine Commissioners, three Commissioners representing each of the States of Idaho, Utah, and Wyoming, selected in accordance with the laws of each such State and, if appointed by the President, one Commissioner representing the United States of America.

2. The credentials of each Commissioner shall be filed with the Secretary of the Commission.

3. Each Commissioner shall advise in writing the Secretary of the Commission as to his address to which all official notices and other communications of the Commission shall be sent to him and shall further promptly advise in writing the Secretary of the Commission as to any change in such address.

ARTICLE II

OFFICERS

1. The officers of the Commission shall be:

   Chairman,
   Vice-Chairman,
   Secretary,
   Treasurer

2. The Commissioner representing the United States of America shall be the Chairman of the Commission. The Chairman shall preside at meetings of the Commission. His duties shall be such as are usually imposed on such officers and such as may be assigned to him by these Bylaws or by the Commission from time to time.

3. The Vice-Chairman and Secretary shall each be one of the Commissioners representing a State. They shall be elected at each annual meeting of the Commission and shall hold office until the next annual meeting and until their successors are elected. In the case of a vacancy in either office, the Commission shall at its next meeting, whether regular or special, elect a successor to serve for the unexpired term. The Vice-Chairman shall perform all the duties of the Chairman when the Chairman is unable for any reason to act, or when for any reason there is a vacancy in the office of Chairman. In addition, the Vice-Chairman and Secretary shall perform such other duties as may be assigned to them under these Bylaws or by action of the Commission.

4. The Treasurer may or may not be a member of the Commission. He shall be elected at each annual meeting of the Commission and shall hold office until his successor is elected and shall have qualified. The Treasurer shall receive, hold, and disburse all funds of the Commission. The Treasurer shall furnish a bond for the faithful performance of his duties in such amount as the Commission may direct. The cost of such bond shall be paid by the Commission. In the case of a vacancy in the office of Treasurer the Chairman shall appoint a new Treasurer to serve for the unexpired term or until such time as the Commission shall elect a successor at a regular or special meeting and the person so elected shall have qualified. The offices of Secretary and Treasurer may be held by the same person.

5. The Commission may employ a secretarial assistant and such engineering, legal, clerical, and other personnel as, in its judgment, may be necessary. They shall receive such compensation and perform such duties as may be fixed by the Commission.

ARTICLE III

PRINCIPAL OFFICE

1. The principal office and place of business of the Commission shall be at a location designated by the Commission.

2. The principal office shall be open for business on such hours and days as the Commission may direct.

3. All books and records of the Commission shall be kept at the principal office of the Commission. Except as otherwise provided in the Compact, or herein, all records of the Commission shall be open to inspection by the public.

ARTICLE IV

MEETINGS

1. The annual meeting of the Commission shall be held on the third Tuesday of April of each year unless otherwise designated by the Commission.

2. The Commission shall hold a regular meeting during the month of November on the Tuesday of the week preceeding the week of Thanksgiving each year unless otherwise designated by the Commission.

3. Special meetings of the Commission may be called by the Chairman or, in case of vacancy in the office of the Chairman or inability of the Chairman to act, by the Vice-Chairman. Upon the request of two or more Commissioners, it shall be the duty of the Chairman to call a special meeting.

4. Notice of all meetings of the Commission shall be sent by the Secretary or the Engineer-Manager, to all members of the Commission, by ordinary mail at least ten days in advance of each such meeting. Such notice shall designate the time, place, and proposed agenda of the meeting. The notice here required may be waived by unanimous consent of all members of the Commission.

5. The approved minutes of the Commission shall be preserved in a suitable manner. Until approved by the Commission, minutes shall not be official and shall be furnished only to members of the Commission, its employees, and committees.

6. Six Commissioners, who shall include two Commissioners from each State, shall constitute a quorum. An absent member may be represented by his proxy who must be an accredited adviser from his State, and such proxy shall have the powers of a member at such meeting.

7. Each Commissioner, except the Federal Representative, shall have one vote.

8. When a quorum is present, an affirmative vote of at least two-thirds of the Commissioners in attendance shall be necessary for Commission action.

9. At each meeting of the Commission, the agenda items, unless agreed otherwise, shall include approval of the minutes of the last meeting, and reports from the Chairman, the Secretary, the Treasurer, the Engineer-Manager, and other agreed-upon agenda items.

10. All meetings of the Commission, except executive sessions, shall be open to the public. Executive sessions shall be open only to officers and members of the Commission, three advisers designated by each State, and the Federal Representative; provided, however, that the Commission may call witnesses in such sessions.

11. Each State may accredit three advisers to the Commission.

ARTICLE V

COMMITTEES

1. There shall be the following standing committees:

   Management Committee
   Operations Committee
   Records & Public Involvement Committee
   Water Quality Committee

2. The standing committees shall have duties as assigned by the Commission.

3. Members of Management, Operations, and Records & Public Involvement Committees shall be Commission members. The number of members on each committee shall be determined by the Commission. Each State shall designate the members and/or advisors on each committee representing such State. In all committee action the votes shall be taken by States, with each State having one vote.

4. The Water Quality Committee will be composed of at least three members who have been designated by each of the three states' Director of Environmental Quality, or its equivalent, as being the lead water quality administrator from that agency to represent the state and serve on the committee. These designated members of the Water Quality Committee need not be members of the Commission. Other members or advisors to the Water Quality Committee may be determined by the Commission and designated by each state. In all committee action the votes shall be taken by States, with each State having one vote.

5. The Chairman shall be an ex-officio member of all committees.

6. Each committee shall designate a chairman from among the members of the committee.

7. The Commission may create special committees and assign them tasks to be determined by the Commission.

8. Committees shall report all of their findings and recommendations.

ARTICLE VI

FISCAL

1. All expenses incurred by the Commission in the administration of the Bear River Compact, except those paid by the United States of America, shall be paid by the signatory States on an equal basis.

2. Commission funds shall be received by the Treasurer and deposited by him in a depository or depositories designated by the Commission.

3. The Treasurer shall disburse Commission funds by check upon vouchers approved and countersigned by the Chairman, the Vice-Chairman, or a member of the Management Committee.

4. On or before May 1 of each odd-numbered year, the Commission shall adopt and transmit to the appropriate water resource agencies of the three States, a budget covering an estimate of its expenses for the following biennium and the amount payable by each State under the provisions of the Bear River Compact.

5. The payment of expenses of the Commission and its employees shall not be subject to the audit and accounting procedures of any of the three States.

6. All receipts and disbursements of the Commission shall be biennially audited by a certified public accountant to be selected by the Commission. The audit report shall be included in the official minutes of the Commission meeting to which the report was submitted.

7. The Secretary shall keep an up-to-date inventory of all Commission property.

8. The fiscal year of the Commission shall begin July 1 of each year and end June 30 of the following year.

ARTICLE VII

MISCELLANEOUS

1. The Commission shall on request make available to the Governor of each of the States signatory to the Bear River Compact any information within its possession at any time, and shall always provide the Governors of such States or their representatives or authorized representatives of the United States of America, free access to records. The cost of making information available shall be borne by the person or government requesting such information.

2. All contracts or other instruments in writing to be signed for and in behalf of the Commission, except matters relating to the receipt or disbursement of funds, shall be signed by the Chairman or Vice-Chairman and the Secretary or Treasurer.

3. Amendments to the Bylaws may be made at any meeting of the Commission, provided notice of the proposed amendment shall have been given in the notice of the meeting.

4. Except as otherwise provided by the Compact or herein, meetings of the Commission shall be in accordance with Robert's Rules of Order.

In the District Court of the United States for the District of Idaho, Eastern Division.

UTAH POWER & LIGHT COMPANY,
Plaintiff

vs.

THE LAST CHANCE CANAL COMPANY,
Limited, et. al.
Defendants.

In Equity
No. 203.

FINAL DECREE

Before HON. F. S. DIETRICH,
District Judge.

Filed July 14, 1920.

W. D. McREYNOLDS,
Clerk.

By PEARL ZANGER,
Deputy.

In Equity No. 203

In the District Court of the United States
for the District of Idaho, Eastern Division

UTAH POWER & LIGHT COMPANY, a Corporation, *Plaintiff,*

vs.

The Last Chance Canal Company, Limited; The Tanner Canal Company, Limited; The Central Canal Company, The North Extension Canal Company, Limited; West Branch Canal Company, Limited; The Turner Canal Company, Limited; The East Branch Canal Company, The Bench Canal, and Budge Land & Live Stock Company, Limited, corporations; W. H. Larkins, Jas. Ellsmore, Geo. Hogan, Lewis S. Pond and Alex Harris as Trustees of the Gentile Valley Irrigation Company, Limited, late a corporation; The Thatcher Irrigation Company, Limited, a corporation; Nathan D. Thatcher, J. A. Folkman, Milton Robbins and Geo. M. Smith, as Trustees of Thatcher Canal & Power Company, Limited, late a corporation; Nelson Ditch Company, a corporation; A. J. Nielson, B. R. Meek, Henry McCuen, C. S. Burton and Eli Fosgreen, as Trustees of Riverdale-Preston Irrigation Company, late a corporation; The Riverdale Irrigating Company, Nielson-Meek Company and West Cache Irrigation Company, corporations; E. P. Johnson, Albert Johnson, Hyrum Johnson, Geo. D. Anderson, Joseph T. Pond, Frank W. Harris, A. C. Bosen, Hyrum J. Smith, John E. Hill, Melvin Green, Robert L. Smith, Charles Westerburg, Peter Westerburg and David P. Evans.

Horace Howard, Henry Rhinehart, Harvey W. Higley, James Monroe (or Munro), Nellie Simmons, John Baird, William Monroe (or Munro), Orrin Monroe (or Munro), Charles Monroe (or Munro), Charles Foster, Hyrum Foster, Mary Baird, John Woodall (or J. D. Woodall), George Ellis, Skinner Irrigation Company, a corporation; Heber Crane, Fred Bartschi, Charles Bartschi, David Chugg, Phillip Chugg, Fred Stauffer, William Williams, Sr. (or William Morgan Williams), William Williams, Jr. (or William Mormon Williams), Oliver Williams, E. M. Lindsay, Georgetown Irrigation Company, a corporation, and Thomas Freeman.

Idaho Ranch Company, Limited, The Banks Investment Company, and Farmers Land and Irrigation Company of Alexander, Idaho, Limited, corporations; Frank Higgenbotham, as Statutory Trustee of Cache Valley Land & Canal Company, late a corporation; S. E. Marshall and W. W. Booth as Trustees of The Bancroft Land and Irrigation Company, late a corporation; James M. Horsley, Matilda J. Horsley, Newell J. Horsley and A. L. Cook, as Trustees of Soda Springs Electric Company, late a corporation; D. J. Lau, H. M. Lau, D. K. McLean, and W. M. Davis, as Trustees of Soda Springs Water Company, late a corporation; Soda Springs, a Municipal Corporation; Thomas H. Horsley, Joseph E. Lau, John G. Schmidt, Laura M. Lau, Colin A. Chester, Chris A. Lallathin, Walter S. Crane, Lorenzo S. Merriott (or Marriott), Hiram M. Lau, Daniel J. Lau, Arthur F. Lau, William J. Hopkins, Ellis Kackley, Ida M. Kackley, Mary E. Kelly (now Mary E. Corrigan), Herbert Horsley, A. C. Anderson (or Abraham C. Anderson), David Anderson, Nels Anderson, Landi C. Eastman, J. T. Torgenson, John Skinner, Clifford M. Reed, E. D. Whitman, C. B. Wilson, David Burnett, David Giles, George Jenkins and Thomas L. Clark.

Hans Nielson, James Strachan, Edmond Beus, Geo. A. L. Williams, Leland S. Williams, Leah Gorton, John Lauritson, Jesse Moore, Arthur Collins, James Moore, C. W. Fryar, Augustine (or Augusta) Rolando, James Rolando, Geo. G. Nelson, August Largilliere, Catherine Largilliere and Harry Horsley; Turner Trust Company, a corporation; Percy G. Turner, Ethel H. Ellsmore, John W. Harris, Alexander Wells Harris (or A. W.) Harris, Joseph L. Hansen, Louisa (or Louise) Medford, David P. (or David) Sant, Leonard Hansen, W. H. Larkins, Dora Larkins, Otto Gulbransen, H. E. Thatcher, Joseph Swenson, Charles Lund, W. J. Turner, John Harrington, Lewis S. Pond, R. E. Hansen, Walter Hogan, George M. Smith, Ira Hogan, Geo. A. Hogan, Amelia Cole, W. S. Cole, Wm. Fowler, James Calkins, Peter Patterson, Ellsworth Norris, Walter Anderson, R. N. Egbert, Charles Izatt, Minnie Walker, Samuel Bollwinkle, C. J. Martinson, J. B. Wagentz, Rosa Martinson, Nathan D. Thatcher, J. Leroy Pond, Geo. B. Folkman, Chas. A. Robbins, Norena B. Robbins and Rachel S. Thatcher.

Benjamin Clegg, Charles Sorenson, William McGee Harris, Nels L. Sorenson, Lars P. Hansen, Charles H. Bassett, Wm. Bassett, Hyrum D. Collins, Joseph Swenson, Harriet Harris, Chris Christiansen, James Fowler, Catherine Sorenson, E. L. Bennett, Wm. Wright, Joseph B. Wright, Mary Bassett, Wm. Meacham, John Meacham, Peter Anderson, John Sorenson, James C. Elliott, Don H Bassett, Thomas M. Ellis, Charles N. Ellis, Anna J. Clegg, Merintha E. Hanson, Anna M. Fowler, Henry C. Christenson, Daniel C. Moorehead, Milton A. Rodeback, Calvin W. Bennett, A. A. Ruud, Charles Hubbard, George Hultz, John C. Sorensen, Leo Bennett, Howard Rodeback, Ed. Meachem, Thomas Redford and Esther Peterson.

James Swenson, Hyrum Swenson, Jos. O. Renshaw (or Joseph Olorenshaw), Hans J. Rasmussen, L. K. Bitten, Wm. H. Mendenhall, John R. Turner, J. W. Gibbs, Robt. Kirkham, Melissa Collins, Harold L. Bassett, Geo. C. Fowler, Michael Mickelson, Carston Bennett, Thomas Bennett and Lars Rasmussen; First National Bank of Logan, a corporation; Leslie Wright, E. A. Bennett, J. P. Anderson, Wm. W. Williams, Austin W. Merrill, H. J. Bennett, Matilda Bennett, Alfred (or Alpheus) Anderson, Leslie Bennett, Frank Manning, L. M. Wright, Howard L. Thomas, Thomas Panter, Alma S. Stalker, John T. Williams, Daniel Harris, Joseph Ames, Hyrum Foreman, Henry Perry, Andrew B. Gray, Joseph Perry, Jr., Sardius S. Stalker, Zina B. Cannon, Austin Pond (or L. Austin Pond), Charles Panter, Charles E. Harris, Ralph Perry, Geo. B. Collins, James D. McGregor, Jr., Wm. C. McGregor, James D. McGregor, Isabelle E. Foreman, Joseph Christensen, John Tanner, Parley Anderson, Rebecca Orrison, H. K. Thatcher, Howard E. Thatcher, B. Geo. White, Orison Thompson, Barnard G. (or Barnard J.) White and John D. Schutt.

Treasureton Irrigation Ditch Company, a corporation; William Smith, Byrum H. Prescott, George R. Ransome and A. C. Nance, as Trustees of Cleveland Irrigation Company, late a corporation; L. Edgar Merrill, James A. Hadley, R. G. Quigley, Alma Hadley, O. E. Hendricks, Heber Allen, James S. Geddes, Daniel Taylor, and John W. Hendricks, as Trustees of Stockton Reservoir Company, late a corporation; Charlotte Walton, Samuel Ames, D. M. Walton. Wm. Smith, Edwin Bennion, A. H. Rencher, J. L. Rencher, Leo Meachem, Ely Beckstead, Byrum H. Prescott, George Ransome, Isabel Ames, H. A. Ransome, Thomas Waddoups and Annie E. Cardon; Mink Creek Irrigation Company, District Number One, a corporation; James Johnson, David P. Evans, Cyrus Ward, Eugene Beckstead and J. G. Nelson, as Trustees of Preston-Riverdale and Mink Creek Canal Company, late a corporation; The Peoples Dairy Company, Limited, a corporation; James M. Keller, Thomas Jensen, Elmer Larsen, Ezra Larsen, Torval Wilde, Peter W. Peterson, Fred Barfus, S. H. Richards, Ivan Rasmussen, Mahonri Larsen, L. P. Larsen, Marinus Jepsen, F. H. Wacker, Lorenzo D. Baird, Annie L. Potter (nee Peterson), J. P. Rasmussen, Richard Olverson, Christina V. Wilde, John C. Hansen, Andrew Jepsen, Nels P. Roholt, Lars W. Nelson, Edw. Balfour, J. S. Hite, Mrs. Hans L. Nelson, John C. Christensen, W. A. Watson, Lars C. Nelson, Martinus Larson, Ingrid Pearson, Leonard Nelson, C. G. Christiansen, Gus Olson, W. E. Crane, Hyrum Bell and Janeus Keller; Joseph Condie, William Schulbert, Jedediah Miles, Francis Clayton and Norman Nisson, as Trustees of Strong Arm Reservoir Company, late a corporation; Thos. R. Condie, Francis Clayton, Thomas Palmer, Wm. H. Carter, O. M. Seamons, Benj. Hymas, Philip Purcer, W. R. Taylor, Ezra C. Foss, Julius Johnson, Joshua Adams, Geo. Sant, Eliza A. Seamons and David Williams.

William E. Larsen, Thomas Sant, William McDermott, Oscar Maddox, and Mae E. Farmer, as Trustees of Clifton Irrigating Company, late a corporation; Rushville Irrigation Company, a corporation; S. H. Atkinson and James Atkinson; Five Mile Creek Irrigation Company, a corporation; L. M. Mendenhall, Willis Mendenhall, S. C. Chadwick and Robert C. Geddes.

Weston Creek Irrigation Company, a corporation; Isaac Jorgensen, George Cole and Thomas Preston, as Trustees of Weston Mills, late a corporation, N. P. Jensen, Yeppa Benson, Frederick Day, Peter Mickelson, and Joseph Georgensen, as Trustees of Weston Reservoir and Power Company, late a corporation; and Isaac McKay; Utah-Idaho Sugar Company, a corporation; Capital Trust Company; Largilliere Company, Bankers; Continental Life Insurance Company, Idaho State Life Insurance Company, Devereaux Mortgage Company, Peabody, Houghteling & Company, National Bank of the Republic, Utah Mortgage Loan Corporation, Peoples Bank & Trust Company, Illinois Trust & Savings Bank, American Trust & Savings Bank (now Continental and Commercial Trust & Savings Bank), and J. N. Ireland & Company, corporations; Jerome W. Wheeler, George I. McFarland, R. T. Hayes, J. P. Toone, Amy L. Toone, Daniel Balls, William O. Creer, and H. D. Maughan.

Sam Gillett, Thorg Johnson, Enoch Johnson, Thomas E. Stanton, Christian Call, Ira Call, Mrs. Freda Anderson, H. C. Atkinson, Fred Baker, Daniel Balls, Kenneth Balls, Minnie Barnard, John Bartlome, Battle Creek Irrigation Company, a corporation; Wm. Behle, Conrad Bell, C. W. Bennett, Chas. Bergquist, Edw. Bergquist, James Bigler, Birch Creek Irrigation Company Number One, a corporation (substituted for and successor in interest to the following: Frederick Barfus, James Keller, Amos Keller, Torval Keller, Ezra Larsen, Marinus Jepson, Elmer Larsen, Norman J. Larson, Walter Nelson, Ervan Larsen, Maren K. Peterson, Marinus Hansen, Elias Hansen, Hyrum Jepson, John M. Hansen, L. B. Wilde, Peter Nelson, Nancy Rasmussen, Chris Hansen, Ivan Rasmussen, Roy Cahoon, Birch Creek Irrigation Company Number One, a water user's association); J. J. Call; Grover C. Hogan, successor to Alex M. Christensen; Annie M. Christensen, Martin Christensen, Steffen C. Christensen, Walter Christensen; Emma Collins and Estate of J. W. Collins, deceased; E. H. Coombs, David Coombs, Albert C. Davis, Wm. J. Davis, Sam Gagon; Geo. Greene, administrator of the estate of Patrick W. Gallagher, deceased; Glencoe Irrigation Company, a corporation (substituted for and successor in interest to the following: Ezra Larsen, P. P. Carver, Emanuel Keller, A. A. Wilde, L. E. Ericksen, Hy. Johnson, Richard Peterson, Enoch Peterson, Peter Ericksen, Mrs. Carl Wallgren and Fred Egley); Robert B. Gunnell, Chris Hansen, John W. Harrington, Geo. W. Harrington, Mrs. Sarah Hess, George Harrison, Thomas J. Hopkins, J. M. Horsley, P. F. Ivie, Dave Jenkins, Joseph Larsen, Ezra E. Larsen, James Larsen, Jr., Nevada A. Larsen, John E. Martinson (or Mortenson), Arwell L. McKay, H. J. McKay, Jedediah McKay, Emma H. Meservey; Mink Creek Irrigation Company Number Four, a corporation (substituted for and successor in interest to the following: James M. Keller, Adam and Urias Keller, Hans C. Jensen, Daniel Jensen, Harry and Frank Jensen, Dora Jensen, Selestres Keller, Wm. Rasmussen, N. C. Eskelson, Christensen and Jeppson, Mrs. C. C. Christensen, J. H. Bell, Wm. D. Baird, Lorenzo S. Baird, James Keller, Lewis Keller, Roy Cahoon, Mink Creek Irrigation Company Number Four, a water user's association); Mink Creek Irrigation Company Number Three, a corporation (substituted for and successor in interest to the following: Lewis Keller, Wm. Rasmussen, Lorenzo S. Baird, Margaret Baird, J. H. Bell, Wm. D. Baird, James M. Keller, Jr., Selestres Keller, Adam and Urias Keller, Thomas Jeppson, Henry Christensen, and Mink Creek Irrigation Company Number Three, a water user's association). Christina Nelson, Wilford Nelson, Wilford Panter, Jacob Peterson, Junius F. Phillips, Mileta Pond, J. T. Pond, L. A. Pond and John Bartlome, a co-partnership known as Pond Bros. and Bartlome; John R. Reeder, J. R. Rencher, Sam Richardson, C. G. Rose, Mrs. Alonzo H. Seamons, David Seamons, Chas. Shumway, A. T. Smith, Mary E. Smith, Nathan Smith, Andrew Stauffer; Ira R. Steed, substituted for A. E. Henderson; Alnora C. Stevenson, Mary Swenson, O. A. Thompson, Dr. Tigertt, Alma Turner; Ole Hansen, Henry Larsen, George A. Smith, Anthon Nelson and Charley Christensen, a co-partnership known as Upper Cleveland Irrigation Company; Alfred Westerburg, C. T. Woodal, Eph. T. Williams, D. A. Woodal, Lawrence Wilde; E. T. Zeigler and Neil M. Sorenson, known as Sorenson & Zeigler, a co-partnership, successors to R. E. Hansen; Arthur Coombs and Lillie Coombs, (substituted for Harlow R. Hoops); Sewell Roper, Simpson Roper, Orrin Roper and Roy Roper, a co-partnership known as Roper Brothers, (substituted for J. F. Medford and Lucinda Walker); Elmer W. Smith, successor to Frank Sant; Frank E. Ellis, (substituted for John Corrigan and Minnie Corrigan); Twin Lakes Canal Company, a corporation, (substituted for Oneida Irrigation District); Edwin D. Whitman, administrator of the estate of Joseph E. Simmons, deceased (substituted for Joseph E. Simmonds); O. H. Brown, Independent School District Number Six, a corporation; Anna L. Westrom, D. Young, Ed and Wilbur Beus; Estate of Mary Baird, deceased; Charles R. Lakey, M. E. Corrigan, the Misses Childs, W. F. Messenger, Mrs. F. J. Fryar, Mary Cox, J. A. Swenson, W. J. Kellogg, W. F. Donahue, Doctor Smedley, Alvin Myers, Eva I. Dygert, Wm. Winchell; Presbyterian Church, a religious corporation; Kate Dubry, George White, T. A. Sterrett, E. C. Foster, J. P. Wannamaker, James Watson, Ellen E. Woodall; Austin Bros. Association, a corporation; Mrs. Albi Williams, A. J. Knollin, Minnie O. Blackburn, Amelia Woodal, Ellen Lund, C. K. Bocker, Madge Bell, Church of Jesus Christ of Latter Day Saints, a religious corporation; L. P. Beus, D. A. Anderson, George Clifford, George Albrecht, D. F. Lau, John Ferebauer, Margaret F. Cully, J. P. Madsen, Henry L. Finch, Elizabeth Dorrien, Chris Panting, Priscilla Gorton, W. M. Davis, A. W. Nicholson, George Horsley, T. W. Horsley, J. J. Skinner, D. K. McLean, Sam Hopkins, Eliza Schmidt; Natural Mineral Water Company, an unincorporated association; Rosina Hopkins, J. H. Schmidt, Anna Hamilton, George R. Small, Arminta Sterrett, Oren Hansen, S. Small, Annie Wetzel, Elizabeth Williams, Ira Hardy, E. T. Wood, C. B. Johnson, Wm. Chester, Caroline D. Eastman, William Body, (substituted for George Woods); Soda Springs Mill and Elevator Company, a corporation; Jesse P. Anderson, George W. Ellis, Otto Rohalt, Wm. B. Fowler, George E. Beckstead, Jr.; and Albert Capson, successor to Leo Meachem,

Defendants.

DECREE

This case came on to be further heard at this term, additional proof being submitted, and the cause further argued by counsel, and thereupon, upon consideration thereof, it is ORDERED, ADJUDGED AND DECREED as follows, viz:

I.

1. That the Bear River is an inter-state stream with a large number of tributaries in the States of Utah, Wyoming and Idaho, said river rising in the Wasatch mountains in northeastern Utah and flowing in a general northerly direction through the States of Utah and Wyoming to a point on the boundary line between the States of Idaho and Wyoming near the town of Border in the State of Wyoming, into the State of Idaho, thence in a general northwesterly direction around the north end of Bear Lake (including North or Mud Lake) located in Bear Lake County, Idaho, and Rich County, Utah, to a point near the town of Alexander in said State of Idaho, thence in a general southerly direction through the States of Idaho and Utah, emptying into Great Salt Lake in said latter state.

That there is hereby drawn within the jurisdiction of this court, for distribution for beneficial uses, under and pursuant to the terms of this decree, all that portion of Bear River, as above described, commencing at a point directly north of Bear Lake in Section 34, Township 13 South, Range 44 East, Boise Meridian, which said point is marked and indicated by the "Stewart Dam," and headgates to the plaintiff's intake canal into Bear Lake Reservoir, known as the "Rainbow Canal," thence generally northwesterly through Idaho, to a point near the town of Alexander, thence in a general southerly direction to the boundary line between the States of Idaho and Utah, together with all intervening tributaries of the Bear River, which are decreed to constitute a single inter-dependent river system, to be administered under the terms of this decree.

2. Subject to the prior rights of the various defendants, as hereinafter decreed in the order of their respective priorities, the said plaintiff, the Utah Power & Light Company, has the right to divert at the Stewart Dam, as hereinbefore described, (and also in seasons of flood water through the "Dingle Inlet Canal" diverting from Bear River in the Northwest quarter of Section 17, Township 14 South, Range 45 East, Boise Meridian) and to impound and store in the Bear Lake Reservoir, consisting of Bear Lake and Mud or North Lake, in Rich County, Utah, and Bear Lake County, Idaho, all of the waters of Bear River to the extent of 5500 cubic feet per second of time, together with the waters naturally flowing into or arising in said lakes, all said waters to be stored in said Reservoir, and to be thereafter released from said reservoir at the said plaintiff's pleasure, through the plaintiff's embankment or "dyke" located within the lake meander lines, and extending from

Section 16 to Section 18, in Township 14 South, Range 44 East, Boise Meridian, by means of control works located therein at a point approximately North 64°15′ East 8120 feet from the Southwest corner of Section 18, Township 14 South, Range 44 East, Boise Meridian, and to be thence conveyed through the plaintiff's outlet canal, extending generally northwardly from the said control works to a confluence with Bear River, near the center of Section 6, Township 13 South, Range 44 East, Boise Meridian, and thence down the natural channel of Bear River, for use at various points of diversion now existing, or which may hereafter be established by the plaintiff for the generation of electric power, and for such irrigation or other beneficial purposes, recognized by law, as the plaintiff may devote or dedicate said released stored waters, by use, sale, rental, or otherwise.

In its exercise of the rights herein defined, the plaintiff may, to the extent of its various appropriations, divert and impound in storage, the waters of Bear River and of Bear Lake at all times, and at all seasons of the year, when by so doing it does not interfere with the exercise of any prior rights fixed by this decree, and the waters released by it from storage may be conveyed through the natural channel of the river, and shall be protected under the provisions of this decree for the distribution designated by the plaintiff, as though kept and conveyed within an artificial channel, and the return of the waters to the river, after their various uses by the plaintiff, shall not be deemed an abandonment thereof, but it is recognized by this decree, and it shall be recognized by the officers charged with the administration hereof, that the plaintiff's rights in said waters continue throughout the portion of the stream brought under this decree for use both in Idaho and beyond the Utah-Idaho state line, and all parties to this suit, their heirs, executors, administrators, successors in interest and assigns, and the agents, servants and attorneys of said parties, their heirs, etc., are hereby perpetually enjoined and restrained from in any manner using or interfering with the use by the plaintiff of the said released stored waters, except with the consent and under the authority of the plaintiff, its successors or assigns.

In administering the rights of the plaintiff herein decreed and mentioned, the following considerations shall be observed and recognized:

For the purpose of regulating and controlling the flow of the river, and in the interest of conservation of the waters thereof, the plaintiff may, at any time, divert at its Stewart Dam, and through its Rainbow Canal (and in seasons of flood through the Dingle Inlet Canal) above mentioned, the entire flow of the waters of Bear River, provided it discharges at the same time through its outlet control works, (when there is need therefor to supply the rights of prior appropriators below), and into its outlet canal, and conveys thence to the natural channel of

Bear River, an equivalent amount of water, such quantity to be regarded as natural flow of the river, and not released stored water. In order to compensate for the natural yield of the Bear Lake area, including Bear Lake and Mud Lake, and the area between the lake meander line and Bear River, and mountainous slopes to the west, which area was formerly drained by a natural channel known and designated herein as the "natural outlet," as claimed in the cross bills of certain defendants, the plaintiff shall discharge from its reservoir, through its outlet works, (when required to supply the rights of prior appropriators below) a quantity of water sufficient to yield at a point in the plaintiff's outlet canal, at measuring devices to be installed by the plaintiff as near as practicable to the present bridge on the Montpelier-Ovid road, in the Southwest quarter of Section 7, Township 13 South, Range 44 East, Boise Meridian, the following amounts in addition to any amount of water then being discharged to equal diversions from Bear River, and regarded as "natural flow," to-wit:

From April 20 to July 1st of each year, 50 cubic feet per second;
From July 1st to July 15th of each year, 35 cubic feet per second;
From July 16th to Aug. 1st of each year, 25 cubic feet per second;
From Aug. 1st to Sept. 15th of each year, 15 cubic feet per second;

such quantity of water to be also regarded and distributed as "natural flow," and not "released stored water," and shall be full compensation for any interruption of natural flow from said Bear Lake area by the plaintiff's reservoir works.

In the delivery to the plaintiff of released stored water at its several power plants, now or hereafter established, or at such points of diversion for irrigation or other beneficial purposes as it may designate for such delivery, transit losses shall be computed as follows:

1½% of the net release from storage (after adjustments for natural flow as aforesaid), from the outlet works at dyke to points between Alexander and plaintiff's Grace Dam, situate in the Northeast quarter of Section 1, Township 10 South, Range 40 East, Boise Meridian;

An additional 1% from said Grace Dam to the headgate of the West Cache Canal Company, situate in the Southeast quarter of Section 25, Township 14 South, Range 39 East, Boise Meridian, and

An additional 1% from said West Cache headgate to the boundary line between Utah and Idaho.

In determining transit losses, or otherwise calculating the division of waters at the various principal points of diversion, as between natural flow of the river and released stored waters, a time lag of twenty-four hours shall be applied for the flow of released stored waters from the plaintiff's control works to points between Alexander and Grace Dam, and an additional twenty-four hours to points between West Cache headgates and the Utah-Idaho State line, and a proportionate time for intervening points of diversion.

3. In addition to the storage rights of plaintiff, herein decreed, the waters of Bear River and its tributaries between the points hereinbefore described, as drawn within the jurisdiction of this court for distribution under this decree, are hereby allotted and decreed for the various beneficial uses herein specified, without waste, to the plaintiff and defendants, respectively, and their successors in title and interest, in the amounts, for the purposes, and with the priorities, established and prescribed by the "Schedule of Rights" hereinafter defined.

The rights herein decreed and recognized are designated and classified as "Power Rights," "Irrigation Rights" and "Domestic Rights," respectively, and shall have the following characteristics:

"Power Rights" include the right to divert and use water for the generation of electric power, and such rights of diversion and use are continuous throughout the year without limitation to time or season.

"Irrigation Rights" include the right to divert and use water for irrigation, culinary, domestic, and agricultural purposes connected therewith, throughout the irrigation season of each year, which is defined as that portion of each calendar year which commences on the 20th day of April and closes on the 30th day of September; subject to the qualification, however, that between the 20th and 30th days of April of each year, and the 15th and 30th days of September of each year, inclusive of each of said days, no irrigation appropriator shall divert or use more than 40 per cent of his or its allottment under the "Schedule of Rights" hereinafter prescribed, except as is hereinafter specifically provided in the "Schedule of Rights." The water allotted and decreed to the parties hereto for irrigation purposes is, and shall be, appurtenant to the land upon which the same has been applied and used, as described in the schedule; subject, however, to the rights of appropriators or shareholders in any appropriating canal company to change the place of diversion or use as provided by law when no damage or injury results to others, or to make any beneficial use of such waters, or any part thereof, which does not injure other appropriators.

"Domestic Rights" include the right to divert and use water during the non-irrigating season, that is to say, from the first day of October of each year to the 19th day of April following, both dates inclusive, under agricultural appropriations and through irrigation ditches, for general domestic uses, including watering stock and culinary purposes. Each irrigation right herein decreed shall include and imply as a part thereof a domestic right to the use, during the non-irrigating season, of such of the waters allotted for irrigation purposes as are necessary for such domestic purposes and such shall be the measure of said domestic rights, and the extent of use of water through irrigation canals in the non-irrigation season, until the amount shall be more definitely fixed under the reservation of jurisdiction hereinafter contained. Nothing herein contained shall affect specific allottments made in the schedule of rights under appropriations for domestic, culinary or other specific beneficial purposes, which rights are to be recognized and administered specifically as decreed.

All rights herein decreed to the plaintiff and the several defendants are decreed for the beneficial uses specified, and none of the parties hereto, or their successors in interest, whether heirs, executors, administrators, successors or assigns, shall have the right to divert any of the waters of said Bear River, or any of its tributaries, except for beneficial use, and whenever such use has ceased, such party or parties shall cease to divert, and shall have no right to divert, the said waters, or any part thereof, and each and every of the parties hereto, their servants, attorneys, employes and successors in interest, as aforesaid, are hereby enjoined and restrained from any and all interference with or diversion or use of the said waters, except in the manner, and to the extent, and for the purposes, provided in this decree, whenever such interference, diversion or use would in any manner interfere with the diversion or use of the water awarded by this decree to any of the other parties to this action.

The parties hereto and their successors in interest shall install and maintain suitable and efficient headgates, controlling works and measuring devices at their respective points of diversion, and all water herein allotted and decreed shall be measured at said points of diversion. Said works and devices shall be built and installed in accordance with plans and specifications to be approved by the state official charged with the duty of supervising the distribution of water, (subject to review by this court). All such devices shall be of such design as to accurately register the amount of water diverted, and in the case of ditches diverting fifty or more cubic feet per second, automatic measuring and registering devices shall be installed and maintained. All such headgates, control works and measuring devices and gauges shall at all times be subject to the inspection of either party, and to public officials or water masters having jurisdiction over the distribution and diversion of water, and no dam or other obstruction to the natural flow of the stream shall be maintained so as to divert water from the channel of the stream, except through ditches, canals or other works provided with such headgates, control works and measuring devices, and each of the parties hereto shall be perpetually enjoined from diverting from the channel of the stream or its tributaries any water through any ditch, conduit or other devices not provided with such headgates, control works and measuring device; *provided,* that in case of diversions through pipes for power purposes, measuring devices may be dispensed with where the quantity of water diverted may be otherwise determined by calculations based on power output or current meter measurements.

4. Subject to the power and duty of this court to supervise and enforce the administration of its decree from time to time as occasion may require, and to that end to appoint if necessary its commissioner for that purpose, for which jurisdiction is hereby expressly reserved, the administration of this decree shall be left in the first instance with the officials of the state of Idaho charged with the duty of supervising the distribution of the public waters within said state, the costs and expenses of such administration to be defrayed as provided by the statutes of Idaho. Any party hereto may apply at any time for directions to the watermaster, or for the appointment of a commissioner, if necessary, to enforce any provision of this decree.

The watermaster or commissioner, or other official charged with the distribution of the waters of the Bear River and its tributaries subject to this decree, need not in the first instance, by reason of the decree, undertake the detailed administration of the waters of the entire portion of the river and tributaries placed under the decree, but only of such section of the main river and such tributaries as he shall be specifically directed to administer. Such administration may be extended upon application of any party, from time to time, as the irrigation season advances and necessity therefor arises. Such watermaster, commissioner, or other official, however, shall, after his appointment, have general supervision of the entire river, and of the tributary waters, and if called upon to administer the waters of any particular tributary he may utilize any agency for the distribution of the waters of such tributary locally selected or agreed upon by the water users from such tributary, and if necessary he may appoint assistants to administer any section of the main river, or any tributary thereof, provided always that any party hereto may invoke the powers of such watermaster, commissioner, or other official, to personally direct and supervise the administration of the waters of any section of the river, or of any tributary or tributaries, in strict conformity to the provisions of this decree, both during the irrigation season, and the non-irrigating or winter season, so far as may be necessary to secure to the several parties their rights hereunder, and failing to obtain proper action by such watermaster, commissioner or other official, may apply to the court for directions in the premises.

5. The plaintiff, Utah Power & Light Company, and the defendant, Utah-Idaho Sugar Company, have certain rights to the use of the waters of Bear River with points of diversion in Utah below the Utah-Idaho state line, which rights are included in the schedule of rights herein decreed. The inclusion of said rights in the said schedule is not to be construed as a decree *in rem*, establishing said rights, or as an adjudication of title to said rights, which have attached in a state or district beyond the jurisdiction of this court, but merely as a recognition of said rights to the extent that in the administration of that part of the river within the jurisdiction of this court, and the operation of this decree as hereinbefore defined, the watermaster, com-

ıissioner or other official charged with the administration of the decree, shall see that there is delivered at the Utah state line such quantity of water as is necessary, together with natural increment below said Utah state line, to satisfy said rights in accordance with their dignity and priority as herein recognized.

II.

("Schedule of Rights.")

c.f.s. is used throughout this schedule to designate a flow of one cubic foot of water per second of time.

ac. ft. is used throughout this schedule to designate a quantity of water sufficient to cover an area of one acre to a depth of one foot, or 43,560 cubic feet of water.

MAIN RIVER DIVERSIONS.

1. *Utah Power & Light Company*—Storage rights.

The plaintiff, Utah Power & Light Company, is entitled to divert from the main channel of Bear River, from the natural flow thereof, for storage purposes, the following amounts:

Date of Priority	Amount in Second Feet	Point of Diversion and Place of Use
1911—March 1 1912—Sept. 11	3000 c.f.s. 2500 c.f.s.	Said water to be diverted from Bear River through what is known as the Rainbow and Dingle Inlet Canals, the headworks of which are located respectively in the Northeast quarter of Section 34, Township 13 South, Range 44 East, B.B.M., and the Northwest quarter of Section 17, Township 14 South, Range 45 East, B.B.M. in Bear Lake County, Idaho, and to be carried into and stored in what is known as the Bear Lake Reservoir and withdrawn therefrom from time to time as needed or required by said Utah Power & Light Company, or its successors in interest, for the development of power or generating electric energy in any power plant which it may now have, or hereafter construct or acquire in or along Bear River, in the states of Idaho and Utah, and for irrigation purposes in what is generally known as Bear River Valley in said states.
From Bear Lake: 1912—Sept. 1 *From Mud Lake*: 1912—Sept. 1	 300 c.f.s. 200 c.f.s.	Said water to be stored in what is known as Bear Lake Reservoir, and withdrawn therefrom from time to time, as provided in the immediately preceding paragraph.
2. *E. P. Johnson, Albert Johnson and Hyrum L. Johnson:* (a) 1889—July 30 April 20 to July 1 July 2 to October 1	 4 c.f.s 1.6 c.f.s	Said water to be diverted from the main channel of Bear River at a point 50 feet West from the first railroad bridge Northwest of Novene Station on the Oregon Short Line R. R., and to be used for the irrigation of 160 acres in the West half of the Northeast quarter and the South-

A G R E E M E N T

THIS AGREEMENT, made and entered into this 6th day of ______________, 1968, by and between the BUREAU OF SPORT FISHERIES AND WILDLIFE OF THE FISH AND WILDLIFE SERVICE, UNITED STATES OF AMERICA, hereinafter called the "Bureau", and UTAH POWER & LIGHT COMPANY, a corporation, hereinafter called the "Power Company";

W I T N E S S E T H

WHEREAS, the Power Company is the owner of the right to divert water from the Bear River by means of the Rainbow Inlet and Dingle Canals and to store such water in Bear Lake and Mud Lake, and

WHEREAS, the rights of the Power Company to release such stored waters through its Lifton Pumping Station and Outlet Canal and into Bear River for downstream use are represented by court decrees and water certificates and are subject to the provisions of the Bear River Compact which was entered into by representatives of the States of Idaho, Utah and Wyoming on February 4, 1955, and thereafter ratified by the legislatures of said states and by the Congress of the United States, and

WHEREAS, the United States Department of the Interior has withdrawn from entry some 17,000 acres of public lands in the Dingle Swamp area in Idaho for migratory bird conservation purposes; and

WHEREAS, optimum water storage in the Mud Lake portion of the Dingle Swamp area during the spring and early summer months is required for the development and management of the Bear Lake National Wildlife Refuge; and

WHEREAS, the Power Company recognizes the value of wildlife development and is desirous of assisting in such a program;

NOW, THEREFORE, in consideration of the premises and the mutual promises of the parties hereto as hereinafter set forth, it is agreed as follows:

1. The Power Company agrees to maintain water levels in Mud Lake within one-half foot of the 5920.5 foot elevation, subject,

however, to all prior commitments, including particularly the terms of the Bear River Compact and provided, nevertheless, that the maintenance of said level is dependent upon the availability of water and acts and occurrences over which the Power Company has no control.

2. It is recognized by both parties that the terms of the Bear River Compact require the storage in Bear Lake of all flows of Bear River available for such storage and it is further recognized that the Power Company has both the right and the obligation to store water in Bear Lake to a maximum elevation of 5923.65 feet; that in order to accomplish such storage of water, elevations on Mud Lake cannot be maintained after Bear Lake has reached elevation 5920 feet; and it is, therefore, agreed that the responsibility of the Power Company to maintain water levels in Mud Lake shall be suspended for such time as the water elevation in Bear Lake is at or above elevation of 5920 feet.

3. The Bureau contemplates development of permanent impoundments within the Dingle Swamp area with short low-level dikes and spillways to provide small stabilized potholes for late nesting waterfowl species; and the Bureau also contemplates the construction of boundary fences, interior grazing compartments, access roads and refuge posting. In the construction and use of such developments, the Bureau agrees that there will be no interference with the present channels running between the Rainbow Inlet Canal, Dingle Canal, Mud Lake, Bear Lake, the Outlet Canal and other appurtenant properties of the Power Company.

4. The Bureau's maintenance of fence lines, access roads, interior dikes and spillways, the issuance of grazing, hay harvesting and trapping permits, and the establishment of seasons for public hunting and fishing will fully recognize the Power Company's water and property rights in Mud Lake and Bear Lake and adjoining areas.

5. Each party hereto agrees that it will conduct its operations in a reasonable and careful manner to the end that the pursuits of the other party may receive the utmost assistance.

6. All elevations stated herein shall refer to Utah Power & Light Company datum measured at the Lifton Pumping Station.

7. This agreement may be terminated by either party at any time upon six months' written notice to the other party.

8. All obligations undertaken by the Bureau under this contract shall be subject to the availability of appropriations by the Congress for the purposes set forth therein.

9. No member of or delegate to Congress or resident Commissioner shall be admitted to any share or part of this agreement, or to any benefit to arise therefrom, separate and apart from any benefit accruing to the general public.

IN WITNESS WHEREOF, the parties hereto have executed these presents the day and year first above written.

UNITED STATES OF AMERICA

ORIGINAL SIGNED BY
JOHN D. FINDLAY

By ______________________________
Regional Director
Bureau of Sport Fisheries and Wildlife

UTAH POWER & LIGHT COMPANY

By ______________________________
Vice President

APPROVED
H Boehmer
CHIEF ENGINEER

in the quiet and peaceable possession of the said parties of the second part, their heirs and assigns, against the said parties of the first part and their heirs, and against all and every person and persons whomsoever, lawfully claiming or to claim the same shall and will warrant, and by these presents forever defend.

IN WITNESS WHEREOF, The said parties of the First part have hereunto subscribed their names the day and year first above written.

Signed and delivered in the presence of:

Gladys MacKay
E. L. Wallace.

Ramsay M. Walker
Abbie Walker

STATE OF IDAHO)
: ss.
COUNTY OF SHOSHONE,)

On this 3rd day of March, A.D. 1924, before me E. L. Wallace a Notary Public in and for said State aforesaid, personally appeared Ramsay M. Walker and Abbie Walker, his wife, personally known to me to be the persons who signed the within instrument, and acknowledged to me that they executed the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at my office in Wallace, Idaho, the day and year in this certificate first above written.

SEAL.

My Commission expires Mar 14, 1926.

E. L. Wallace
Notary Public in and for the State of Idaho.

Residing at Wallace, Idaho.

Recorded at the request of Wallace Bank & Trust Co. March8A.D. 1924 at 10:10 o'clock A.M.

By Ariella Lindley Deputy.

J. S. Peterson
Recorder.

" "

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF

THE STATE OF IDAHO, IN AND FOR THE COUNTY OF BEAR LAKE

PRESTON-MONTPELIER IRRIGATION COMPANY, a corporation,
Plaintiff,
vs.
DINGLE IRRIGATION COMPANY, a corporation; Grimmett-Black Otter Irrigation Company, a corporation; Peg Leg Island Irrigation Company, a corporation; West Fork Irrigation Company, a corporation; Ream-Crockett Irrigation Company, a corporation; Pugmire Livestock & Land Company, a corporation; Continental Life Insurance Company, a corporation; Ola Transtrum; Carrie Hill; J. A. C. Nielson, John A. Jensen; Oron Quayle; Thomas Quayle; George Parker; Edw. LaRocco; John O. Miller; Ezra J. Phelps; George A. Sparks; Hyrum Esterholdt, and Joseph Esterholdt,
Defendants,

D E C R E E

. . . .

This cause came on regularly for trial on the 4th day of August, 1923, John A. Bagley Esquire, and D. C. Kunz, Esquire, appearing as attorneys for the plaintiff, Preston-Montpelier Irrigation Company, a corporation; and John A. Bagley, Esquire, appearing as attorney for Oron Quayle, Thomas Quayle, George Parker, Edward LaRocco, John O. Miller, Ezra J. Phelps, and George A. Sparks, defendants and cross-complainants; and D. C. Kunz, Esquire, appearing as attor-ney for the Continental Life Insurance Company, a corporation, Ole Transtrum, Carry Hill, J. A. C. Nielson and John A. Jensen, defendants and cross-complainants; and A.B. Gough, Esquire, appearing as attorney for Dingle Irrigation Company, a corporation, Peg Leg Island Irrigation Company, a corporation, Grimmett Black Otter Irrigation Company, a corporation, and the Pugmire Livestock & Land Company, a corporation, defendants and cross-complainants; Ross W. Bates Esquire, appearing as attorney for the Ream-Crockett Irrigation Company, a corporation, defendants and cross-complainants; and Jesse P. Rich, Esquire, appearing as attorney for the West Fork Irrigation Company, a corporation, defendants and cross-complainants, and Darwin Haddock, Esquire, appearing as attorney for Hyrum Esterholdt and Joseph Esterholdt, defendants and cross-complainants, Whereupon, the respective parties proceeded to negotiate a settlement and adjustment of the issues raised by the complainant and the answers of the defendants thereto and by the cross-complainants, and answers thereto and thereafter, to-wit: On the 4th day of August, 1923, a stipulation of facts was entered into, signed and filed herein, in which it was agreed between the parties, that it should be; and the same is hereby adopted as the findings of fact herein, and the court-from the stipulation and findings of fact- being fully advised in the premises and conclusions of law being waived:

IT IS HEREBY ORDERED, ADJUDGED AND DECREED that the respective parties hereto be, and each of them is hereby awarded and decreed the quantity of water hereinafter specified with date of priority and for the irrigation of lands as hereinbefore set forth, such water to be directed from the several points of diversions as hereinafter stated all rights herein decreed to be either what is hereinafter designated as a "Meadow Right or an "Agricultural Right" and to be by the respective dates and particular years fixed as the date of priority;

Northwest Corner of Section 17, Township Fourteen South, Range Forty-five East of the Boise Meridian, to be used upon 2500 acres of land.
Situated in the following sub-divisions:

Section Fourteen (14) of Township Fourteen south 14 S. Range Forty-four east 44E Boise Meridian:
Section twenty-three (23) of Township fourteen south (14S.)Range forty-four east (44E) Boise Meridian;
The East one-half (E½) the southwest one-quarter (SW¼) and the south one-half of the the northwest one-quarter ~~one-quarter~~ (S½ of NW¼) of Section fifteen (15) all in Township fourteen South (14S) Range forty-four east (44E) Boise Meridian;
The East one-half (E½); the east one-half of the West one-half (E½ of W½); the east one-half of the West one-half of the southwest one-quarter (E½ of W½ of SW¼), all in Section 26 of Township fourteen south (14S) Range forty-four east (44E), Boise Meridian.
Lots One (1), two (2) and three (3) of Section thirty-five (35) of township fourteen south (14S), Range forty-four east (44E) Boise Meridian.
The Southeast one-quarter of the Northeast one-quarter (SE¼) of NE¼) of Section sixteen (16) of township fourteen south (14S) Range forty-four east (44E) Boise Meridian.
Commencing at the northwest corner of section twenty-three (23) township fourteen south (14S), Range forty-four east (44E) Boise Meridian and running thence west eighty (80) rods, thence south two hundred forty (240) rods; thence east eighty (80) rods thence south eighty (80) rods, thence east eighty (80) rods to the southwest corner of Lot three (3) of said section twenty-three (23) thence north along thewestern boundary line of lots three (3) two (2) and one (1) and the northwest quarter of the northwest quarter of said section twenty-three (23) to point of beginning.

GRIMMETT-BLACK OTTER IRRIGATION COMPANY:

1877, April 15th, what is designated in this decree as a "Meadow Right".
April 15th-July 1st, 133.5 cubic feet per second.
July 1st, September 30th, 89 cubic feet per second.

All of said waters to be diverted from Bear River through the Black Otter Slough near the line between Sections Six and Seven, Township Fourteen South, Range Forty-four east of the Boise Meridian, and from said slough through two main ditches, one of whibh is known as the Grimmett Ditch, taken from said slough in the Northwest quarter of Section Eleven, Township Fourteen South Range Forty-four East of the Boise Meridian, and the other ditch taken from said slough in the Northwest Quarter of Section Twelve, Township Fourteen South, Range Forty four East of the Boise Meridian, and other smaller ditches and dams, said water to be used upon 4434.25 acres of land described as follows, to-wit:

Commencing at a point South 88° 30' East 205 feet and South 2°10' West 355. 8 and East 150 feet from the North quarter corner of Section 6 in Township 14 South, Range 44 East of Boise Meridian; which point is 150 feet East from the East bank of the Outlet canal of the Utah Power & Light Company, running thence in a southerly direction approximately 3160 feet to a point which is 710 feet south of the Northeast corner of Lot 9 of said Section 6; thence North 580.8 feet to quarter Section line; thence East 1320 feet; thence in a Southerly direction, following boundary line of Lot 5 of Sec. 5 in Township 14 South, Range 44 East Boise Meridian to the Southwest corner of the Northeast quarter of the Southwest quarter of said Section 5; thence East 2640 feet; thence North 3366 feet; thence West 660 feet; thence North 313.5 feet; thence west 1980 feet; thence North 290. 5 feet; thence West 2640 feet; thence South 354.75 ft. thence West 965 feet to place of beginning.

Also Lot 10 of Sec. 6 in Township 14 South, Range 44 East of Boise Meridian, containing 24.93 acres; and containing in all 452 acres, more or less.

Also commencing at the N. E. Corner of the SW¼ of SE¼ of Sec. 32, Township 13 South Range 44 East of Boise Meridian, and running thence South 68 rods; thence West 40 rods; thence South 29 rods; thence West 120 rods; thence North 81 rods, more or less, to Bird Slough; thence Easterly along said slough 94 rods, more or less, to intersection of subdivision line; thence East 66 rods, more or less, to place of beginning containing 83 acres, more or less.

Also, beginning at the southeast corner of the Northwest quarter of the southwest quarter of Sec. 32, Township 13 South, Range 44 East of Boise Meridian, and running thence North 60 rods, thence West 160 rods; thence South 60 rods; thence East 160 rods to place of beginning containing 60 acres more or less.

Also, commencing at the Northwest corner of the Southeast quarter of the Southwest quarter of Sec. 32 in Township 13 South Range 44 East of Boise Meridian, and running thence South 16 rods to slough; thence easterly along the meanderings of said slough 109 rods; to a point where it intersects the subdivision line; thence West along the said subdivision line 86 rods to the place of beginning, containing 4 acres and 64 square rods, more or less.

Also, the Southwest quarter of the Northwest quarter and West half of the Southwest quarter of Sec. 32, and the Southeast quarter of the Southeast quarter of Sec. 31; all in Township 13 South. Range 44 East of Boise Meridian, containing 160 acres.

Also Lot 6 in Sec. 5, Township 14 South, Range 44 East Boise Meridian, containing 20 acres; and Lot 1 in Sec. 8, Township 14 South, Range 44 East of Boise Meridian, containing 34 acres.

Also commencing 23 rods South from the Northwest corner of the Northeast quarter of the Northeast quarter of Section 8 Township 14 South, Range 44 East Boise Meridian, thence South 57 rods; thence East 38 rods; thence North 57 rods; thence West 38 rods to the place of beginning, containing 13.5 acres, more or less.

Also beginning at a point 40 rods West of the Southwest corner of the Northwest quarter of the Northwest quarter of Section 9, Township 14 South, Range 44 East of Boise Meridian, and running thence South 28 rods; thence West to the West Line of Lot 2 of Sec. 8 of said Township and Range; thence in a Northwesterly direction following the West line of said Lot 2 to the Northwest corner of said Lot 2; thence East on Forty line to place of beginning.

Also, commencing at the Northeast corner of Lot 2, Section 5, Township 14 South, Range 44 East of Boise Meridian, and running thence South 36 rods; thence West 40 rods; thence North 36 rods; thence East 40 rods to place of beginning. Also, commencing at the Southeast corner of the Southeast quarter of Sec. 32, Township 13 South, Range 44 East of Boise Meridian, and running thence North 4 chains; thence West 10 chains; thence South 10 chains, thence West 10 chains; thence South 4 chains; thence East 20 chains; thence North 10 chains to place of beginning, containing 18 acres, more or less. Also commencing at a point 10 chains West and 4 chains North from the Southeast corner of the Southeast quarter of Sec. 32 Township 13 South, Range 44 East of Boise Meridian, and running thence North 10 chains; thence west 10 chains; thence South 10 chains; thence East 10 chains to the place of beginning, containing 10 acres more or less./ Also, commencing at the Southwest Corner of Sec. 33 Township 13 South, Range 44 East Boise Meridian, and running thence North 64 rods; thence East 40 rods; thence South 104 rods; thence West 40 rods; thence North 40 rods to place of beginning, containing 26 acres.

Also, commencing at a point 10 chains South from the Southeast corner of the Southeast quarter of Sec. 32, Township 13, South, Range 44 East of Boise Meridian, and running thence

West 20 chains; thence South 10 chains; thence East 20 chains; thence North 10 chains to the place of beginning containing 20 acres, more or less. Also commencing at a point 10 chains West from the Southeast corner of Section 32, Township 13, South, Range 44 East of Boise Meridian, and running thence North 4 chains; thence West 10 chains; thence South 10 chains; thence East 10 chains; thence North 6 chains to place of beginning, containing 10 acres, more or less.

Also, commencing at a point 4 chains North from the Southeast corner of the Southeast quarter of Sec. 32, Township 13 South, Range 44 East of Boise Meridian, and running thence North 20 chains; thence West 10 chains; thence South 20 chains; thence east 10 chains to place of beginning, containing 20 acres. Also, commencing at a point 24 chains North from the Southeast corner of the Southeast quarter of Section 32, Township 13 South, Range 44 East of Boise Meridian, and running thence North 10 chains; thence West 10 chains; thence South 10 chains; thence East 10 chains to place of beginning, containing 10 acres, Also commencing at a point 10 chains West and 15 chains and 50 links South from the Northeast corner of the Southeast quarter of Sec. 32, Township 13 South, Range 44 East of Boise Meridian, and running thence West 10 chains; thence South 10 chains; thence East 10 chains thence North 10 chains to place of beginning, containing 10 acres.

Commencing at the Southeast corner of the Northeast quarter of Sec. 4, Township 14 South, Range 44 East of Boise Meridian, and running thence North 30 rods; thence East 17½ rods to center of Black Otter Slough; thence north and east following the windings of said Slough for a distance of 160 rods, more or less; thence north 6 rods; thence following the windings of said Slough West a distance of 70 rods; thence North 21 rods to township line; thence West on said line 70 rods and 3 feet, more or less, to William Quayle's line; thence South 45 rods; thence West 281 rods to West line of said Section 4; thence South 115 rods to quarter corner; thence East 320 rods to place of commencement, containing 270 acres, more or less. Also, beginning at a point 40 rods North of the Northeast corner of the Southeast quarter of Sec. 31, Township 13 South, Range 44 East of Boise Meridian, and running thence West 160 rods; thence South 80 rods; thence East 65 rods; thence South 40 rods; thence East 95 rods; thence North 120 rods to place of beginning, containing 103⅔ acres, save and except therefrom a strip containing 7.72 acres from said above tract sold to Bear River Water Company, and for a particular description of said strip reference is made to page 625 of Deed Book 6, records of Bear Lake County, Idaho.

Also, commencing at a point in the center of a deep slough 20 chains East along Quarter section line and 8 chains and 90 links South along eight section line from the Northwest corner of the NE¼ of Section 33 Township 13 South, Range 44 East of Boise Meridian, and running thence South along eight section line 51 chains and 10 links; thence West along eighth Section line 4 chains and 83 links; thence North 34 minutes East 49 chains and 50 links; thence along center of said slough 4 chains and 33 links to the place of beginning, containing 23 acres and 5 square rods. Also, commencing at the SW corner of the NE¼ of the SE¼ of Sec. 33, Township 13 South, Range 44 East Boise Meridian, and running thence East 36 rods; thence North 180 rods to Peg Leg Slough; thence Westerly along said Slough 55 rods more or less, to half quarter government line; thence South along said line 194 rods to place of beginning, containing 43 acres.

Also, the Southeast Quarter of the Northeast Quarter and Lots numbered Two, three and four of Sec. 8, and Lot numbered one of section seventeen, Township 14 South, Range 44 East B. M., 127.05 acres.

Also, the East half of the Northeast quarter, and the northeast quarter of the Southeast quarter of Section 33, and the Northwest quarter of the Southwest quarter of Sec. 34, all in Township 13 South, Range 44 East of Boise Meridian, containing 160 acres; excepting therefrom the following tract, to-wit: Commencing at the Southwest corner of the northeast quarter of the southeast quarter of Sec. 33 in Township 13 South, Range 44 East of Boise Meridian, and running thence East 36 rods; thence North 180 rods to Peg Leg Slough; thence Westerly along said Slough 55 rods, more or less, to half quarter government line; thence South along said line 194 rods to the place of beginning, containing 43 acres, more or less.

Also, beginning at a point on the East boundary line of the Utah Power & Light Company's Canal right-of-way, and on the South boundary line of Township 13 South, Range 44 East of Boise Meridian, which point is South 88°30' East 456.4 feet from the South corner of Sec. 31, Twp. 13 South R. 44 E.B.M., thence S. 4° 28' East 168.7 feet to a point of curve; thence on a 1° 03' curve to the left, for a distance of 188 feet to a point 21½ rods South of Township line; thence East 840 feet, more or less, to local line; thence North 1674 feet; thence West 240 feet, more or less, to local corner; thence North 660 feet; thence West 800 feet, more or less, to east line of said right of way; thence South 4° 28' East along said right-of-way 1991 feet to point of beginning, containing 46.75 acres, more or less.

Also, beginning at the quarter section corner between sections 5, and 8 in Township 14 South, Range 44 East Boise Meridian, and running thence East 1320 feet; thence South 379½ feet to a ditch; thence East along said ditch 585 feet to a corner of fence; thence North 8° 15' West 1715 feet to corner of fence; thence West 1659 feet; thence South 1320 feet to point of beginning, which is a quarter corner between said Sections 5 and 8, containing 58 acres, more or less.

Also, the Northwest quarter of Sec. 11 in Township 14 South, Range 44 East of Boise Meridian, containing 160 acres.

Also, commencing at the Northwest quarter of the Southwest quarter of Sec. 11 in Township 14 South, Range 44 East of Boise Meridian, and running thence East 120 rods; thence South 160 rods; thence West 120 rods; thence North 160 rods to place of beginning containing 120 acres.

Also the South half of the Southeast quarter and the South Half of the Southwest quarter of Sec. 3, in Township 14 South, Range 44 East of Boise Meridian, Bear Lake County, Idaho, containing 160 acres, excepting therefrom 40 acres heretofore deeded to the Utah Power & Light Company, also, the North half of the Northwest quarter of Sec., 15, in Township 14 South, Range 44 East of Boise Meridian, containing 80 acres.

Also commencing at a point 35 rods south from the Northeast corner of the Southeast quarter of Sec. 9, in Township 14 South, Range 44 East of Boise Meridian, running thence South 25 rods; thence west 320 rods; thence North 25 rods; thence East 320 rods to the place of beginning, containing 50 acres.

Also, the South half of the Northwest quarter and the South half of the Northeast quarter of Sec. 9, in Township 14 South, Range 44 East of Boise Meridian, containing 160 acres.

Also, the Northeast quarter of the Northeast quarter of Sec. 9 in Township 14 South, Range 44 East of Boise Meridian, containing 40 acres.

Also, the Northwest quarter of the Northeast quarter of Sec. 9 in Township 14 South, Range 44 East of Boise Meridian, containing 40 acres.

Also, the Northeast quarter of Sec. 10 in Township 14 South, Range 44 East of Boise Meridian, containing 160 acres; excepting therefrom 60 acres heretofore deeded to the Utah Power & Light Company.

Also, the Southeast quarter of Sec. 10 in Township 14 South, Range 44 East of Boise Meridian, containing 160 acres.

Also, commencing at a point 23 rods south from the Northeast corner of the Northwest quarter of Sec. 9, Township 14 South Range 44 East of Boise Meridian, and running thence

West 202 rods; thence South 57 rods; thence East 2 rods; thence South 55 rods; thence East 40 rods; thence North 55 rods; thence East 160 rods; thence North 57 rods to place of beginning, containing 85 acres, more or less.

Also, commencing at the Northeast corner of the Southwest quarter of Sec. 11, Township 14 South, Range 44 East of Boise Meridian, U. S. Survey, in Idaho, running thence West 40 rods; thence South 160 rods; thence East 40 rods; thence North 160 rods to place of beginning, containing 40 acres.

Also, the Southwest quarter of Sec. 10, Township 14 South, Range 44 East Boise Meridian containing 160 acres.

Also, Lot 1, the S½, of the SE¼ of Sec. 4 Tp. 14 S. R. 44 E. B. M., containing 80 acres, Also, Lot 2 commencing at the NW corner of Sec. 9. Tp. 14 S. R. 44 E.B.M., running thence N. 23 rods to place of beginning, containing 23 acres. Also, Lot 3 commencing at the SE corner of the NE¼ of the SW¼ of Sec. 4, Tp. 14 South R. 44 E.B.M., running thence West 80 rods; thence N. 20 rods, thence E. 80 rods; thence S. 20 rods to place of beginning, 10 acres.

Also, Lot 4, commencing at the NE corner of the SE¼ of the SE¼ of Sec. 5, Tp. 14 S.R. 44 E.B.M. running thence West 45 rods; thence S. 103 rods; thence E. 45 rods; thence N. 103 rods to place of beginning, 29 acres.

Also, commencing at the NW corner of the NE¼ of Sec. 16, Tp. 14 S. R. 44 E.B.M., run thence S. 78 rods; thence E. 80 rods; thence N. 78 rods; thence W. 80 rods to place of beginning, containing 39 acres.

Also, commencing at the SE corner of Sec. 9, Tp. 14 S.R. 44 E.B.M., and running thence N. 50 rods; thence W. 160 rods; thence S. 50 rods; thence E. 160 rods to place of beginning containing 50 acres.

Also, the NE¼ of the NE¼ and the SW¼ of the NE¼ of Sec. 16, Tp. 14 S.R. 44 E.B.M., containing 80 acres.

Also the NE¼ of the SW¼ of Sec. 3, Tp. 14 S.R. 44 E.B.M. containing 40 acres; also commencing at the SE corner of the SW¼ of the NE¼ of Sec. 3, Tp. 14 S.R. 44 E.B.M., and running thence N. 7½ chains; thence in a Northwesterly direction 10 chains, following the meanderings of the Black Otter Slough; thence in a northeasterly direction, following the meanderings of said Slough, 6 chains; thence West across said Slough 3½ chains; thence following the meanderings of said Slough, first in a Southwesterly direction and then in a Southeasterly direction 9½ chains; thence W. 4½ chains thence S. 7½ chains; thence E. 80 rods to place of beginning, containing 20 acres.

Also, commencing at the SW corner of the SW¼ of Sec. 9, Tp. 14 S. R. 44 E.B.M., running thence N. 50 rods; thence E. 160 rods; thence S. 50 rods; thence W. 160 rods to the place of beginning, containing 50 acres.

Also, commencing at a point 40 rods N. from the NE corner of Sec. 9, Tp. 14 S.R. 44 E.B.M., thence N. 120 rods; thence W. 240 rods; thence S. 60 rods; thence E. 80 rods; thence S. 60 rods; thence E. 160 rods to place of beginning, containing 150 acres and SE¼ of NE¼ Sec. 5 Also, the NW¼ of the SW¼ of Sec. 4 and the NE¼ of the SE¼ of Sec. 5, Tp. 14 S. R. 44 E.B.M., containing 120 acres.

Also, the NE¼ of the NW¼ of Sec. 16, Tp. 14 S. R. 44 E.B.M., containing 40 acres.

Also, the NW¼ of the NE¼ and the NE¼ of the NW¼ of Sec. 16, Tp. 14 S. R. 44 E.B.M. containing 80 acres.

Also, commencing at the NW corner of the SE¼ of Sec. 11 Tp. 14 S.R. 44 E.B.M., running thence S. 34 rods; thence E. 40 rods; thence N. 34 rods; thence W. 40 rods to the place of beginning, containing 8½ acres.

Also, the NW¼ of Sec. 10 Tp. 14 S. R. 44 E.B.M., containing 160 acres.

Also, the N½ of the SW¼, and the N½ of the SE¼ of Sec. 9, Tp. 14. S. R. 44 E.B.M. containing 160 acres.

Also, commence at a point 60 rods N. of the SW corner of Sec. 9 Tp. 14 S.R. 44 E.B.M. and running thence E. 320 rods; thence; S. 20 rods; thence W. 320 rods; thence N. 20 rods to the place of beginning, containing 40 acres;

Also, the SE¼ of the NE¼ and the lots numbered 2,3, and 4, of Sec. 8, and the Lots numbered 1 of Sec. 17, Tp. 14 S.R. 44 E.B.M. 127 acres.

Also, commencing at the SW corner of the NE¼ of Sec. 11, Tp. 14, S.R. 44 E.B.M., and running thence N. 160 rods, thence E. 12 rods to the thread of the steam of the Black Otter Slough; thence following the windings of the Black Otter Slough a distance of 40 rods in a southeasterly direction; thence 79 rods in a Northeasterly direction to the northern section line of said section 11; thence along said line to the thread of said Black Otter Slough; thence following the windings of said Slough in a Southeasterly direction a distance of 25 rods; thence S. 58 rods; thence W. 5 rods; thence Southeast 12 rods and six links; thence S. 34 rods; thence W. 53 rods; thence S. 33 rods; thence W. 84 rods to theplace of beginning, containing 121 acres, more or less.

Also, commencing at a point 40 rods E. from the NW corner of Sec. 4, Tp. 14 S.R. 44 E.B.M., and running thence N. 80 rods; thence E. 120 rods; thence S. 125 rods; thence W. 20 rods; thence N. 45 rods to place of beginning, containing 93¾ acres.

Also commencing at a point 9½ chains W. from the Northeast corner of Section 4, Tp. 14 S.R. 44 E.B.M., and running thence S. 11¼ chains; thence W. 30½ chains, more or less, to half section line; thence N. 11¼ chains; thence E. 30½ chains, more or less, to place of beginning, containing 34 acres, more or less.

The South half of the southeast quarter and the southeast quarter of the southwest quarter of Section 33 Township 13 South and the lot numbered 3 of section four in Township 14 South of Range 44 east of the Boise Meridian in Idaho, containing 160 acres and 19/100 of an acre.

PUGMIRE LIVESTOCK & LAND COMPANY:

1877-April 15th, what is designated in this decree as a "Meadow Right".
April 15th-July 1st 6.9 cubic feet per second.
July 1st- Sept. 30th, 4.6 cubic feet per second.

All of said waters to be diverted from Bear River through the Kent-LaRocco ditch about forty rods west of its intake out of the Casto Slough, to be used upon 231.75 acres of land, described as follows, to-wit:

Commencing at the Northwest corner of Section 34 and running thence North 50 rods, more or less, to Bear River; thence following up the channel of said Bear River in a Southeasterly direction to its intersection with the North boundary line of said Section 34, thence East 40 rods; more or less, to the Northeast corner of the Northwest quarter of said Section 34; thence South 80 rods; thence East 80 rods; thence South 80 rods; thence West 80 rods; thence South 13 rods; more or less to center of Slough; thence Westerly along center of said Slough 80 rods, more or less, to intersection of West boundary line of the Northeast quarter of the Southwest quarter of Section 34; thence North 10 rods, more or less to the half section line; thence West 35 rods, more or less, to center of Slough; thence following the meanderings of said Slough in a Northwesterly direction to itsintersection with the West boundary line of said Section 34; thence North 12 rods, more or less, to a point which is 44 rods South from the Northwest corner of said Section 34; thence East 10.4 rods; thence North 44 rods; thence west 10.4 rods to the place of beginning, and containing 210 acres, more or less,

E. 160 rods; thence S. 23 rods; thence W. 160 rods; thence

GEORGE A. SPARKS:

1897-May 1st, What is designated in this decree as an "Agricultural Right.", 3 cubic feet per second.

All of said water to be diverted from Bear River at a point described as follows, and S½ SW¼, SW¼ SE¼, Section 23, NE¼ NW¼, Section 26, Township 14 South, Range 45 East Boise Meridian in Bear Lake County, State of Idaho. and to be used on 160 acres of land described as follows, to-wit:

All of said waters to be diverted from Bear River by means of a Dam known as the Ezra J. Phelps Dam located at or near the Southeast Corner of the Southeast Quarter of Section 23, Township 14 South, Range 45 East, of the Boise Meridian, to be used on 160 acres of land, described as follows, to-wit:

S½ SW¼, SW¼ SE¼, Section 23; and NE¼ NW¼ Section 26, Township 14 South, Range 45 East B.M. in Bear Lake County, State of Idaho, containing 160 acres.

JOHN O. MILLER:

1877-April 15th What is designated in this decree as a "Meadow Right."
April 15th-July 1st 4.50 cubic feet per second.
July 1st- September 30th 3.0 cubic feet per second.

1880-April 15th, What is designated in this decree to be a "Meadow Right."
April 15th- July 1st 4.5 cubic feet per second.
July 1st-September 30th 3.0 cubic feet per second.
1885 April 15th What is designated in this decree to be an "Agricultural Right." 3.6 cubic feet per second.

All of said waters to be diverted from Bear River by means of the Miller Ditch, the point of diversion of which is about 150 yards E ast from the Northeast corner of Section 31, Township 14 South, Range 45 East of the Boise Meridian, to be used upon 480 acres of land described as follows:

E½ NE¼, N½ SE¼, S½ NW¼, and SW¼ Section 31, Township 14 South Range 46 east Boise Meridian.

And E½ SE¼, Section 36 Township 14 South, Range 45 East B.M. all in Bear Lake County, State of Idaho.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED; That there shall be allowed to pass by the Wardboro Dam in Bear River five cubic feet per second of water at all times for the use of the West Fork Irrigation Company for culinary and domestic purposes; and it is further understood and agreed that said West Fork Irrigation Company is to have a riparian right, inferior to the irrigation rights herein decreed, for forty cubic feet per second of water to be run through its canal at all times during the year except when needed for irrigation purposes.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED: That all of the above described lands are arid in character and require irrigation for their proper cultivation and for the profitable raising of crops thereon, and that the duty of water shall be fixed and determined at one and one-half (1½) miners inches per acre of water from April 15th to July 1st of each year, and at one (1) miners inch per acre from July 1st to September 30th, of each year for the lands designated as meadow lands, and for the lands designated as agricultural lands, it is agreed that the duty shall be one miners inch per acre through the irrigation season, except that it is adjudged and decreed that 500 acres of agricultural lands under the canal of the Dingle Irrigation Company and 400 acres of Agricultural lands under the Preston-Montpelier Irrigation Company's Canal, and 400 acres of land under the Ream-Crockett Ditch have a gravelly sub-soil and require one and one-fourth (1¼) miners inches per acre, for their proper irrigation, which amount is hereby decreed to said lands, it is further adjudged and decreed that if within five years it is determined that said gravelly land does not need one and one-fourth (1¼) miner's inches per acre, the same may be reduced which in no event shall it be reduced so as to give less than one (1) miner's inch per acre to such lands, the court retaining jurisdiction of this cause for said purpose.

IT IS FURTHER ORDERED ADJUDGED AND DECREED, that the lands herein classified as "Meadow Lands" or rights are understood to mean those lands along Bear River producing what is commonly called "Wild Hay" or "natural meadow grass" which lands must be flooded in order to produce crops, the water running over said lands and back into Bear River, which said meadow lands shall be subject to rights hereinafter specified in this decree.

The agricultural lands or rights as herein classified are intended to mean those lands which have been cultivated and irrigated for the production of crops. The acreage of said agricultural lands are hereby decreed and disignated as follows: Preston Montpelier Irrigation Company, 2200 acres, Dingle Irrigation Company, 1721 acres, Peg Leg Irrigation Company 866.5 acres, Ream-Crockett Irrigation Company 861 acres, and Kent-LaRocco Ditch 365 acres. It being adjudged and decreed that this is the number of acres designated as agricultural lands under this decree.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED: that if at any time between the 17th day of June and the 4th day of July of any year there shall not be sufficient water in Bear River to supply the above designated agricultural lands, consisting of Six Thousand Twelve and Twenty-five hundredths (6012.25) acres, then, in that event, there shall be taken from the lands or rights hereinbefore designated as "Meadow Rights" pro rata a sufficient amount of water so that the said six Thousand Twelve and twenty-five hundredths acres (6012.25) of agricultural lands shall receive seventy-five per cent (75%) of the full amount of water herein decreed to said agricultural lands, and if after July 4th of any year there is not sufficien t water in Bear River to supply the said six Thousand Twelve and Twenty-five Hundredths acres (6012.25) acres with the full amount of their decreed water rights, then, in that event, there shall be taken from the said meadow lands or rights a sufficient amount of water to supply said Six thousand Twelve and Twenty-five Hundredths (6012.25)acres of agricultural lands to the full extent of their decreed right.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED: That the Court shall retain jurisdiction, and jurisdiction is hereby reserved for a period of five years from the date hereof, for the purpose of correcting said decree if it shall be made to appear to the court that there are errors in the description or amounts of land to which water has been decreed under this decree.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED, that each party pay its own costs herein.

Dated this 7th day of March, 1924.

Robert M. Terrell
District Judge

Endorsed:
Filed Mar. 7, 1924.
J. S. Peterson, Clerk District Court.

Book of By Laws of the Dry Lake
Canal Company of
Paris, Idaho

Article I

This company shall be known as the Dry Lake Company and has a capital stock of twenty five hundred dollars $2,500 divided into five hundred shares, of the par value of five dollars each.

Article II

There shall be elected annually a board of five directors, the Chairman, of which shall be the President of the Company, also a Secretary and Treasurer and a Watermaster.

Article III

It shall be the duty of the President to preside at all meetings and to sign all certificates of stock and in case of the absence of the President a President may be appointed by a majority of the shares present to act in his stead for that meeting.

Article IV

The Secretary shall keep a record of all proceedings also take charge of all books belonging to the Company and report the financial condition of the Company at each annual meeting also act as Treasurer for the Company and sign all certificates of stock with the President.

Article V

The Watermasters duties are to take a general supervision of the ditch and have control of the water under the direction of the Directors of the Company.

Article VI

All voting shall be done by ballot and each share shall be entitled to one vote.

Article VIII

One share in this company shall consist of one acre of land.

Article IX

The Directors shall have power to meet and levy assessments for the construction and maintenance of said canal at anytime that the best interests of the Company requires said assessment shall become delinquent with in fourty days after such assessment is made and after additional notice of fifteen days sufficient of his stock shall be sold according to law to pay said assessment and all expenses of sale.

Article X

Any person or persons taking and using the water without permission from the Watermaster shall after an impartial hearing before the Board of Directors and proof of his guilt being established, be fined any not less than one dollar nor more than twenty five dollars at the direction of the Board of Directors and is not paid in ten days after judgement sufficient of his capital stock shall be transferred to the person or persons who sustain the loss.*

Article XI

A majority of the shares present at any meeting either in person or by proxy shall form a quorum for the transaction of business and no person shall act as proxy for another without written authority.

Article XII

Each share holder shall be required to sign his name to there by laws and there by assent to the provisions there in contained.

Article XIII

A special meeting may be called at any time and any business transacted in case of emergency by order of the Board of Directors.

Article XIV

No certificate of stock shall be issued for any stock not fully paid up, and no stock shall be transfered on the company book without written authority or upon surrender of certificate.

Article XV

There by laws may be ammended or repealed by a two thirds majority of the votes present at city regular annual meetings.

* This part of the law was stricken out on March 21, 1908

Article XVI

The annual meeting of the Company shall be held at Paris Idaho on the second Saturday in March of each year, lawfull notice of which shall be posted in three conspicuous places in the district, or be published in the nearest newspaper in the county ten days prior to the time of the meeting.

March 21, 1908

Minutes of adjourned meeting held at the office of J.W. Stucki, President.

Present:

M.L. Rich, J.W. Stucki, Edward Sutton, Charles Ames, J.H. Stocker, J.L. Linvall, Wm. G. Heyward.

The By Laws were read and it was moved and carried that the latter part of Article X of the By Laws be stricken out namely that part commencing:

and if not paid in ten days after judgement sufficient of his capital stock shall be transferred to the person or persons who sustain the loss.

The financial condition of the ditch was read, showing a delinquence of about $20.00. The Water Master was allowed $6.00 for his services during 1907. It was moved and carried that 15¢ be levied on the capital stock. Voting by ballot for officers and directors resulting in election of:

Edward Sutton - Secretary and Treasurer
Wm. L. Rich - Water Master
Directors:
Wm. L. Rich, Edward Sutton, Wm.G. Hayward, J.H. Stocker, J.L. Linvall

355 shares represented
Minutes read and accepted.

March 21, 1908

Minutes of directors meeting at the ajournment of annual meeting.
W.L. Rich was elected President and Edward Sutton Secretary and Treasurer of Directors.

Book of By-laws of the Dry Lake Canal Company of Paris [illegible] 1

First

This company shall be known as the Dry Lake Canal Company and has a Capitol Stock of twenty five hundred dollars $2,500 devided into Five hundred Shares of the par value of Five dollars each

Article II

There shall be elected Annually a board of five Directors the Chairman of which shall be the President of the Company also a Secretary and Treasurer and a Watermaster

Art III

It shall be the duty of the President to preside at all meetings and to sign all Certificates of Stock and in case of the absence of the President a President may be appointed by a majority of the Shares present to act in his stead for that meeting

Art IV

The Secretary shall keep a record of all proceedings also take charge of all Books [illegible] to the Comp [illegible] and report the Financial condition

of the company at each Annual Meeting
& also act as Treasurer of the Company
and sign all certificates of Stock
with the President

Art V

The watermasters duties are to take
a general supervision of the ditch
and have control of the water under
the direction of the Directors of the
Company

Art VI

All voting shall be done by
ballot and each share shall be
entitled to one vote

Art VIII

One [illegible] of the company shall
consent [illegible]

Art IX

The directors shall have power
to meet and levy assessments for the
construction and maintainance
of said Canal at any time that
the best interests of the Company
requires said Assessment shall

become delinquent with in Twenty days after such assessment or where and after an additional notice of fifteen days sufficient of his stock shall be sold according to Law to pay said assessment and all expenses of sale

Art X

Any person or persons takeing and useing the water with out per-mission from the watermaster shall after an impartial hearing before the board of directors and proof of his guilt being established, be fined any sum not less than one dollar nor more than Twenty five dollars at the discretion of the Board of directors (and if not paid in ten days after Judgment sufficient of his Capitol Stock shall be transferred to the person or persons who sustain the Loss)

This part of this Art was stricken by [illegible] out on March 21-1908

Art XI

A majority of the shares present at any meeting either in person or by proxy shall form a quorum for the transaction of Business and no person shall act as proxy for another with out written authority

Art XII

Each share holder shall be required to sign his name to these by laws and thereby assent to the provisions there in contained

Art XIII

A special meeting ~~shall~~ may be called at any time and any business transacted in case of emergency by order of the Board of directors

Art XIV

No certificate of stock shall be issued for any stock not fully paid up, and no stock shall be transferred on the company's book with out written athority or upon surrender of certificate

XV

These by Laws may be ammended or repealed by a two thirds majority of the votes present at any regular annual meeting

Art XVI

The annual meeting of the company shall be held at Paris Idaho on the Second Satuarday in March of each year, Lawfull notice of which shall be posted in three conspecious places in the district, or be published in the nearest News paper in the County ten day prior to the time of Meeting.

1908
Mar 21

Minutes of ajorned meeting held at the office of J W Stucki President – W L Rich J W Stucki Edward Sutton Charles Jones J H Stocker J L Sundall Wm G Heyward the By Laws was read and it was moved and carried that the latter part of article 10 of the by laws be struck out namely that part commencing and if not paid in ten days after Judgment Sufficient of his capital Stock Shall be transferd to the person or persons who sustaind the loss

The financial condition of the ditch was read showing a delinquance of about $20 the water master was allowed 4 dollars for his services during 1907. It was moved and carried that 15 cts a share be levied on the capital stock voting for ballet for officers and directors resulting in Election of Edw Sutton Sec & treasurer Wm L Rich water master. directors W L Rich Edw Sutton W G Hayward H Stocker J Sundall 355 shares represented minutes read and accepted.

Mar 21 1908
minutes of directors meeting
held at the ajournd of annual meeting
W L Rich was elected presest Edw Sutton
sec & treasure of directors

Appendix N. Unit Habitat Targets

The acreages for the individual habitat types that comprise a habitat type are provided in this appendix. The Thomas Fork Unit, Oxford Slough WPA Units, and five Complexes (composed of 14 individual impoundments) of Bear Lake NWR will be managed as indicated for the habitat targets identified below. Comparisons of the baseline (current conditions) are provided to contrast the degree of change required to meet the target acres.

Tall Emergent Wetlands (Includes: Open Water, Submerged Aquatic, Deep Emergent and Shallow Emergent)	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	74% (1,327 ac)	93% (3,266 ac)	86 % (2,155 ac)	94 % (1,973ac)	91 % (7,353 ac)	27 % (273 ac)	42 % (764 ac)
Target % (acres)	56% (1,003 ac)	86% (3,026 ac)	67% (1,689 ac)	85% (1,796 ac)	90% (7,230 ac)	24% (241 ac)	43% (790ac)
Acceptable Range %	46.5%-95.0%	66.1%-95.0%	45.0%-90.0%	61.0%-98%	46.1%-95%	19%-33%	33.5%-55.5%
Acceptable Range ac	833-1,702 ac	2,331-3,350 ac	1,134-2,269 ac	1,289-2,071 ac	3,734-7,694 ac	192-335ac	621-1,029 ac

Deep “Hemi” Marsh (Includes: Open Water, Submerged Aquatic, Deep Emergent)	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	13.0% (233 ac)	51% (1,884 ac)	54% (1,348 ac)	54% (1,146 ac)	70 % (5,668 ac)	6.3% (63 ac)	30 % (554 ac)
Target % (acres)	16.0% (287 ac)	61% (2,136 ac)	42% (1,059 ac)	55% (1,162ac)	79% (6,327 ac)	6% (60 ac)	31% (571ac)
Acceptable Range %	6%-25.5%	41%-80%	23%-62.5%	38%-78%	40%-80%	4%-8%	23.5%-40.5%
Acceptable Range ac	833-1,702 ac	1,446-2,821 ac	579-1,585 ac	803-1,649 ac	3,240-6,450 ac	40-81ac	436-751 ac
Baseline Hemi Ratio	1:4	1:8.6	1:6.3	1:3.3	3.8:1	1:2.3	1:12.8
Target Hemi Ratio	1:2.7	1:3	1:3.5	1:2.75	2.8:1	1:3	1:5.2

Open Water	**Management Complex Targets**						
	Bear Lake NWR (18,010 ac)					**Thomas Fork Unit ()**	**Oxford Slough WPA**
	North Meadows Complex	**Bunn Lake Complex**	**Bloomington Complex**	**Rainbow Complex**	**Mud Lake Complex**		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres) **Target % (acres)** **Acceptable Range %** **Acceptable Range ac**	2.2% (40 ac) 1% (18 ac) 0%-3% 0-54 ac	4.1% (144 ac) 5.0% (178 ac) 1%-10% 35-353 ac	6.3% (159 ac) 2.0% (50 ac) 1%-7.5% 25-189 ac	8.0% (170 ac) 5.0% (106 ac) 3%-8% 63-169 ac	50.3 % (4,055) 28% (2,260 ac) 20%-60% 1,620-4,859ac	2.8% (28 ac) 2.0% (20 ac) 1.0%-3.0% 10-30 ac	2.0 % (36ac) 1.0% (18 ac) 1%-3% 19-56 ac

Submerged Aquatic	**Management Complex Targets**						
	Bear Lake NWR (18,010 ac)					**Thomas Fork Unit ( )**	**Oxford Slough WPA**
	North Meadows Complex	**Bunn Lake Complex**	**Bloomington Complex**	**Rainbow Complex**	**Mud Lake Complex**		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres) **Target % (acres)** **Acceptable Range %** **Acceptable Range ac**	1.1% (20 ac) 5.0% (90 ac) 1%-7.5% 18-134 ac	1.9% (68 ac) 15.1% (534 ac) 10%-20% 353-705 ac	2.2% (57 ac) 10% (252 ac) 2%-10% 50-252 ac	8.3% (175 ac) 15% (317 ac) 5%-20% 106-423 ac	1.4 % (112 ac) 22.4% (1,808) 5%-55% 405-4,454 ac		0.4 % (7 ac) 5.0% (92 ac) 2.5%-7.5% 46-139 ac

Deep Emergent	**Management Complex Targets**						
	Bear Lake NWR (18,010 ac)					**Thomas Fork Unit ( )**	**Oxford Slough WPA**
	North Meadows Complex	**Bunn Lake Complex**	**Bloomington Complex**	**Rainbow Complex**	**Mud Lake Complex**		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres) **Target % (acres)** **Acceptable Range %** **Acceptable Range ac**	9.7% (174 ac) 10.0% (179 ac) 5%-15% 90-269ac	45.4% (1,603 ac) 40.4% (1,424 ac) 30%-50% 1,058-1,763 ac	44.9% (1,133ac) 30.0% (756 ac) 20%-45% 504-1,144 ac	38.1% (802 ac) 35.0% (739 ac) 30%-50% 634-1,057ac	18.6 % (1,501ac) 28% (2,260) 15%-30% 1,215-2,430 ac	3.5 % (35 ac) 4.0% (40 ac) 3%-5% 30-51 ac	27.8 % (511 ac) 25.0% (461 ac) 20%-30% 371-556 ac

Shallow Emergent	**Management Complex Targets**						
	Bear Lake NWR (18,010 ac)					**Thomas Fork Unit ( )**	**Oxford Slough WPA**
	North Meadows Complex	**Bunn Lake Complex**	**Bloomington Complex**	**Rainbow Complex**	**Mud Lake Complex**		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	61.1% (1,094 ac)	41% (1,451 ac)	32% (806 ac)	39.2% (826 ac)	20.9 % (1,685ac)	20.9% (210ac)	11.4 % (210 ac)
Target % (acres)	40% (716 ac)	25.2% (890 ac)	25% (630 ac)	30% (634 ac)	11.2% (904 ac)	18% (181 ac)	11.9% (219 ac)
Acceptable Range %	30%-60%	20%-30%	20%-40%	20%-45%	5%-20%	15%-25%	10%-15%
Acceptable Range ac	538-1,075 ac	705-1,058 ac	504-1,008 ac	423-951 ac	405-1,620 ac	152-254 ac	185-278 ac

Ephemeral Marsh Wetlands **(Includes: Wet Meadow and Alkali Meadow habitats)**	**Management Complex Targets**						
	Bear Lake NWR (18,010 ac)					**Thomas Fork Unit ( )**	**Oxford Slough WPA**
	North Meadows Complex	**Bunn Lake Complex**	**Bloomington Complex**	**Rainbow Complex**	**Mud Lake Complex**		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	11.4% (203 ac)	2.4% (86 ac)	1.8% (46 ac)	2.1% (45 ac)	2.1 % (172 ac)	38.8% (390ac)	33.3 % (613 ac)
Target % (acres)	26.0% (466 ac)	10.2% (360 ac)	15% (377 ac)	9.8% (207 ac)	2.5% (204 ac)	37.5% (373 ac)	37.5% (607 ac)
Acceptable Range %	10%-32%	5%-15%	2%-15%	3%-18%	1%-4.5%	32%-44%	25%-40%
Acceptable Range ac	188-565 ac	180-536 ac	50-378 ac	63-380 ac	100-364 ac	325-447 ac	463-741 ac

Wet Meadow	**Management Complex Targets**						
	Bear Lake NWR (18,010 ac)					**Thomas Fork Unit ( )**	**Oxford Slough WPA**
	North Meadows Complex	**Bunn Lake Complex**	**Bloomington Complex**	**Rainbow Complex**	**Mud Lake Complex**		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	11.3% (202 ac)	2.3% (81 ac)	<1% (23ac)	2.1% (44ac)	1.9 % (150 ac)	35.7% (358ac)	12.9% (237 ac)
Target % (acres)	25.0% (448 ac)	10.1% (356ac)	10.0% (252 ac)	4.9% (103 ac)	2.3% (185 ac)	35.0% (349 ac)	13.0% (239 ac)
Acceptable Range %	10%-30%	5%-15%	1%-10%	2%-10%	1%-4%	30%-40%	10%-17.5%
Acceptable Range ac	179-538 ac	176-529 ac	25-252 ac	42-211 ac	84-324 ac	305-406ac	185-324 ac

Alkali Meadow	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	0.1% (1 ac)	0.1% (5 ac)	0.9% (23ac)	0% (1 ac)	0.3 % (23 ac)	3.2% (32 ac)	20.4 % (376 ac)
Target % (acres)	1.0% (18 ac)	0.1% (4 ac)	5.0% (125 ac)	4.9% (104 ac)	0.2% (18 ac)	2.5% (24 ac)	20.0% (368 ac)
Acceptable Range %	0.5%-1.5%	0.1%-0.2%	1.0%-5%	1%-8%	0.1%-0.5%	2%-4%	15%-22.5%
Acceptable Range ac	9-27 ac	4-7 ac	25-126 ac	21-169 ac	16-40 ac	20-41ac	278-417ac

Wooded Riparian	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	0.1% (2 ac)	0.2% (8 ac)	0.1% (3 ac)	0.5% (10 ac)	0.3 % (26 ac)	4.1% (41 ac)	0.1 % (2 ac)
Target % (acres)	1.0% (18 ac)	0.2% (7 ac)	0.1% (3 ac)	0.5% (11 ac)	0.5% (40 ac)	5.0% (51 ac)	0.2% (4 ac)
Acceptable Range %	1%-3%	0.2%-0.5%	0.1%-0.5%	0.5%-1.5%	0.3%-1%	4%-7.5%	0.2%-0.4%
Acceptable Range ac	18-54 ac	7-18 ac	3-13 ac	11-32 ac	27-81 ac	41-76 ac	4-7ac

Uplands (Includes: Alkali Upland Meadow, Meadow Grass, and Shrub)	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	12.7% (228 ac)	4.1% (143ac)	10.9% (274 ac)	3.8% (80 ac)	6.3 % (511 ac)	25.6% (257ac)	18.1 % (333 ac)
Target % (acres)	16.0% (287 ac)	3.1% (110 ac)	16.2% (409 ac)	4.5% (95 ac)	7.3% (587 ac)	29.4% (295 ac)	19.5% (359 ac)
Acceptable Range %	14%-28.5%	1.5%-7%	7%-23.5%	3.5%-8%	5.5%-9%	22.5%-35.5%	14%-23.5%
Acceptable Range ac	251-510 ac	53-251 ac	179-593 ac	74-169 ac	445-729 ac	229-361 ac	260-427 ac

Alkali Upland Meadow	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	5.1% (92 ac)	1.3% (47 ac)	4.9% (123 ac)	1.1% (24 ac)	0.4 % (28 ac)	0.2% (2ac)	6.9% (127ac)
Target % (acres)	5.0% (90 ac)	1.0% (36 ac)	6.0% (151 ac)	1.0% (21ac)	0.6% (45ac)	0.5% (5 ac)	6.5% (120 ac)
Acceptable Range %	3%-7.5%	0.5%-2%	2%-8%	1%-2%	0.5%-1%	0.2%-0.5%	5%-10%
Acceptable Range ac	54-134 ac	18-71 ac	50-202 ac	21-42 ac	40-81 ac	2-5 ac	93-185ac

Meadow Grass	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	6.9% (124 ac)	2.7% (97 ac)	5.8% (147 ac)	2.6% (55 ac)	1.8 % (148 ac)	23.0% (231ac)	6.5% (119ac)
Target % (acres)	10.0% (179 ac)	2.0% (71 ac)	10.1% (254 ac)	3.0% (63 ac)	2.2% (181 ac)	24.0% (240 ac)	8.0% (146 ac)
Acceptable Range %	10%-20%	1%-5%	5%-15%	2%-5%	1%-3%	20%-30%	5%-8%
Acceptable Range ac	179-358 ac	35-176 ac	126-378 ac	42-106 ac	81-243 ac	203-305 ac	93-148 ac

Mixed Shrub	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres)	0.7% (12 ac)	0% (0 ac)	0.2% (4 ac)	0.1% (1 ac)	4.2 % (335 ac)	2.4% (24 ac)	4.7% (87 ac)
Target % (acres)	1.0% (18 ac)	0.1% (4 ac)	0.2% (4 ac)	0.5% (11 ac)	4.5% (362 ac)	5.0% (50 ac)	5.1% (94 ac)
Acceptable Range %	0.7%-1%	0%-0.1%	0.1%-0.5%	0.5%-1%	4%-5%	2.3%-5%	4%-5.5%
Acceptable Range ac	12-18 ac	0-4 ac	3-13 ac	11-21 ac	324-405 ac	24-51 ac	74-94 ac

Agriculture Upland Crops	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline Fields **Baseline % (acres)** **Target Crop Fields** **Target % (acres)** **Target Restore Fields** **Target Restore % (ac**	 2 0.3% (10.7)	11 1.9% (68.3 ac) 9 1.6% (57.6 ac) 0 0% (0 ac)	3 1.0% (25.1 ac) 3 1.0% (25.1 ac) 0 0% (0 ac)			4 4.4% (44.3 ac) 4 4.4% (44.3 ac) 0 0% (0 ac)	7 4.3% (79.2 ac) 7 4.3% (79.2 ac) 0 0% (0 ac)

Hayed Meadow and Uplands	Management Complex Targets						
	Bear Lake NWR (18,010 ac)					Thomas Fork Unit ( )	Oxford Slough WPA
	North Meadows Complex	Bunn Lake Complex	Bloomington Complex	Rainbow Complex	Mud Lake Complex		
	1,791 ac	3,528 ac	2,521 ac	2,108 ac	8,062 ac	1,004 ac	1,840ac
Baseline % (acres) **Target % (acres)** **Target Restoration of Hayed % (ac**	73% (1,300) 22% (391) 70% (909)	34% (1,191) 13% (450) 62% (741)	12% (311) 10% (260) 16% (51)	*	1.2% (94) 0.5% (39) 60% (57)	34% (337) 21% (215) 57% (122)	16% (300) 8% (150) 50% (150)

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Appendix P. Public Comments and Service Responses

In this appendix the Service responds to comments that were received on the Bear Lake National Wildlife Refuge and Oxford Slough Waterfowl Production Area Draft Comprehensive Conservation Plan and Environmental Assessment (Draft CCP/EA, September 2012) during the official public comment period from September 28-October 29, 2012, which was extended to provide additional opportunities for comment and to accommodate a request from PacifiCorp to allow more time to review the lengthy DCCP document, which they received late due to a change of personnel at the Grace station. Comments were received via letter, e-mail, and phone. Since the volume of comments received was not substantial, all comments, paraphrased for clarity and emphasis, are presented below.

P.1 Index to Comments

P.2 Comments and Responses

1. Barbara Sachau (Jean Q. Public)

Comment 1.1: Ban all hunting and trapping . . . [I oppose] attracting birds to an area so they can be shot . . . I oppose all changes to water to attract birds if they don’t have peace and tranquility when they nest there. This is federal land paid for by national taxpayers, not local [people] . . . This plan consigns this site to poverty, since hunters represent less than 1% of the U.S. population and they are cheap. Wildlife watchers are the big spenders . . .

Service Response: Thank you for reviewing and commenting on the Draft CCP. The first priority of every refuge is to conserve, manage, and if needed, restore fish and wildlife populations and habitats.

The CCP was designed to address that primary mission. Hunting is one of six priority public uses identified in the Fish and Wildlife Administration Act, as amended, which also include wildlife observation, wildlife photography, fishing, interpretation, and environmental education. All of these uses, if determined to be compatible, are to receive equal consideration. The Migratory Bird Conservation Act (Act) states that the amount of a Refuge open to waterfowl hunting, up to the maximum 40%, is variable and subject to the mandate that the Refuge meet the needs of wildlife first. Forty percent of Bear Lake NWR is open to hunting. Therefore, 60% of the Refuge acreage remains a sanctuary for wildlife.

While NWRs are closed to hunting unless formally opened, lands acquired as WPAs are open to recreational hunting and public trapping unless closed (50 CFR 31.16). Hunting occurs outside the nesting season for birds and the rearing season for other wildlife on the WPA. Impacts of trapping to colonial nesting birds has not been documented to date. If monitoring demonstrates unacceptable impacts, seasonal restrictions on trapping would be instituted.

In designating hunting as one of the six priority public uses on national wildlife refuges, Congress acknowledged the important contributions by hunters in wildlife conservation and the purchase of some National Wildlife Refuge System lands. Funding for National Wildlife Refuges may come from a variety of sources, such as Land and Water Conservation Fund, which is primarily from off-shore oil leases, and the sale of Federal Duck Stamps, which are primarily purchased by waterfowl hunters. Federal Duck Stamps have funded the acquisition of 2.3 million acres of National Wildlife Refuge lands, including two NWRs in Idaho (Kootenai and Camas), and easements or leases on an additional 4 million acres of wetland habitat. These wetland habitats benefit a wide array of species, including 1/3 of our nation’s threatened and endangered species. Under the Sport Fish and Wildlife Restoration Programs, $200 million in Federal excise taxes on firearms, archery equipment, ammunition, and other sporting equipment are distributed to the State wildlife agencies annually. Over the 75-year history of the Sport Fish and Wildlife Restoration Programs, these excise taxes have generated a cumulative total of more than $10 billion for wildlife conservation efforts by State and Territorial wildlife agencies.

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation reported that hunters comprised 6% of the US population 16 years old and older in 2011. Hunters spent more on equipment and trip related expenses than wildlife watchers ($766 per person for people who took trips to observe wildlife, compared to $2,484 per hunter). Part of hunter expenditures include purchases of licenses and equipment that directly fund wildlife conservation and habitat protection. In 2011 this included $33 million on Federal Duck Stamps, and $6 billion on equipment that is taxed to fund wildlife and sport fish restoration programs.

Comment 1.2: Ban new roads.

Service Response: No new roads are proposed at the Refuge.

Comment 1.3: Ban all pesticide applications.

Service Response: In accordance with Departmental and Service policy (517 DM 1 and 569 FW 1), refuges use an integrated pest management (IPM) approach, where practicable, to eradicate, control, or contain pest and invasive species (herein collectively referred to as pests) on refuge lands (Draft CCP, pages 2-4, 5). The Refuge’s IPM Plan is included in the Draft CCP/EA (Appendix F). Pests targeted for IPM are those which cause environmental harm (defined as a biologically substantial decrease in environmental quality as indicated by a variety of potential factors including declines in native species populations or communities, degraded habitat quality or long-term habitat loss, and/or altered ecological processes.) IPM uses methods based upon effectiveness, cost, and minimal ecological disruption (including minimum potential effects to non-target species and the refuge environment). Pesticides may be used where physical, cultural, and biological methods or combinations thereof, are impractical or incapable of providing adequate control, eradication, or containment. If a pesticide is needed on refuge lands, the most specific (selective) chemical available for the target species would be used unless considerations of persistence or other environmental and/or biotic hazards preclude it. In accordance with 517 DM 1, pesticide usage would be further restricted because only pesticides registered with the US Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and as provided in regulations, orders, or permits issued by USEPA, may be applied on lands and waters under refuge jurisdiction.

Comment 1.4: Ban all prescribed burns which . . . cause lung cancer and six other deadly health issues … from ingesting fine particulate matter.

Service Response: Department of Interior policy (910 DM 1-3) and Service policy (621 FW 1.1) require that Service lands with burnable vegetation have a fire management plan (FMP). The Fire Management Plan (FMP) for the Southeast Idaho NWR Complex (which includes Bear Lake NWR, Oxford Slough WPA, and the Thomas Fork Unit), included as Appendix G of the Draft CCP/EA, allows for a program of prescribed fire when deemed necessary to reduce hazardous fuels, restore the natural processes and vitality of ecosystems, improve wildlife habitat, remove or reduce non-native species, and/or conduct research. The FMP describes objectives for the use of prescribed fire of the Refuge. The FMP also describes appropriate timing of burns to avoid undesirable impacts to wildlife and other resources. Prescribed burn guidelines prohibit initiating burns at times when weather conditions are such that a burn would negatively impact air quality.

The FMP meets the Federal Interagency Wildland Fire Policy by implementing a number of guiding principles, including incorporation of public health and environmental quality considerations in fire management plans and activities. This FMP is also in accordance with FWS fire policy (621 FW 1) which states that FMPs must address “public health issues related to smoke and air quality.” FWS policy also states that “. . . fire management activities which result in the discharge of air pollutants are subject to, and must comply with, all applicable Federal, state, interstate, and local air pollution control requirements as specified by Section 118 of the Clean Air Act.”

The US Fish and Wildlife Service in south Idaho participates in the Montana/Idaho Airshed Group, which includes all federal agencies, state land management agencies, and private forest products companies. The intent of the Airshed Group is to limit negative impacts from controlled burns through scientific monitoring of weather conditions and formal coordination of burns. The Missoula Monitoring Unit issues daily decisions which can restrict burning when atmospheric conditions are not conducive to good smoke dispersion. Prescribed burn projects are not conducted if the Missoula Monitoring Unit posts a burning restriction for the airshed in which the refuge is located.

Comment 1.5: [Do not] mow; leave the site natural . . .

Service Response: Mowing is used to ensure that maintenance vehicles can access dikes and water control structures. Mowing is a proven management tool that is used to remove or reduce some invasive plant species that degrade the quality of habitat for wildlife. Since settlement of the area in the mid-1800s, humans have modified the landscape, both purposefully (as in the case of irrigation development) and inadvertently (as in the case of the introduction of non-native, invasive plant species). Although the Refuge contains natural elements, both in terms of hydrology and species present it is no longer as “natural” as it was before settlement. Therefore, habitat management is necessary to maintain desirable conditions for migratory birds and other native wildlife.

Comment 1.6: Ban all pesticides and toxic agribusiness and all farms from this site. American taxpayers did not . . . pay for this land so local agribusiness could use it for their own [profit]. These agribusinesses use toxic Monsanto [chemicals] that kill life.

Service Response: No agribusiness occurs on the Refuge. The Refuge uses Cooperative Land Management Agreements (CLMAs) and Special Use Permits (SUPs) for crop production (Draft CCP, Appendix B, page B-61). CLMAs are negotiated agreements between the Refuge and a private party, and are used to implement cooperative programs that help achieve Refuge purposes as well as provide an economic benefit to the farmer. Under Refuge CLMAs, private farmers (cooperators) raise a Refuge-specified crop in a designated field or fields, and are entitled to remove hay from the Refuge in exchange for farming the agricultural crop. Cooperators also maintain fences and water control infrastructure, conduct weed control, manage water levels, and spray for weeds when needed. Herbicide use must be in compliance with the Service policy requirements for completing an approved Pesticide Use Proposal, and it must meet other State and Federal requirements. Insecticides, fungicides and other chemicals are not permitted under this agreement.

For landowners who do not participate in the crop production CLMAs, the Refuge issues Special Use Permits (SUPs) to manage haying in designated fields. Private ranchers or farmers, generally landowners adjacent to the Refuge, hay Refuge fields to provide short stature habitat for wildlife. The rancher or farmer pays the Refuge a negotiated or bid price per ton of hay removed. CLMA and SUP holders use their own farm equipment such as tractors, swathers, balers, and diskers. The cooperator in a CLMA or permittee within an SUP, is responsible for all the costs of production. This allows the Service to provide crops for wildlife at a lower cost to the Government.

Comment 1.7: Croplands should not be in these sites.

Service Response: Croplands on the Refuge promote sustained use of these areas by migrating waterfowl and sandhill cranes by providing an accessible, high-energy food source during late fall and early winter as wetlands freeze up. While agricultural crops are typically not limiting within the regional landscape, agricultural fields where all grain is produced and retained for wildlife use are. Additionally, scale small grain production in the Bear Lake region is beginning to experience a downward trend, which not only reduces grain availability for waterfowl and cranes, but increases pressure on privately owned small grain fields. Considering recent off-Refuge conversions from small grain to alfalfa and meadow hay production, Refuge agricultural crops provide supplemental food for wildlife, as well as a depredation benefit to those local farmers still growing small grain crops (Draft CCP, page 2-72).

Comment 1.8: Taxpayers do not want to pay for new offices or huts . . . We need fewer buildings in these rustic sites.

Service Response: In the Preferred Alternative, we propose developing plans for a combined Refuge office, small visitor contact station, with a small environmental education classroom on or near the Refuge within five years of CCP completion, and seeking funding to construct these facilities (Draft CCP, page 2-14). The Refuge has the need for on-site facilities and staff presence to provide compatible wildlife-dependent recreation opportunities to visitors. The footprint of this facility will be small and it will be sited carefully to prevent impacts to sensitive species and habitats.

Comment 1.9: Wildlife watchers … can't come to an area where they can be shot … by … hunters.

Service Response: Due to the early winter conditions at this high elevation Refuge, few visitors other than waterfowl hunters use the Bear Lake NWR during the hunting season. Due to the low level of use by non-hunting visitors at this time of year, conflicts between waterfowl and upland game hunters and other visitors have never been documented and would likely remain negligible for the near future. Other uses that could potentially occur at the same time and place as waterfowl hunting include vehicle traffic on the Salt Meadow Unit Wildlife Observation Route, hiking on roads that are open to vehicle travel, and hiking, cross-country skiing and snowshoeing within the hunt area. Although non-hunters may walk or drive on the wildlife observation route, which is within the hunt area, the road is wide (between 12 and 20 feet) and is located on elevated dikes with good visibility. To promote visitor safety, hiking, cross-country skiing, and snowshoeing would be limited to service roads and dikes within the hunt area from July 1- January 20 under proposed management (Draft CCP, Appendix B, page B-22). State law prohibits shooting across roads. The Refuge receives little visitation from upland game hunters and this activity occurs in an area that is not used by other visitors, east of the Merkley Lake (County) Road (Appendix B, page 28). Other measures to reduce potential conflicts between hunters and other user groups would include providing information at the trailhead kiosks and in the Refuge's brochure that clearly indicates permitted uses and rules of conduct.

2. Kelly Griffin

Comment 2.1: I am writing this letter in response to the Bear Lake DCCP/EA planning update 3. Having lived my entire life in Preston, Idaho, my main concern is the Oxford Slough WPA. I am in full support of Alternative 3, the preferred alternative, with one exception. As an avid Duck hunter, and Trapper I am questioning the rule about non-motorized boats. I am proposing the idea of allowing the use of a boat with a motor, during the fall season, similar to the current rule for motorized boats in the Bear Lake NWR. This would then not interfere with spring bird nesting. My concern is for two reasons, the first being a more efficient hunting-trapping opportunity, and last but not least for a simple safety reason being if an accident occurred in the middle of the marsh, a boat with a motor will get you to help quicker than a boat without a motor.

Service Response: Motorized boats at Oxford Slough WPA (OSWPA) are not allowed due to the shallow and limited extent of the water and the impact that a boat motor would have on marsh vegetation. In most years, water at the OSWPA is in short supply by the fall, so even a nonmotorized boat may not be a practical way to access hunting and trapping opportunities.

3. Lee W. Mabey, Acting Forest Fisheries Biologist, Caribou-Targhee National Forest

Comment 3.1: Upon review of the CCP for Bear Lake Refuge I am pleased with the understanding and emphasis that is being placed upon Bonneville Cutthroat [trout] and maintaining fluvial and adfluvial populations from Bear River and Bear Lake. I am encouraged by the actions taken to date and the actions planned under the various alternatives. From my brief review of the CCP I am most highly supportive of the preferred alternative, alternative 3. Please feel free to involve the Forest Fisheries program and staff as it relates to the implementation of the chosen alternative especially in those systems that would connect cutthroat to Forest Service lands.

Service Response: We acknowledge your support of the Preferred Alternative, Alternative 3. We agree that this alternative will best support meeting the purposes of the Refuge (including the Thomas Fork Unit), including working toward maintaining and enhancing habitat for Bonneville cutthroat trout, and providing habitat connectivity.

Comment 3.2: Page 4-43: Correct leatherback chub to leatherside chub.

Service Response: The correction has been made.

4, 5. Dean Ward and Sons

Comment 4.1: We, Dean Ward and Sons, have very adamant feelings concerning the Bird Refuge. . . . We strongly feel the only option that would be beneficial to the land and the wildlife in this section of ground would be Alternative 1 (No Action Alternative). There can still be improvements made we would love to continue to work together.

Service Response: Thank you for your comments, and we look forward to continue working with you and other adjacent landowners in the future. We acknowledge your support of Alternative 1, the no action alternative. However we believe that Alternative 3 will better address pressing issues such as water quality, and will better meet the purposes of the Refuge both by providing a wider array of habitats and by improving habitat quality.

Comment 4.2: [It] was promised on the arrival of the Bird Refuge, [that] we would be able to continue to graze and hay the allotted section below our property line. We complied with what was asked understanding that we would be able to still be able to use the land which was and still is essentially vital to our black angus cow calf operation. The existing dikes and flood water irrigation system was installed by our forbearers, mainly George Ward, and to this day it has been kept up and maintained by the family. It takes constant maintenance to plug the [musk]rat runs to prevent it from washing out. And to continue running the head gates to control the flow and amount of water to provide the most desirable quality of hay. The hay harvested from the above mentioned section is extremely vital to our family's livelihood. When the Bird Refuge came in we complied with the regulations and still do. We moved our two story Log Barn and Corrals that had previously existed below our property to above the property line. We've keep up on our agreements. But all too soon we lost our promised grazing rights.

Comment 5.1. When the permit was first issued it was always in the name of Dean Ward and Sons, and Dean Ward and Sons were promised that as long as they were living they would be allowed to hay and graze the units as specified in the permits. The permittee name was set up with the same language as the Idaho State brand records.

The Refuge has asked periodically to have access through the Ward property and the Wards have worked with Refuge staff giving permission as needed. The Wards feel they have always accommodated the refuge and feel the refuge should keep their promises as were set up with permits in 1968 when the refuge was established.

The Wards were given permission to put in a cement headgate on bird refuge property to help regulate irrigation water on Bloomington Creek to enhance hay operation on private ground and on bird refuge ground.

Service Response to Comments 4.2, 5.1: We appreciate your efforts to work with the Refuge over the years, and the haying you currently perform on the Refuge under a permit. We hope to continue working with you in the future. We understand that you believe the government promised that both grazing and haying would continue to be allowed on the newly established Refuge land, as had occurred when the land was under the jurisdiction of the Bureau of Land Management.

Upon Refuge establishment, negotiated sale hay permits were awarded to individuals and entities that had previously hayed the lands which became Bear Lake NWR. Individual landowners adjacent to the hayed fields and with livestock operations in the Bear Lake Valley, including yourself, were given first priority to secure USFWS permits and continue their haying operations. The 1960s Refuge haying and grazing program was designed to prevent emergent bulrush and cattail encroachment and provide open-water foraging and brood rearing areas for waterfowl. By the 1980s, Refuge staff recognized that conflicts with livestock grazing had affected wildlife production and damage had occurred to Refuge habitat. In many cases the same units were being both hayed and grazed. These concerns were addressed by reducing grazing permits and changing the amount and timing of grazing. In 1993, the Refuge fully reexamined grazing as a habitat management tool to determine if it met the criteria for a compatible Refuge use. Managers concluded that it was not compatible, and grazing permits were phased out, with 1994 being the last year of issuance. Problems documented from the grazing program were: increased nutrient loading in wetlands, reduction of residual nesting cover that reduced nest success, and direct mortality to nesting sandhill cranes from impacts with grazing allotment fences.

While grazing was removed as a compatible Refuge use, haying was still considered compatible with Refuge purposes and hay permits continued to be issued. Since 2003, the Refuge has retired hay units as permit holders decided to no longer hay on the Refuge. Most units that were retired were notably wet and difficult to dewater to conduct haying operations.

The Refuge Improvement Act of 1997, which amended the earlier Refuge Administration Act, states that all Refuge uses must be compatible with the purposes for which the Refuge was established. The Act also requires that all Refuge uses be evaluated for appropriateness and compatibility, and that uses be periodically re-evaluated. Farming (including haying and growing crops) must be re-evaluated every ten years, since conditions on Refuges may change. Therefore we have evaluated haying and farming (small grains and alfalfa) as part of the Draft CCP. In evaluating the current haying program we noted two major issues: 1) dewatering of some of the wetter hay units before birds have completed brood rearing; and (2) most of the Refuge's wet meadow habitats are currently hayed. Under negotiated sale permits, wetland hay units must be dewatered annually during late summer/early fall for hay removal, regardless of habitat condition or necessity from a habitat management standpoint. Because of the hay unit distribution, entire units may need to be dewatered annually by August 1st to facilitate hay removal; often at a time when fledgling waterbirds require these shallowly flooded habitats to reach flight stage. The Preferred Alternative would moderately reduce meadow and upland haying operations over the next 15 years to maintain inundation of shallow wetlands and wet meadow habitat through the summer, allowing birds to complete their life cycles.

In addition, as the planning team began examining soils, vegetation, and wetland data for development of the Draft CCP, it became clear that the Refuge was haying almost all (80-90 percent) of its wet meadow habitat, as well as some additional shallow emergent wetland habitat. While haying benefits certain species that prefer to forage in short grass (for example, Canada geese), hayed meadows do not provide for all requirements of these species (for example nesting or roosting habitat), nor does it provide the habitat characteristics needed by many species of wildlife that use wet meadow habitats. Many species, for example Wilson's phalarope, northern pintail, and black tern, require tall wet meadow vegetation for nesting or brood cover, or depend upon invertebrates that are abundant in unhayed wet meadow habitat. Furthermore, tall stature (unhayed) wet meadow is a rare habitat both within the Bear Lake Valley, and on the Refuge. The Preferred Alternative is intended to strike a balance between managing short-cover habitat through haying, and providing dense, late successional wet meadow habitat for those wildlife species that require it.

The Refuge will maintain a haying program as long as it continues to demonstrate a benefit to wildlife and habitat, as well as mitigating wildlife depredation on adjacent private land. The periodic re-evaluation of haying through Compatibility Determinations allows the Refuge to adapt to changing conditions and provide the best possible mix of habitats that meet the needs of many wildlife species. The Service strives to follow the best available science in its decision-making. As science is constantly evolving, it follows that management decisions must also evolve to embrace the latest science-based findings. These decisions may not keep to the promises made by previous managers; however, the Service must do what is best for the habitat and wildlife, as mandated by Congress.

Comment 5.2: I would prefer to continue haying on all the units I currently have (Units 109, 108W, and 108E). I would prefer not to have any of these units retired. If that is not possible, I would prefer to give up the northern part of Unit 109 and continue haying Unit 108W.

Service Response: Based on the best biological information available, managers will assess habitat quality and wildlife use on specific hay units before the time proposed for unit retirement or retention in the hay program. Based on this assessment, management has the discretion to retire or retain a hay unit to fulfill habitat and wildlife objectives.

6. Charles and Connie Hulme

Comment 6.1: As you know, I have been well acquainted with the history and use of the property now known as the Bear Lake National Wildlife Refuge. Even before the Refuge was designated, we operated, hayed and grazed the lands included in the Refuge. Since the Refuge was designated, I have continued to be permitted to hay certain areas, and have enjoyed a good association with the wildlife managers. Thank you for your cooperation in the past; and hopefully, this association will continue as previous managers had promised that we would be able to use the permitted properties for haying—at least.

Service Response: We appreciate your efforts to work with the Refuge over the years, and the haying you currently perform on the Refuge under a permit. We hope to continue working with you in the future.

Comment 6.2: Now that there <u>may</u> <u>be</u> changes and alternatives suggested I would just like to say that I think that the refuge has been managed very well in the past and would hope that it could continue as in the last several years.

Service Response: Thank you for your comment.

Comment 6.3: . . . it seems that the newly preferred alternative will likely be chosen. It looks to me like over the next several years that less grain would be planted and less haying allowed. If less haying is allowed, it appears that our permitted acreage would be reduced some time after the next 10 year period. After visiting with you, Annette, I was told that we would count on continued haying until at least the 2022 year period at least, at which time our unit would probably be retired for haying. . . . If after the ten year period, it is determined that haying should again be allowed, I would like to request that we be considered as the likely ones to once again be the operators of the unit that we have been utilizing in the past. That would more nearly meet the promises made by past managers; and we hopefully have fulfilled our part of the agreements.

Service Response: In the Service's Preferred Alternative, a phased-in reduction in the acreage being hayed or planted in grain would occur. The Preferred Alternative strikes a balance between managing short-cover habitat through haying, and providing dense, late successional wet meadow habitat for those wildlife species that require it (see Response to Comment 4.2 above). Management practices under the Preferred Alternative would produce habitats that are suitable for not only species that readily use human-managed habitats such as hayed fields, but a diverse suite of species. Management will monitor the response of the habitat and wildlife and, using adaptive management, can modify the program to provide optimal conditions. The Hulmes' entire current hay unit (110M) would be retired sometime in the third 5-year phase beginning 2022. We acknowledge that they would like to be considered should permitting on those units continue or be modified.

Comment 6.4: While I am not sure that retiring these haying areas will be beneficial to wildlife use, because on our own meadows which are very similar, we find that the hay grown becomes lodged and matted and does not provide anything but old rushes and needs to be removed to open it up for wildlife use, I think that occasional haying in these areas is a good practice. That is my opinion! . . . We have hundreds—maybe thousands of birds that enjoy our private meadows, especially after the hay is removed and the new grass emerges. They enjoy that regrowth.

Service Response: Haying can remove tall decadent vegetation and provide for regrowth of new shoots which as you have observed, are preferred by certain wildlife species. It can also make insects and small rodents more readily available for those species that prey on them. For this reason haying is one tool used by wildlife managers to provide habitat for wildlife, and haying permits or CLMAs are established on Refuges under this premise. However hayed areas do not meet the needs of all wildlife species, and certain species (for example Wilson's phalarope, northern pintail, black tern) require unhayed meadow, wet meadow, or shallow wetland habitats to complete their life cycles. Also even though haying can make invertebrates more easily accessible to foraging birds, the removal of vegetation can also reduce the abundance of invertebrates, by removing the litter these small creatures feed upon.

Comment 6.5: The grain planted on the refuge has been beneficial to the birds and has helped to keep them satisfied on the refuge, rather than so much damage to grainfields on private land. I would hope that the grain planting will continue.

Service Response: The Refuge currently grows grain to provide high-carbohydrate food for waterfowl and sandhill cranes during migration, and to reduce depredation on neighboring private lands. We plan to continue doing so. However we are planning minor reductions where we believe other uses would provide greater benefits to wildlife.

7. Bryce Nielson

Comment 7.1: As a wildlife biologist who has lived and worked at Bear Lake for the last 37 years I would like to make some comments concerning the plan. After reading it, it is obvious that there has been a lot of effort and information put together.

Service Response: Thank you for your comment.

Comment 7.2: I am an avid waterfowl hunter who has used the marsh for years and am very well acquainted with the dynamics of water in the marsh and Bear Lake. . . . Hunters have been the group that has funded the refuge system over the years in addition to DU but unfortunately they don't seem to be addressed significantly in this document.

Service Response: Hunting is one of six priority public uses identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the Refuge Improvement Act in 1997. Priority public uses also include wildlife observation, wildlife photography, fishing, interpretation, and environmental education. All of these uses, if determined to be compatible, are to and receive equal consideration. The Refuge spent considerable effort in examining the existing hunting program and determining ways to improve quality, ensure safety, and reduce conflicts with other user groups (see Chapter 2, Alternatives; Appendix B, Compatibility Determinations, in the Draft CCP). The Migratory Bird Conservation Act (Act) states that the amount of a Refuge open to waterfowl hunting, up to the maximum 40%, is variable and subject to the mandate that the Refuge meet the needs of wildlife first. Bear Lake NWR has 40% of its acreage open to hunting, the maximum allowed under the Act. We also hope that with habitat management actions proposed in the CCP will improve habitat for fall-migrating waterfowl and that therefore hunting opportunities will increase.

Comment 7.3: I have watched the quality of hunting decline dramatically over the last five years due to improper water management on the marsh. Even during the drought period there was more water in the ephemeral wetlands than there has been recently. This lack of flooding as resulted in food producing and open water areas being dry and nonproductive. In 2012 even the interior units were dry and have attracted few waterfowl. Most migrating birds just pass through. Hunting has suffered dramatically. . . . I know that there are specific obligations between the FWS and Pacificorp that need to be met. I feel that these have not been effectively managed recently. This may be a result of poor communication between the two organizations.

Service Response: The Refuge and PacifiCorp work closely together to regulate water flows through the Refuge in accordance with prior agreements and subject to water availability. PacifiCorp has accommodated Refuge requests in the past few years to facilitate lowering water levels on the Refuge for dike and water control construction and maintenance, prescribed burns, and control of invasive carp. Although these lower water levels may not have been optimal for waterfowl production during the last several years, the goal of these management actions, and future management actions proposed in the CCP, has been to improve wildlife habitat over the long term. In 2012, Bear Lake County was declared a drought-affected county. Water was in short supply throughout the Bear Lake Valley, including the Refuge.

Comment 7.4: I am also a birder and am concerned about bird viewing on the marsh during the summer. Unfortunately few people that visit Bear Lake are aware of the opportunities the refuge offers.

Service Response: Wildlife observation is one of six priority public uses identified in the Fish and Wildlife Administration Act, as amended, which also include wildlife photography, hunting, fishing, interpretation, and environmental education. All of these uses, if determined to be compatible, are to receive equal consideration. Refuge management hopes to increase both opportunities for wildlife observation, photography, environmental education, and interpretation, and outreach to the public so that they are informed about, and have opportunities to enjoy the Refuge's resources (Draft CCP, page 2-14). We hope to be able to establish a visitor services position in the SE Idaho Complex that will serve all Refuges in the Complex. With the support of this position we would be able to recruit and retain volunteers which, given the Refuge's small staff and funding available for visitor services, will be essential to provide expanded wildlife-dependent recreation opportunities in the future. We also hope that habitat management actions proposed in this CCP would enhance wildlife use of the Refuge, and therefore wildlife observation and photography opportunities as well.

Comment 7.5: I was astounded to see that fishing may be regulated, why I have no idea.

Service Response: The Refuge has always "regulated" fishing through abiding by the Idaho Department of Fish and Game regulations. The Refuge seeks to expand opportunities for fishing, as well as creating a safer and more comfortable fishing infrastructure (Draft CCP, page 2-14).

Comment 7.6: I have also been involved in many discussions concerning the impacts of the marsh on Bear Lake water quality and silt loading from the Bear River. . . . Reclamation work on riparian zones really is not needed. Attempting to minimize silt loading from Thomas Fork is also an effort in futility.

Service Response: Siltation of wildlife habitat can reduce its productivity for waterfowl. Although attempting to minimize silt load at BLNWR (including the Thomas Fork Unit) is a daunting task, by working with stakeholders and other partners, we believe that this is an achievable long-range goal.

Comment 7.7: Farming on the refuge is a byproduct that does not need to occur unless benefit to waterfowl can be documented.

Service Response: Since Refuge establishment, managers have planted crops to provide carbohydrate resources for waterfowl and sandhill cranes during migration, as well as to prevent depredation on nearby private lands. The Refuge will continue to do so as long as a benefit to wildlife can be demonstrated. Management will monitor the response of the habitat and wildlife and, using adaptive management, can modify the program to provide optimal conditions.

Comment 7.8: In looking at the alternatives all have good points and bad. I would chose #1 as long as the management of the marsh returned to early 2000-2005 practices.

Service Response: We acknowledge your support of Alternative 1, the no action alternative. However we believe that Alternative 3 will better address pressing issues such as water quality, and will better meet the purposes of the Refuge both by providing a wider array of habitats and by improving habitat quality.

Comment 7.9: BLWMA is a key component of the Bear Lake ecosystem that should be allowed to develop naturally. Changing water regimes or hunting areas are untested and results are questionable. Understand that all wetlands go through the eutrophication process and to spend large sums of money to fight mother nature is ridiculous. Just manage it correctly and all the rest will follow.

Service Response: In regard to your comment that "BLWMA is a key component of the Bear Lake ecosystem that should be allowed to develop naturally:" Bear Lake is a National Wildlife Refuge (NWR) not a Waterfowl Management Area (WMA). The Service agrees that the Refuge is a key component of the Bear Lake ecosystem as well as the larger Bear River watershed. However, the Refuge has that status largely because of the man-made diversion of the Bear River through the Refuge. Although silt loading and eutrophication are natural processes, these processes may be accelerated and exacerbated by human actions. Refuge management seeks to provide habitat that meets the requirements of a diverse suite of wildlife species; often this means mitigating the effects of human actions. Changing the waterfowl hunting area was considered in Alternative 2, but ultimately we selected Alternative 3 (which retains the existing hunting area) as the Preferred Alternative. Changing the hunting area would have reduced the acreage available to hunt to 5,800 acres (32% of the Refuge).

8. Malone Hemmert

Comment 8.1. I prefer Alternative 1 (No Action alternative).

Service Response: We acknowledge your support of Alternative 1, the no action alternative. However we believe that Alternative 3 will better meet the purposes of the Refuge both by providing a wider array of habitats and by improving habitat quality.

Comment 8.2: Is there compensation available to adjacent landowners flooded because of high waters on the Refuge during calendar year 2011?

Service Response: The issue of compensation for flooding on private lands adjacent to the Refuge is outside the scope of this CCP. The affected landowners will be contacted regarding this issue independent of the CCP process.

Comment 8.3: Look at grazing on the Refuge again. The Refuge is wasting resources: drowning out grasses that could be grazed or hayed; using fertilizer that could be provided by cattle. Use grazing and haying instead of burning. Haying and grazing benefit the local economy.

Service Response: Please see response to Dean Ward and Sons (Comment 4.2 above), regarding Refuge grazing and haying. Temporary flooding is a natural process in wet meadows and shallow wetlands, which in turn causes a flush of invertebrates in spring that benefit a wide variety of bird species. Haying, grazing, and burning are all strategies that may be used to provide desired habitat conditions on Refuges and control weeds; but not all are appropriate or equally effective, based on site conditions.

We agree that haying and grazing on refuges can be beneficial to the local economy. However, before these or any other economic uses can be allowed on a refuge, science must support them as beneficial to the refuge-specific habitat and wildlife conditions. Grazing on Bear Lake NWR was determined to be incompatible in 1993 (see Response to Comment 4.2 above). Haying was determined to be compatible; however in the Draft CCP we propose a gradual reduction in hayed area over 15 years to provide more tall-stature wet meadow habitat on the Refuge (a habitat type that is currently rare in the Bear Lake Valley) to benefit a larger number of wildlife species.

Comment 8.4: Trapping for muskrat would be more beneficial and better for the local economy. There are not as many muskrat on the Refuge as when they were trapped.

Service Response: Trapping ceased on Refuge lands when the Refuge was established in 1968. When Congress establishes a Refuge, it is closed to all public uses unless and until management opens the Refuge. Public uses are allowed on Refuges only after following appropriateness and compatibility determination procedures and policies. While trapping on refuges can be beneficial to the local economy, before this economic use can be allowed on a refuge, science must support it as beneficial to the refuge-specific habitat and wildlife conditions. A few people have requested that the Refuge allow trapping. At this time, management does not have the science-based studies necessary to support the benefits to wildlife, of opening the Refuge to trapping. We agree that there are fewer muskrats on the Refuge than there were historically. We also believe that the lower muskrat populations seen on the Refuge are a result of long-term changes in habitat (including both changes to wetland hydrology and drought). We believe that higher muskrat populations on the Refuge would be beneficial to a diverse group of wildlife species, since muskrats open up areas of dense wetland vegetation, thereby providing the mix of dense vegetation and open water preferred by many wildlife species.

9. Lee Ream

Comment 9.1: I am 80 years old and have used the refuge ground for a long time. Birds do not feed in tall refuge!! They like to feed and land [in areas] that has been mowed and close to the ground where they find food! They nest in tall grasses and go where the vegetation is removed to feed and travel with their young! Birds need less water and more area to feed in to stay off private ground. We need to cut more areas in the refuge and not to close down Hay Ground that has been used for many years.

Service Response: Please see responses to Dean Ward and Sons and Malone Hemmert above. We agree that some species of birds, for example Canada geese, prefer to feed on short grass provided by haying. As you also note, waterfowl require tall grasses for nesting. The Refuge also provides habitat that meets the needs of many species of waterfowl, waterbirds, and landbirds. For example, many species of ducks and waterbirds require a mixture of open water and tall bulrush/cattail to nest and rear their broods. Colonial nesting birds like white-faced ibis may forage in short grass habitat but require dense stands of bulrush for nesting. One of the Refuge’s most important roles, regionally, is providing secure nesting habitat for colonial waterbirds. Other birds, such as white pelicans, use large open water areas for roosting or foraging. The Refuge’s open water habitat supports less wildlife than it could, largely due to carp, which uproot aquatic vegetation, and siltation. By reducing carp populations and siltation, habitat management strategies proposed in the Preferred Alternative could improve habitat quality in open water areas, resulting in increased growth of aquatic vegetation and consequently, increased bird use.

Comment 9.2: You do a good job in running the Refuge!

Service Response: Thank you for your comment.

10. Todd Bateman

Comment 10.1: It is a poor society when birds and fish are put before human life. I believe the refuge should allow public use as well as agricultural production in the future. The refuge is set aside for the wildlife and then the wildlife [go to] habitat on the private property where haying and livestock grazing take place. This indicates that maybe to enhance the wildlife, management could apply practices demonstrated to be successful for a number of years.

Service Response: The Service acknowledges that wildlife use private lands that are used for hay and livestock production. We also agree that haying, and in some cases grazing, can produce short-grass habitat that benefits certain species. Accordingly, haying, grazing, and farming occur on National Wildlife Refuges throughout the US. However under law and policy each refuge must determine if these uses are appropriate and compatible based on the purposes of the Refuge and local conditions. Grazing was determined to be incompatible at Bear Lake NWR in 1993; however, haying and growing crops were found to be compatible and continue to occur on the Refuge to this day. Where and how these uses occur are described in Compatibility Determinations that analyze local conditions and the needs of wildlife species. The Compatibility Determinations for haying and farming on Bear Lake NWR and the Oxford Slough WPA are included in the Draft CCP/EA (Appendix B).

However, while lands managed for hay production or livestock use may support species of wildlife that prefer short-grass conditions during certain stages of their life cycles (for example Canada geese), it does not support species that require tall grass conditions for foraging and nesting. Even those species that do forage in short-grass habitat usually require other adjacent habitats to meet all of their life history needs (for example, nesting, roosting, or brood rearing). Therefore, Refuge management attempts to provide the broadest possible array of habitats that meet the needs of a diverse suite of wildlife species, and particularly focusses on providing habitat types that are currently rare or limited in a highly modified landscape. For example, wetlands occupied about 25,000 acres in the Bear Lake Valley prior to settlement (DCCP 3-23). Wetlands have been reduced to about 18,000 acres – the size of the Refuge. Tall stature wet meadows were once a common habitat type in the Bear Lake valley. They are currently a limited habitat type in the valley (while hayed and grazed lands are abundant) and therefore, increasing the amount of unhayed wet meadows on the Refuge is emphasized in the Preferred Alternative.

11, 12, 13. PacifiCorp Energy (Mark Stenberg)

Note: Comments and Service responses to these three submittals are combined here, since the second and third submittals provides specifics on general comments in the first.

Comment 11.1: Contrary to statements in the Draft CCP/EA, PacifiCorp has not been involved in its development. In Appendix K . . . Mark Stenberg is listed as an extended team member on the Draft CCP/EA team; however . . . he has not been involved in any of the roles listed for extended team members.

Service Response: Mr. Stenberg’s name was included as an extended team member in error. His name has been removed from the list of extended team members in Appendix K. We appreciate Mr. Stenberg’s thorough review of the Draft CCP/EA and have made a number of changes to the CCP based on his comments (see below). In Actions Common to All Alternatives, we note that the Service currently does, and will continue to, work with PacifiCorp to maintain optimal water levels for wildlife and habitat on Bear Lake NWR while abiding by the stipulations of the Bear River Compact and the Agreement of 1968 between PacifiCorp and the Service.

Comment 11.2: Statements made in the plan about fish passage at PacifiCorp facilities give the impression that IDFG, PacifiCorp and USFWS had had extensive conversions about these ideas, which is not the case.

Comment 11.3: The Draft CCP/EA has not sufficiently evaluated the environmental effects of fish passage . . . to aquatic species that will occur when previously separate fish populations can migrate above and below the identified diversion structures/dams.

Comment 11.4: On pages 2-7, 2-28, and 2-58, we request rewording of the following [two] statements [strategies]:

1) "Participation in Fish Passage Projects. The Refuge would work in partnership with PacifiCorp and the Idaho Department of Fish and Game to construct four fish passage ladder projects on Bear Lake NWR (Rainbow Bridge; Paris Creek, Paris Dike, and Bloomington Creek) to increase fish spawning passage and reconnect the two most genetically viable populations of Bonneville cutthroat trout in the Bear River by 2027."

2) "In partnership with PacifiCorp, and Idaho Department of Fish and Game, construct 4 fish passage ladder projects on Bear Lake NWR (Rainbow bridge; Paris Creek, Paris Dike, and Bloomington Creek) to increase fish spawning passage and reconnect the 2 most genetically viable populations of Bonneville cutthroat trout in the Bear River by 2027" throughout the document to change this to a goal to study and consult on the effects of passage. Suggest changing wording to something like this, "The refuge will work in partnership with PacifiCorp and IDFG to study and consult on the effects of fish passage at irrigation diversion and water control structures within the refuge."

Service Response to Comments 11.2-4: We agree that both study of effects of fish passage and consultation with PacifiCorp would be needed before any fish passage projects could be initiated on Bear Lake NWR. Therefore the first statement (Draft CCP, page 2-7; Final CCP, page 2-10) has been replaced with: "The Refuge will work in partnership with PacifiCorp and the Idaho Department of Fish and Game to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge."

The strategy on page 2-28 of the Draft CCP (page 2-24 of the Final CCP) and repeated on page 2-58 of the Draft CCP (page 2-45 of the Final CCP) has been replaced with the following strategy: "The Refuge will work in partnership with PacifiCorp and the Idaho Department of Fish and Game to study and consult on the effects of fish passage at irrigation diversions and water control structures within the Refuge."

Comment 11.5. There are other inaccuracies in the plan concerning PacifiCorp's rights and obligations, property, and operations that need to be corrected . . .

Service Response to Comments 11.5: We appreciate PacifiCorp's thorough review of the Draft CCP/EA. We have made the requested corrections to factual errors, and have added language clarifying or further explaining the Refuge's current and proposed water management, and the rationale for proposed changes. These are listed in Table 1 below.

Comment 11.6: Note [on page 2-10]: PacifiCorp habitat enhancement grants are available in an action area along the Bear River that starts at the confluence of Outlet Canal and the Bear River and goes south to the Utah border. Tributaries in this reach are included. Project funding outside of this action area can be approved by PacifiCorp [if] supported by the Bear River Hydro Electric Project Environmental Coordination Committee [ECC].

Service Response: Management is aware of PacifiCorp's ECC program both inside and outside of the "action area" and in the past USFWS has used this funding for private lands projects.

Comment 11.7: [Page 2-10] Does the FWS have a plan or strategy for control of Phragmites within the refuge?

Service Response: Control of noxious and invasive weeds is covered in the Refuge's IPM Plan (Appendix F) and is a strategy common to all alternatives. While this section of the Draft CCP was written before Phragmites (or common reed, *Phragmites australis*) was classified a noxious weed by the State of Idaho, the plan includes the use of a variety of strategies that are applicable to the control of Phragmites. The Refuge actively controls Phragmites on its lands and will update references to Phragmites in the CCP to reflect that is now classified as a noxious weed in Idaho, and included in the Statewide Control List.

Comment 11.8: [We concur with the statement on] page 2-41, "Therefore the more realistic desired condition proposed in this CCP is to promote 100% coverage in high clarity open water habitat in impounded wetland units, at the Thomas Fork Unit, and at Oxford Slough WPA, while accepting <50% coverage in Mud Lake."

Service Response: Thank you for your comment.

Comment 11.9 The statement on page 2-42 [3rd paragraph] "Until the Mud Lake Unit can be subdivided into smaller impoundments" is similar to the fish passage statements. No consultation with PacifiCorp has occurred. These smaller impoundments could result in even more sediment being "delivered" into Bear Lake. This needs to be reworded as a goal to study and consult on the effects of creating smaller impoundments in Mud Lake.

Service Response: The strategy under the Preferred Alternative (page 2-41) states that we would implement feasibility studies on techniques to further reduce sediment loading within the Mud Lake Complex, and present recommendations by 2020. We would consult with PacifiCorp in developing recommendations. The statement on page 2-42 of the Draft CCP (page 2-32 of the Final CCP) has been replaced with: "The Refuge will work in partnership with PacifiCorp and other stakeholders to study and consult on the effects, desirability, and feasibility of reducing sediment loading in the Mud Lake Unit."

Comment 11.10: Check map 9 [on page 3-19] for accuracy.

Service Response: To the best of our knowledge, this map is accurate.

Comment 11.11: Would recommend reviewing the Utah plan to confirm this information [on Page 3-22] is still accurate.

Service Response: We have reviewed the Utah plan ("Bear River Basin: Planning for the Future," part of the Utah Water Plan) at following website: http://www.water.utah.gov/planning/SWP/bear/bearRiver-1A.pdf; the information on page 3-22 in the Draft CCP appears to be current.

Comment 11.12: Please describe the local community based working group referenced on page 3-27 ["The 510 acre St. Charles Creek Unit is a direct result of a local community based working group developed to promote restoration of the Bear Lake Bonneville cutthroat trout fishery (BCT)."]

Service Response: A description of the St. Charles Creek Working Group and the Refuge's coordination with this group has been added to the CCP (page 3-27).

Comment 11.13: From a reviewer's perspective there seems to unnecessary levels of cut and paste in the document.

Service Response: We acknowledge that there is some redundancy between chapters. We repeated certain information rather than incorporating it by reference, to allow readers to better follow the discussion in each chapter (rather than having to flip back and forth between chapters to find relevant material).

Comment 11.14: Throughout the document, as in these paragraphs there is considerable discussion about Mud Lake water quality and the habitat issues it is reported to create. . . . The concern about alteration of natural conditions is raised numerous times in this document which seems somewhat incongruous with statements here about the desire to modify the natural vegetation but having inadequate budget to do so.

. . . In contrast to the apparent water quality issues, the benefit of the availability of water because of the diversion of the Bear River and its storage in Mud Lake and Bear Lake and its movement through Rainbow and Outlet Canals is discussed in the document as it allows the refuge many opportunities to move water, flood areas and create enhanced bird reproduction habitat that would not be available without the current water management system. Some reconciliation of these somewhat contradictory statements may be warranted. Also inclusion of the amount of additional marsh that was created through the diversion of the Bear River could help with this discussion.

Service Response: We have added clarifying language that acknowledges the benefit of the reliable source of water for Refuge wetlands (see table below). While redirection of the Bear River has resulted in a reliable source of water for the Refuge, it has also resulted in excessive sediment deposition throughout the Mud Lake system. We have added language to the Alternatives stating that we will work in partnership with PacifiCorp and other stakeholders to study and consult on the effects, desirability, and feasibility of reducing sediment loading in Mud Lake. The hydrologic regime is altered from what it was historically. Wetlands north of Bear Lake proper were fed by undiverted streams, snowpack, and rainfall. The historically high spring runoff has been replaced with water levels that are regulated annually (rather than seasonally) by storage of spring runoff and release of this stored water in summer. We cannot return to the hydrologic conditions that existed before settlement of the Bear Lake Valley. Bear Lake NWR represents a modified system that is managed to mimic historic conditions. We must, working with all our partners, manage water levels on the Refuge to provide the most favorable conditions for the target habitats and wildlife species, balanced with all the other beneficial uses of the water. We also use prescribed fire and other treatments to create desirable habitat conditions and control invasive species, such as carp.

Comment 11.15. Fluctuations in the marsh [described on page 4-8] did not occur historically because historically, much of the marsh did not exist.

Service Response: We disagree with the statement that historically, much of the Bear Lake marsh did not exist. The wetland-marsh-open water area (not including Bear Lake proper) covered 25,000-30,000 acres before people started settling the valley and diverting water (Draft CCP, page 3-23).

Comment 11.16. Much of the following narrative [page 4-11 on] on historical practices/ management, etc., in this section and others seems to not add to the points that are trying to be made. What year was [the drawdowns described on pages 4-13, 14]? Did they work? If so, why are we changing management now? If not, why are we detailing them here? What purpose do these year by year comments serve here? Again, suggest reducing wordiness so the points can be more clearly made. Do we need this level of detail, especially as it is in large part a repeat from earlier sections of the document? What is the purpose of this narrative?

Service Response: The Draft CCP/EA serves not only to describe alternatives for future management, but also serve as a reference for future refuge managers. We have, therefore, included this narrative to describe as completely as possible how the Refuge has been managed in the past. The narrative in Chapter 4 describes how the Refuge has been managed in the past during a drought situation and with the cooperation of PacifiCorp. It can be used as an example of how the Refuge might be managed in future drought situations.

We agree that additional rounds of editing would have resulted in a more concise document, but decided not to undertake additional editing in the interests of a timely release of the Draft CCP/EA for public review and comment.

Comment 11.17: [It] might be good to reference the actual water rights and their details (season and amount) here [page 5-23].

Service Response: Interested parties can obtain water right information from the Refuge or the Idaho Department of Water Resources.

Corrections Incorporated: (Note: D= page number in Draft CCP; F= page number in Final CCP.)		
Page (s)	**Original Text**	**Revised Text**
1-1, 4-8, 4-9	Telluride Canal Company	Telluride Power Company
1-24	"In 1911, a canal was constructed that now diverts almost all the water in the Bear River at Stewart Dam …"	*Change to*: "In 1911, the Dingle inlet canal was constructed, which diverted almost all the water in the Bear River southward to Mud Lake. (Later, Stewart Dam and the Rainbow Inlet canal were constructed to divert the Bear River water. The Dingle inlet canal is now used as an irrigation canal.)"
D 2-3, F 2-5	"The Refuge and PacifiCorp work together to maintain optimal water levels for wildlife and habitat on the Refuge while abiding by the stipulations of the Bear River Compact and the Rainbow Decree (Appendix N)."	*Change to*: "The Refuge and PacifiCorp work together to maintain optimal water levels for wildlife and habitat on the Refuge while abiding by their 1968 agreement and applicable laws related to PacifiCorp's operations (Appendix M)."
D 2-39, F 2-32	*Strategy under No Action Alternative:* "Maintain a stable average water elevation of 5,920.5' . . ."	*Add* +/- 0.5 feet *after 5,920.5'* *No Action Alternative not included in Final CCP, but this statement has been added to Objective 1.1 Rationale to describe current management.*
D 2-42, F 2-32	minimum elevation (app. 5,920' UP&L datum)	(app. 5,920.5' UP&L datum)
3-18	Telluride canals	Dingle Inlet canals
3-21	"Figure 3.2 (from Lamarra et al. 1986) depicts the … (Palacios et al. 2007a)." (2 sentences)	*Change to*: "Figure 3.2 (from Lamarra et al. 1986) documents water levels in Bear Lake proper as a reservoir from 1915 to 2005. Highest annual input from the Bear River occurred in 1980 at 450 million cubic yards; lowest in 1977 at 15.8 million cubic yards (Palacios et al. 2007a). Water entering the Bear Lake system is primarily from diversion of the Bear River with some water coming from streams, springs, and precipitation (Palacios et al. 2007a)."
3-21	Paragraph 3, starting with "During dry years . . ."	*Change to:* "During an extended drought, PacifiCorp uses over 20 vertical feet of Bear Lake for supplemental irrigation downstream. Hydroelectric power is produced incidentally, as a secondary benefit, after the water is released from Bear Lake for irrigation or flood control. This release, along with the natural flow of the Bear River, passes through five on-river hydropower stations along the Bear River Basin. (A sixth plant, the Cove Dam, was decommissioned and removed in 2006.) The five remaining hydroelectric developments are Last Chance, Soda, Grace, Oneida, and Cutler. These are all part of the Bear River Hydro Project."
3-22, O-3	*3-22* UDWR 2005 *3-22 (2 instances), O-3* BLRC 1997	*Change* (UDWR 2005) *to* (UDWR 2000) *Change* (BLRC 1997) *to* (BRC 1997)
3-22, 4-36	*3-22, 1st paragraph:* "PacifiCorp merged with UP&L in 1989 (UP&L is now a wholly owned subsidiary of PacifiCorp) and currently controls the operation of Bear Lake portion of the Bear River Compact . . . Since the mid 1960s, UP&L has operated Bear Lake at an elevation of 5918	*Change to:* "PacifiCorp merged with UP&L in 1989; the resulting company is currently called PacifiCorp and controls the operation of Bear Lake . . . Since the mid 1960s, UP&L, and later PacifiCorp, operated Bear Lake to a target elevation of 5,918 feet for flood control purposes (BRC 1997; Bear River operations agreement, 2000)."

Corrections Incorporated: (Note: D= page number in Draft CCP; F= page number in Final CCP.)		
Page (s)	**Original Text**	**Revised Text**
	feet (BLRC 1997)." *4-36, 5th paragraph*: "(now a wholly owned subsidiary . . .)"	*Change to:* ("which merged with PacifiCorp in 1989)"
3-22, 4-36	*3-22 2nd paragraph; 4.36 5th par:* "The Dietrich Decree of 1968 between Utah Power and Light Company . . ."	*Change to:* "The 1968 Agreement between PacifiCorp . . ."
3-24, 4-13-15	UP&L/Utah Power and Light Company	*Changed to* PacifiCorp, *unless referring to events occurring before 1989 when UP&L merged with PacifiCorp*
3-24	1968 Rainbow Ditch Agreement	1968 Agreement
3-27	"Through a 1968 MOU …"	*Change to*: "Through the 1968 Agreement . . ."
3-37	"To accomplish this PacifiCorp has established a late winter lake target elevation of 5918 to assist in spring flood mitigation, leaving a buffer of 5.56 feet of 390,000 acre-feet for basin flood control each year."	*Change* 5,918 to 5,916 to 5,920 *Add to end of sentence:* "at the typical elevation of 5,918."
4-21	*Last paragraph*, " . . .an opportunity to get 6,000 feet of power line properly marked. Power line marking was completed by UP&L in July on 1996."	*Change to:* " . . .an opportunity to get 6,000 feet of power line outfitted with avian diverters. Installation of avian diverters on the power line was completed by PacifiCorp in July 1996."
K-2	Table of extended team members	*Remove* Mark Stenberg
O-31	UDWR 2005	*Change to:* UDWR 2000
O-33	USGS 2006	*Insert line break between this reference and* USU 1995
Editorial Comments Incorporated:		
	Original Text	**Revised Text**
1-36	*Under heading Sedimentation (Bear Lake NWR):* "Because the Refuge serves as a storage basin for irrigation use in the lower Bear River, water quantity is not a problem."	*To clarify this statement, add after this sentence:* "Allen (2011) found that the majority of total suspended solids (TSS) and total phosphorus (TP) loading entered the Refuge from the Bear River. As flows moved across the Refuge marsh (Dingle Swamp), the loading of TSS and TP was greatly reduced. Allen (2011) cites studies on the impacts of TSS on the aquatic food web, on fish gills, and on the channelization of wetlands. Allen (2011) notes that TSS can also be a pathway for other pollutants. Allen (2011) notes that excess nutrients (like phosphorus) can cause over-fertilization (eutrophication) of water bodies. Allen's 2011 thesis can be consulted for references on several past efforts to study the potential impacts of Bear River water on Bear Lake proper and on the Refuge."
1-36,; D 2-42, F 2032	"The Refuge maintains an agreement with PacifiCorp (the primary water rights holder), through which target elevations are set, at the Refuge's request, to meet wildlife	*To clarify this statement, change to:* ". . . target elevations are maintained within one-half foot of the 5,920.5-foot elevation, subject to the Bear River Compact, irrigation needs, and flood control."

Corrections Incorporated: (Note: D= page number in Draft CCP; F= page number in Final CCP.)		
Page (s)	**Original Text**	**Revised Text**
	requirements."	
D 2-3, F 2-5	"The Refuge and PacifiCorp work together to maintain optimal water levels for wildlife and habitat on the Refuge . . ."	*To clarify the meaning of "optimal" insert:* "In this context, management defines "optimal" as those water levels providing the most favorable conditions for the target habitat and species. For example, for waterfowl production, water levels should remain relatively stable throughout the breeding season and be neither so low that predators have easy access to nests, nor so high that suitable nesting habitat is reduced."
D 2-39, D 2-42, F 2-32	*Draft CCP, Strategy under Current Management (2-39); Rationale (2-42)*; Final CCP, Rationale (2-32): "Maintain a stable average water elevation on 5920.5' . . ."	*To clarify current management and constraints, add:* "Note: During seasons with very high runoff it can be difficult to maintain a stable water level."
D 2-41, F 2-32	*Rationale:* "While the refuge desired condition is to convert approximately 50% of baseline open water habitat to submergent aquatic habitat, this objective cannot be achieved until mechanisms to control sediment deposition and carp movement in Mud Lake are developed."	*To clarify rationale, insert after this sentence:* "Management believes that as technology advances, techniques are and will become available to exclude carp and sediment while allowing passage of Bonneville cutthroat trout and other desirable fish species."
D 2-42, F 2-32	*Rationale:* "Because it [Mud Lake] serves as a storage basin . . ."	*Replace sentence with:* "Mud Lake and Bear Lake proper are operated as one unit by PacifiCorp and together they serve as a storage basin for irrigation use in the lower Bear River."
D 2-42, F 2-32	*Rationale:* "… surprisingly, several species have adapted to these conditions and preferentially select the Mud Lake Unit to fulfill certain life history events."	*Change to:* "… anecdotally, several species appear to select the Mud Lake Unit over other units to fulfill certain life history events. These observations warrant further study."
D 2-42, F 2-32	*Rationale:* "Until the Mud Lake Unit can be subdivided into smaller impoundments, it would appear that proposed normal/drought simulations would be the more appropriate management strategy for the Mud Lake Unit . . ."	*For consistency with strategy on page 2-41, replace with:* "The Refuge will work in partnership with PacifiCorp and other stakeholders to study and consult on the effects, desirability, and feasibility of reducing sediment loading in the Mud Lake Unit."
3-16	"Man made dams and canals now divert the Bear River . . ."	*Add to end of sentence:* ", which is also now used for flood control."
3-18	"Bear Lake's 8,000- year isolation … into Dingle Marsh (now Bear Lake NWR)."	*Replace with:* "Bear Lake, the Dingle Marsh, and the Bear River have been connected to each other at various times throughout prehistory. Their most recent separation occurred about 8,000 years ago and has endured until the Bear Lake project came to fruition. This project, consisting of inlet and outlet canals, control structures and pumps, was begun around 1907 and completed in 1918."
3-18	"In 1911 the Telluride Power Company completed a … releases (USU 1995)." *(last 2 sentences of 3rd paragraph)*	*Deleted*

Corrections Incorporated: (Note: D= page number in Draft CCP; F= page number in Final CCP.)

Page (s)	Original Text	Revised Text
	"The Utah Power … outflow. These structures … Bear Lake (Palacios et al. 2007a)." *(4th paragraph)* "At Stewart Dam … cubic feet per second." *(2nd sentence of 5th paragraph)*	
3-21	"However the Commission does not get involved in the operation of the river unless conditions exist that trigger provisions of the Compact. Rights to direct flow in the three administrative diversions of the Bear River is administered by the contributor state under state law."	*Change to:* "However the Commission is not directly involved in the operation of the river unless conditions exist that trigger provisions of the Compact. Rights to direct flow in the three administrative divisions of the Bear River is administered by the states under state law."
3-30	*1st paragraph beginning* "Mud Lake serves as the turning basin . . ."	*Add sentence to 1st paragraph:* "Mud Lake and Bear Lake proper are operated by PacifiCorp as one unit in terms of water storage."
4-8	"While small scale diversion from the Bear River to produce meadow hay likely occurred during the late 1800s, it wasn't until the early 1900s that there was substantial modification to the system." "The Utah-Idaho Sugar Company bought rights to the Bear River . . ." "The Bear River has not naturally entered Bear Lake for roughly 12,000 years." "In the late 1800s irrigators conceived a plan to divert the Bear River . . ."	*Change to:* "While small scale diversion from the Bear River to produce meadow hay likely occurred during the late 1800s, it wasn't until 1909 to 1918 that the Stewart Diversion Dam, the Rainbow Inlet Canal, the Outlet Canal, and the Lifton Pumping Plant were built." *Change to:* "The Utah-Idaho Sugar Company secured rights to the Bear River . . ." *Change to:* "The Bear River was joined and disconnected to Bear Lake, Mud Lake, and the Dingle Marsh several times throughout the geologic history of the system. During the last 8,000-12,000 years, the Bear River has been separated from the lake and marsh." *Change to:* "In the late 1800s developers conceived a plan to divert the Bear River . . ."
4-9	*3rd paragraph, last sentence* *4th paragraph, sentence starting* "Unfortunately, redirection of the Bear River has resulted in excessive sediment deposition . . ." *5th paragraph, 2nd sentence*: "The natural frequency and intensity of fire in the Dingle Marsh has been all but eliminated through the absence of long-term drought and associated lack of dry residual material to carry fire."	*To clarify meaning of "relatively sterile wetland ecosystem," add:* ". . . resulting in limited productivity of aquatic vegetation and waterfowl." *Change to*: "Redirection of the Bear River has resulted in a reliable source of water for the Refuge, but also excessive sediment deposition throughout the Mud Lake system." *Change to:* "The natural frequency and intensity of fire in the Dingle Marsh has been all but eliminated through the absence of long-term drought and associated lack of residual material dry enough to carry fire." *To clarify current fire management, add after this sentence:* "The natural role of fire in the Bear Lake Valley has been modified by human actions; however, Refuge management attempts to mimic natural fire regimes, where appropriate, through prescribed burns."
4-10	2. Sediment deposition occurs at great frequency	*Replace with:*

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Page (s)	**Original Text**	**Revised Text**
	where historically, deposition was not a formative factor; 4. Historically wide spring hydrologic fluctuations have been replaced by extreme fluctuations throughout the annual cycle; and 5. Absence of drought has led to less frequency of disturbance (e.g. fire) which has resulted in homogeneous emergent communities with excessive residual vegetation.	2. Sediment deposition occurs at a greater frequency than before the system was modified; 4. The natural spring high water runoff has been replaced with water levels that are regulated annually (rather than seasonally) by storage of spring runoff and release of this stored water in summer; and 5. Absence of drought has led to less frequency of disturbance (e.g., fire) which has resulted in homogenous emergent communities with excessive residual vegetation that is not dry enough to carry fire.
4-13	*4th paragraph*, "This struggle to keep water at respectable levels in the marsh . . ." *4th paragraph*, "UP&L" *5th paragraph*, "The benefits of a drawdown during this severe drought cycle outweighed the negative impacts and UP&L was instructed to pull boards at the Paris Dike . . ."	*Change to:* "This struggle to keep water levels in the marsh adequate for waterfowl needs . . ." *Change to: Change to:* "PacifiCorp (which merged with UP&L in 1989)" *Change to*: ". . . PacifiCorp was asked . . ."
4-14	*2nd paragraph*, "In late August several boards were pulled at the Paris structure . . ."	*Change to:* "In late August of 1990 . . ."
4-16	*3rd paragraph* "By allowing PacifiCorp to meet its downstream irrigation demands, we requested and were granted the opportunity to bring Mud Lake and our management units to a full pool level . . ." *Draft CCP, 4th paragraph, 3rd sentence* "Permission was obtained from PacifiCorp . . ."	*Insert after 2nd sentence:* "It is important for successful swan nesting to maintain a certain level of water throughout the summer. Other impoundments could be allowed to fluctuate more "naturally" with the existing drought conditions in 2003." *Change to:* "The Refuge requested and PacifiCorp granted the opportunity to bring Mud Lake . . ." *Deleted*
4-36	*Paragraph 4*, "Where the Bear River was once functionally isolated from the Bear Lake system . . . These have resulted in numerous, and mostly undesirable, changes to habitat structure and function . . ." *Draft CCP, Paragraph 6, 1st sentence*: "In normal water years . . ." *Paragraph 6*, "Also, silt laden Bear River water	*Change to:* "Where the Bear River was functionally isolated from the Bear Lake system in the recent geologic past . . . These have resulted in numerous changes to habitat structure and function . . ." *Deleted* *Change to:* "Silt laden Bear River water now enters the Refuge . . ."

Corrections Incorporated: (Note: D= page number in Draft CCP; F= page number in Final CCP.)		
Page (s)	**Original Text**	**Revised Text**
	now enters the Refuge . . .” “This combination creates a relatively sterile wetland ecosystem.”	*To clarify meaning of “sterile” add to end of sentence:* “. . . resulting in limited productivity of aquatic vegetation and waterfowl.”
I-3	Acronym UP&L	*Add* “now PacifiCorp”
App O, Refs	*Add to References:* Allen, Cody M., "Seasonal Transport of Suspended Solids and Nutrients Between Bear River and Bear Lake." (2011). All Graduate Theses and Dissertations. Paper 1277. http://digitalcommons.usu.edu/edt/1277	*The reference has been added.*

Comment 14: Mark Gamblin, Regional Supervisor, Southeast Region, Idaho Department of Fish and Game

We believe Alternative 3 (Preferred Alternative) adequately addresses the service mandate to protect and sustain natural resources, habitats and migratory bird populations and provides emphasis on priority public use programs – hunting, fish[ing], wildlife observation, wildlife photography, environmental education, and interpretation. We also believe that the implementation of Alternative 3 would contribute substantial improvements to water quality, stream channel stability and overall riparian health, for the benefit of native Bonneville cutthroat trout and a variety of other important aquatic and terrestrial wildlife species and values.

Service Response: Thank you for your comments. We acknowledge your support of the Preferred Alternative, Alternative 3. We agree that this alternative will best support meeting the purposes of the Refuge (including the Thomas Fork Unit), including providing the Service's six priority public uses. Alternative 3 emphasizes the health of Bonneville cutthroat trout by working toward habitat quality and connectivity. Alternative 3 also stresses the importance of wetland habitat health and diversity to support a variety of wildlife, especially migratory bird populations.

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National Wildlife Refuge System Information
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The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

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Sandhill cranes
Justine Belson/USFWS

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White-faced ibis
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Sandhill crane on wing
Steve Emmons/USFWS