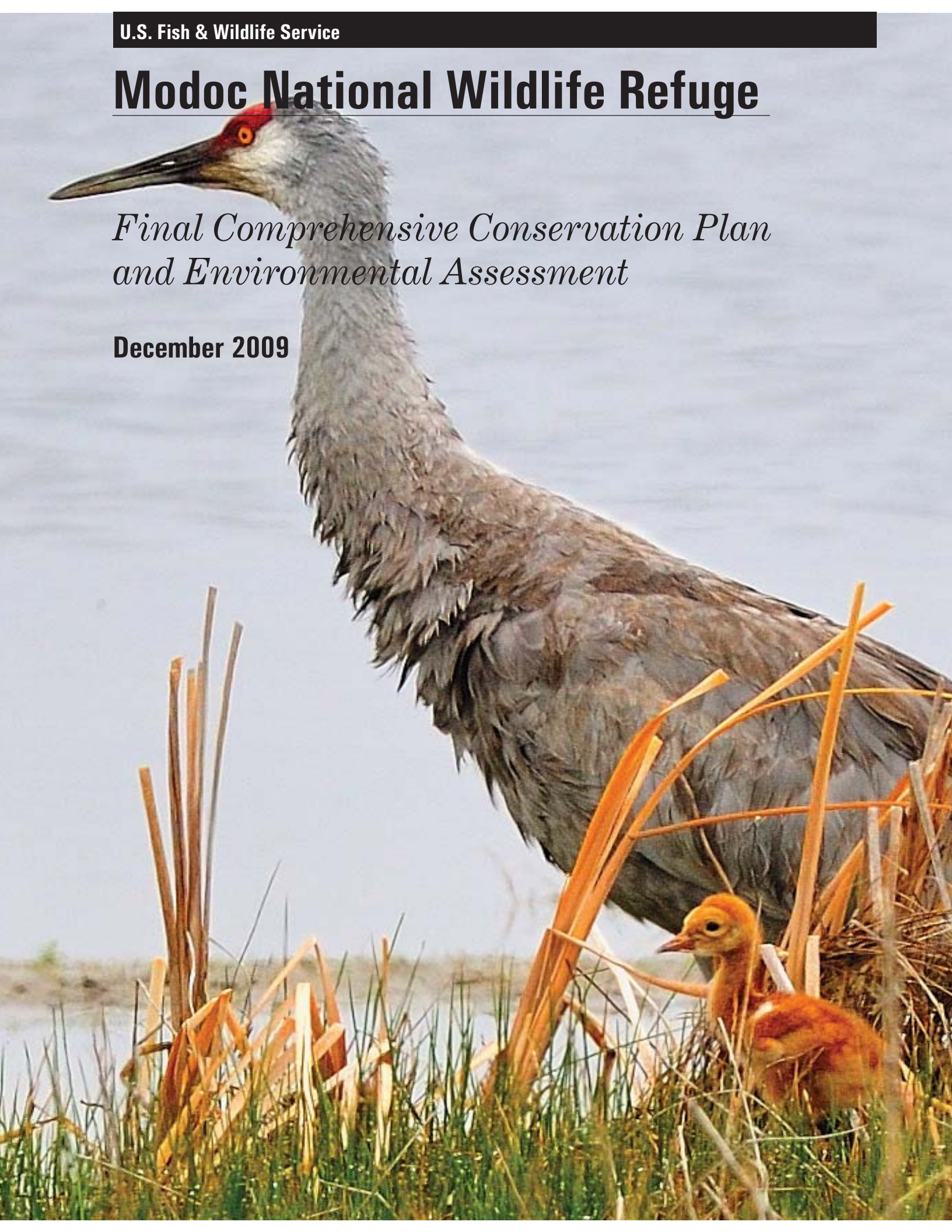
U.S. Fish & Wildlife Service

Modoc National Wildlife Refuge

Final Comprehensive Conservation Plan and Environmental Assessment

December 2009



Vision Statement

"Located near the confluence of the north and south forks of the Pit River, Modoc National Wildlife Refuge will conserve, restore, protect, and manage a mosaic of seasonal wetlands, semi-permanent wetlands, wet meadows, riparian, and sagebrush-steppe habitats. These habitats will provide important resting, feeding, and nesting areas for ducks, geese, and other migratory birds. Modoc Refuge's high- quality habitat will play a key role in the long-term recovery of Central Valley greater sandhill cranes.

As an integral part of the surrounding community, Modoc Refuge will provide high quality wildlife-dependent recreation including hunting, fishing, wildlife observation, photography, and interpretation. The Refuge will continue to be known for its high-quality environmental education program offered to generations of students. Visitors will develop a greater understanding and appreciation for the mission of the National Wildlife Refuge System and refuge management programs and for the importance of protecting lands for wildlife conservation."

Disclaimer

CCPs 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.

Modoc National Wildlife Refuge

Final Comprehensive Conservation Plan

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December 2009

Approved: _____ Date: 12-15-09
Acting Regional Director, Pacific Southwest Region

Implementation of this Comprehensive Conservation Plan and alternative management actions/programs have been assessed consistent with the requirements of the National Environmental Policy Act (42 USC 4321 et seq.)

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Acronyms

ADA	Americans with Disabilities Act
AHMP	Annual Habitat Management Plan
AHPA	Archaeological and Historic Preservation Act
APCD	Air Pollution Control District
ARPA	Archaeological Resources Protection Act
ATV	all terrain vehicle
BIDEH	biological integrity, diversity, and environmental health
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
BOR	U.S. Bureau of Reclamation
Cal Fire	California Fire (also, California Department of Forestry, CDF)
CCP	Comprehensive Conservation Plan
CD	Compatibility Determination
CDF	California Department of Forestry (also, Cal Fire)
CDFG	California Department of Fish and Game
cfs	Cubic feet per second
CFR	Code of Federal Regulations
CWA	California Waterfowl Association
DMBM	Division of Migratory Bird Management
DOI	Department of the Interior
DWR	Department of Water Resources
EA	Environmental Assessment
EE	Environmental Education
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
FTE	Full-time Equivalent
FY	Fiscal Year
GIS	Global Information System
GPS	Global Positioning System
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
IPM	Integrated Pest Management
IWJV	Intermountain West Joint Venture

MAPS	Monitoring Avian Productivity and Survivorship
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NOA	Notice of Availability
NRCS	U.S. Natural Resources Conservation Service
NWR	National Wildlife Refuge (also, Refuge)
NWRS	National Wildlife Refuge System (also, Refuge System)
PRBO	Point Reyes Bird Observatory, PRBO Conservation Science
PUP	Pesticide Use Permit
RCD	Resource Conservation District
Refuge	Modoc National Wildlife Refuge (also, Modoc NWR)
Refuge System	National Wildlife Refuge System (also, NWRS)
Service	U.S. Fish and Wildlife Service (also, USFWS)
Service Manual	Fish and Wildlife Service Manual
SHPO	State Historic Preservation Office
SUP	Special Use Permit
SWRCB	State Water Resources Control Board
T&E	Threatened and Endangered Species
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service (also, Service)
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
YCC	Youth Conservation Corps
WUI	Wildland Urban Interface

Chapter 1. Introduction and Background

1. Introduction

The U. S. Fish and Wildlife Service (Service) manages the Modoc National Wildlife Refuge (Refuge) located southeast of the town of Alturas in northeastern California (Figure 1). The Refuge contains critically important habitats for a great diversity of wildlife, particularly migratory birds of the Pacific Flyway.

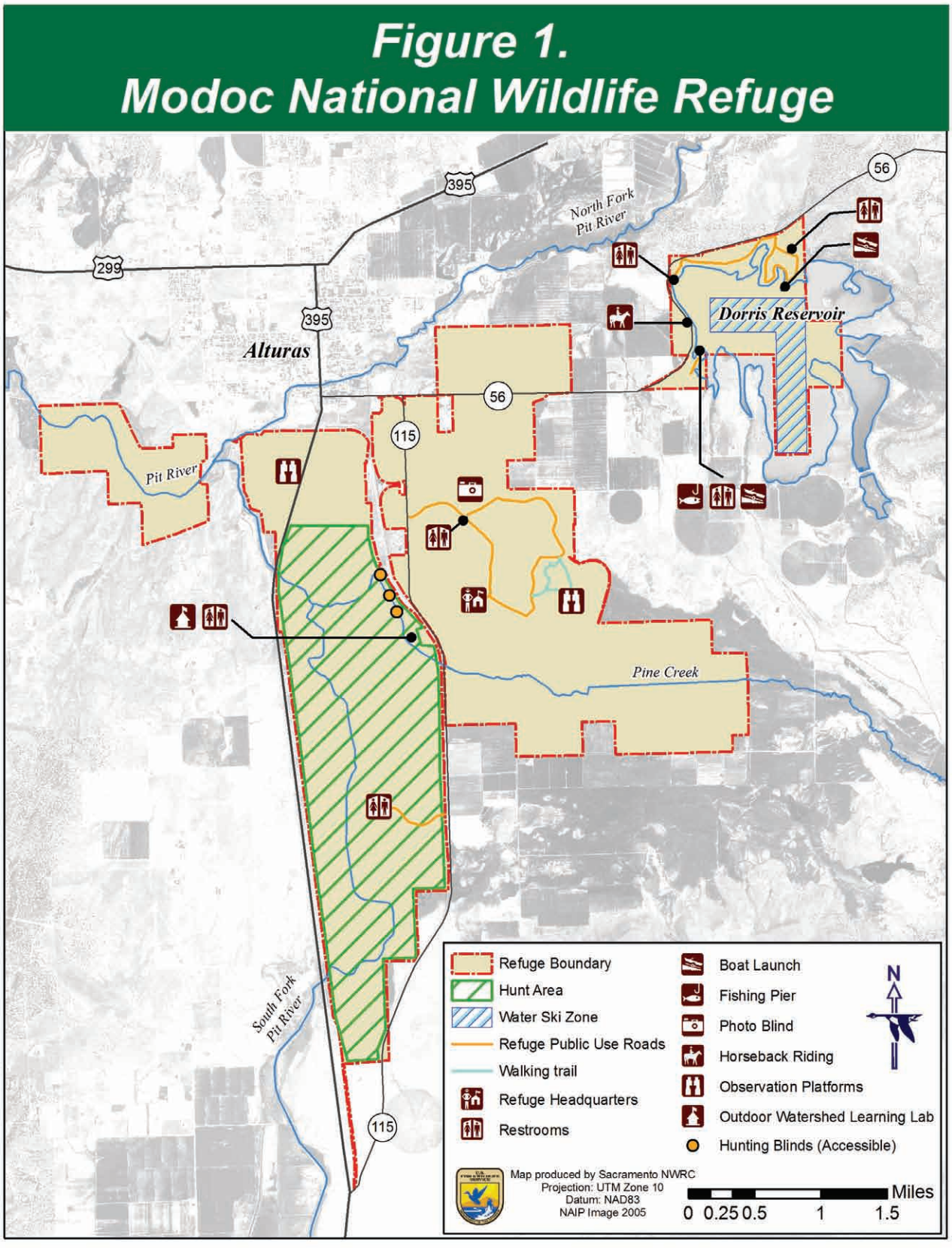
Sandhill Crane and Colt
Photo by Share The Road Productions

This document is a Draft Comprehensive Conservation Plan (CCP) designed to guide management of the Refuge for the next fifteen years. The CCP provides a description of the desired future conditions and long-range guidance to accomplish the purposes for which the Refuge was established. The CCP and accompanying Environmental Assessment (EA) address Service legal mandates, policies, goals, and National Environmental Policy Act (NEPA) compliance. The EA (Appendix A) presents a range of administrative, habitat management, and visitor services alternatives that consider issues and opportunities on the Refuge. The Service's initial proposal for future management of the Refuge is presented in the EA. Chapter 4 of the CCP describes the goals, objectives, and strategies for the Service's preferred alternative (Alternative C). The Final CCP will be developed through modifications made during the internal and public review processes.

The CCP is accompanied by six new plans: a Hunting Plan (Appendix C), Fishing Plan (Appendix D), Visitor Services Plan (Appendix E), Annual Habitat Management Plan (Appendix F), and Integrated Pest Management Plan (Appendix G). Other existing plans that will remain in place include a Fire Management Plan, Emergency Action Plan for Dorris Reservoir, Standard Operating Procedures for Dorris Reservoir, Disease Control Plan, Pest Control Plan, and Safety Plan.

The CCP is divided into five chapters: Chapter 1, Introduction and Background; Chapter 2, Planning Process; Chapter 3, Refuge Environment; Chapter 4, Planned Refuge Management and Programs; and Chapter 5, Management Plan Implementation.

Figure 1. Modoc National Wildlife Refuge



2. Purpose of and Need for Plan

Currently, the Refuge is guided by a Master Plan (U.S. Fish and Wildlife Service 1963). The National Wildlife Refuge System Improvement Act of 1997 (16 United States Code [USC] 668dd-668ee) (Improvement Act) requires that all refuges be managed in accordance with an approved CCP by 2012. Under the Improvement Act, the National Wildlife Refuge System (Refuge System) is to be consistently directed and managed to fulfill the specific purpose(s) for which each refuge was established as well as the Refuge System mission. The planning process helps the Service achieve the refuge purposes and the Refuge System mission by identifying specific goals, objectives, and strategies to implement on each refuge.

The purposes of this CCP are to

- provide a clear statement of direction for the future management of the Refuge;
- provide long-term continuity in Refuge management;
- communicate the Service's management priorities for the Refuge to their partners, neighbors, visitors, and the general public;
- provide an opportunity for the public to help shape the future management of the Refuge;
- ensure that management programs on the Refuge are consistent with the mandates of the Refuge System and the purposes for which the Refuge was established;
- ensure that the management of the Refuge is consistent with Federal, State, and local plans; and
- provide a basis for budget requests to support the Refuge's needs for staffing, operations, maintenance, and capital improvements.

3. Legal and Policy Guidance

National wildlife refuges are guided by the purposes of the individual refuge, mission and goals of the Refuge System, Service policy, laws, and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the Improvement Act, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual (Service Manual).

Refuges are also governed by a variety of other laws, treaties, and executive orders pertaining to the conservation and protection of natural and cultural resources (refer to Appendix I for additional information about these laws and executive orders).

3.1 National Wildlife Refuge System Improvement Act

The Improvement Act, which amends the National Wildlife Refuge System Administration Act of 1966, provides comprehensive

legislation on how the Refuge System should be managed and used by the public. The Improvement Act:

- identified a new mission statement for the Refuge System.
- established six priority public uses (hunting, fishing, wildlife observation and photography, environmental education and interpretation);
- emphasized conservation and enhancement of the quality and diversity of fish and wildlife habitat;
- stressed the importance of partnerships with Federal and State agencies, Tribes, non-governmental organizations, industry, and the general public;
- mandated public involvement in decisions on the acquisition and management of refuges; and
- required, prior to acquisition of new refuge lands, identification of existing compatible wildlife-dependent uses that would be permitted to continue on an interim basis pending completion of comprehensive conservation planning.

The Improvement Act establishes the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; requires a CCP for each refuge by the year 2012; and provides guidelines and directives for the administration and management of all areas in the Refuge System, including wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas.

Modoc National Wildlife Refuge
Photo by USFWS

3.2 Appropriate Use Policy

This policy describes the initial decision process the refuge manager follows when first considering whether to allow a proposed use on a refuge. The refuge manager must find a use appropriate before undertaking a compatibility review of the use. An appropriate use as

defined by the Appropriate Use Policy (603 FW 1 of the Service Manual) is a proposed or existing use on a refuge that meets at least one of the following four conditions:

- The use is a wildlife-dependant recreational use as identified in the Improvement Act.
- The use contributes to the fulfilling of 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.
- The use involves the take of fish and wildlife under State regulations.
- The use has been found to be appropriate as specified in Section 1.11 (603 FW 1 of the Service Manual).

If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. If a use is determined to be an appropriate refuge use, the refuge manager will then determine if the use is compatible (see Compatibility Policy section below). Although a use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or modify the use. Uses that have been administratively determined to be appropriate are the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation) and take of fish and wildlife under State regulations.

Chapter 5 of this CCP includes a review of appropriateness of existing Refuge uses and planned future uses.

3.3 Compatibility Policy

Lands within the Refuge System are different from other multiple use public lands in that they are closed to all public uses unless specifically and legally opened. The Improvement Act states, "... the Secretary shall not initiate or permit a new use of a Refuge or expand, renew, or extend an existing use of a Refuge, unless the Secretary has determined that the use is a compatible use and that the use is not inconsistent with public safety."

In accordance with the Improvement Act, the Service has adopted a Compatibility Policy (603 FW 2 of the Service Manual) that includes guidelines for determining if a use proposed on a national wildlife refuge is compatible with the purposes for which the refuge was established. A compatible use is defined in the policy as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the Refuge. Sound professional judgment is defined as a finding, determination, or

decision that is consistent with the principles of sound fish and wildlife management and administration, available science and resources (funding, personnel, facilities, and other infrastructure), and applicable laws. The Service strives to provide priority public uses when they are compatible. If financial resources are not available to design, operate, and maintain a priority use, the refuge manager will take reasonable steps to obtain outside assistance from the State and other conservation interests.

When a determination is made as to whether a proposed use is compatible or not, this determination is provided in writing and is referred to as a compatibility determination (CD). An opportunity for public review and comment is required for all CDs. For compatibility determinations prepared concurrently with a CCP or step-down management plan, the opportunity for public review and comment is provided during the public review period for the draft plan and associated NEPA document. The CDs prepared in association with this CCP are provided in Appendix B.

3.4 Biological Integrity, Diversity, and Environmental Health Policy

The Improvement Act directs the Service to "ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans..." To implement this directive, the Service has issued the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3 of the Service Manual), which provides policy for maintaining and restoring, where appropriate, the biological integrity, diversity, and environmental health of the Refuge System. The policy is an additional directive for refuge managers to follow while achieving the refuge purpose(s) and Refuge System mission. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuge and associated ecosystems. Further, it provides refuge managers with an evaluation process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions and restore lost or severely degraded components where appropriate and in concert with refuge purposes and the Refuge System mission. When evaluating the appropriate management direction for refuges, refuge managers will use sound professional judgment to determine their refuges' contribution to biological integrity, diversity, and environmental health at multiple landscape scales.

4. The U.S. Fish and Wildlife Service

The Service is the primary Federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. Although the Service shares this responsibility with other Federal, State,

Tribal, local, and private entities, the Service has specific responsibilities for migratory birds, threatened and endangered species, anadromous and interjurisdictional fish, and certain marine mammals. These are referred to as Federal trust species. The Service also manages the Refuge System and National Fish Hatcheries; enforces Federal wildlife laws and international treaties on importing and exporting wildlife; assists State fish and wildlife programs; and helps other countries develop wildlife conservation programs.

Mule Deer
Photo by USFWS

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."

5. The National Wildlife Refuge System

The Refuge System is the world's largest collection of lands and waters set aside specifically for the conservation of wildlife and ecosystem protection. The Refuge System consists of 548 national wildlife refuges that provide important habitat for native plants and many species of mammals, birds, fish, and threatened and endangered species.

The mission of the Refuge System, as stated in the Improvement Act, 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" (16 USC 668dd et seq.).

In 1903, President Theodore Roosevelt named Florida's Pelican Island the nation's first bird sanctuary, which, along with other sanctuaries and preserves, evolved into the National Wildlife Refuge System. Since that time, the Refuge System has grown to more than 97 million acres. It includes 548 refuges, at least one in every state and many U.S. territories, and over 3,000 Waterfowl Production Areas. The needs of wildlife and their habitats come first on refuges, in contrast to other public lands managed for multiple uses.

The goals of the Refuge System, as defined in the Refuge System Mission and Goals and Refuge Purposes Policy (601 FW 1 of the Service Manual) 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 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;
- 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); and
- foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Collectively, these goals articulate the foundation for our stewardship of the Refuge System and define the unique and important niche it occupies among the various Federal land systems. These goals will help guide development of specific management priorities during development of CCPs.

In addition, the guiding principles of the Refuge System are as follows:

- We are land stewards, guided by Aldo Leopold's teachings that land is a community of life and that love and respect for the land is an extension of ethics. We seek to reflect that land ethic in our stewardship and to instill it in others.
- Wild lands and the perpetuation of diverse and abundant wildlife are essential to the quality of the American life.
- We are public servants. We owe our employers, the American people, hard work, integrity, fairness, and a voice in the protection of their trust resources.

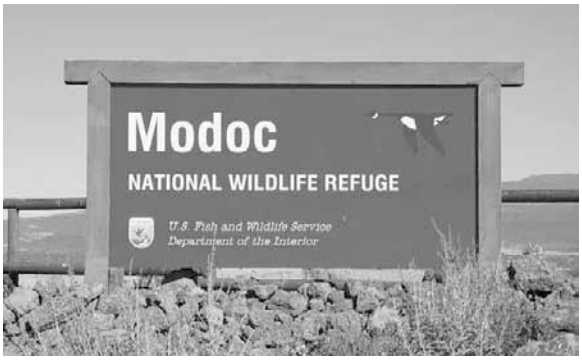
- Management, ranging from preservation to active manipulation of habitats and populations, is necessary to achieve Refuge System and Service missions.
- Wildlife-dependent uses involving hunting, fishing, wildlife observation, photography, interpretation, and education, when compatible, are legitimate and appropriate uses of the Refuge System.
- Partnerships with those who want to help us meet our mission are welcome and indeed essential.
- Employees are our most valuable resource. They are respected and deserve an empowering, mentoring, and caring work environment.
- We respect the rights, beliefs, and opinions of our neighbors.

6. Modoc Refuge

6.1 Introduction

The 7,021-acre Modoc Refuge is located along the South Fork of the Pit River in Modoc County, southeast of the town of Alturas, in extreme northeastern California (Figure 1). The Refuge is located on the western edge of the Great Basin, a high elevation, cold desert environment. The Refuge consists of wetland, reservoir, riparian, sagebrush-steppe, and cropland habitats.

The Refuge is part of a larger complex of mid-elevation wetlands and lakes of northeastern California and is strategically situated to meet the needs of waterfowl and other migratory birds of the Pacific Flyway. Modoc Refuge acts as a migration and staging area for ducks, geese, and other wetland birds on the southward migration funnel into this region. After feeding and resting on the Refuge, they continue to the Central and Imperial Valleys of California and other wintering areas. This pattern is reversed in the spring. The Refuge's wetlands and adjacent uplands are also an important nesting area for ducks, geese, greater sandhill cranes, and several other species of marsh birds.



Entrance to the Modoc National Wildlife Refuge
Photo by USFWS

6.2 Refuge History

In 1870, Presley A. Dorris, Henry Fitzhugh, and several other Dorris family members drove cattle and horses into the area. With lands granted under the U.S. Homestead Act, the Dorris family established a livestock ranch, which they operated for ninety years. In the 1930s, the Dorris family created Dorris Reservoir to provide water storage for their ranch.

Acquisition of lands for establishing Modoc Refuge was authorized by the Migratory Bird Conservation Commission on April 8, 1959. In 1960, the Refuge was established to manage, protect, and produce migratory waterfowl.

In November 1960, 5,360 acres (Tracts 4, 5, 6, and 7) were purchased from the Dorris family. In 1967, 187-acre Tract 16 was purchased from Tad Fender. In 1972, the State conveyed 487 acres to the Refuge. In 1973, 40 acres of Tract 1 were acquired and in 1975, the 208-acre Tract 17 was acquired from Barre Stephens. Tract 19 (103 acres) was purchased from Edward Clark in 1992. In 1995, 310-acre Tract 20 was purchased from the J.K. Hamilton Family Trust. In 1998, the 325-acre Tract 21 was purchased from Adair Brown and The American Land Conservancy. Currently, the Refuge is 7,021 acres.

7. Refuge Purposes

The Service acquires Refuge System lands under a variety of legislative acts and administrative orders. The official purpose or purposes for 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. The Service defines the purpose of a refuge when it is established or when new land is added to an existing refuge. These purposes, along with the Refuge System mission, are the driving force in developing refuge vision statements, goals, objectives, and strategies in the CCP. The purposes also form the standard for determining if proposed refuge uses are compatible.

The refuge purposes for Modoc Refuge are:

> "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation Act of 1929).
>
> "... 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 "... 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 of 1962 (16 U.S.C. 460k-460k-4), as amended).
>
> "... for the development, advancement, management, conservation, and protection of fish and wildlife resources ..." 16 U.S.C. 742f(a)(4) "... 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).

8. The Refuge Vision

A vision statement is developed or revised for each individual refuge unit as part of the CCP process. Vision statements are grounded in the unifying mission of the Refuge System. They describe the desired future conditions of the refuge unit in the long term (15 years) and are based on the refuge's specific purposes, the resources present on the refuge, and any other relevant mandates. This CCP incorporates the following vision statement for the Modoc Refuge.

> "Located near the confluence of the north and south forks of the Pit River, Modoc National Wildlife Refuge will conserve, restore, protect, and manage a mosaic of seasonal wetlands, semi-permanent wetlands, wet meadows, riparian, and sagebrush-steppe habitats. These habitats will provide important resting, feeding, and nesting areas for ducks, geese, and other migratory birds. Modoc Refuge's high-quality habitat will play a key role in the long-term recovery of Central Valley greater sandhill cranes.
>
> As an integral part of the surrounding community, Modoc Refuge will provide high quality wildlife-dependent recreation including hunting, fishing, wildlife observation, photography, and interpretation. The Refuge will continue to be known for its high-quality environmental education program offered to generations of students. Visitors will develop a greater understanding and appreciation for the mission of the National Wildlife Refuge System and refuge management programs and for the importance of protecting lands for wildlife conservation."

9. Existing and New Partnerships

In Fulfilling the Promise (U.S. Fish and Wildlife Service 1999), the Service identified the need to forge new and non-traditional alliances and strengthen existing partnerships with States, Tribes, non-profit organizations, and academia to broaden citizen and community understanding of and support for the Refuge System. The Service recognizes that strong citizen support benefits the Refuge System. Involving citizen groups in refuge resource and management issues and decisions helps managers gain an understanding of public concerns. Partners yield support for refuge activities and programs, raise funds for projects, are activists on behalf of wildlife and the Refuge System, and provide support for important wildlife and natural resource issues.

A variety of people including, but not limited to, scientists, birders, anglers, hunters, farmers, outdoor enthusiasts, and students are keenly interested in the management of Modoc Refuge, its fish and

wildlife species, and its plants and habitats. This interest is demonstrated by the number of visitors the Refuge receives and the partnerships that have already developed.

Refuge partners include: California Department of Fish and Game (CDFG), National Resources Conservation Service (NRCS), U.S. Forest Service (USFS), Bureau of Land Management (BLM), Central Modoc Resource Conservation District (RCD), Pit RCD, Goose Lake RCD, North CAL/NEVA Resource Conservation and Development, California Department of Transportation, U.C. Cooperative Extension, Modoc County Department of Agriculture, Friends of Modoc Refuge, The River Center, California Department of Water Resources, Ducks Unlimited, California Waterfowl Association (CWA), Rocky Mountain Elk Foundation, National Wild Turkey Federation, National Rifle Association, Alturas Chamber of Commerce, Modoc County Office of Education, and Modoc Joint Unified School District. We will continue to form new partnerships with interested organizations, local civic groups, community schools, Federal, State, and County governments, Tribes, other civic organizations, and private landowners.

White-faced Ibis
Photo by Steve Emmons

10. Wilderness Review

As part of the CCP process, lands within the boundaries of the Modoc Refuge were reviewed for wilderness suitability. No lands were found suitable for designation as Wilderness as defined in the Wilderness Act of 1964.

Modoc Refuge does not contain 5,000 contiguous roadless acres, nor does the Refuge have any units of sufficient size to make their preservation practicable as Wilderness. The lands of the Refuge have been substantially affected by humans. As a result of the extensive modification of natural habitats and ongoing manipulation of natural processes, adopting a wilderness management approach at the Refuge would not facilitate the restoration of a pristine or pre-settlement condition, which is a goal of wilderness designation.

Chapter 2. The Planning Process

1. Introduction

This CCP for the Modoc Refuge is intended to comply with the requirements of the Improvement Act and NEPA. Refuge planning policy also guided the process and development of the CCP, as outlined in Part 602, Chapters 1, 3, and 4 of the Service Manual.

Service policy, the Improvement Act, and NEPA provide specific guidance for the planning process, such as seeking public involvement in the preparation of the EA. The development and analysis of "reasonable" management alternatives within the EA include a "no action" alternative that reflects current conditions and management strategies on the Refuge. Management alternatives were developed as part of this planning process and can be found in Appendix A Environmental Assessment.

The planning process for this CCP began in October 2006 with pre-planning meetings and coordination. The CCP team (Appendix J) was also formed. Initially, members of the refuge staff and planning team identified a preliminary list of issues, concerns, and opportunities that were derived from wildlife and habitat monitoring and field experience from the past management and history of the Refuge. Early in the process, visitor services, especially hunting and fishing, were identified as primary issues. This preliminary list was expanded during public scoping and then refined and finalized through the planning process to generate the vision, goals, objectives, and strategies for the Refuge. Throughout this process, close coordination with CDFG was emphasized.

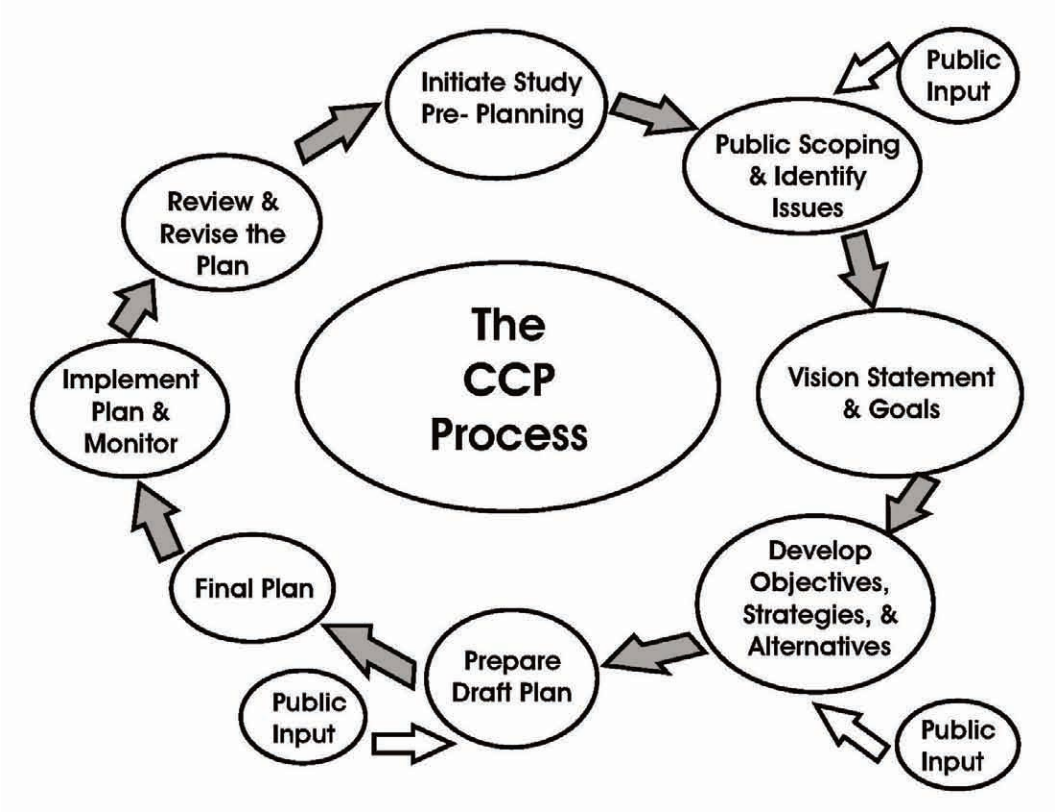
2. The Planning Process

Part of comprehensive conservation planning includes preparation of a NEPA document. Key steps in the CCP planning process and the parallel NEPA process include the following:

- preplanning and team formation
- public scoping
- identifying issues, opportunities, and concerns
- defining and revising vision statement and Refuge goals
- developing and assessing alternatives
- identifying the preferred alternative plan
- draft CCP and EA
- revising draft documents and releasing final CCP
- implementing the CCP
- monitoring /feedback (adaptive management)

Figure 2 shows the overall CCP planning steps and process in a linear cycle. The following sections provide additional detail on individual steps in the planning process.

Figure 2. The CCP process



3. Planning Hierarchy

The Service planning hierarchy that determines the direction of the goals, objectives, and strategies is a natural progression from the general to the specific (Figure 3). Described as a linear process, the planning hierarchy is, in reality, a multi-dimensional flow that is linked by the refuge purposes, missions, laws, mandates, and other statutory requirements (Figure 4).

In practice, the process of developing the vision statement, goals, and objectives is repetitive and dynamic. During the planning process, or as new information becomes available, the plan continues to develop.

Figure 3. Hierarchical relationship of refuge goals and objectives to other aspects of the planning process

*When in conflict, we give priority to the refuge purpose(s) over the Refuge System mission.

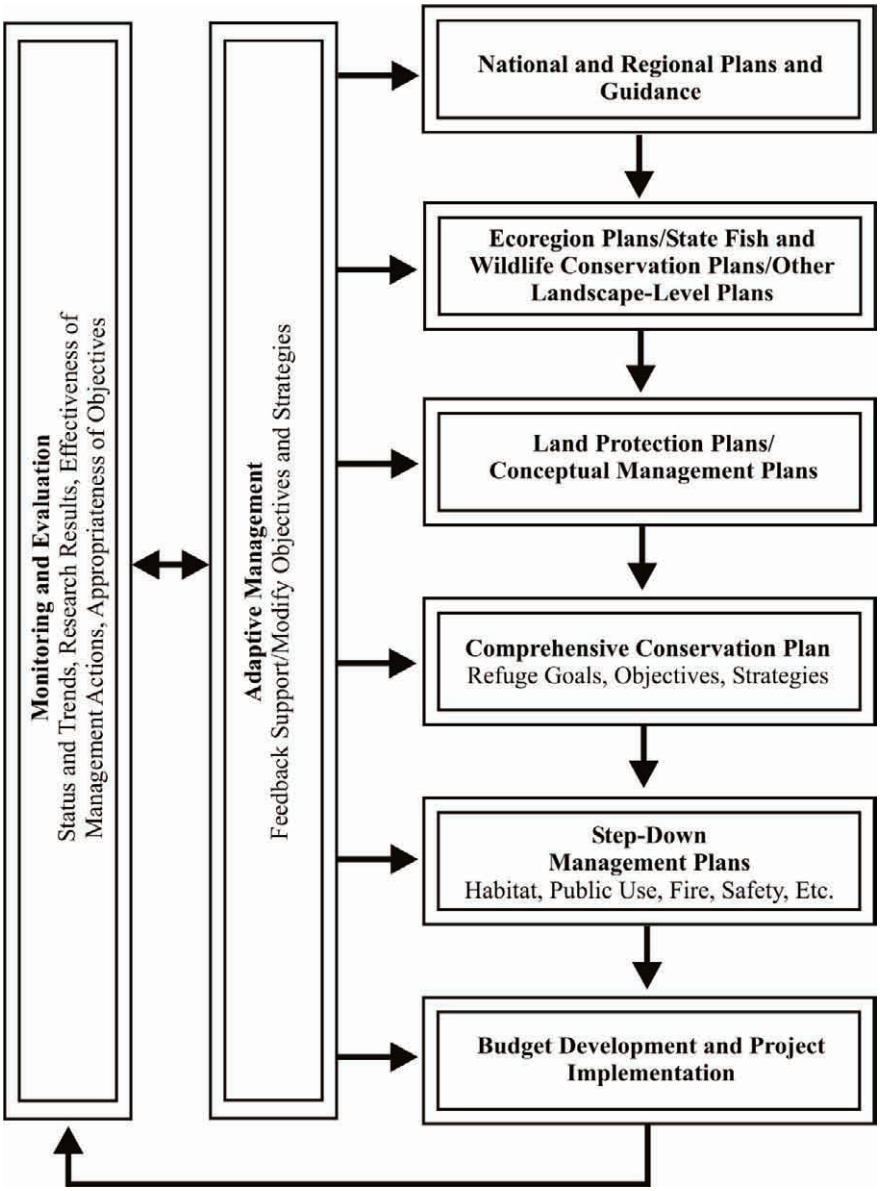
4. The Planning Team

The CCP process requires close teamwork with staff, planners, and other partners to accomplish the necessary planning steps, tasks, and work to generate the CCP document and associated EA.

The core team is the working/production entity of the CCP. The members are responsible for researching and generating the contents of the CCP document and participate in the entire planning process. The core team, refuge staff facilitated by the refuge planner, meets regularly to discuss and work on the various steps and sections

of the CCP. The team members also work independently in producing their respective CCP sections, based on their area of expertise. Multi-tasking by team members is a standard requirement since work on the CCP occurs in addition to their regular workload (Appendix J).

Figure 4. Relationships between Service, System, and other planning efforts



5. Pre-Planning

Pre-planning involved formation of the planning team, development of the CCP schedule, and gathering data. The team determined procedures, work allocations, and outreach strategies. The team also created a preliminary mailing list.

6. Public Involvement in Planning

Public involvement is an important and necessary component of the CCP and NEPA process. Public scoping meetings allow the Service to provide updated information about the Refuge System and the Refuge. Most important, these meetings allow the refuge staff to hear public comments, concerns, and opportunities. These public meetings provide valuable discussions and identify important issues regarding the Refuge and the surrounding region.

The Refuge hosted a public meeting in Alturas, California in August 2007. Sixteen people attended the meeting held at the Refuge. The meeting began with a presentation introducing the Refuge and staff, provided an open forum for public comment, and ended with a breakout session to allow for individual questions and conversations. In addition to comments made by participants and noted on flip charts at the meeting, comments were also received by written comment cards, email, and letters. These comments were analyzed and used to further identify Refuge issues and develop CCP goals, objectives, and strategies (Table 1).

Table 1. Refuge issues identified through public comment

Refuge Issue Category	Number of Comments Received[1]	
Visitor Services	11	
Hunting		3
Fishing		1
Bike Trail		2
Other		5
Refuge Management	12	
Wildlife & Habitat	10	
Invasive Species Control		3
Habitat Management		5
Wildlife		2
Partnerships	4	
Other Comments	4	
Total Comments (Total Number of People/ Organizations Commenting)	41 (12)	

[1]*Total number of comments received is greater than the total number of people commenting since each letter, email, fax, comments card, and flipchart comment received may contain more than one comment.*

7. Public Outreach

During the planning process, refuge staff continued to actively participate in the various working groups and agency teams concerning the Modoc Refuge. The staff also met with several special interest and local groups to explain the planning process and to listen to their concerns.

An information letter called "Planning Update" was also mailed to over 80 individuals, agencies, and organizations. These periodic publications were created to provide the public with up-to-date Refuge information and progress on the CCP process. The Planning Updates were also made available at the Refuge, on the Refuge's webpage, and at various outreach meetings/events. The EA (Appendix A) contains a list of individuals and organizations that were notified or were sent a copy of the Draft CCP, were sent planning updates, or attended scoping meetings.

8. Issues, Concerns, and Opportunities

Through the scoping process and team discussions, the planning team identified issues, concerns, and opportunities. Sixteen people attended the public scoping meeting held in Alturas, California on August 21, 2007. Twelve people/organizations provided forty-one comments (Table 1) for consideration in identifying issues and opportunities for the CCP. The team categorized the comments into five main areas of interest: visitor services, wildlife and habitat, refuge management, partnerships, and other comments. Refuge management received the most comments (12) followed by visitor services (11), wildlife and habitat (10), partnerships (4), and other comments (4).

Students Enjoy Field Trips to the Refuge
Photo by USFWS

Comments regarding refuge management included wanting more prescribed burning on the Refuge; opening the Godfrey Tract to public use, maintaining the wildlife first philosophy; and analyzing the impact of human activities and non-wildlife dependant activities.

Visitor services comments included expanding hunting on the Refuge, prohibiting hunting on the Refuge, adding a bike trail, adding a picnic area, and expanding fishing opportunities.

Comments regarding wildlife and habitat included wanting to see the Refuge continue its invasive species control program, questions

regarding habitat management in specific Refuge units, and suggesting additional wildlife inventories.

Partnership comments included a request to use the Refuge to provide grazing opportunities for permittees temporarily displaced by the Modoc National Forest and Alturas Office of Bureau of Land Management Sage Steppe Ecosystem Restoration Strategy (Modoc National Forest and Alturas Field Office Bureau of Land Management 2007).

9. Development of the Refuge Vision

A vision statement is developed or reviewed for each individual refuge unit as part of the CCP process. Vision statements are grounded in the unifying mission of the Refuge System and describe the desired future conditions of the refuge unit in the long term (more than 15 years). They are based on the refuge's specific purposes, the resources present on the refuge, and any other relevant mandates. Please refer to Chapter 1 for Modoc Refuge's vision statement.

10. Determining the Refuge Goals, Objectives, and Strategies

The purpose for creating the refuge is established by law (Chapter 1). The Improvement Act directs that the planning effort develop and revise the management focus of the refuge within the Service's planning framework, which includes the Service mission, the Refuge System mission, ecosystem guidelines, and refuge purposes. This is accomplished during the CCP process through the development of goals, objectives, and strategies.

10.1 Goals

Goals describe the desired future conditions of a refuge in succinct statements. Each one translates to one or more objectives that define these conditions in measurable terms. A well-written goal directs work toward achieving a refuge's vision and ultimately the purpose(s) of a refuge. Collectively, a set of goals is a framework within which to make decisions.

10.2 Refuge Management Goals

The interim management goals for Modoc Refuge (2003) are to

- protect, restore, and maintain high quality habitats for the benefit of migratory birds;
- protect existing water rights and enhance water quality to ensure that the water of the Pit River and its tributaries will continue to provide a reliable source of high quality water for the Refuge and associated wetlands;

- protect, restore, and enhance habitats for and otherwise support recovery of endangered, threatened, and candidate species of wildlife;
- protect and enhance habitats, and associated populations of fish and wildlife, representative of the native biological diversity of the Modoc plateau; and
- provide opportunities for quality wildlife-dependent recreation, education, and research which is compatible and consistent with other Refuge purposes.

Through the CCP process, these interim goals were evaluated and revised. Modoc Refuge's goals are detailed in Chapter 4.

10.3 Objectives, Rationale, and Strategies

Once the refuge goals are reviewed and revised, the various objectives, rationale, and strategies are determined to accomplish each of the goals. Modoc Refuge's objectives, rationales, and strategies are detailed in Chapter 4.

Objectives: The Service defines objectives as "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" (602 FW 1 of the Service Manual). Objectives are incremental steps we take to achieve a goal. They are derived from goals and provide a foundation for determining strategies, monitoring refuge accomplishments, and evaluating success. The number of objectives per goal will vary. Where there are many, an implementation schedule may be developed. All objectives must be specific, measurable, achievable, results-oriented, and time-fixed.

Rationale: Each objective should document the rationale for forming the objective. The degree of documentation will vary, but at a minimum, it should include logic, assumptions, and sources of information. This promotes informed debate on the objective's merits, provides continuity of management in the event of staff turnover, and allows reevaluation of the objective as new information becomes available.

Strategy: The Service defines a strategy as "a specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives" (602 FW 1 of the Service Manual). Multiple strategies can be used to support an objective.

11. Development of the Refuge Management Alternatives

Alternatives are "different sets of objectives and strategies or means of achieving refuge purposes and goals, helping to fulfill the Refuge System mission, and resolving issues" (602 FW 1 of the Service Manual). The development of alternatives, assessment of their environmental effects, and the identification of the preferred

management alternative are fully described in the EA (Appendix A). Alternatives were developed to represent reasonable options that address specific Refuge issues and challenges. A "no action" or continuation of current management alternative is required by NEPA. A range of other alternatives were studied and are described in the EA (Appendix A).

11.1 Alternative A: No Action

Under Alternative A: No Action, Modoc Refuge would continue to be managed as it has in the recent past. Recent management has followed existing step-down management plans as follows:

- Annual Habitat Management Plan
- Fire Management Plan
- Safety Plan
- Emergency Action Plan for Dorris Reservoir
- Standard Operation Procedures for Dorris Reservoir
- Disease Control Plan
- Pest Control Plan

The focus of the Refuge would remain the same: to provide habitat and maintain current active management practices; and continue to manage and provide habitat for migratory and resident birds, threatened and endangered species, and other wildlife. The Refuge would continue to provide wildlife-dependant recreation opportunities including hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Current staffing and funding levels would remain the same.

11.2 Alternative B: Habitat Emphasis

Under this alternative, the Refuge would emphasize management for biological resources. Biological opportunities would be maximized to allow optimum wildlife and habitat management throughout the majority of the Refuge. Visitor service opportunities would be reduced. In addition, staffing and funding levels would need to be redirected and increased to fully implement this alternative. A wildlife biologist, park ranger, and wage grade position would be hired to accomplish this alternative.

11.3 Alternative C: Proposed Action

Alternative C would achieve an optimal balance of biological resource objectives and visitor services opportunities. Habitat management and associated biological resource monitoring would be improved. Visitor service opportunities would focus on quality wildlife-dependant recreation distributed throughout the Refuge. Staffing and funding levels would need to be increased to fully implement this alternative. An interpretive specialist, wildlife biologist, park ranger,

and wage grade position would be hired to accomplish this alternative.

11.4 Alternative D: Visitor Services Emphasis

Under Alternative D, the Refuge would emphasize management for visitor services. Wildlife-dependant recreational opportunities would be expanded on the Refuge. However, wildlife and habitat management would remain as described in Alternative A. Staffing and funding levels would need to be redirected and increased substantially to implement this alternative. An outdoor recreation planner, interpretive specialist, park ranger, and wage grade position would be hired to accomplish this alternative.

12. Selection of the Refuge Proposed Action

The alternatives were analyzed in the EA (Appendix A) to determine their effects on the Refuge environment. Based on this analysis, we have selected Alternative C as the proposed action because it best achieves the Refuge goals and purposes, as well as the Refuge System and Service missions.

Alternative C is founded upon the existing cooperative management programs, with enhancements in habitat and monitoring programs and an integration of a cooperative visitor services program that includes hunting, fishing, wildlife observation and photography, interpretation, and environmental education. Cooperative management refers to the current practice of working closely with State and other partners to provide protected and enhanced habitat along with visitor service opportunities and adjacent land uses on publicly owned properties. Please refer to Chapter 4, which describes this proposed management plan.

13. Plan Implementation

This Draft CCP and EA will be provided for public review and comment. Comments received by the Service will be incorporated where appropriate and perhaps result in modifications to the preferred alternative or selection of one of the other alternatives. The alternative that is ultimately selected will become the basis of the ensuing Final CCP. This document then becomes the basis for guiding management over the coming 15-year period. It will guide the development of more detailed step-down management plans for specific resource areas and will underpin the annual budgeting process for Refuge operations and maintenance (Chapter 5). Most importantly, it lays out the general approach to managing habitat, wildlife, and people at the Modoc Refuge that will direct day-to-day decision-making and actions.

A review of the CCP will take place approximately every five years, and the CCP will be updated every fifteen years.

Chapter 3. The Refuge Environment

1. Refuge Description

This chapter provides a detailed description of the Refuge, its habitats, the species upon which it depends, and the recreational opportunities it offers. Located just south of the town of Alturas in Modoc County, California, the Modoc National Wildlife Refuge has 7,021 acres of wetlands, reservoir, riparian, cropland, and sagebrush-steppe habitats. These habitats provide important resting, nesting, and feeding areas for ducks, geese, and other migratory birds including greater sandhill cranes. Located in the Pacific Flyway, the Refuge is used by migratory birds on their southern and northern migrations. The Refuge also provides hunting, fishing, wildlife observation, photography, environmental education, and interpretation as well as non-wildlife dependent recreational opportunities, such as boating, waterskiing, bicycling, horseback riding, and swimming.

Modoc Refuge is West of the Warner Mountains
Photo by North State Resources, Inc.

2. Geographic/Ecosystem Setting

The Modoc Plateau historically has supported high desert plant communities and ecosystems similar to that region—shrub-steppe, perennial grasslands, sagebrush, antelope bitterbrush, mountain mahogany, and juniper woodlands. Sagebrush plant communities are characteristic of the region, providing important habitat for sagebrush-dependent wildlife. Conifer forests dominate the higher elevations of the Warner Mountains and the smaller volcanic mountain ranges and hills that shape the region. Wetland, spring, meadow, vernal pool, riparian, and aspen communities scattered across the rugged and otherwise dry desert landscape support diverse wildlife. The region has varied aquatic habitats, from high mountain streams to the alkaline waters of Goose and Eagle lakes to the clear spring waters of Fall River and Ash Creek.

Northeastern California is an outstanding region for wildlife, providing habitat for mountain lion, mule deer, pronghorn antelope,

Rocky Mountain elk, greater sage-grouse, and waterfowl of the Pacific Flyway. Golden eagles, peregrine and prairie falcons, northern goshawks, greater sandhill cranes, and American white pelicans nest and hunt or forage in the region. The varied aquatic habitats and natural barriers along the Pit River and its tributaries have allowed the evolution of several unique aquatic communities that include endemic fish and invertebrates.

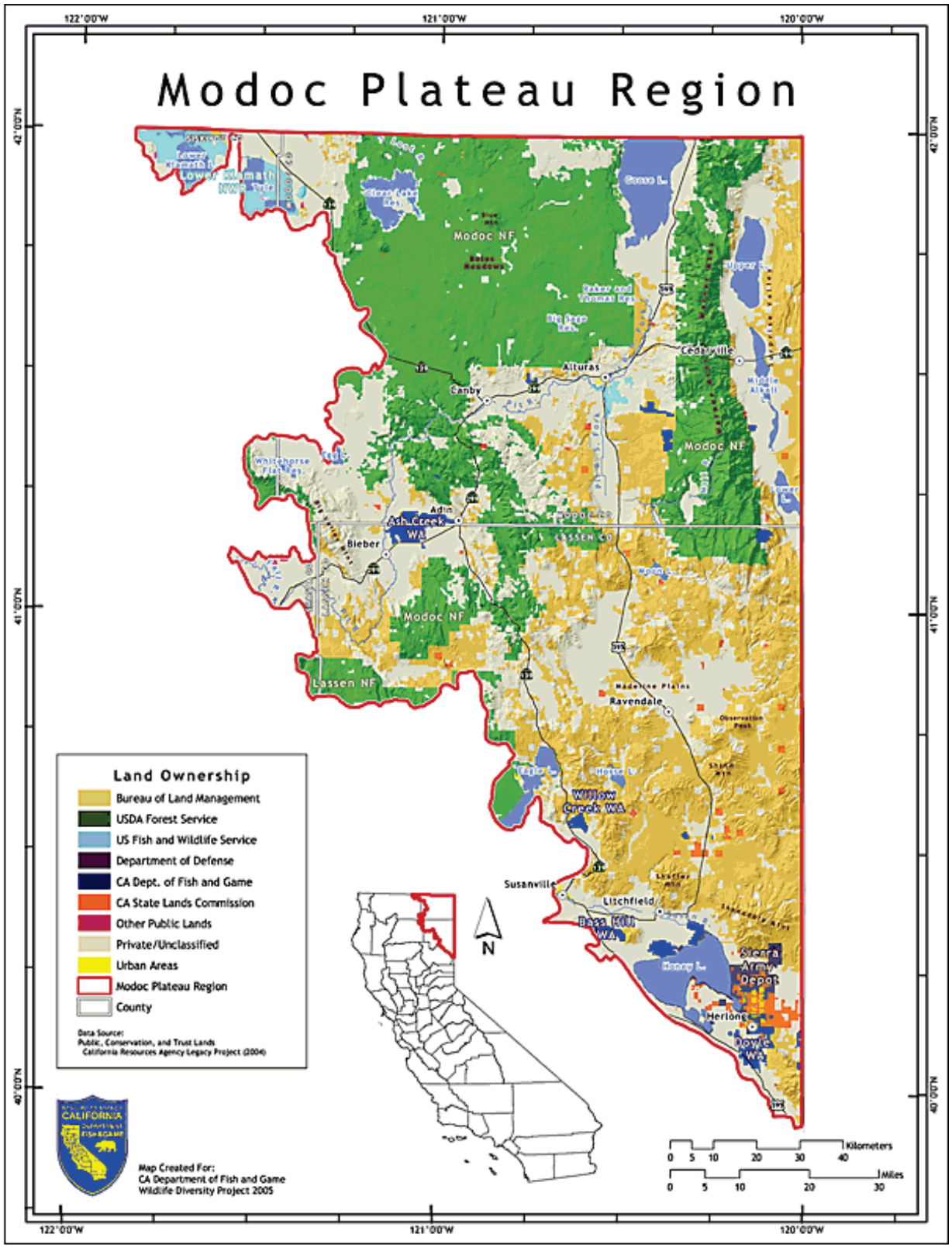
Sixty percent of the Modoc Plateau is Federally managed (Figure 5); the USFS manages 30 percent, BLM manages 26 percent, and the Service and Department of Defense each manage about 2 percent of the lands (California Department of Fish and Game 2005a). CDFG manages 1 percent of the region as wildlife areas, and about 37 percent of the lands are privately owned or belong to municipalities (California Department of Fish and Game 2005a). Only nine percent of the forests and rangelands of the Modoc region are designated as reserves, such as wilderness areas, less than is protected in any other region of the state except the Central Valley (California Department of Fish and Game 2005a). The combined total of lands managed by State Parks and the National Park Service is about 2,500 acres (California Department of Fish and Game 2005a).

Many of the region's plant communities and ecosystems have been substantially altered or degraded over the last 120 years by a combination of stressors. Despite being in one of the least-developed regions of the state, habitats of the Modoc Plateau are among the most threatened ecosystems of North America (The Nature Conservancy 2001). Many of the meadow and riparian areas are overgrazed, channelized, or are suffering from encroachment by juniper, pine, fir, and invasive plants (USDA Forest Service 1991; Loft 1998; USDA Forest Service 2001).

The major stressors negatively affecting terrestrial wildlife on the Modoc Plateau ecosystem are a combination of livestock and feral horse grazing, invasive annual grasses, the expansion of native western juniper, and altered frequencies of fire (California Department of Fish and Game 2005a). Together, these stressors have combined to alter the region's sagebrush and forest habitats and ecosystems (Miller et al. 1994; Schaefer et al. 2003). Aquatic ecosystems throughout the region are affected by water diversions, erosion, poor grazing practices, and introductions of non-native species (California Department of Fish and Game 2005a).

Private land owners, State and Federal land management agencies, resource conservation districts, watershed groups, and fishing and hunting organizations working through various partnerships, are involved in stream, riparian, wetland, and upland restoration and conservation projects across the region (California Department of Fish and Game 2005a).

Figure 5. Modoc Plateau Region

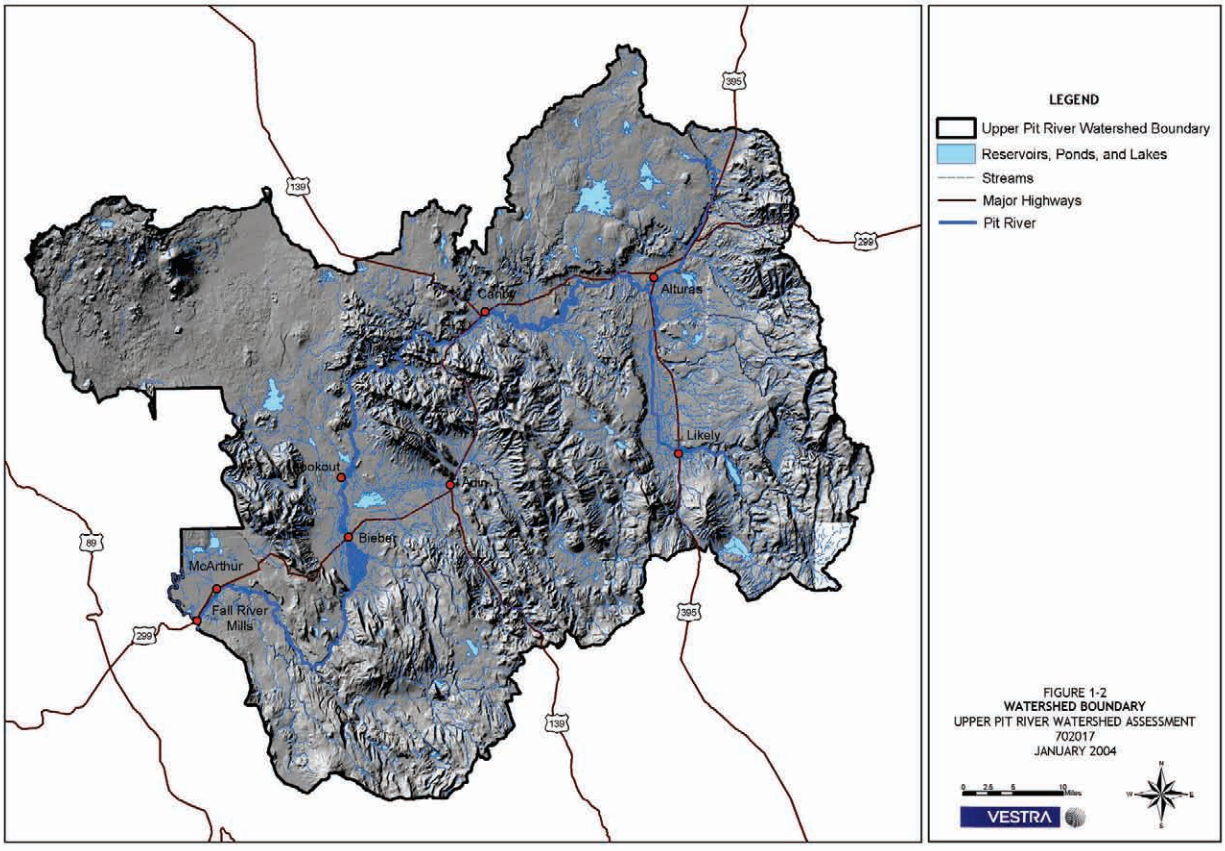


Source: California Wildlife Action Plan (California Department of Fish and Game 2005a)

Modoc Refuge is located in the eastern part of Modoc County on the west side of the Warner Mountains, lying in a valley surrounded by lava plateaus and mountains. The area surrounding the Refuge is primarily agricultural, planted with irrigated crops such as wild rice, alfalfa, and meadow hay. Raising livestock is the main farm enterprise and nearly all the livestock are cattle (USDA Soil Conservation Service 1980).

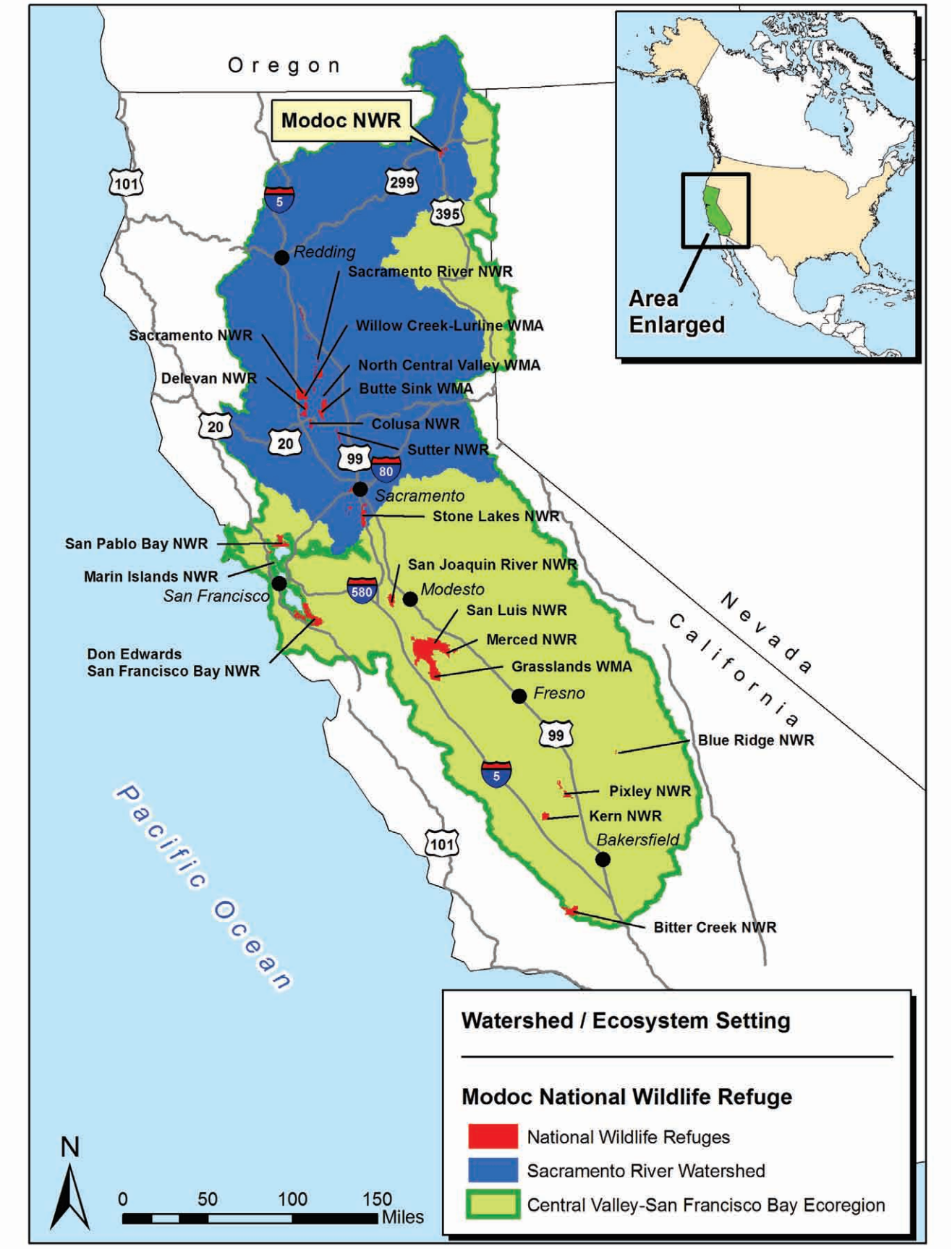
At an elevation of approximately 4,365 feet, the Refuge is located immediately upstream of the confluence of the north and south forks of the Pit River in the Upper Pit River Watershed (Figure 6). The Upper Pit River Watershed is located in northeastern California and covers approximately 2,620 square miles (Environmental Statistics Group 2003). The north fork of the Pit River originates near the southern end of Goose Lake. The south fork of the Pit River originates from several tributaries in the southern Warner Mountains. Both forks join in the town of Alturas, and then flow in a southwesterly direction to Shasta Lake in Shasta County, and eventually into the Sacramento River and the San Francisco Bay and Delta. Modoc Refuge is part of the Service's Central Valley-San Francisco Bay Ecoregion (Figure 7).

Figure 6. Upper Pit River Watershed



Source: Upper Pit River Watershed Alliance (VESTRA 2004)

Figure 7. Watershed Ecosystem Map



3. Physical Environment

3.1 Climate and Air Quality

The Refuge has a semi-arid climate with hot, dry summers and cold winters. Summer temperatures can reach 100 degrees Fahrenheit (°F), but generally cools rapidly during the evening and nighttime hours. January is the coldest month of the year, with temperatures occasionally dropping below -30 °F. Strong winds are common, with prevailing winds typically from the south and west. Precipitation generally occurs during the winter and spring months, with the Refuge receiving approximately 7-11 inches of rainfall annually. Relative humidity ranges from 10-20 percent during summer months and averages 75 percent during the winter months.

The Pit River Basin climate includes periodic drought cycles that usually follow 10-year patterns. During the driest years, annual precipitation can be as low as 30 percent of average.

Climate change is already affecting wildlife throughout California (Parmesan and Galbraith 2004), and its effects will continue to increase. Climate change has particular significance for this region's major river systems. Depending on the model and assumptions, scientists project the average annual temperature in California to rise between 4 and 10.5 degrees above the current average temperature by the end of the century (Schneider and Kuntz-Suriseti 2002; Turman 2002; Hayhoe et al. 2004). Within 50 years, average wintertime temperatures are expected to rise between 2 and 2.5 degrees. A rise in this range would substantially reduce annual snowpack and increase fire frequency and intensity. By mid-century, the Sierra snowpack could be reduced by 25 to 40 percent and by as much as 70 percent at the end of the century (duVair 2003). The snow season would be shortened, starting later and melting sooner, while the fire season would be longer and hotter. The reduction of snowpack and more extreme fire conditions would have cascading effects on water resources, plant communities, and wildlife. Hotter temperatures, combined with lower river flows, would dramatically increase the water needs of both people and wildlife. This is likely to translate into less water for wildlife, especially fish and wetland species (California Department of Fish and Game 2005a).

The Service's Draft Climate Change Strategic Plan (USFWS 2009) will follow six guiding principles in responding to climate change:

- We will be a leader in national and international efforts to address climate change.
- We will commit to a new spirit of coordination, collaboration and interdependence with others.
- We will leverage our resources by building coalitions that emphasize the shared conservation of habitats and species within sustainable landscapes.

- We will continually evaluate our priorities and approaches, make difficult choices, take calculated risks and adapt to climate change.
- We will assemble and use state of-the-art technical capacity to meet the climate change challenge.
- We will reflect scientific excellence, professionalism, and integrity in all our work.

The Draft Climate Change Strategic Plan (USFWS 2009b) employs three key strategies to address climate change: adaptation, mitigation, and engagement. The Service will adaptively manage Modoc Refuge in response to climate change. Changes and responses will continually be assessed through monitoring and the Refuge will modify actions accordingly.

The Federal and State governments have each established ambient air quality standards for several pollutants. Most standards have been set to protect public health. However, standards for some pollutants are based on other values, such as protecting crops and materials and avoiding nuisance conditions.

The Refuge is located in California's Northeast Plateau Air Basin. The Northeast Plateau Air Basin is the fourth largest basin in California, encompassing an area of 15,900 square miles. It includes all of Modoc, Lassen, and Siskiyou counties. The Modoc County Air Pollution Control District (APCD) is the agency responsible for ensuring compliance with Federal and State air quality standards in the basin where the Refuge is located.

Currently, the Modoc County APCD is designated as attainment for ozone standards and non-attainment for the State particulate matter (PM10) standards (California Air Resources Board 2006). When an area is a non-attainment area, the State must develop an implementation plan to outline methods for reaching identified air quality standards. Permitting, scheduling, and restrictions on some activities may be required. Federal and State PM10 standards are designed to prevent respiratory disease and protect visibility.

PM10 is produced by stationary point sources (e.g., fuel combustion and industrial processes), fugitive sources, (e.g., roadway dust from paved and unpaved roads), wind erosion from open land, and transportation sources. PM10 levels in Modoc County are highest during December (California Air Resources Board 2005). Colder, more stagnant conditions during this time of the year are conducive to the buildup of PM10, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur. The Modoc County APCD requires smoke management plans and limits the acreage of prescribed burns conducted by the Refuge.

Certain land uses are more sensitive to air pollution than other uses. Locations such as schools, hospitals, and convalescent homes are sensitive receptors because their occupants (the young, old, and infirm) are more susceptible to respiratory infections and other air quality-related health problems than the public. Residential areas are also considered sensitive receptors because residents tend to be home for extended periods, resulting in sustained exposure to any pollutants present.

3.2 Water Supply and Water Quality

In 1960, the Service purchased the land comprising the Refuge and the accompanying water rights. The water rights held by the Service fall into four categories:

- direct diversion rights from the North Fork Pit River
- riparian rights from the South Fork Pit River
- direct diversion rights from Pine Creek
- storage rights to divert water from Parker Creek, Pine Creek, and Stockdill Slough to Dorris Reservoir

The Service's direct diversion rights to water during the irrigation season are based upon judicial decrees and legal agreements that are not subject to the permitting and licensing process administered by the State Water Resources Control Board (SWRCB), pursuant to Water Code Section 1200 et seq. The Service's rights to divert water to storage from Parker Creek, Pine Creek, and Stockdill Slough are held under appropriative Water Right Licenses 465, 466, and 4822 and Permit 854.

The Refuge receives water from the South Fork of the Pit River, Pine Creek direct diversion, and Pine Creek and Parker Creek storage into Dorris Reservoir. Delivery ditches on the Refuge include Pine Creek Ditch, Pine Creek Canal, Parker Creek Diversion Canal, Dorris Canal, High Line Canal, East Side Canal, and Pine Creek Overflow (Figure 8). The South Fork of the Pit River flows through the Refuge and provides riparian flood water to the wetlands and riparian areas on the west side of the Refuge, including Sharkey Field, North and South Grain Fields, Matney Fields, Pit Marsh, Matney Marsh, 395 Ponds, and the South Dam Pond. Pine Creek direct diversion provides water to the Hamilton Tract and Pine Creek Field.

Storage water in Dorris Reservoir provides water to the remaining wetlands, meadows, and ponds in the Refuge. During the irrigation season (April 1-September 30), water is withdrawn from Dorris Reservoir to maintain wetland habitats. Dorris Reservoir may be drawn down to minimum pool by the end of the irrigation season. The Refuge also has five irrigation wells.

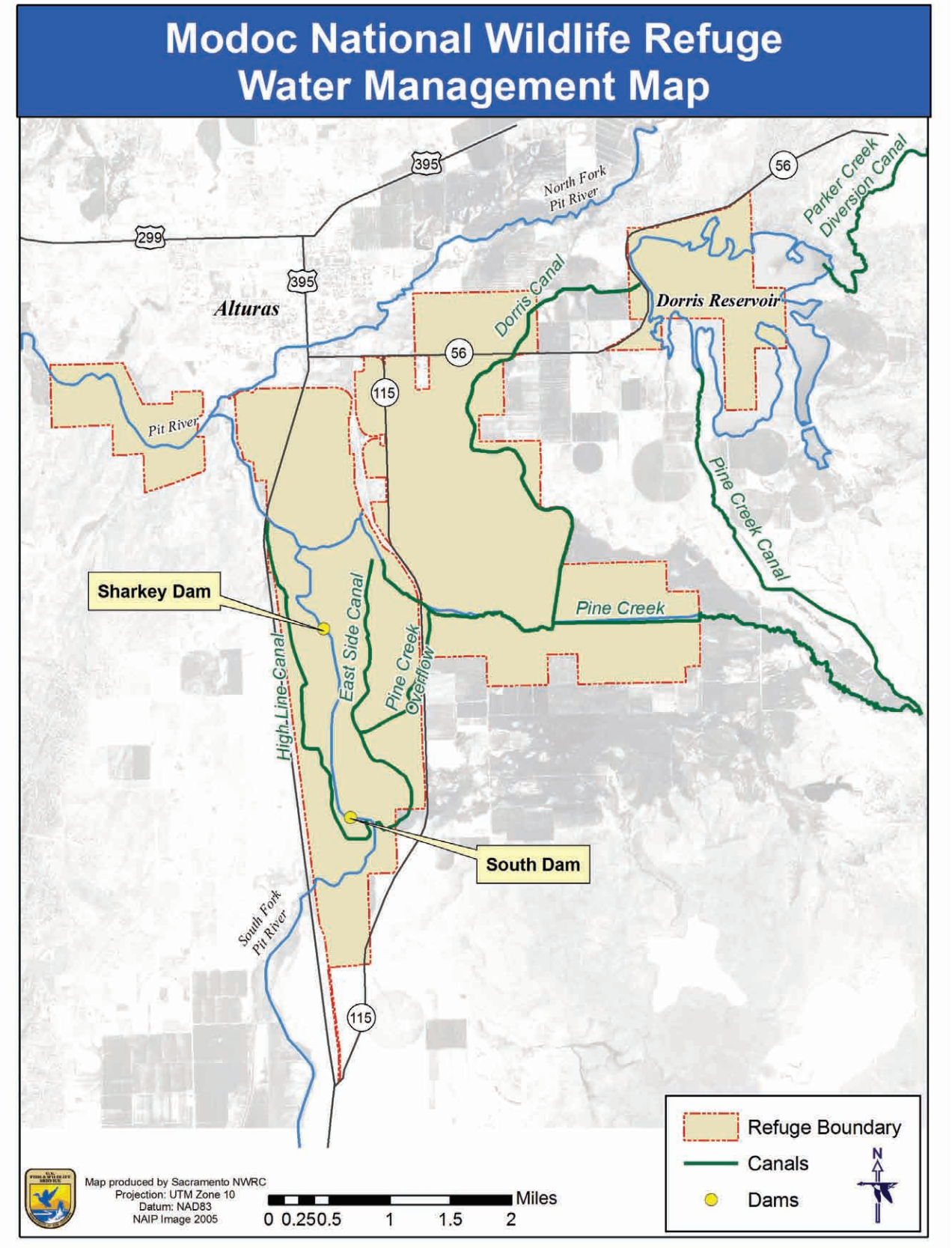
The Refuge monitors the quantity of water diverted to storage and at primary points of diversion for irrigation. This information fulfills monitoring requirements under appropriative licenses. The Modoc County Water Master sets the diversions to deliver water in accordance with Refuge water rights.

Modoc Refuge lies within the jurisdiction of the Central Valley Regional Water Quality Control Board, which established beneficial uses and water quality objectives for surface water and groundwater in the Water Quality Control Plan (Basin Plan) for the region (California Regional Water Quality Control Board 1998).

The Pit River is an impaired water body under the Clean Water Act Section 303(d). The pollutants/stressors include nutrients, organic enrichment/low-dissolved oxygen, and temperature. The potential sources of pollution include municipal and agricultural. The Refuge is a member of the Northeastern California Water Association, which was formed to meet the water quality monitoring requirements under the California's Irrigated Lands Program.

Dorris Reservoir—Downstream
Photo by USFWS

Figure 8. Water Management Map of Modoc Refuge



3.3 Geology and Soils

Virtually the entire Upper Pit River Watershed from the headwaters to the historical confluence with Fall River is within the Modoc Plateau Geomorphic Province. The Refuge lies just beyond the western edge of the Great Basin with the Warner Mountain range on the east and the Adin Mountain range on the west. The Modoc Plateau is a flat-topped upland area built up of irregular masses of a variety of volcanic materials, although it consists predominately of basalt (Oakeshott 1971). This area is characterized by attenuation, or stretching and thinning of the earth's crust, which results in the high-angle normal faults found throughout the region.

Three main soil types formed from alluvial parent material derived from basic igneous rocks predominantly underlie the Refuge:

- *Pit-Buntingville-Goose Lake* – nearly level to moderately sloping, very deep, somewhat poorly drained and poorly drained silt loams, clay loams, silty clay loams, and clays in basins and on floodplains

- *Tulana-Pasquetti* – nearly level, very deep, poorly drained mucky loams and silty clay loams in basins

- *Bieber-Barnard-Modoc* – nearly level to strongly sloping, shallow and moderately deep, well-drained gravelly loams, cobbly loams, clay loams, and sandy loams on alluvial fans and terraces

4. Habitat

The Refuge currently consists of 7,011 acres of wetlands, reservoir, riparian, sagebrush-steppe, and cropland habitats (Figure 9, Table 2). An additional 10 acres of the Refuge are comprised of administration sites (e.g., roads, buildings, and ditches). Figure 9 shows the locations and names of the units on the Refuge.

Table 2. Refuge Habitat Classifications

Habitat Type	Acres
Seasonal wetlands	1,062
Semi-permanent wetlands	553
Wet meadows	2,183
Reservoir	547
Riparian*	64
Sagebrush-steppe	2,053
Croplands	549
Administrative	10
TOTAL	**7,021**

** These acres include woody riparian habitat only. There are also 282 acres of degraded herbaceous riparian on the Pit River system which is included in wet meadows and seasonal wetlands habitat types.*

Figure 9. Vegetation map of Modoc Refuge

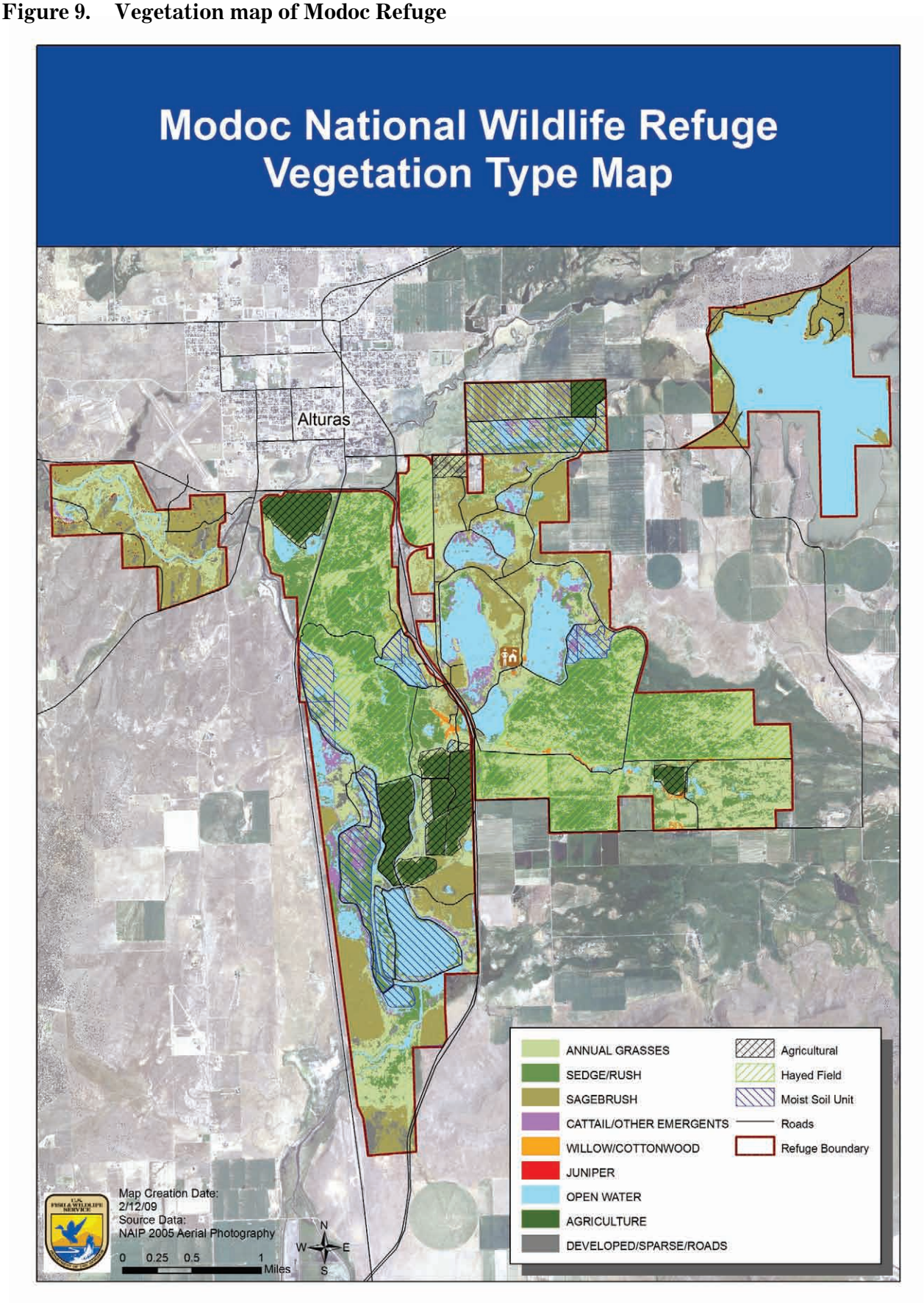
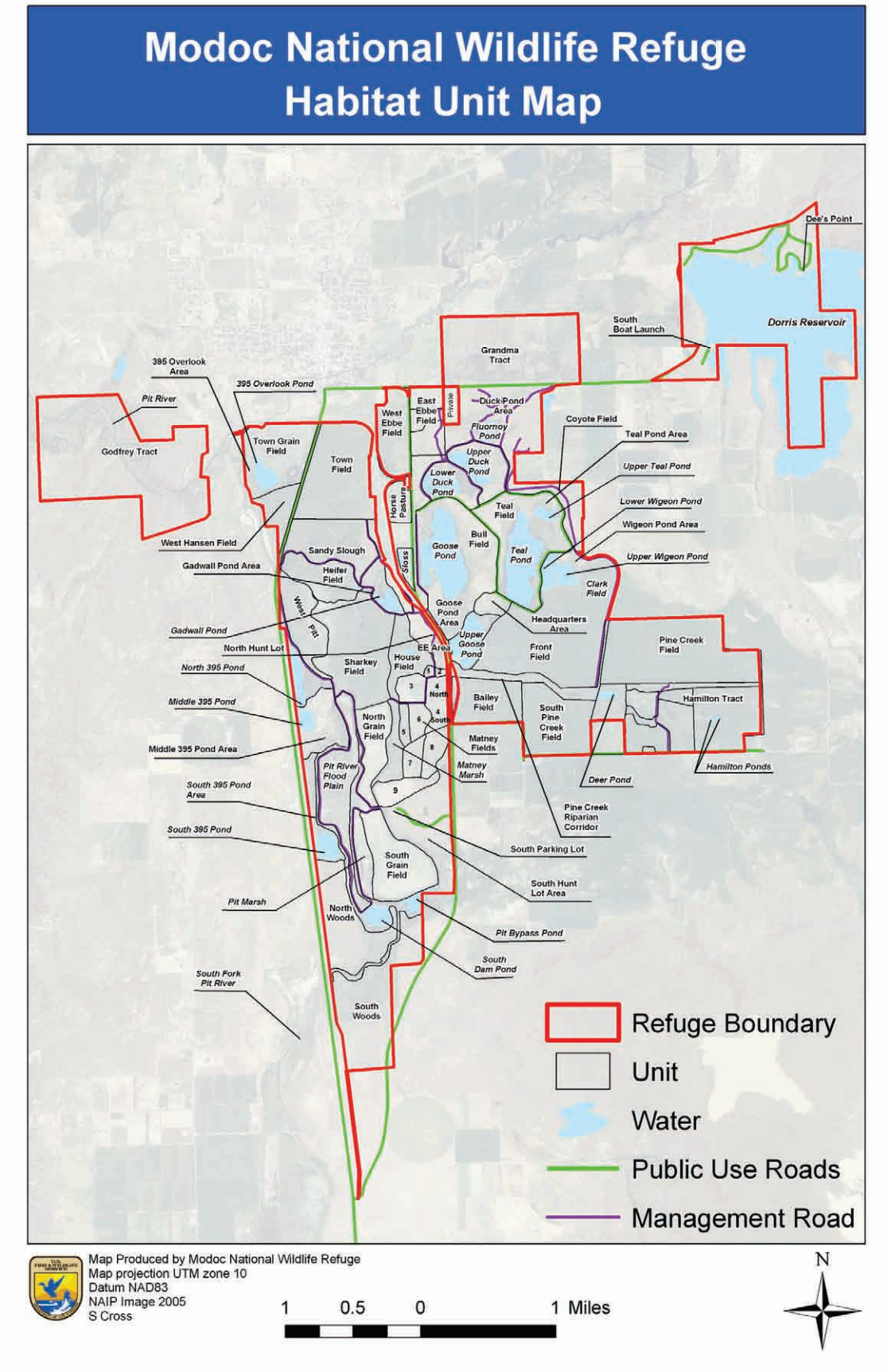


Figure 10. Habitat Unit Map of Modoc Refuge



Most of the habitats on the Refuge have been altered from historic conditions due to man's activities. Vegetation has responded to modified hydrology within the landscape, non-native/invasive plant infestations, altered fire regimes, and agricultural practices. The most evident changes have occurred in the sagebrush-steppe uplands, which have been subject to non-native grass infestation and western juniper encroachment.

4.1 Wetlands

At the time of European settlement in the early 1600s, the area that was to become the conterminous United States had approximately 221 million acres of wetlands (Dahl and Allord 1996). About 103 million acres remained as of the mid-1980s (Dahl and Johnson 1991). California lost greater than 85 percent of its original wetland acreage (Dahl 1990).

Because of these historic losses of wetlands, the Refuge's wetlands are intensively managed. Modoc Refuge is part of a large complex of mid-altitude wetlands and lakes in northeastern California. These wetlands freeze up in mid-winter and burst into life in summer. They occur in a mosaic with extensive grassland, sagebrush flats, and large tracts of coniferous forest in this wild and virtually unpopulated corner of the State. Modoc Refuge acts as a migration hub and staging area for ducks, geese, and other wetland birds during their spring and fall migrations.

Modoc Refuge Wetlands
Photo by USFWS

The wetlands of the Modoc Plateau boast the highest diversity of breeding waterfowl in the State (National Audubon Society 2008). Wetlands also provide feeding and nesting grounds for great egrets, snowy egrets, black-crowned night-herons, American bitterns, great blue herons, white-faced ibis, marsh wrens, and red-winged and yellow-headed blackbirds. Shorebirds, such as sandpipers, Wilson's phalaropes, willets, long-billed curlews, killdeer, black-necked stilts, and American avocets, also nest at the Refuge.

The Refuge contains three main types of wetlands, seasonal, semi-permanent, and wet meadows.

4.1.1 Seasonal wetlands

Seasonal wetlands (approximately 1,062 acres) support the greatest abundance and diversity of wildlife species and are highly productive sources of food for wildlife. They contain abundant seeds and other vegetative food items, such as leaves, stems, and tubers, as well as invertebrates (e.g., insects, spiders, and crustaceans). Seasonal wetlands provide a diverse amount and distribution of emergent vegetation (e.g., bulrushes and cattails) and contain bare islands, levees, and open shorelines that provide excellent waterfowl loafing sites.

These wetlands are intensively managed, with the timing and depths of water and vegetation manipulated to meet resource management objectives. In general, they are wet from fall through spring and dry during the summer. The cover in this habitat, including cattails and bulrush, can range from mostly open water to almost 100 percent cover (Figure 9).

4.1.2 Semi-permanent wetlands

Semi-permanent wetlands provide important breeding habitat for waterfowl and many other wetland-dependent species during all or part of the summer, as well as most of the rest of the year.

Semi-permanent wetlands (approximately 553 acres) are characterized by surface water present throughout the year and emergent vegetation including cattails and bulrush. They are normally drawn down on a five-year rotation. Semi-permanent wetlands include Goose, Teal, Little Goose, Wigeon, Flournoy, Duck, Sloss, and South Dam ponds (Figure 9).

4.1.3 Wet meadows

Wet meadows typically exhibit shallow surface water or saturated soil conditions. Wet meadows occur over most of the Refuge (approximately 2,183 acres) and areas associated with its developed irrigation system. Herbaceous plants, including rushes, a variety of sedges, and reed canary grass, dominate these habitats (Figure 9).

Wet Meadows
Photo by USFWS

4.2 Riverine

Aquatic ecosystems throughout the Modoc Plateau are affected by water diversions, erosion from logging roads, grazing activities, and introductions of non-native fish and invertebrates (California Department of Fish and Game 2005a). These stressors have degraded the main stem and tributaries of the Pit River.

Pit River
Photo by USFWS

There are five miles of riverine habitat on the Refuge, comprised of two miles of the main stem of the Pit River and three miles of the south fork of the Pit River (Figure 9).

4.3 Reservoir

In the 1930s, the Dorris family created Dorris Reservoir to provide water storage for their ranch. Dorris Reservoir is a 1,100 surface-acre (only 547 acres of which are owned by the Refuge) storage facility used to supply water to the Refuge (Figure 9). The Refuge stores 11,500-acre feet of water within Dorris Reservoir. At spillway elevation, depths average 11.4 feet with a maximum depth of 22 feet. Nearly 40 percent of the Reservoir is less than 10 feet deep. Approximately 11 miles of shoreline exist at spillway elevation. Emergent vegetation is scarce except in the upper arms and shallow bays.

The primary purpose of Dorris Reservoir is to provide water for habitat management purposes on other areas of the Refuge. Withdrawals of water to meet the irrigation needs of the Refuge cause large seasonal fluctuations in water levels. Therefore, Dorris Reservoir is not specifically managed as habitat for wildlife. However, through seasonal closures, the wildlife that uses the Reservoir is protected.

Dorris Reservoir provides habitat for fish eating birds, including American white pelicans, double-crested cormorants, ring-billed gulls, Forster's terns, Caspian terns, western grebes, and eared grebes.

Dorris Reservoir
Photo by USFWS

4.4 Riparian

Riparian communities are among the most important habitats for wildlife because of their high floristic and structural diversity, high biomass (and therefore high food abundance), and high water availability. In addition to providing breeding, foraging, and roosting habitat for a diverse array of animals, riparian communities provide movement corridors for some species, connecting a variety of habitats throughout a region.

Riparian habitat (approximately 64 acres) on the Refuge is associated with creeks, river edges, and ditches and is found along the South Fork Pit River, Pit River, Pine Creek Ditch, Hamilton Tract, and Sub-headquarters Areas (Figures 9 and 10). Dominant woody species present include willows and cottonwoods with a native and non-native grass understory. An aspen stand is also included in this habitat type.

The Pit River provides habitat for the scarce cottonwood-willow forest and riparian scrub communities and consequently areas of high species richness (Davis et al. 1998). Small but important riparian areas on the Refuge provide excellent nesting and foraging areas for the red-tailed hawk, Swainson's hawk, great horned owl, barn owl, downy woodpecker, hairy woodpecker, and Neotropical migrants, such as the yellow warbler, Bullock's oriole, Wilson's warbler, tree swallow, and willow flycatcher.

Riparian Habitat
Photo by USFWS

4.5 Sagebrush-steppe

Sagebrush habitat on the Refuge (approximately 2,053 acres) occurs in the uplands (areas not subject to flooding) and includes basin big sagebrush, western juniper, rabbitbrush, and perennial grasses such as Great Basin wild rye interspersed with bunchgrasses. Sagebrush-steppe habitat is dispersed throughout the Refuge, but the majority is located around Dorris Reservoir and in the Godfrey Tract. Small upland areas are located around the Refuge Headquarters, interspersed among wetland habitats and on the margins of the South Fork Pit River (Figures 9 and 10).

Sagebrush-steppe Habitat
Photo by USFWS

Sagebrush-steppe habitat at the Refuge has undergone significant modification since settlement, including the invasion of cheat grass, a non-native annual that prefers frequently burned areas. Further, the recent history of fire suppression has allowed unimpeded juniper encroachment. These changes in the plant community structure and composition have altered the fire regime and subsequently changed wildlife utilization of the habitat.

Sagebrush-steppe areas on the Refuge provide forage and nesting sites for northern harriers, short-eared owls, California quail, western kingbirds, western meadowlarks, sage thrashers, and other passerine species.

4.6 Croplands

Croplands (approximately 549 acres) are composed of those areas planted to crops of high value for wildlife. Approximately 200 acres of barley and winter wheat are planted annually. Farm fields include Ebbe, Matney, North Grain, Grandma Tract, and Town Grain (Figures 9 and 10).

5. Habitat Management

Refuge management is guided and tracked by an annual habitat management planning process. Appendix F contains an example of the annual habitat management work plan from 2006.

Pine Creek Structure
Photo by USFWS

5.1 Water Management

Refuge wetlands are maintained by a complex and extensive irrigation system to allow for flooding and draining of various areas. Water is diverted through a system consisting of the 11,500-acre-foot Dorris Reservoir, twenty miles of major canals, fifty miles of minor ditches, the South Fork Pit River, and several pond and marsh areas.

5.1.1 Seasonal wetlands

During the fall and winter months, water levels in most seasonal wetland units are kept relatively shallow (<12 inches), with portions of some units up to 36 inches deep. Beginning in June, water levels in individual seasonal wetlands are slowly drawn down to mostly mudflat, typically over a period of 10-20 days. Seed-producing plants germinate and grow to maturity on the moist pond bottoms during the summer. In the fall, individual units are flooded on a staggered schedule between August and October, making appropriate amounts of habitat available to fall migrating birds and other wildlife as their numbers increase.

5.1.2 Semi-permanent wetlands

Water depth in semi-permanent wetlands ranges from 12 to 72 inches. Water levels are maintained at consistent levels, to the extent possible, to minimize negative impacts to overwater nesting birds and growth of undesirable vegetation. Semi-permanent wetlands are maintained by a flow-through of water.

Semi-permanent wetlands are typically managed by flooding and maintaining the water throughout the year (i.e., permanent wetland). Permanent wetlands may be maintained for up to five years or more, but without periodic drawdown, productivity decreases over time. In addition, emergent vegetation grows relatively fast and its density can become a problem. As a result, these units are typically drawn down every three to five years to recycle nutrients and conduct any required maintenance or vegetation control.

5.1.3 Wet Meadows

Approximately 2,183 acres are irrigated and managed as wet, short-grass meadows for the benefit of waterfowl and greater sandhill cranes (see Section 6 Fish and Wildlife). Wet meadows are irrigated

beginning April 1. A continual flow of shallow water (2-4 inches) is maintained across these units until July 15. Beginning on July 15, wet meadows are allowed to dry naturally. During the month of August, wet meadows are hayed (see Section 5.2.3 Haying). Beginning September 1, water is reapplied to the wet meadows as in the spring until the end of the irrigation season on September 30.

5.2 Vegetation Management

5.2.1 Sagebrush-steppe

Juniper Removal in Sagebrush-Steppe Habitat
Photo by USFWS

The sagebrush-steppe habitat on the Refuge is not actively managed other than juniper removal and very limited prescribed fire to remove the decadent stands of grasses and stimulate growth of native grasses and forbs.

5.2.2 Croplands

Croplands are composed of those areas planted to crops of high value for wildlife, including barley and winter wheat. Farming helps to alleviate waterfowl and sandhill crane depredation of neighboring private crops by attracting them onto the Refuge.

A rotational system of cropping and flood/fallowing is currently used in six of the Matney fields. Three of these fields are flooded during the fall, winter, and spring and are then drawn down gradually beginning June 1. This process is followed for three years. Then the fields are put into a winter wheat/spring barley rotation. The remaining three fields, which were in a winter wheat/spring barley rotation, are then put into flood/fallow.

Remaining croplands are planted to winter wheat/spring barley rotation. Planted in the fall, winter wheat matures the following spring and summer, and is left standing through the fall and winter. The field is then planted to spring barley. Spring barley matures in the summer, is left standing through the following summer, and is planted with winter wheat.

5.2.3 Haying

A late-season haying program is conducted on 2,079 acres of wet meadows to provide foraging and nesting habitat for greater sandhill cranes. All haying is conducted by permittees beginning August 1 and ending August 31. The start of haying can be delayed if sandhill crane colts less than three weeks of age are present.

Haying is conducted through the Special Use Permit (SUP) process. All SUPs are allotted through a bid process. Every three years the Refuge conducts a rate survey to determine the base rate for a ton of hay. This base rate provides the minimum bid used during the bidding process. Individual haying units are awarded to the highest bidder. The previous year's permittee has the right to match the high

bid. The Refuge has one "grandfathered" haying permittee who pays the base rate annually.

5.2.4 Grazing

Grazing can occur on approximately 935 acres of wet meadow habitat. This includes two unhayed units that are grazed only. Grazing is done by permittees and is conducted from September 1 through November 30. Grazing provides short green browse for geese.

Grazing is conducted through the SUP process. All SUPs are allotted through a bid process. Every three years the Refuge conducts a rate survey to determine the base rate for an animal unit month (AUM). This base rate provides the minimum bid used during the bidding process. Individual grazing units are awarded to the highest bidder. The previous year's permittee has the right to match the high bid. The Refuge has two "grandfathered" grazing permittees who pay the base rate annually.

Male Gadwall
Photo by Steve Emmons

5.2.5 Prescribed Burning

Prescribed burning is used in both wetland and upland habitats to remove hazardous fuel loads, control non-native invasive species, and enhance and maintain habitat values. Burning in wetland areas reduces perennial vegetation that has expanded to the point where decreased wildlife use and overall productivity has resulted. Perennial vegetation includes hard-stemmed bulrush, cattail, and reed canary grass. Typically, prescribed burns are applied to managed wetlands during winter and early spring. Depending on conditions and habitat objectives, both dry and overwater burning can be successful.

The frequency of burning wetland units depends on the habitat type, vegetation species composition, tendency for growth, and soil type. In some cases, this may be as often as once every five years and in others, it may be once every 20 to 30 years.

Fire replenishes depleted growth elements to soils and helps clear fields of vegetative debris. Resource benefits include maintaining biodiversity (especially native plant communities and the wildlife they support), providing browse and nesting cover for waterfowl, and general maintenance of habitat for short grass wildlife species.

These burns also reduce the risk of large unwanted wildfires by reducing the accumulation of hazardous fuels and establishing a

mosaic of fuel loads. Burns may occur at any time of year, depending on specific objectives and condition of the habitat.

The Refuge is within the Klamath fire management zone. The fire management staff of the Klamath Basin National Wildlife Refuge Complex has annually conducted prescribed fire activities at the Modoc Refuge.

Prescribed burns are conducted in accordance with both Department of the Interior and Service Fire Management Policy (621 FW 1-3 of the Service Manual). Use of prescribed burns for habitat management and hazardous fuel reduction is consistent with both the approved habitat and fire management plans for the Refuge. A Fire Management Plan and EA (U.S. Fish and Wildlife Service 2003) were completed in 2003. Individual prescribed burn plans are written, reviewed, and approved for each unit as outlined in the Interagency Prescribed Fire Guide. They include a variety of information detailing how the burn will be conducted, considerations for safety, and measures to minimize impacts to sensitive species and air quality. All prescribed burns are conducted in compliance with the Clean Air Act and associated permitting requirements.

Prescribed Burning
Photo by USFWS

Prescribed burning eliminates fuel build-up, prepares land for new growth, creates diversity needed by wildlife, and helps certain plants and trees germinate. Prescribed burns were conducted on the Refuge from 1985 to 2001. During this period the annual prescribed burned area ranged from 50 to 275 acres, with a total of 1,554 acres burned on the Refuge. Most of the acres burned were in wet meadow and agricultural habitats. Additional prescribed burns were conducted in 2004 and 2005. The goals of the prescribed fire program are to

- restore/perpetuate native grasses, forbs, and shrubs,
- reduce non-native plant species,
- periodically reduce dense cattail and bulrush growth in wetlands to improve the ratio of open water to cover,
- maintain/rejuvenate nesting cover for waterfowl and other native birds,
- maintain water delivery systems, and
- protect riparian habitats from catastrophic wildland fire events through the establishment of firebreaks.

5.2.6 Control of Invasive/Non-native Species

The Refuge actively controls a number of invasive and/or non-native plants. Invasive plant species compete with desirable plants for space, sunlight, nutrients, and water. They have detrimental effects on the distribution and abundance of plants that are important to wildlife as food, shelter, and nesting areas. In some cases, certain plants may be desirable in modest proportions, but can be detrimental to diversity and productivity if they become dominant. Currently, approximately 5,210 acres of the Refuge are infested with non-native species. The Refuge treats approximately 1,000 acres annually.

There are five primary invasive/non-native weed species on the Refuge: perennial pepperweed, Scotch thistle, Canada thistle, bull thistle, and Mediterranean sage. Other non-native or nuisance invasive species include common teasel, cheat grass, reed canary grass, and poison hemlock. Perennial pepperweed and scotch thistle are the most invasive and damaging of the non-native species on the Refuge. However, the most widespread is Canada thistle, which occurs along wetland margins, wet meadows, irrigation canals, and roadsides.

The Refuge actively participates in the Modoc County Noxious Weed Management Group, which includes the CDFG, California Department of Food and Agriculture, NRCS, USFS, BLM, Central Modoc Resource Conservation District (RCD), Pit RCD, Goose Lake RCD, North CAL/NEVA Resource Conservation and Development, California Department of Transportation, U.C. Cooperative Extension, and Modoc County Department of Agriculture. The Group was brought together by the common goals of noxious weed exclusion, early detection, and control within Modoc County.

Controlling Invasive Plant Species
Photo by USFWS

The Service pest management policy goal (30 AM 12.1 of the Administrative Manual) is to eliminate the unnecessary use of pesticides through the use of Integrated Pest Management (IPM). IPM uses a combination of biological, physical, cultural, and chemical control methods (30 AM 12.5 of the Administrative Manual). This approach notes environmental hazards, efficacy, costs, and vulnerability of the pest. An IPM Plan (Appendix G) has been developed for the Refuge. Mechanical, physical, biological, and chemical applications are the primary mechanisms used to control non-native/invasive species. Prescribed fire is also an effective means of reducing weed infestations, particularly in native communities that evolved with fire.

When plants or animals are considered a pest, they are subject to control on national wildlife refuges if the pest organism represents a threat to human health, well-being, or private property; the acceptable level of damage by the pest has been exceeded; State or

local governments have designated the pest as noxious; the pest organism is detrimental to primary refuge objectives; and the planned control program will not conflict with the attainment of Refuge objectives or the purposes for which the Refuge is managed (7 RM 14.2 of the Refuge Manual).

5.2.7 Wildlife Sanctuary

Sanctuaries are areas on the Refuge that are closed to public use (approximately 4,265 acres or 61 percent of the Refuge). They provide places where human-caused disturbances are reduced, thereby reducing the interruption of wildlife activities, such as foraging, resting, breeding, feeding nestlings, and other maintenance activities. They are also important for wildlife to avoid predation by other wild animals, as they can devote less energy to avoiding humans and more to avoiding predators. Sanctuaries are areas where wildlife concentrate and reproduce, resulting in increased numbers of wildlife, which can lead to more wildlife-dependent public use in areas near the sanctuary.

Short-term sanctuaries occur on Dorris Reservoir during the wintering and nesting seasons. Dorris Reservoir is closed to public access from October 1 through January 31 to provide sanctuary for migratory waterfowl. From February 1 through May 31, shorelines, islands, and peninsulas are closed to public access to reduce disturbance of nesting waterfowl. In addition, the 2,130-acre hunt area is closed to public access, outside of the waterfowl hunting season.

6. Fish and Wildlife

Situated along the Pacific Flyway, the Refuge is an important resting, nesting, and feeding area for migratory birds, and it has been recognized as an Important Bird Area (IBA). The IBA program is a global effort to identify and conserve areas that are vital to birds and other biodiversity. By working with Audubon chapters, landowners, public agencies, community groups, and other non-profits, Audubon endeavors to interest and activate a broad network of supporters to ensure that all IBAs are properly managed and conserved.

To qualify as an IBA, sites must satisfy a variety of criteria. In the U.S., the IBA program has become a key component of many bird conservation efforts, including Partners in Flight, North American Waterbird Conservation Plan, and the U.S. Shorebird Conservation Plan.

The Upper Klamath Lake IBA was selected and approved as an IBA because it supports greater than 10 percent of the California breeding population of greater sandhill cranes, 12 sensitive species, and greater than 5,000 waterfowl (Cooper 2004).

Depending upon the season, bird populations on the Refuge vary greatly in abundance and diversity, with over 240 bird species recorded, including 40 accidentals (species not normally found in the region). Seventy-seven of these species nest on the Refuge. In addition to the numerous species of birds, 53 species of mammal and 19 species of reptiles and amphibians are known to inhabit the Refuge, as well as both native and non-native fish and invertebrate species. Appendix H contains a complete list of fish and wildlife species that occur or potentially could occur on the Refuge. An overview of wildlife use of the Refuge follows.

6.1 Waterfowl

The Refuge is an important northern California waterfowl production area, providing nesting habitat for 11 species. Duck production (to fledging) averages approximately 3,600 birds/year and is dominated by mallards, gadwalls, cinnamon teals, northern shovelers, and redheads (Figure 11). In addition, approximately 2,000 Canada geese are produced on the Refuge each year (Figure 12).

Fall migrating waterfowl begin to arrive on the Refuge in September and stage there until hard freezes drive the majority of the birds into the Central Valley. These birds return in the spring as they migrate back to their northern breeding grounds. Up to 25,000 ducks stop and rest on the Refuge (Table 3). The number of geese using the area averages between 4,000 and 5,000 birds (Table 3). Approximately 1,000 tundra swans also use the Refuge each year during migration.

Canada Geese with Goslings
Photo by USFWS

Figure 11. Waterfowl production 1972-2001

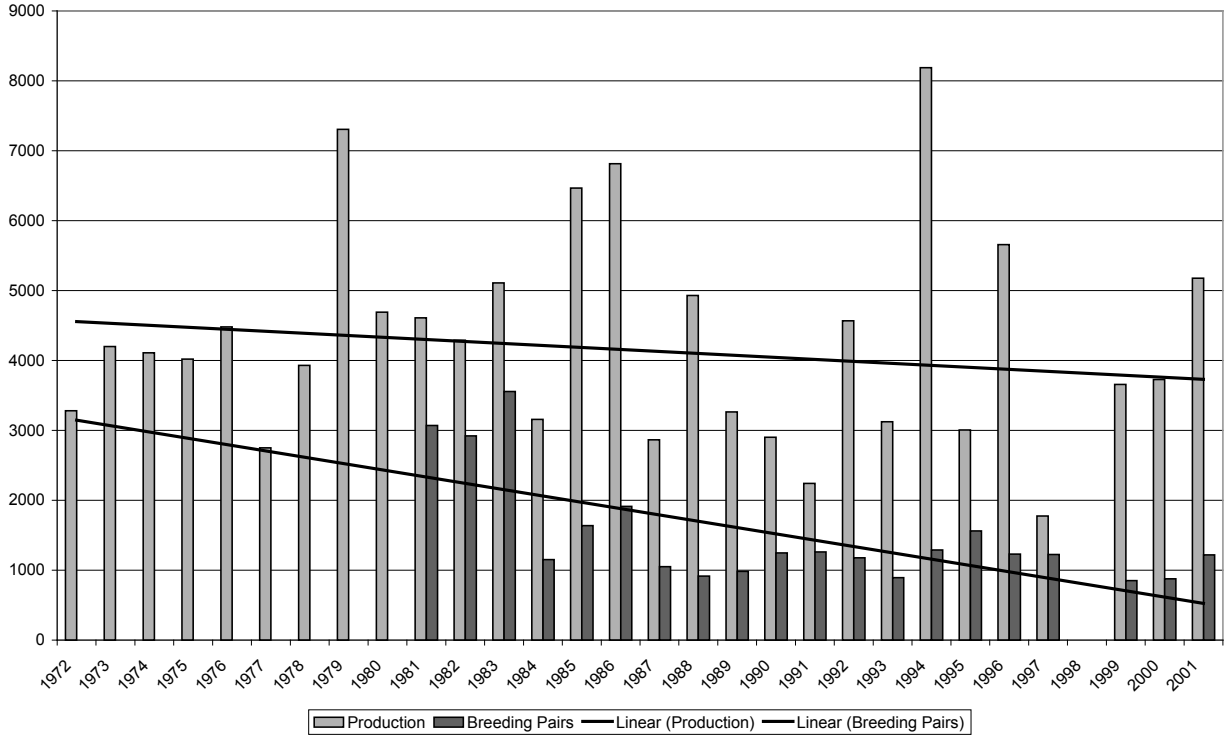


Figure 12. Canada goose production 1961-2003

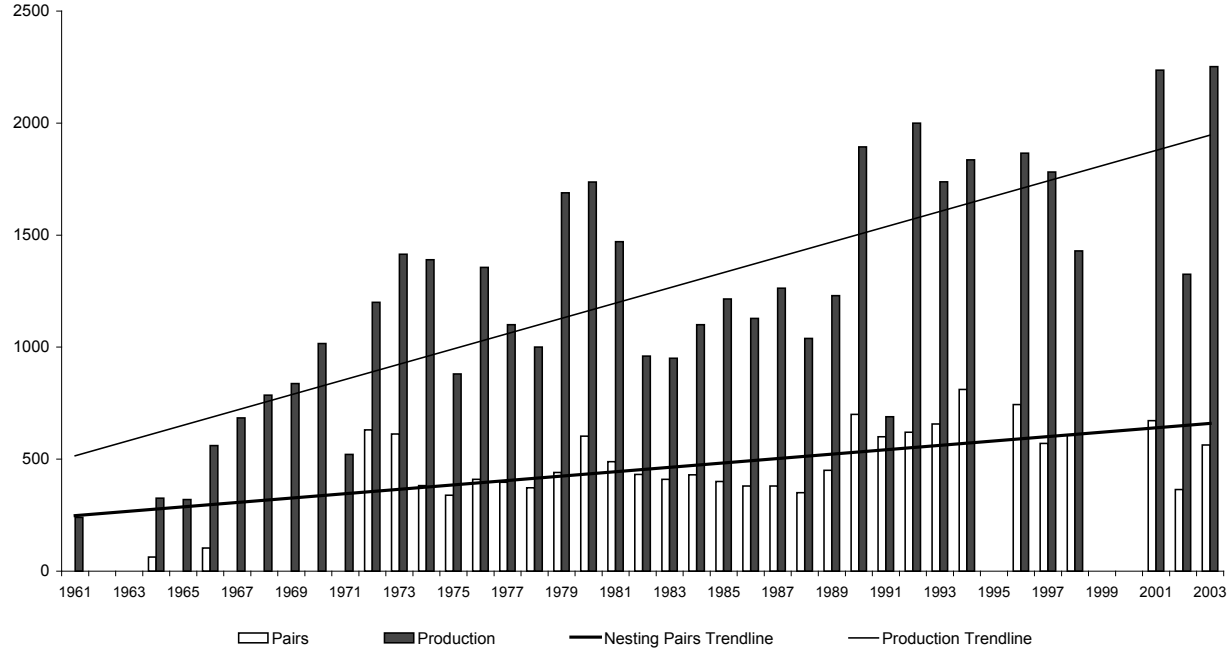


Table 3. Periodic wildlife survey Modoc Refuge, 2004

Species	September	October	November
Tundra swan	0	0	153
Trumpeter swan	0	0	0
TOTAL SWANS	0	0	153
White-front goose	0	83	10
Snow goose	0	0	0
Canada goose	1,008	2,795	1,443
TOTAL GEESE	1,008	2,878	1,453
Mallard	2,393	9,145	1,983
Gadwall	1,454	7,130	1,877
Green-winged teal	0	2,150	588
American wigeon	117	3,650	977
Northern pintail	75	6,370	266
Northern shoveler	162	1,500	627
Blue-winged teal	0	0	0
Cinnamon teal	26	850	0
Canvasback	0	0	0
Redhead	223	250	14
Ring-necked duck	0	40	420
Lesser scaup	225	0	0
Common goldeneye	0	0	286
Bufflehead	0	10	748
Common merganser	0	0	0
Hooded merganser	3	0	0
Ruddy duck	0	0	0
TOTAL DUCKS	4,678	31,095	7,786
GRAND TOTAL	**5,686**	33,973	9,392

Waterfowl use of the Refuge's habitat varies by species as well as factors such as water depth, ratio of open water to emergent vegetation, food availability, access to loafing sites, and level of human disturbance. Most of the waterfowl that occur on the Refuge are dabbling ducks and geese, which all prefer relatively shallow water. Species such as northern pintails, American wigeons, and northern shovelers prefer more open water, whereas mallards and gadwalls will use wetlands with denser cover.

Greater Yellowlegs
Photo by Steve Emmons

6.2 Shorebirds

Numerous shorebirds nest on the Refuge and forage in its shallow ponds and mudflats. Nesting has been recorded for the Wilson's phalarope, willet, long-billed curlew, killdeer, black-necked stilt, American avocet, and spotted sandpiper.

6.3 Waterbirds

Wetlands on the Refuge provide feeding and nesting grounds for a variety of wading birds including the greater sandhill crane (State listed threatened species), great egret, snowy egret, black-crowned night-heron, American bittern, great blue heron, and white-faced ibis.

Areas of open and usually deep water, such as at Dorris Reservoir, attract fish-eating birds, including the American white pelican and double-crested cormorant. Other year-round species include Virginia rails, soras, and grebes (e.g., pied-billed, eared, Clark's, and western).

6.4 Gulls and Terns

Ring-billed and California gulls are the most common gulls on the Refuge, occurring primarily during the summer. Forster's, Caspian, and black terns are common to abundant during the summer. Forster's and black terns nest on the Refuge.

6.5 Birds of Prey

The small but important riparian habitats on the Refuge provide nesting and foraging areas for the red-tailed hawk, Swainson's hawk, American kestrel, great horned owl, and barn owl. Upland and wetland habitats provide foraging and nesting for the northern harrier and short-eared owl. In addition, bald eagles, golden eagles, prairie falcons, and rough-legged hawks are common winter visitors.

American Kestrel
Photo by Steve Emmons

6.6 Game Birds

Game birds use a variety of habitats on the Refuge. Ring-necked pheasant can be found foraging in the agricultural areas and nesting in nearby shrubs. Mourning doves and California quail can also be found on the Refuge. Mourning doves and Wilson's snipe (a shorebird) are technically "migratory birds," but are also classified as upland game birds in the California hunting regulations. Mourning doves occur year-round. They are a common nester during the spring and summer and a less common winter resident. Wilson's snipe are abundant during the summer and nest in shallow wetlands. Wilson's snipe and ring-necked pheasant (Junior Hunt only) are the only game birds hunted on the Refuge.

Wilson's Snipe
Photo by Steve Emmons

6.7 Other Landbirds

The riparian habitat on the Refuge is occupied by species such as the downy and hairy woodpecker. This habitat also provides nesting and foraging areas for Neotropical migrants such as the yellow warbler, Bullock's oriole, Wilson's warbler, tree swallow, and willow flycatcher.

Upland habitat on the Refuge provides nesting and foraging areas for passerines such as the western kingbird, western meadowlark, black-billed magpie, song sparrow, and sage thrasher. Non-native European starlings and house sparrows are common and often out-compete native species for nesting sites.

6.8 Mammals

Most of the mammals found on the Refuge are year-round residents. The most abundant species include the deer mouse, Great Basin pocket mouse, Ord's kangaroo rat, western harvest mouse, northern grasshopper mouse, and Belding's ground squirrel. Nuttall's cottontails and black-tailed jackrabbits are common in the sagebrush habitat. Bats, including the Brazilian free-tailed bat, little brown bat, California myotis, and Yuma myotis, are also present on the Refuge.

Large mammals commonly found in the Refuge include mule deer, badger, striped skunk, bobcat, and coyote. In addition, muskrat, beaver, and river otter are found in the Refuge's aquatic habitats.

Western Pond Turtle
Photo by Steve Emmons

6.9 Amphibians and Reptiles

Common amphibians and reptiles occurring on the Refuge include the western toad, Pacific treefrog, western fence lizard, sagebrush lizard, western skink, gopher snake, common garter snake, and western pond turtle.

6.10 Fish

Native fish species expected to occur in the Reservoir and/or riverine habitats on the Refuge include the Pit-Klamath brook lamprey, Goose Lake redband trout, Sacramento sucker, hardhead, pit roach, Sacramento pike minnow, speckled dace, tui chub, and Pit sculpin. Non-native species include the bluegill, green sunfish, largemouth bass, brown trout, rainbow trout, brown bullhead, crappie, and channel catfish.

In July 1989, a gill net survey was conducted on Dorris Reservoir. The survey included 113 fish (54 percent tui chub, 20 percent brown bullhead, 16 percent largemouth bass, 5 percent rainbow trout, 4 percent bluegill sunfish, and 1 percent channel catfish).

Within the Refuge, fish are primarily found in the Pit River and Dorris Reservoir. However, they can also be found in canals and ponds. The CDFG stocks Dorris Reservoir with rainbow trout and is the primary source of existing fish species. The Reservoir was treated with Rotenone in 1947 and then annually stocked with rainbow trout until 1968. As a result of public pressure, annual stocking of catchable sized trout by CDFG resumed in 1980. Because of annual summer drawdowns and associated warm temperatures, this is not a self-sustaining population. The State also planted largemouth bass in 1949, bluegill in 1955, channel catfish in 1972, and brown bullhead (date unknown). In 2007, CDFG planted 2,450 Eagle Lake rainbow trout into Dorris Reservoir.

Fish barriers have been installed in Parker Creek and Pine Creek delivery canals to prevent fish migration during high precipitation years. Fish habitat enhancement projects on Dorris Reservoir are conducted annually. Juniper stumps and recycled Christmas trees are used to create brush piles that provide escape cover for fish.

6.11 Invertebrates

Invertebrate populations are greatest and most diverse in aquatic habitats, and provide an important food base for many fish and wildlife species both aquatic and terrestrial. Invertebrates present on the Refuge are an important resource based on their contribution to biotic diversity and their vital function in the food chain for many fish and wildlife species. They occur in all habitat types, both aquatic and terrestrial. Some are abundant such as many species of midges, while others are quite rare.

In combination with seeds and other vegetation, aquatic invertebrates are an essential part of many waterbird diets at various times of the year, as they provide a balance of amino and fatty acids to facilitate fat and protein storage (Euliss and Harris 1987; Miller 1987; Heitmeyer and Raveling 1988). Invertebrates provide energy for migration, protein to replace molted feathers, and calcium for the production of eggs. Wetlands support a wide variety of aquatic

invertebrates including water fleas, snails, clams, dragonflies, damselflies, water boatmen, backswimmers, beetles, midges, mosquitoes, worms, mussels, crayfish, and various species of zooplankton. While many of these species' larvae occur in the water column or sediment in wetlands, the adult stages are aerial and an important food source for landbirds as well as mammals (i.e., swallows, flycatchers, and bats).

Terrestrial invertebrates are also an important food base for many migratory and resident bird species, and include numerous species of grasshoppers, beetles, butterflies, moths, ants, spiders, and other insects. In addition, many of these invertebrates play key roles in plant pollination.

6.12 Threatened and Endangered Species

The Refuge provides breeding, rearing, migratory, and wintering habitat for Federal and State threatened and endangered species and species of special status. Federally and State listed species are presented in Table 4 and are discussed in more detail below. Other special-status species are presented in Appendix H. No Federal or State listed plant species are known to occur on the Refuge.

6.12.1 Greater Sandhill Crane

The greater sandhill crane (State listed as threatened) is one of six subspecies of sandhill cranes found in North America. The greater sandhill cranes are divided into five distinct migratory populations, which return to the same breeding and wintering sites every year (Littlefield and Ivey 2000). These five populations are the Eastern, Prairie, Rocky Mountain, Lower Colorado River Valley, and California Central Valley (Littlefield and Ivey 2000, 2002). Greater sandhill cranes that occur on the Modoc Refuge belong to the California Central Valley population.

Greater Sandhill Crane Colt
Photo by USFWS

In 2000, there were an estimated 62,600 greater sandhill cranes in existence (Littlefield and Ivey 2000). In 2005, the estimate for greater sandhill cranes within their Pacific Flyway range was between 5,000 and 6,000 individuals (California Department of Fish and Game 2005c). Estimates of breeding crane pairs were made in these northern California counties: Modoc (252), Lassen (122), Siskiyou (51), Plumas (20), Shasta (10), and Sierra (10). Breeding population estimates have ranged from a low of 112 breeding pairs in 1971 (in 3 of the above 6 counties) to a high of 465 pairs in 2000 (California Department of Fish and Game 2005c).

This species continues to experience threats on both wintering and breeding grounds due to agricultural and urban conversion of habitat, predation, human disturbance, and collisions with power lines.

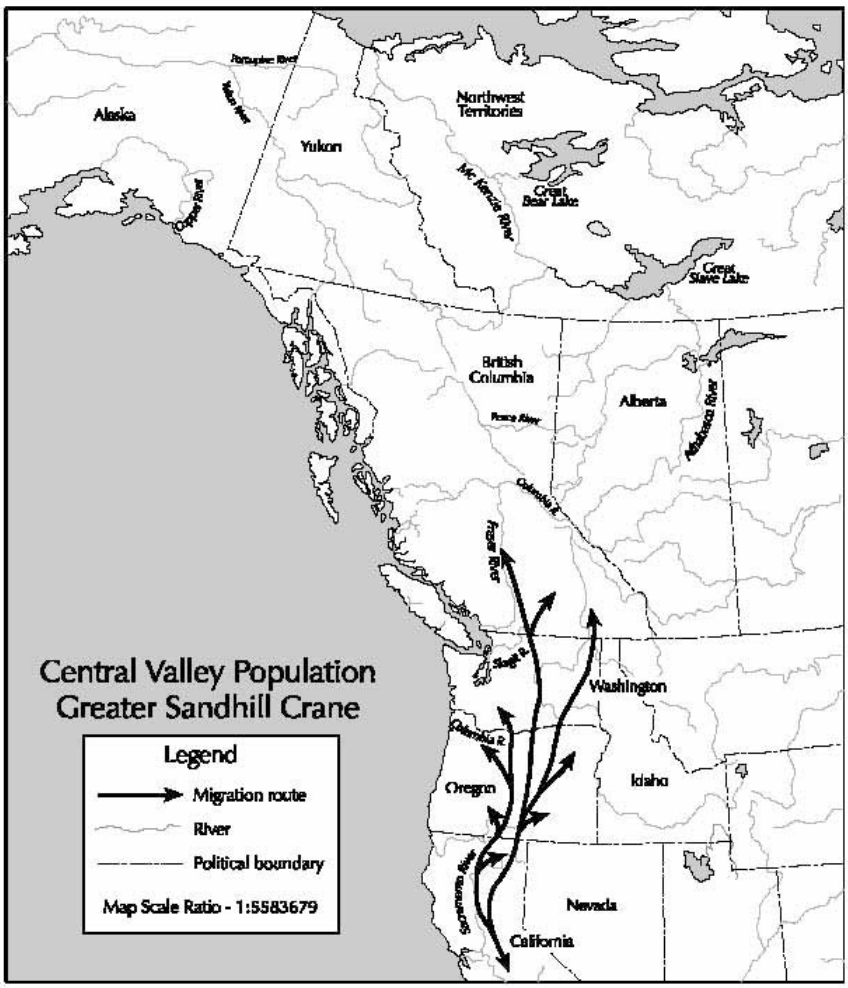
Table 4. Federal and State listed wildlife species occurring at or near Modoc National Wildlife Refuge

Common Name *Scientific Name*	Status[1]	General Habitat Description	Comments
Greater sandhill crane *Grus canadensis tabida*	CT, CFP	Wetlands required for breeding; forage in nearby pastures, fields, and meadows.	Common spring, summer, and fall resident; known to breed on the Refuge.
Western snowy plover *Charadrius alexandrinus nivosus*	FT, CSC	Inland, breeds on barren to sparsely vegetated ground at alkaline or saline lakes, reservoirs, and ponds.	Rare summer resident; suspected of nesting on the Refuge.
Swainson's hawk *Buteo swainsoni*	CT	Breeds in stands with few trees in juniper-sage flats, riparian areas, and oak savannah; forages in adjacent livestock pasture, grassland, or grain fields.	Summer resident; known to nest on the Refuge.
American peregrine falcon *Falco peregrinus anatum*	FD, CE, CFP	Forages in many habitats; requires cliffs for nesting.	Rare migrant.
Bald eagle *Haliaeetus leucocephalus*	FD, CE, CFP	Riverine and open wetland habitats. Perches high in large, stoutly limbed trees, on snags or broken-topped trees or on rocks near water.	Winter resident and occasional migrant.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FC, CE	Nesting habitat is cottonwood/willow riparian forest.	Rare migrant and summer resident; suspected of nesting on the Refuge.
Willow flycatcher *Empidonax traillii*	CE	Wet meadow and montane riparian habitats.	Uncommon summer resident; known to nest on the Refuge.
Bank swallow *Riparia riparia*	CT	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	Common migrant and uncommon summer resident; known to nest on the Refuge.
Oregon spotted frog *Rana pretiosa*	FC, CSC	Wet areas in mountainous woodlands and wet meadows.	Suitable habitat occurs on the Refuge. Has been recorded historically in Pine Creek and the south fork of the Pit River near Alturas (California Herps 2007).
Modoc sucker *Catostomus microps*	FE, CE	Small streams	Known to occur in Turner and Rush Creeks in Modoc County, not known to occur on the Refuge

[1]*Status Key: Federal: FE = Endangered, FT = Threatened, FC = Candidate Species; FD = Delisted State of California: CE = Endangered, CT=Threatened, CSC = Species of Special Concern, CFP = Fully Protected*

The California Central Valley population consists of two groups, which breed in different areas (Figure 13). One group winters in the southern part of California's Central Valley and breeds in southeast Washington, southeast and south-central Oregon, northwest Nevada, and in northeast California. The other group winters in the northern part of the Central Valley, and breeds in British Columbia (Littlefield and Ivey 2002).

Figure 13. Migration routes of Central Valley population of greater sandhill cranes

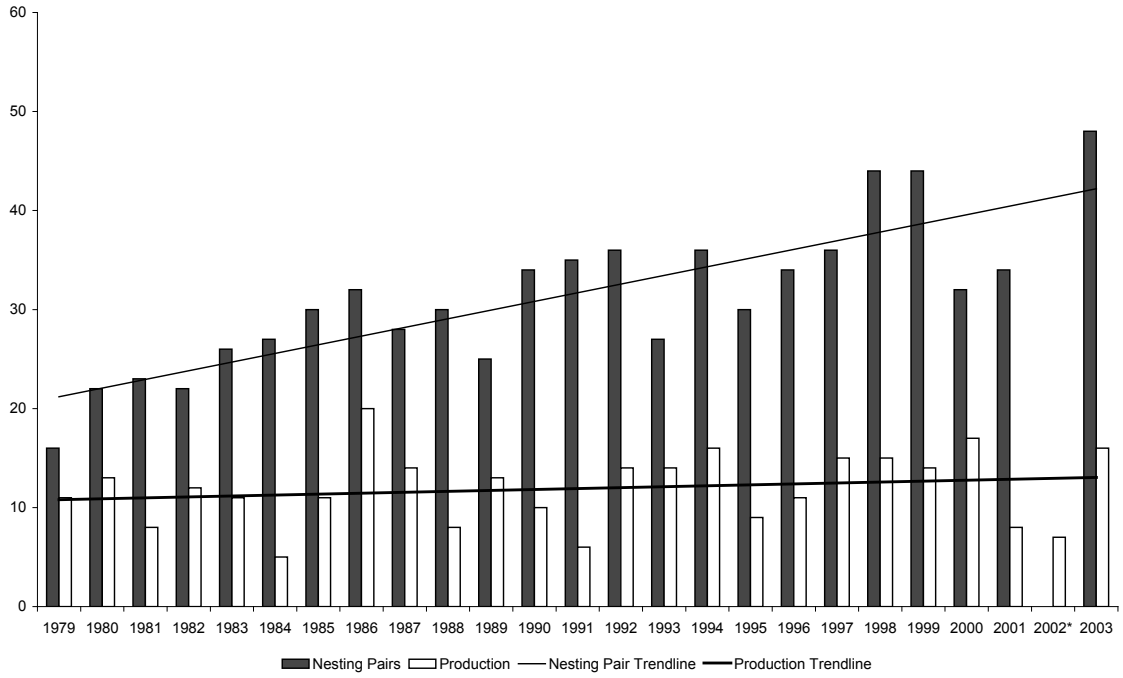


Source: Littlefield and Ivey 2002

In California, sandhill cranes establish territories in wet meadows that are often interspersed with emergent marsh. They tend to nest in rather open habitat; however, in certain areas they nest in association with a dense cover of bulrush and bur-reed.

The greater sandhill crane is a common spring, summer, and fall resident at the Refuge, which supports approximately 40 to 50 nesting pairs each year with an average recruitment (number of young surviving to adulthood) of 12 cranes per year (Figure 14).

Figure 14. Greater sandhill crane production at Modoc Refuge, 1979-2003



Greater sandhill cranes require wet meadows and wetlands to support their breeding and brood rearing efforts. Many of the pairs nesting on the Refuge also use areas adjacent to the Refuge for foraging. During the spring and fall, thousands of cranes use the Refuge on their way to and from the Central Valley of California.

6.12.2 Western Snowy Plover

The western snowy plover (Federally listed as threatened) is a small shorebird distinguished from other plovers by its small size, pale brown upper parts, dark patches on either side of the upper breast, and dark gray to blackish legs. The western snowy plover lays its eggs in a shallow depression in the salt pan or salt flat area of an estuary or in the beach dune areas near estuaries. Plovers feed primarily on insects and other invertebrates that they find in the wet sand along the surf or in lagoons.

Western snowy plovers breed from Washington State to Baja, California, and winter in coastal areas from southern Washington to Central America. Most western snowy plovers return to the same site in subsequent breeding seasons. Their preferred coastal nesting habitats are sand spits, dune-backed beaches, unvegetated beach strands, open areas around estuaries, and beaches at river mouths. In winter, snowy plovers are found on many of the beaches used for nesting as well as on beaches where they do not nest, and on estuarine sand and mud flats.

Recreational and other human disturbance, loss of habitat to urban development, introduction of beachgrass and other nonnative species, and expanding predator populations have all contributed to a decline in active nesting areas and in the size of the breeding and wintering populations. Current estimates project that there are roughly 1,800 western snowy plovers along the Pacific Coast from Washington to Baja (U.S. Fish and Wildlife Service unpublished data).

Western snowy plovers are a rare summer visitor at the Refuge where limited numbers have been observed during early summer. The closest documented nesting for this species occurs on Goose Lake and in Surprise Valley.

6.12.3 American Peregrine Falcon

The American peregrine falcon (Federally delisted, State listed as endangered) is a migratory species. Peak fall migration occurs between mid-September and mid-November, and individuals arrive on breeding grounds and establish territories in early March (White et al. 2002). The California breeding range, which has been expanding, now includes the Channel Islands, coast of southern and central California, inland north coastal mountains, Klamath and Cascade ranges, and the Sierra Nevada (California Department of Fish and Game 2005b). Nesting sites are typically on ledges of large cliff faces, but some pairs nest on city buildings and bridges. Nesting and wintering habitats are varied, including wetlands, woodlands, other forested habitats, cities, agricultural areas, and coastal habitats.

American Peregrine Falcon
Photo by Steve Emmons

Ninety-six randomly chosen peregrine nest sites in Washington, California, Oregon, Idaho, and Nevada were monitored in 2003. Under the Service-funded effort, 30 territories were sampled in California. The Pacific region's overall occupancy was 86 percent (93 percent in California), the overall nest success was 64 percent (75 percent in California), and the overall productivity was 1.4 young per occupied site (1.5 in California). In these five states, approximately 43 new territories were discovered in 2003, including nine in California (California Department of Fish and Game 2005c). Currently, the population of the peregrine falcon in California is increasing (California Department of Fish and Game 2005c).

On the Refuge, the peregrine falcon is a rare migrant, summer, and winter resident. Peregrine falcons are not known to nest in the Upper Pit River Watershed (VESTRA 2004).

6.12.4 American Bald Eagle

The bald eagle (Federally delisted, State listed as endangered) occupies various woodland, forest, grassland, and wetland habitats. The species winters throughout most of California at lakes, reservoirs, rivers, and some rangelands and coastal wetlands. Nesting territories are found mostly in the northern half of the State, and also in the southern Sierra Nevada, Central Coast Range, inland southern California south to Riverside County, and on Santa Catalina Island (California Department of Fish and Game 2005b). The breeding range expanded from portions of eight counties in 1981 to at least 32 of California's 58 counties by 2003 (California Department of Fish and Game 2005c). The population of bald eagles in California is currently increasing (California Department of Fish and Game 2005c).

American Bald Eagle
Photo by Steve Emmons

Modoc and Shasta counties have the highest densities of nesting bald eagles in California (VESTRA 2004). Between 1959 and 1977, only two bald eagle territories were documented in the Upper Pit River Watershed. Since then, 16 have been recorded (VESTRA 2004).

Wintering bald eagles utilize the Refuge from October through March. Large cottonwoods and junipers near Dorris Reservoir and the Pit River provide eagle roosting and perching sites.

6.12.5 Swainson's Hawk

Swainson's hawks (State listed as threatened) breed in North America and winter in Mexico, Central America, and South America. In California, this species may have declined by as much as 90 percent (Riparian Habitats Joint Venture 2004). Swainson's hawks were once found throughout the lowlands of California and were absent only from the Sierra Nevada, north Coast Ranges and Klamath Mountains, and portions of the desert regions of the State. Today they are restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available (California Department of Fish and Game 2005c).

Approximately 95 percent of Swainson's hawks in California exist in the Central Valley (California Department of Fish and Game and University of California at Davis 2006). They nest in trees along riparian corridors or in isolated trees or small groves near suitable foraging habitat. Foraging habitat consists of grassland vegetation and short herbaceous croplands.

During historical times (ca. 1900), Swainson's hawks may have maintained a population of more than 17,000 pairs. Based on a study conducted in 1994, the statewide population was estimated to be approximately 800 pairs. The loss and conversion of native grasslands and agricultural lands to various residential and commercial developments is the primary threat to Swainson's hawk populations throughout California (California Department of Fish and Game 2005c). Currently the population of Swainson's hawks in California is declining (California Department of Fish and Game 2005c).

In northeast California, Swainson's hawks arrive at nesting areas in early to mid-April and begin to depart in early September, with a few individuals remaining on territories in early October. A pair of Swainson's hawks has been observed on the Refuge since 2000 and nesting has been documented for the past several years.

6.12.6 Western Yellow-billed Cuckoo

The western yellow-billed cuckoo (Federal candidate species, State listed as endangered) requires dense, large tracts of riparian woodlands with well-developed understories for breeding. Their breeding range in California includes the lower Colorado, Kern, and Sacramento Rivers. The current population in California is about 60 to 100 pairs (Halterman et al. 2001).

The western yellow-billed cuckoo is threatened by loss and degradation of its habitat due to land clearing, fire, flood control projects, surface water diversions and groundwater pumping, and overgrazing by livestock (California Department of Fish and Game 2005c). Such disturbances often foster the establishment of invasive non-native plants such as tamarisk and giant reed. The resulting fragmentation reduces the size and quality of habitat for the cuckoo. Cuckoo's nest in larger trees, such as Fremont cottonwoods, located in close proximity to foraging habitat (mixed riparian forest and willow and herbaceous scrublands).

Western yellow-billed cuckoos are rare summer visitors to the riparian habitat on the Refuge. Nesting has not been verified but is suspected to have occurred.

6.12.7 Willow Flycatcher

The willow flycatcher (State listed as endangered) is a rare to locally uncommon, summer resident in wet meadow and montane riparian habitats at 2,000-8,000 feet in the Sierra Nevada and Cascade Range. They have specific habitat requirements, typically consisting of riparian habitat often dominated by willows and/or alder, and permanent water, often in the form of low gradient watercourses, ponds, lakes, wet meadows, marshes, and seeps within and adjacent to forested landscapes. Peak fall migration occurs between mid-August and mid-September, and breeding individuals arrive in their breeding territory around late May and early June (Sedgwick 2000).

Willow flycatchers are thought to primarily winter in Central America.

Willow flycatchers historically nested throughout much of California wherever deciduous shrubs, mainly thickets of willow, occurred (Grinnell and Miller 1944). In the latter half of the 20th century, the breeding populations drastically declined in lower elevation habitats (Serena 1982). Habitat alteration and overgrazing are cited as the two most responsible factors (Remsen 1978, Serena 1982). Generally, throughout the range of the willow flycatcher, historic wet meadow habitats have been drained for agricultural purposes and a percentage converted to crop production. More recently, predators and brood parasitism have been discovered to have a negative influence on survival and reproduction (Green et al. 2003). Approximately 315 territories are thought to occur in California (Green et al. 2003).

Willow flycatchers are a common spring and fall migrant at lower elevations, primarily in riparian habitats (California Department of Fish and Game 2005b). On the Refuge, willow flycatchers are a spring and fall migrant and uncommon summer resident of riparian habitats. One successful nesting attempt has been documented.

6.12.8 Bank Swallow

Bank swallows (State listed as threatened) are Neotropical migrants that breed in California from April to August and spend the winter months in South America. In California, they are found primarily in riparian and other lowland habitats. The current population is restricted to portions of the upper Sacramento River, primarily between Redding and Colusa; about four or five central and north coast colonies; and scattered colonies in northern and northeastern California, including a large one (usually about 1,500 burrows) at Fall River Mills (Schlorff 2000). Sacramento Valley riparian systems provide habitat for over 70 percent of the remaining population (Schlorff 2000).

Bank Swallow
Photo by Steve Emmons

Bank swallows are the smallest North American swallow species. They nest colonially and inhabit isolated places where fine-textured or sandy, vertical bluffs or riverbanks are available in which to dig burrows. Bank swallows forage over open riparian areas, brushland, grassland, and cropland. The rip-rapping of natural stream bank associated with bank protection projects is the single most serious, human-caused threat to the long-term survival of the bank swallow in California (California Department of Fish and Game 2005b).

VESTRA (2004) states that there are six bank swallow colonies reported in the Upper Pit River Watershed along the Pit River. Four colonies occur on the Pit River between 3 to 10 miles southwest of

Alturas, one 5 miles north of Alturas, and one colony near McArthur. Currently the McArthur colony is active, but it is unknown whether any of the other colonies are still active.

Bank swallows are a common migrant and uncommon summer resident on the Refuge. During the spring, the species has been observed feeding on flying insects over much of the Refuge. In the summer, they seem to be restricted to areas along the Pit River where they nest in limited numbers.

6.12.9 Modoc Sucker

The Modoc sucker was listed as endangered with critical habitat on June 11, 1985. Critical habitat for the Modoc sucker was designated in Modoc County, California to include a total of approximately 26 miles of the following streams and a 50 foot riparian zone on either side of the steam channel: Turner Creek, Washington Creek (including its tributary Coffee Mill Gulch), Hulbert Creek (including its tributary Cedar Creek), Johnson Creek (including its tributaries Rice Flat and Higgins Flat), and Rush Creek.

Modoc suckers are known from only two widely separated watersheds of the Pit River, Ash Creek and Turner Creek, and from two streams (Bauers and Thomas creeks) in the upper Goose Lake basin in Oregon (Moyle 2002). The decline of the species is largely attributed to habitat destruction and hybridization between the Modoc sucker with the Sacramento sucker a species that occupies larger streams in the region.

Even though suitable habitat may occur, Modoc suckers are not known to occur on the Refuge.

6.12.10 Oregon Spotted Frog

The Oregon spotted frog is a Federal candidate species. Historically, they ranged from extreme southwest British Columbia south through Washington and Oregon, to extreme northeast California, where it is known from only a few scattered localities including Pine Creek, South Fork Pit River near Alturas, Warner Mountains, and the southwest side of Lower Klamath Lake from near sea level to 5,000 feet.

Currently, 36 Oregon spotted frog locations are known in the U.S. including 7 in Washington (Klickitat, Skamania, and Thurston counties), 29 in Oregon (Deschutes, Klamath, Jackson, Lane, and Wasco counties), and 3 in British Columbia, Canada (USFWS 2007c). In California, this species has not been detected at historic sites and may be extirpated; however, there has not been an adequate survey of potential habitat, so this species may still occur in California.

Watson et al. (2003) summarized the conditions required for completion of Oregon spotted frog life cycle as shallow water areas for egg and tadpole survival, perennial deep moderately vegetated pools for adult and juvenile survival in the dry season, and perennial water for protecting all age classes during cold wet weather. Threats to the species' habitat include changes in hydrology due to construction of dams and alterations to seasonal flooding, introduction of exotic plant and animal species, plant successional changes, poor water quality, livestock grazing (in some circumstances), and residential and commercial development (USFWS 2007c).

7. Fish and Wildlife Management

Fish and wildlife management is accomplished through habitat restoration, enhancement, and management. Habitat restoration and management can improve the overall health and productivity of fish and wildlife populations by increasing water, food, breeding, staging, winter areas, cover, and shelter. Habitat management needs can be designed to benefit certain target species or multiple species.

7.1 Migratory Bird Management

Canada Geese Banding and Neck Collaring
Photo by USFWS

One of the Refuge's primary purposes is to provide habitat for migratory birds, particularly migrating and nesting waterfowl. The habitat management described in Section 5 contributes to achieving that purpose. The combination of managed habitat types support nesting and migrating ducks, geese, shorebirds, greater sandhill cranes, and a host of other wetland dependent species.

The Refuge participates in or conducts a number of migratory bird surveys and monitoring projects throughout the year. Surveys include ground migratory bird surveys, Canada goose production surveys, waterfowl and greater sandhill crane banding, Monitoring Avian Productivity and Survivorship project (MAPS) surveys, and other special surveys. This information is stored, tracked, and analyzed in a database and then used to develop annual habitat management plans.

7.2 Threatened and Endangered Species Management

The Refuge manages for greater sandhill cranes by providing and enhancing nesting and foraging habitat (see Section 5). Annual greater sandhill crane breeding pair surveys are conducted and successful reproduction (the presence of greater sandhill crane colts) is recorded. In addition to documenting the number of nesting pairs on the Refuge, the information gathered provides the refuge manager with a means of determining greater sandhill crane preferred nesting habitat and nest success, which can be used to guide habitat management on the Refuge.

7.3 Game Management

Game management at the Refuge is limited to habitat management for waterfowl and snipe (see Section 5). Game species other than waterfowl and snipe are not managed for explicitly. However, upland game species receive incidental benefits from the habitats that are managed for other priority Refuge resources. For example, sagebrush-steppe, seasonal marshes, and semi-permanent wetlands all contribute to nesting cover for upland game birds. Well-distributed semi-permanent wetlands provide essential water sources during summer months, when the Refuge is relatively dry.

7.4 Monitoring, Research, and Investigations

Greater Sandhill Crane Colt
Photo by USFWS

Monitoring and research projects are conducted by refuge staff or cooperatively with principle investigators from government agencies, universities, and private conservation organizations. Monitoring and research are the foundation for Refuge management decisions.

A mist-netting project at the Refuge initially began in 1982 as a ten-year study to monitor the breeding population of yellow warblers and willow flycatchers. After 1992, the mist-netting project continued and data were formally submitted to MAPS on the various Neotropical migrants captured. MAPS data are collected at various locations all over the United States by the Institute for Bird Populations in Point Reyes, California.

Collecting MAPS Data is a Key Activity at the Modoc Refuge
Photo by USFWS

Study proposals are evaluated by refuge staff to assure that the research is compatible with the Refuge and that some aspect of the results will contribute to wildlife and habitat management. A SUP is issued to each research investigator. The SUP identifies and describes individual projects, provides contact information, identifies where research activities will take place, and describes special conditions to assure the health and safety of the environment and those who visit the Refuge.

7.5 Wildlife Disease Monitoring and Treatment

Wildlife disease monitoring is conducted opportunistically during site visits, field inspections, and wildlife surveys. Follow-up treatment includes carcass retrieval, documentation of site and carcass conditions, and either carcass disposal or shipment to the U.S. Geological Survey (USGS) National Wildlife Health Center, located in Madison, Wisconsin, where the carcass is tested to determine the cause of death. When appropriate, results are shared with other Service divisions (e.g., Law Enforcement and National Forensics Laboratory at Ashland, Oregon) and CDFG (e.g., game wardens and Wildlife Investigations Laboratory at Rancho Cordova).

8. Visitor Services

8.1 Visitor Services and Management Policy

There are a variety of sources for policy and guidance to manage public use programs on the Refuge. The Service Manual (605 FW 1-7) provides the policy for wildlife-dependent recreation including hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation. The policy also provides guiding principles for each of the wildlife-dependant recreation programs. A Visitor Services Plan for the Refuge is included in Appendix E.

8.2 Trends

The ability to compare and analyze population and demographic trends is invaluable in making projections about future recreational needs as well as for assessing existing visitor facilities and programs. The following are highlights of some recreation reports and surveys that are available for consideration when managing the visitor services program.

The Public Opinions and Attitudes on Recreation in California report (California Department of Parks and Recreation 2003) summarizes surveyed public attitudes, opinions, and values regarding key areas of interest relating to outdoor recreation opportunities in California; and public participation interests in different types of outdoor recreation activities. The results of this study on public opinions and attitudes about outdoor recreation in California are in general agreement with past editions of this study. Californians think outdoor recreation areas and facilities are very important to their quality of life (84.1 percent), and more than two-thirds (69.1 percent) reported spending the same or more time in outdoor recreation activities than five years ago. Almost all Californians (96.7 percent) agreed or strongly agreed that maintaining the natural environment in outdoor recreation areas was important to them. The most important factors influencing enjoyment of recreational activities were being able to relax (75.9 percent), feeling safe and secure (68.3 percent), being in the outdoors (75.9 percent), and beauty of the area (61.8 percent); meeting new people (13.2 percent) ranked last.

Three priority wildlife-dependent activities were surveyed and ranked (Table 5), although it should be noted that the nature study category could also include educational and interpretive activities. Walking for fitness and fun was ranked number one with 91.1 percent participating an average of 94.4 days per year. Driving for pleasure, sightseeing, and driving through natural scenery ranked second with 90.2 percent (31.3 days). Windsurfing showed the lowest percentage participation (3.4 percent), with snowmobiling and orienteering/geo-caching tied for next lowest (4.6 percent). Fifty percent or more of the respondents participated in 11 of the 55 recreation activities at least one day during the 12 months prior to the survey.

Kiosk at the Auto Tour Route on Modoc Refuge
Photo by USFWS

The Park and Recreation Trends in California 2005 report (California State Parks 2005) summarizes the State's population and demographic trends affecting parks, recreation areas, programs, and services. Some of the highlights include the following:

- California's population is currently 34 million and will increase by ½ million persons annually.
- California is continuing to be more culturally and racially diverse – Asian's and Hispanics are the top two groups.
- California's senior population will double by 2010.
- Baby boomers (40-60 years) are reaching retirement age, adding to the citizen-steward group.
- Today's youth (18-40 years) are the most urban of any generation, seeking one-day excursions with multiple activities.
- Understanding how people recreate will be the most effective way to serve visitors.
- California's advanced technology and transportation will expand recreational opportunities.

- Favorite outdoor recreation activities pertinent to refuges that will continue to dominate include walking, picnicking, sightseeing, and visiting nature centers.
- Day hiking, bicycling, running, and wildlife viewing are predicted to increase in popularity.
- Educational and interpretive programs will continue to be essential to help visitors understand the relationship between humans, nature, and cultural heritage.

Table 5. Ranks of three wildlife dependent activities

	Rank	Participation	Average Number of Days Participated
Wildlife viewing, bird watching, viewing natural scenery	8	75.1%	25.3
Fishing (freshwater)	19	34.0%	5.8
Hunting	49	9.0%	1.9

Source: California Department of Parks and Recreation 2003

Recreation trends in the U.S. are found in Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends (Cordell et al. 1999). Projections were made nationally for four U.S. regions, with California included in the Pacific coast region. Trends for the Pacific region indicate wildlife viewing and nature study are expected to increase by 65 percent and double the number of days per year per person in the next 40 years. Fishing is expected to increase, while hunting is expected to decrease.

The 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation – California (Survey) (U.S. Fish and Wildlife Service et al. 2006) is a comprehensive publication that provides information about the numbers of U.S. anglers, hunters, and wildlife-watchers by state. The Survey found that 7.4 million California residents and nonresidents 16 years and older fished, hunted, or watched wildlife in California. Of the total participants, 1.7 million fished, 281 thousand hunted, and 6.3 million participated in wildlife-watching activities spending a total of $8.0 billion on wildlife recreation in California. When compared to the 1996 Survey (U.S. Fish and Wildlife Service et al. 1996), the number of anglers decreased by 36 percent, number of hunters decreased by 45 percent, and wildlife-watching (away from home) increased by 23 percent.

8.3 Hunting

Hunting for waterfowl, snipe, moorhen, and coot is currently permitted on approximately 30 percent (2,130 acres) of the Refuge. An average of 1,650 hunter visits occur annually (Table 6). Habitats included in the hunt area are croplands, wet meadows, and wetlands. The most common species harvested include Canada geese, mallards, gadwalls, green-winged teal, and American wigeons.

Junior Waterfowl Hunters
Photo by USFWS

Hunters must enter the area from one of two designated parking areas, and are required to fill out a self-registration permit prior to hunting. The kill record portion of the permit must be carried at all times, filled out, and returned prior to leaving the hunt area. All equipment is carried in and out each day. Three spaced blinds are available (Figure 1), all of which are universally accessible. The remainder of the hunt area is open for free-roam hunting (Figure 1).

The hunt area is open for waterfowl hunting on Tuesdays, Thursdays, and Saturdays. Hunting on opening weekend is by reservation only. Hunters are selected through a drawing conducted by the Refuge. The normal quota is 100 hunters for both Saturday and Sunday. Typically, 350-400 hunters apply for opening weekend. Up to four hunters may apply on an application. Each hunting party may bring up to two junior hunters. A separate drawing is conducted for the three universally accessible blinds. There is a $3 application fee per person and successful applicants pay a $10 per person permit fee. Interagency Senior Pass, Interagency Access Pass, Golden Access, and Golden Age cardholders pay $5. There is no fee for junior hunters.

Mallard
Photo by Steve Emmons

Table 6. Hunting summary for Modoc Refuge, 1981-2007*

Year	# Hunters	# Ducks	Ducks Hunter	# Geese	Geese Hunter	Total Birds	Birds Hunter
1981	2,429	1,900	0.78	515	0.21	2,415	0.99
1982	3,335	2,850	0.85	1,208	0.36	4,058	1.22
1983	2,249	2,203	0.98	484	0.22	2,687	1.19
1984	1,801	1,808	1.00	524	0.29	2,332	1.29
1985	1,800	1,325	0.74	796	0.44	2,121	1.18
1986	1,696	1,409	0.83	440	0.26	1,849	1.09
1987	1,379	1,672	1.21	337	0.24	2,009	1.46
1988	1,547	1,637	1.06	509	0.33	2,146	1.39
1989	1,477	894	0.61	330	0.22	1,224	0.83
1990	1,459	1,050	0.72	692	0.47	1,742	1.19
1991	2,268	1,536	0.68	821	0.36	2,357	1.04
1992	1,176	616	0.52	420	0.36	1,036	0.88
1993	1,835	1,425	0.78	502	0.27	1,927	1.05
1994	973	1,716	1.76	289	0.30	2,005	2.06
1995	1,317	1,859	1.41	176	0.13	2,035	1.55
1996	1,674	2,844	1.70	362	0.22	3,206	1.92
1997	1,851	2,533	1.37	385	0.21	2,918	1.58
1998	1,757	2,246	1.28	339	0.19	2,585	1.47
1999	1,645	2,535	1.54	287	0.17	2,822	1.72
2000	1,227	1,815	1.48	246	0.20	2,061	1.68
2001	1,155	715	0.62	386	0.33	1,101	0.95
2002	1,412	1,321	0.94	309	0.22	1,630	1.15
2003	1,475	2,307	1.56	275	0.19	2,582	1.75
2004	1,513	2,333	1.58	280	0.18	2,613	1.73
2005	1,446	3,186	2.20	243	0.17	3,429	2.37
2006	1,441	2,708	1.88	274	0.19	2,982	2.07
2007	1,201	2,324	1.94	219	0.18	2,543	2.12
Average	1,650	1,880	1.19	431	0.26	2,312	1.44

**This table does not include youth waterfowl hunt numbers.*

After opening weekend, waterfowl hunting is conducted through a self-check-in/out system. There is no quota or fee after opening weekend. Universally accessible blinds may be reserved by contacting the Refuge Headquarters no later than 24 hours in advance of the hunt day. Non-reserved blinds are available to all hunters on a first come first serve basis.

The Refuge conducts a youth waterfowl hunt usually two weeks prior to opening weekend. The youth waterfowl hunt is by reservation only. Hunters are selected through a drawing conducted by the Refuge. The normal quota is 50 youth hunters. Typically, 75-100 hunters apply for the youth waterfowl hunt. Up to four hunters may apply on an application. Youth hunters must be accompanied by an adult non-hunter with no more than two youth hunters per adult.

Universally Accessible Hunting Blind
Photo by USFWS

The Refuge also conducts an annual youth pheasant hunt. Hunters are selected through a drawing conducted by the Refuge. This hunt is for wild pheasant and is limited to ten youth hunters. Youth hunters must be accompanied by an adult non-hunter with no more than two youth hunters per adult.

The Refuge Hunting Program Working Group was established in 2004 to help improve the quality of waterfowl hunting on the Refuge. All interested parties are welcome to participate in annual meetings.

8.4 Fishing

Fishing on Dorris Reservoir is permitted during daylight hours from February 1 through September 30. Largemouth bass, channel catfish, sunfish, and rainbow trout can be found in the Reservoir. All California State fishing regulations apply. A 60-foot long, wheelchair-accessible fishing pier is located at the south end of the Reservoir (Figure 1). Approximately 3,000 fishing visits occurred in 2007.

8.5 Wildlife Observation and Photography

Excellent wildlife viewing and photography opportunities can be found on the Refuge. Animals, such as greater sandhill cranes, waterfowl, shorebirds, raptors, and mule deer, can be seen from the three-mile auto tour loop, fully accessible Wigeon Pond Nature Trail with observation blind and interpretive overlook, and the U.S. 395 Overlook (Figure 1). The auto tour is accessible by pedestrians, bicycles, vehicles, and horseback riders. Dogs, on a

Wildlife Observation
Photo by USFWS

leash, are also permitted on roads and trails open to the public. In addition, wildlife-viewing opportunities can be found at Dorris Reservoir and from the roads along the perimeter of the Refuge. Friends of the Modoc Refuge have constructed a photography blind on Duck Pond Dike (Figure 1). The blind is available year-round by reservation through the Refuge Headquarters. Approximately 4,400 wildlife observation and 900 photography visits occurred in 2007.

8.6 Environmental Education

The visitor center at the Refuge offers a variety of exhibits, nature collections, and mounted wildlife. Complimentary brochures, posters, and leaflets regarding the Refuge System are available. Refuge staff also conducts presentations and tours upon request both on and off the Refuge.

Environmental Education – Up Close and Personal with a Bug
Photo by USFWS

In the spring of 2004, the Refuge joined forces with the River Center, a local non-profit environmental education facility, to initiate the Pit River Watershed Adoption Project (Project). The Project is a hands-on environmental education program that promotes awareness and understanding of watersheds through hands on projects. Each spring, all kindergarten through eighth grade students in the Alturas School system take part in a field trip to the outdoor learning laboratory on the Refuge.

The Refuge has designated a 20-acre site as an outdoor watershed learning lab. Activities include revegetation of native plants, plant inventory, wildlife inventory, water quality monitoring, and more. Participation provides an opportunity for students to complete hands-on, place-based learning projects at the site as they progress in grade levels. Over 1,000 students typically participate in the project annually both on and off the Refuge.

The Service's Children and Nature initiative strives to ensure that America's children have enjoyable and meaningful experiences in the out-of-doors and develop strong life-long connections with the natural world. The Refuge also strives to meet this initiative.

8.7 Interpretation and Outreach

Interpretation involves participants of all ages who learn about the complex issues confronting fish and wildlife resource management as they voluntarily engage in stimulating and enjoyable activities. First-hand experience with the environment is emphasized although presentations, audiovisual media, and exhibits are often necessary components of the interpretive program.

Refuge related information is provided at annual local festivals or during special events, such as the Wings of the Warners Migratory Bird Festival. The Festival is a combined effort of the Refuge and many other entities including the Friends of Modoc Refuge, Alturas Chamber of Commerce, Modoc County Office of Education, and Modoc Joint Unified School District. It celebrates the diversity of migratory birds at the Refuge and includes informational workshops, booths, Refuge tours, children's activities, music, and food. The Refuge also participates in the Children's Fair. Refuge staff conducts presentations and tours upon request both on and off the Refuge. In 2007, there were 150 off-site participants and 120 on-site participants.

Wings of the Warners Migratory Bird Festival
Photo by USFWS

8.8 Non-wildlife Dependent Recreation

Dorris Reservoir provides a number of recreational opportunities including swimming, boating, bicycling, horseback riding, and waterskiing. However, the Reservoir is closed to all public access during the waterfowl hunting season, from October 1 through January 31, to provide a sanctuary for wildlife. In addition, shoreline areas, islands, and peninsulas with nesting waterfowl are signed and closed to public access during waterfowl nesting season, March 1 through May 31.

Walk-in access is allowed on the Reservoir beginning February 1. Licensed motorized vehicles and bicycles are permitted at the Reservoir from April 1 through September 30 on roads designated for motor vehicles. Horseback riding is permitted from April 1 through September 30 on roads designated for motor vehicles and on the equestrian trail across the dam (Figure 1). Horseback riding is also allowed year-round on roads designated for motor vehicles in the remaining portions of the Refuge.

Bicycling is permitted from April 1 through September 30 on roads designated for motor vehicles. Bicycling is also allowed year-round on roads designated for motor vehicles, including the entrance road and auto tour route, in the remaining portions of the Refuge.

Boating is open April 1 through September 30. Swimming is open June 1 through September 30. No-wake zones in coves are designated with buoys to protect wildlife. Boat launch ramps, restrooms, and walking access are provided at the north and south sides of the Reservoir (Figure 1). Waterskiing is from June 1 through September 30 in the designated area (Figure 1). Personal watercrafts are prohibited.

8.9 Youth Program

A Youth Conservation Corps (YCC) program was implemented during the summer of 2002. It consists of one crew leader and six crew members. During the eight-week program, enrollees complete facilities maintenance and repair projects and assist with biological monitoring and banding efforts. YCC contributes over 2,000 project work hours annually. For every eight hours of work, one hour of environmental education is provided as field trips, presentations, or discussions.

Youth Conservation Corps Building a Blind
Photo by USFWS

8.10 Volunteer Program

The National Wildlife Refuge System Volunteer and Partnership Enhancement Act of 1998 (P.L. 105-242) strengthens the Refuge System's role in developing relationships with volunteers. Volunteers possess knowledge, skills, and abilities that can enhance the scope of refuge operations. Volunteers enrich refuge staff with their gift of time, skills, and energy. Refuge staff will initiate, support, and nurture relationships with volunteers so that they may continue to be an integral part of Refuge programs and management. The volunteer program is managed in accordance with the Fish and Wildlife Service Manual, Part 150, Chapters 1-3, "Volunteer Services Program", and Part 240 Chapter 9 "Occupational Safety and Health, Volunteer and Youth Program".

In 2007, the volunteer program consisted of 118 individuals (564 hours) that assisted with biological, environmental education, interpretive, wildlife observation, hunting, and maintenance events and activities.

The Friends of the Modoc National Wildlife Refuge (Friends) is a non-profit organization dedicated to assisting the enhancement of the Refuge as a community asset. The group meets monthly at the Refuge. The Friends have assisted the Refuge by sponsoring the annual sandhill crane count, providing new benches for the auto tour route, improving universally accessible hunting blinds, landscaping the front entrance, assisting with the youth waterfowl hunts, and constructing a new photography blind.

A Photography Blind
Photo by USFWS

9. Partnerships

Partnerships have been a cornerstone of Refuge development and management. In addition to the partnerships described in the sections above, the Refuge works closely with CDFG, Ducks Unlimited, and the CWA to secure funding to restore and rehabilitate habitat on the Refuge.

Through the Partners for Fish and Wildlife program, the Service assists landowners to protect, enhance, or restore wetland, riparian, or native grassland habitats on their property. The Service works with a variety of Federal, State, and private partners including CDFG, NRCS, local RCDs, California Department of Water Resources, Ducks Unlimited, CWA, and Intermountain West Joint Venture (IWJV) to benefit landowners and further Refuge land conservation objectives.

Additionally, refuge staff is available to provide technical assistance and education and outreach information to landowners who are interested in conserving fish and wildlife habitats on their lands.

We will continue to form new partnerships with interested organizations; local civic groups; community schools; Federal, State, and County governments; Tribes; and other civic organizations.

10. Cooperation with Adjacent Landowners

The Refuge is part of a mosaic of public and private lands along the Pit River corridor. The private lands are an important part of the river system that supports a wide range of wildlife species and provides for economic vitality through agricultural production. To maximize conservation efforts, the Refuge encourages and supports a cooperative approach to problem solving by working with neighbors on common issues. The refuge manager is the primary contact for cooperation with adjacent landowners.

11. Fire Prevention and Hazard Reduction

The Service has been recording wildland fire history at the Refuge since its establishment in 1960. The Refuge has had 22 recorded fires since that time, resulting in the burning of approximately 149 acres (U.S. Fish and Wildlife Service 2007a). One of these fires was natural (caused by lightning). A number of other escaped prescribed burns and equipment caused fires have scorched different areas. The 1980s were a busy time, relatively, for wildland fire suppression at Modoc Refuge compared to its overall fire history. The Refuge continues to experience a dominant pattern of human influenced fires today. Its annual fuels growth and high visitation numbers (both users spending time on the Refuge and passing through on one of the surrounding transportation networks) poses a continued risk for wildland fire in the future (U.S. Fish and Wildlife Service 2007a).

Fire prevention and fire hazard reduction programs are intended to protect and reduce risks to human life and property at nearby homes, farms, businesses, developed areas, structures, improvements, and the Refuge boundaries. The Wildland Urban Interface (WUI) program is part of the National Fire Plan and is designed to reduce the potential for wildfire damage in zones where wildlands and infrastructure (assets at risk) mix. The WUI program emphasizes pre-fire management around communities that are listed as "at-risk" to wildfire in the Federal Register and by the state of California.

The program is part of a national stimulus package to implement wildfire hazard reduction projects on Federal lands, especially emphasizing use of local contractors. Development of site-specific projects includes collaboration with local landowners, local, County, and State firefighting departments, the refuge manager, and the Klamath Basin Complex fire management officer. Projects include, but are not limited to, prescribed burns for fuel reduction, permanent fuel breaks, selective cutting, mowing, or disking along boundaries and developed areas, and cooperative agreements with local fire districts for wildfire suppression.

12. Law Enforcement and Resource Protection

The staff of the Modoc Refuge recognizes the obligation that has been entrusted to them—the care of valuable natural and cultural resources—and they take this responsibility very seriously.

Law enforcement on the Refuge is used both for protection and for prevention. Used for prevention, law enforcement safeguards the visiting public, staff, facilities, and natural and cultural resources from criminal action, accidents, vandalism, and negligence. Used as prevention, law enforcement inhibits incidents from occurring by providing a law enforcement presence. The refuge manager supervises law enforcement on the Refuge. Currently, there are no law enforcement officers stationed at Modoc Refuge, but the law

enforcement officer stationed at Klamath Basin Complex and CDFG wardens provide limited law enforcement on the Refuge.

13. Facilities

There are a number of structures located on the Refuge, including shops, vehicle storage, offices, residences, pump houses, and hazardous materials storage areas. A complex infrastructure of roads, buildings, fences, canals, and water control structures is needed to provide suitable habitat for wildlife and provide safe functional areas for Refuge visitors and staff. Refuge facilities require frequent maintenance and repair. Currently, the Refuge has two permanent and one term wage grade positions for maintenance and operations.

Modoc National Wildlife Refuge Headquarters
Photo by USFWS

An intricate system of power lines also exists on the Refuge. Aboveground transmission lines are found primarily along county roads. One subsurface line follows the Refuge entrance road and provides service to the Refuge Headquarters.

The Refuge has many miles of roads that were primarily constructed to facilitate farming or access to adjacent farms. Most of the main roads are paved or have an aggregate surface. Secondary roads are native surface and are inaccessible when wet. General road maintenance, including grading and mowing, is required to provide safe access through the Refuge.

In order to maintain the integrity of the Refuge, it is critical to reduce trespass, dumping, and poaching on Refuge lands. It is the intent of the Service to maintain a positive working relationship with neighbors to reduce trespass, vandalism, and theft on adjacent landowner properties. To achieve these goals, the Refuge has fenced, signed, and gated the Refuge boundaries. This infrastructure helps to alleviate trespass problems. Annually, most Refuge units will require installation of some new posts due to vandalism. Information signs are maintained on the Refuge.

14. Safety

Safety is important both for the Modoc Refuge staff and for visitors. Monthly staff safety meetings are held at the Refuge headquarters. The intent of the meetings is to update and train personnel, as well as to resolve any safety concerns that arise. Sample topics include Lyme disease, West Nile virus, and hantavirus safety; heavy equipment safety; hazardous materials; boating safety; first aid; hypothermia; heat stress; and respiratory safety.

The Refuge has a Safety Plan, which is updated annually, that describes the safety program and the responsibilities of the Refuge staff and volunteers. The Safety Plan has an extensive amount of safety information provided in the appendices. A safety committee comprised of a collateral duty safety officer and additional staff meets quarterly to discuss safety issues and coordinate annual safety inspections.

15. Cultural Resources

From the late Pleistocene more than 10,000 years ago, through the late Holocene, to present time humans have occupied northern California and utilized its generous natural resources. Many diverse and complex cultures developed during this time, culminating in the Native American Tribes recorded by early ethnographers.

The Pit River Indians have traditionally inhabited a vast portion of northeastern California. The current site of the Refuge and the surrounding area was the home of the Kosealekte division of the Achumawi, whose winter village was located at the confluence of the north and south forks of the Pit River. These people fished the Pit River and harvested camas, tule potato, and seed bearing grasses. The marshy areas supplied willow and tule, from which houses were built, baskets were made, and items of tule clothing were woven.

The first European contact in the region was in 1826, with Peter Skene Ogden, who named the Pit River. A Hudson Bay Company group led by John Work in 1832 seems to be the first major, documented group of fur trappers to traverse and stay in Modoc County (Modoc County 1998). During the 1840s, several overland parties or trailblazers traveled through the region. During the 1850s, several other groups traversed the area, including two Pacific Railroad explorations in 1854. By 1857, several wagon trails through Modoc County were established, and in 1864, the first permanent non-Indian settlement was established in Surprise Valley (Modoc County 1998).

In 1870, Presley, Carlos, and Jim Dorris settled the town of Dorris Bridge, later to become the City of Alturas. With land granted under the U.S. Homestead Act, the Dorris family established a livestock ranch, which they operated for 90 years. Dorris Bridge was established as the County seat in 1876.

The period of 1880 to 1910 saw steady expansion in Modoc County. The predominant economic activity was agriculture, with the lumber business also being notable. The railroad arrived in 1908, four years after electricity. By 1910, Alturas had about 1,200 people (Mintier Harnish and Associates 1998).

16. Social and Economic Environment

16.1 Transportation

Major transportation routes near the Refuge include State Routes 299, U.S. Highway 395, and County Roads 56 and 115. There are no public transportation systems that provide access to the Refuge.

16.2 Employment

California has a $1.4 trillion gross state product, which makes it the largest state economy in the nation and the fifth largest economy in the world (California Department of Transportation 2005). The 2005-2025 County-Level Economic Forecast (California Department of Transportation 2005) reported that the state has 14.9 million wage and salary jobs. In 2004, 139,500 jobs were created, 97 percent of which came from the non-farm sector. The unemployment rate declined to 6.2 percent. The per capita income in California is $34,220 and the average salary per worker is $49,690. Employment growth is expected to increase over the next several years.

Cinnamon Teal
Photo by Steve Emmons

The following information regarding employment in Modoc County was taken from the 2007 Modoc County Economic & Demographic Profile (Center for Economic Development 2007). The average unemployment rate in Modoc County from 1990 to 2006 was 10.3 percent. Tracking monthly unemployment trends during that time revealed seasonal changes in the level of employment. In Modoc County there have been, on average, significant declines in unemployment from August through October. During this period, unemployment dropped from over 10 percent to 7.6 percent on average before it began to rise again. This decline may be largely, but not completely, driven by both seasonal ranching and forestry-related jobs.

In 2006, 4,000 residents, or 41 percent of Modoc County's population, were members of the labor force, compared to 48 percent in California. The city of Alturas had a labor force of 1,200 members in 2006 and a 7 percent decrease between 1990 and 2006. As of 2006, 3,800 members, or 95 percent of Modoc County's labor force, were

employed, which equaled the preceding year. Employment in the County is expected to rise in upcoming years.

In 2006, 200 members of Modoc County's labor force were unemployed, making up nearly 6 percent of the labor force. Modoc County's unemployment rate has been consistently higher than the California average since 1990.

16.3 Local Economy

The Government sector is the dominant employer (46 percent) in Modoc County (California Department of Finance 2007a). The second-largest sector, the trade, transportation, and utilities sector, accounts for 15.7 percent of all jobs and farming accounts for 11.7 percent of total jobs (California Department of Finance 2007a). Modoc County's labor force in 2006 totaled 4,000, with 1,100 of these workers residing in Alturas. During that year, the County's average unemployment rate was estimated at 7.7 percent, significantly higher than the statewide rate of 4.9 percent (California Department of Finance 2007b). On a per capita basis, income growth in Modoc County has slightly lagged statewide income growth since 1990, although income in the County has remained well below statewide levels.

In 2004, Modoc County's agriculture industry had an estimated value of 71 million dollars. Leading commodities included alfalfa, beef, potatoes, vegetables, and wheat. Government added 60 jobs, with increases in local and Federal components (70 and 10 jobs, respectively) offsetting a slight loss in state government (down 20 jobs). Educational and health services and leisure and hospitality posted no cumulative growth during these years, while trade, transportation, and utilities; goods producing; and other services employment declined by 10, 20, and 100 jobs, respectively (Employment Development Department 2006).

In general, recreational visits to national wildlife refuges generate substantial economic activity. In Fiscal Year 2006, more than 34.8 million people visited refuges for recreation (U.S. Fish and Wildlife Service 2005). Their spending generated $1.7 billion of sales in regional economics. As this spending flowed through the economy, nearly 27,000 people were employed and $542.8 million in employment income was generated (U.S. Fish and Wildlife Service 2005).

In 2006, there were approximately 17,344 visits to the Refuge. Local spending by visitors was estimated at $314,000. Residents of Modoc County accounted for about 60 percent of all recreation-related spending (U.S. Fish and Wildlife Service 2007b). Visitation to the Refuge also generates value to visitors over and above the amount that they spend to recreate, known as net economic values. Based on the average net economic values per visit derived by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 2007b), Refuge visits in 2006 are estimated to have generated about $303,200 in net economic values to Refuge visitors.

Festivals bring visitors to Modoc County
Photo by USFWS

Refuge operations generated about 33 full- and part-time jobs in Modoc County in 2007, accounting for almost one percent of countywide employment opportunities (see Attachment 1 of Appendix A). About half of the jobs generated by Refuge operations were directly attributable to administration of the Refuge (see Attachment 1 of Appendix A). Personal income generated by the Refuge for Modoc County residents totaled an estimated $1.4 million in 2007, including $844,000 in direct income and $583,200 in indirect and induced income (see Attachment 1 of Appendix A). The income directly and indirectly generated by the Refuge accounted for about 0.8 percent of total countywide income in 2007.

16.4 Land Use and Zoning

The Refuge is bordered by private, city, county, and Tribal lands. Modoc County has its own General Plan that outlines land use policies. The portion of the Modoc County General Plan that relates to Refuge management is summarized in Appendix I.

16.5 Demographics

In the first 150 years of statehood, California grew from fewer than 100,000 citizens in 1850 to almost 34 million in 2000 (California Department of Finance 2002). Between 1950 and 2000 alone, California's population increased by 200 percent (California Department of Finance 2002). If California continues to add nearly 500,000 persons each year, by 2012, the population could easily exceed 40 million. The 50-million mark will be passed sometime between 2030 and 2040 if current growth rates persist (California Department of Finance 2002).

The following information regarding the demographics of Modoc County was taken from the 2007 Modoc County Economic & Demographic Profile (Center for Economic Development 2007). Modoc County is currently home to 9,836 people with a projected population of 9,870 by 2015. Between 1996 and 2006, population decreased by 0.1 percent.

The largest age group in Modoc County in 2006 was the 50-59 year-old group, with 1,521 people. Since 1990, the number of people between the ages of 50-59 increased 6 percent, while those 30-39 decreased 6 percent, causing a 6 percent decline among children between 0-9. These trends may indicate that the number of jobs for those 30-39 has declined, while people looking towards retirement are migrating into the area. Residents over 60 make up a higher percentage of the population in Modoc County than the state average.

In 2006, 2,866 people inhabited the city of Alturas. Alturas saw an annual average population decrease of 0.9 percent between 1996 and 2006.

Approximately 79 percent of residents in Modoc County classified themselves as white in 2006, compared to 42 percent statewide. Hispanics represented the next largest group, with 13 percent of the population, compared to 36 percent in California. American Indians and Asians are the next largest groups, with 434 and 70 people respectively, and blacks are the smallest census-classified group, with 68 people.

Chapter 4. Planned Refuge Management and Programs

1. Overview of Goals, Objectives, and Strategies

One of the most important parts of the CCP process is the development and refinement of the refuge vision and goals. This section contains the primary goals that will define the management direction of the Modoc Refuge for the next 15 years. In addition, as part of the CCP, refuges are expected to develop objectives and strategies that, together, will help achieve the goals. Goals are broad statements of the desired future conditions for refuge resources. Refuge goals may or may not be feasible within the 15-year time frame of the CCP. Whenever possible, objectives are quantified statements of a standard to be achieved or work to be accomplished. They should be specific, measurable, achievable, results-oriented, and time-fixed, and should be feasible within the 15-year lifespan of the CCP. Strategies are specific actions, tools, or techniques that contribute toward accomplishing the objective. In some cases, strategies describe specific projects in enough detail to assess funding and staffing needs.

The five goals of the Modoc National Wildlife Refuge are outlined below to provide a context for the proposed management direction.

Goal 1: Conserve, manage, and restore a diversity of habitat types native to the Modoc Plateau for the benefit of fish, wildlife, plants, and special-status species.

Goal 2: Provide optimum migrating and nesting habitat for greater sandhill cranes.

Goal 3: Provide quality wildlife-dependent recreation and interpretation to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources.

Goal 4: Provide quality environmental education opportunities focusing on fish, wildlife, and habitats of the Pit River watershed.

Goal 5: Promote partnerships to preserve, restore, and enhance diverse, healthy, and productive ecosystems of northeastern California.

2. Organization

Each objective and each strategy are given a unique numeric code for easy reference. Objectives have a two-digit code (e.g., 1.1, 1.2, 2.1,

2.2). The first digit corresponds to the goal to which the objective applies. The second digit is sequential. Similarly, each strategy has a three-digit code (e.g., 1.1.1, 1.1.2, 2.1.1, 2.1.2). The first and second digits refer to the appropriate goal and objective, respectively. The third digit is sequential.

3. Refuge Management Goals, Objectives, and Strategies

Goal 1: Habitat and Wildlife

Conserve, manage, and restore a diversity of habitat types native to the Modoc Plateau for the benefit of fish, wildlife, plants, and special status species.

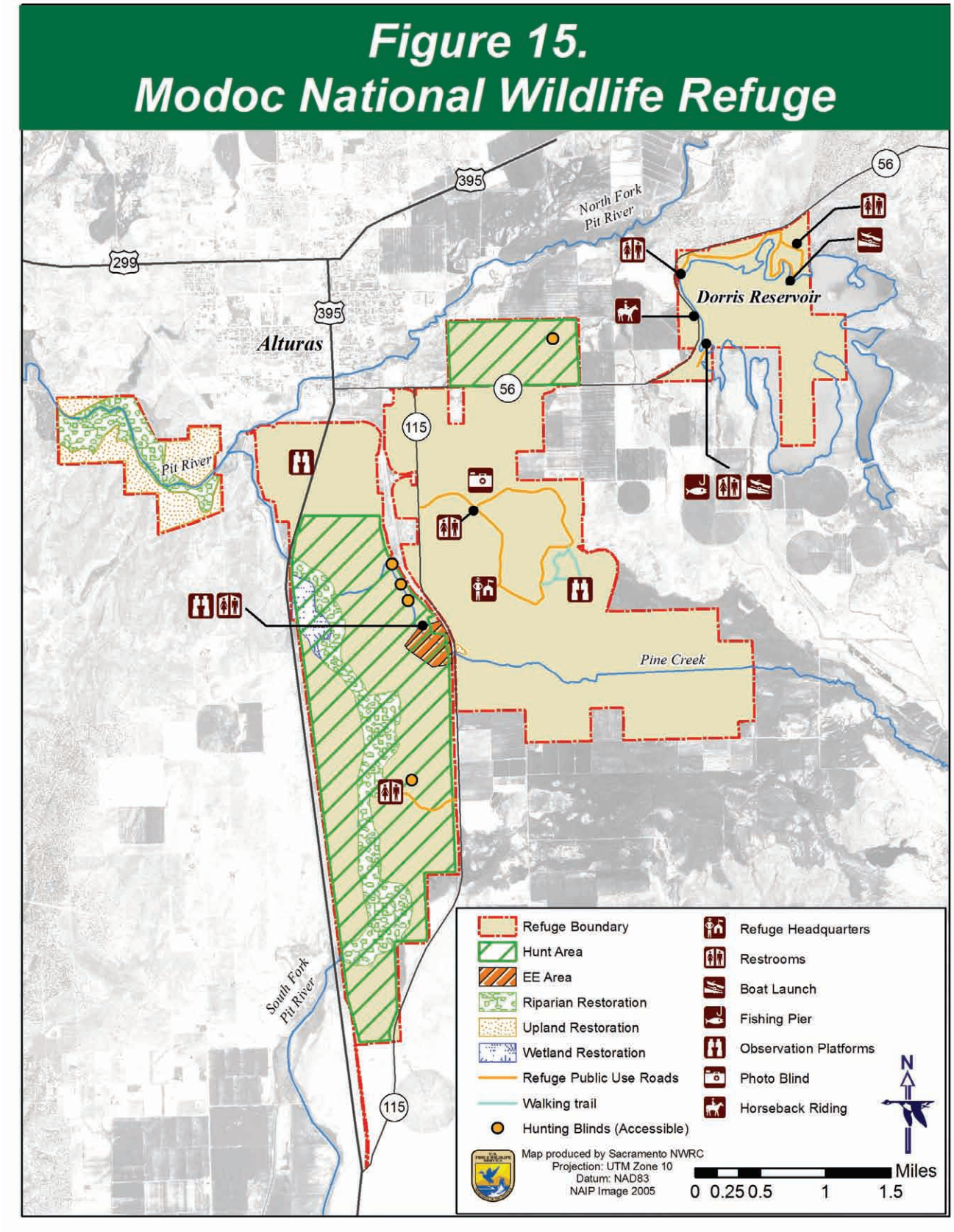
Objective 1.1: Wetland Habitat

Protect and enhance 1,615 acres of wetland habitat to provide seasonal wetlands (1,062 acres) and semi-permanent wetlands (553 acres) comprised of >50 percent native plant species cover by 2024. Seasonal wetlands will be managed as shallow water habitats (<12 inches water depth) and will produce desirable food plants such as smartweed and swamp timothy. Semi-permanent wetlands will be managed to include an approximately 50:50 ratio of open water (approximately 12-72 inches water depth) to native emergent plant species including cattails and bulrush.

Rationale: Wetlands support the greatest abundance and diversity of wildlife on the Refuge. Freshwater wetlands have declined by 90 to 95 percent in the state of California. The North American Waterfowl Management Plan (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1986; U.S. Fish and Wildlife Service et al. 1998) and Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005) address population and habitat objectives for healthy waterfowl populations. The Intermountain West Regional Shorebird Plan (Oring et al. 2001) and Intermountain West Waterbird Conservation Plan (Ivey and Herziger 2006) address goals and objectives to maintain healthy populations, distributions, and habitats of shorebirds and waterbirds throughout the Intermountain West region. Refuge management strategies will support these objectives. Wetlands are an essential component upon which significant numbers of waterfowl, waterbirds, shorebirds, and other wildlife rely. This objective also helps to achieve Modoc Plateau Region Conservation Action A in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Vegetation Management
Photo by USFWS

Figure 15. Visitor services and habitat restoration map



Wetland Habitat Strategies

1.1.1 Use mowing, disking, deleveling, prescribed fire (approximately 200 acres/year), and herbicides to manage and enhance wetland habitat.
1.1.2 Restore/enhance additional acres of wetlands using native plant materials derived from local ecotypes as opportunities arise.
1.1.3 Enhance West Pit (105 acres) wetland habitats by restoring the natural floodplain and seasonal wetlands, reduce erosion impacts to the South Fork Pit River, and control non-native reed canary grass (see Figure 15).
1.1.4 Conduct and evaluate wetland vegetation surveys annually to determine percent cover, species composition, and stand condition.
1.1.5 Conduct and evaluate monthly wildlife surveys to assess wildlife use of wetland habitats.
1.1.6 Support and facilitate management-oriented research on wetland habitat.
1.1.7 Maintain water control infrastructure.
1.1.8 Implement water quality monitoring (organics, heavy metals, etc.) on the Refuge water supply at initial points of entry.
1.1.9 Hire a full-time wildlife biologist to accomplish this objective and objectives 1.2-1.11 and 2.1.

Objective 1.2: Sagebrush-steppe Habitat

Protect and enhance 2,053 acres of sagebrush-steppe habitat comprised of >20 percent native plant species cover including sagebrush, rabbitbrush, and Great Basin wild rye, with <1 percent western juniper cover by 2024.

Sagebrush
Photo by USFWS

Rationale: Sagebrush-steppe provides numerous important habitat components, including foraging areas and nesting, thermal and escape cover for a variety of wildlife species on the Refuge. Sagebrush, perennial bunchgrass, aspen, and bitterbrush habitats of the Modoc Plateau are among the most threatened ecosystems of North America (The Nature Conservancy 2001).

The sagebrush-steppe habitats on the Refuge are dominated by non-native species. Invasion of cheatgrass has altered the fire regime and impacted native shrub-steppe habitat (California Department of Fish and Game 2005a). In addition, the recent history of fire suppression has allowed encroachment of juniper (California Department of Fish

and Game 2005a). The protection/restoration sagebrush-steppe habitat represents an important contribution to biological integrity of the Refuge.

The Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005) and Sagebrush Bird Conservation Plan (California Partners in Flight 2005) address population and habitat objectives for healthy sagebrush bird populations throughout the Intermountain West region. Refuge management strategies will support these objectives. This objective also helps to achieve Modoc Plateau Region Conservation Actions A and E in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Sagebrush-steppe Habitat Strategies

1.2.1 Use mowing, disking, prescribed fire (approximately 200 acres/year), herbicides, grazing, or other appropriate treatments to reduce and control non-native and invasive plant species and enhance and maintain native species composition.
1.2.2 Restore/enhance additional acres to sagebrush-steppe using native plant materials derived from local ecotypes as opportunities arise.
1.2.3 Restore HQ Field (5 acres) to sagebrush-steppe habitat (see Figure 15).
1.2.4 Remove juniper on Godfrey Tract (240 acres) (see Figure 15).
1.2.5 Conduct invasive plant species control projects.
1.2.6 Conduct and evaluate regular wildlife surveys to assess wildlife use of sagebrush-steppe habitats.
1.2.7 Conduct and evaluate periodic sagebrush-steppe vegetation surveys.
1.2.8 Support management-oriented research on sagebrush-steppe habitats.
1.2.9 To promote native vegetation and eliminate cheatgrass, evaluate summer (July/August) and winter (February) prescribed burning.

Objective 1.3: Riparian Habitat

On the Pit River system, protect and enhance 64 acres of existing woody riparian habitat and restore up to 282 acres of degraded herbaceous riparian habitat comprised of >80 percent native woody vegetation (e.g., willows spp., black cottonwood, and rose spp.) and herbaceous cover (i.e., various grasses and sedges) by 2024 for the benefit of native fish and wildlife.

Rationale: Riparian forests and other riparian plant communities provide habitat for a diversity of resident and migratory terrestrial and aquatic wildlife, including rare and endangered species. The Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004), the Riparian Bird Conservation

Yellow Warbler
Photo by Steve Emmons

Plan (Riparian Habitats Joint Venture 2004), and the Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005) identify focal species and habitat conservation and restoration needs throughout the Intermountain West region. Refuge management strategies will support these objectives. This objective also helps to achieve Modoc Plateau Region Conservation Actions A and E and Statewide Conservation Action G in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Riparian Habitat Strategies

1.3.1 Restore riparian habitat by planting native trees and shrubs using local ecotypes when practicable and feasible on the South Fork and mainstem of the Pit River (282 acres) (see Figure 15).
1.3.2 Maintain woody riparian habitat (64 acres) on mainstem of the Pit River, South Fork Pit River, and Pine Creek Ditch (see Figure 15).
1.3.3 Conduct and evaluate regular surveys to assess wildlife use of riparian habitats.
1.3.4 Conduct and evaluate regular riparian vegetation surveys.
1.3.5 Support management-oriented research on riparian habitats.

Objective 1.4: Croplands

Manage 549 acres of croplands, plant 150 acres of alternative crops to meet migratory bird objectives while improving the soil condition by 2009, and convert 8 acres of croplands to native vegetation by 2014.

Managing Croplands
Photo by USFWS

Rationale: Since the early 1900s, many species of migratory birds have become highly dependent on croplands during part of their annual life cycle. There is a long history of geese, sandhill cranes, and other migratory birds using the croplands and pastures of the Modoc Plateau. The Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005) and The Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004), address population and habitat objectives for healthy bird populations throughout the Intermountain West region. Refuge management strategies will support these objectives.

Individual refuges contribute to biological integrity, diversity, and environmental health (BIDEH) at larger landscape scales, especially when they support populations and habitats that have been lost at an ecosystem, national, or even international scale. In pursuit of refuge purposes, individual refuges may at times compromise elements of BIDEH at the refuge scale in support of those components at larger landscape scales. For example, because of the large-scale loss of

wetland habitat nationwide, the remaining wetlands must produce more habitat, more consistently, to support wetland-dependent migratory birds. Therefore, to conserve these migratory bird populations at larger landscape scales, many refuges like Modoc Refuge along the content's four major flyways are intensively managed. On Modoc Refuge, this includes active water management in wetlands, vegetation management, and cropland management. These strategies are aimed at maximizing habitat values for waterfowl.

Croplands Strategies

1.4.1 Croplands (549 acres) are planted with crops of high value for wildlife. Approximately 200 acres of barley and winter wheat will be planted annually.

1.4.2 Convert 5 acres (Headquarters Field) of croplands to native sagebrush-steppe and convert 3 acres (Matney 2) of cropland to native riparian vegetation (see Figure 15).

1.4.3 Enhance Matney 3-8 Fields (150 acres) by planting alternative crops to meet migratory bird objectives while improving the soil condition (see Figure 15).

1.4.4 Conduct and evaluate regular surveys to assess wildlife use of croplands.

Objective 1.5: Climate Change

Reduce the Refuge's energy consumption 3 percent annually and 30 percent by 2019.

Rationale: Climate change is already affecting wildlife throughout the State (Parmesan and Galbraith 2004), and its effects will continue to increase. It has particular significance for this region's major river systems. Depending on the model and assumptions, scientists project the average annual temperature in California to rise between 4 and 10.5 °F above the current average temperature by the end of the century (Hayhoe et al. 2004). Within 50 years, average wintertime temperatures are expected to rise between 2 and 2.5 degrees. A rise in this range would substantially reduce annual snowpack and increase fire frequency and intensity. By mid-century, the Sierra snowpack could be reduced by 25 to 40 percent and by as much as 70 percent at the end of the century (duVair 2003). The snow season would be shortened, starting later and melting sooner, while the fire season would be longer and hotter. The reduction of snowpack and more extreme fire conditions would have cascading effects on water resources, plant communities,

Winter at the Refuge
Photo by USFWS

and wildlife. Hotter temperatures, combined with lower river flows, will dramatically increase the water needs of both people and wildlife. This is likely to translate into less water for wildlife, especially fish and wetland species (California Department of Fish and Game 2005a). This objective also helps to achieve Statewide Conservation Action I in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Climate Change Strategies

1.5.1 Support and facilitate management-oriented research on wildlife and habitat (Objectives 1.1-1.11 and 2.1), including monitoring the impacts of climate change.
1.5.2 Replace Refuge vehicles with more fuel-efficient vehicles (hybrid, electric, etc.) as funding permits.
1.5.3 Investigate the use of solar, wind, and/or geothermal power to reduce the energy costs of Refuge buildings.
1.5.4 Retrofit existing facilities to increase energy efficiency (e.g., use compact fluorescent bulbs, increase insulation, and replace single paned windows).
1.5.5 Refuge staff will use telephone or computer video conferencing whenever possible to reduce carbon emissions.
1.5.6 The Refuge will continue to meet or exceed requirements for recycling and using recycled goods.

Objective 1.6: Waterfowl

Implement seven regular and periodic surveys for migrating and breeding waterfowl annually.

Mallard's Nest
Photo by USFWS

Rationale: Migratory birds are Federal trust species under the jurisdiction of the Service. Many species of migratory and resident birds depend on wetlands for nesting and migrating habitat. Their conservation, management, and restoration are among the mandated purposes of the Refuge. The North American Waterfowl Management Plan (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1986; U.S. Fish and Wildlife Service et al. 1998), Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005), and Pacific Flyway Management Plan (Pacific Flyway Council 2007) address population and habitat objectives for healthy waterfowl populations. Refuge management strategies will support these objectives. The Refuge provides nesting and migrating habitat for waterfowl. Monitoring is necessary to determine population status, assess trends, and identify habitat use, as well as restoration and management needs.

Waterfowl Strategies

1.6.1 Conduct and evaluate monthly wildlife surveys to assess waterfowl abundance and species composition.
1.6.2 Conduct annual duck brood and pair counts during May-July.
1.6.3 Conduct annual duck nest success surveys during May-June.
1.6.4 Conduct annual Canada goose brood and pair counts during March-June.
1.6.5 Conduct annual Canada goose nest success surveys during April.
1.6.6 Conduct annual waterfowl banding of Canada geese, gadwalls, mallards, redheads, etc. during the summer months.
1.6.7 Provide seasonal and semi-permanent wetlands to enhance waterfowl habitat for Canada geese, mallards, gadwalls, cinnamon teals, redheads, etc.
1.6.8 Optimize water level management to enhance habitat for waterfowl. Seasonal wetlands will be managed as shallow water habitats (<12 inches water depth) and will produce desirable food plants such as smartweed and swamp timothy. Semi-permanent wetlands will be managed to include an approximately 50:50 ratio of open water (approximately 12-72 inches water depth) to native emergent plant species including cattails and bulrush.
1.6.9 Monitor avian disease outbreaks.
1.6.10 Support management-oriented research on waterfowl.

Canada Goose
Photo by Steve Emmons

Objective 1.7: Shorebird

Conduct one periodic and one regular survey annually in order to assess trends in the abundance and distribution of shorebirds.
Rationale: Migratory birds are Federal trust species under the jurisdiction of the Service. Many species of migratory and resident birds depend on wetlands for winter habitat. The U.S. Shorebird Conservation Plan (Brown et al. 2001), Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005), and Intermountain West Regional Shorebird Plan (Oring et al. 2001) address population and habitat objectives for healthy shorebird populations. Refuge management strategies will support these objectives. The Refuge provides wintering, migration, and breeding habitat for shorebirds. Monitoring is necessary to determine population status, assess trends, and identify habitat use, as well as restoration and management needs.

Shorebird Strategies

1.7.1 Conduct and evaluate monthly surveys to assess wildlife.
1.7.2 Conduct periodic long-billed curlew nest surveys during April-June.
1.7.3 Provide shallow water and mudflats around wetland margins to enhance shorebird habitat, including habitat for black-necked stilts, long-billed dowitchers, western sandpipers, and American avocets.
1.7.4 Monitor avian disease outbreaks.

Black-Necked Stilt
Photo by Steve Emmons

1.7.5 Support management-oriented research on shorebirds.

Objective 1.8: Waterbird and Landbird

Conduct four surveys annually in order to assess trends in the abundance and distribution of waterbirds and landbirds.

Rationale: Migratory birds are Federal trust species under the jurisdiction of the Service. The Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005), North American Waterbird Conservation Plan (Kushlan et al. 2002), Intermountain West Waterbird Conservation Plan (Ivey and Herziger 2006), Sagebrush Bird Conservation Plan (California Partners in Flight 2005), Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004), and Riparian Bird Conservation Plan (Riparian Habitats Joint Venture 2004) address goals and objectives to maintain healthy populations, distributions, and habitats of waterbirds and landbirds throughout the Intermountain West region. Refuge management strategies will support these objectives. The Refuge provides breeding and migrating habitat for egrets, herons, rails, ibises, grebes, and other waterbirds as well as numerous landbirds. Monitoring is necessary to determine population status, assess trends, and identify habitat use, as well as restoration and management needs.

California Quail
Photo by USFWS

Waterbird and Landbird Strategies

1.8.1 Conduct annual colonial waterbird survey during April-September.
1.8.2 Conduct annual Breeding Bird Survey during June.
1.8.3 Conduct annual MAPS survey and banding May-August.
1.8.4 Conduct periodic raptor survey, including annual Swainson's hawk production survey during May-June.
1.8.5 Monitor avian disease outbreaks.
1.8.6 Manage wetlands to provide large stands of emergent vegetation (e.g., cattail and bulrush) for nesting habitat and successful breeding of waterbirds including black-crowned night herons and white-faced ibises.
1.8.7 Support management-oriented research on waterbirds and landbirds.

Objective 1.9: Non-native, Invasive Species Control

Treat new or small infestations of non-native species, such as perennial pepperweed, Mediterranean sage, and Scotch thistle, for 100 percent eradication. Treat wide spread non-native species, such as Canada thistle, reed canary grass, and poison hemlock, to control spread to other areas of the Refuge. Treat non-native, invasive species using prescribed fire, grazing, herbicide treatment, mowing,

disking, or other proven techniques on 2,000 acres of the Refuge annually as described in the IPM Plan.

Rationale: Invasive non-indigenous (non-native) species have become the single greatest threat to the Refuge System and the Service's wildlife conservation mission. More than eight million acres within the Refuge System are infested with invasive weeds (National Audubon Society 2002). Invasive species cause widespread habitat degradation, compete with native species, and contribute significantly to the decline of trust species (U.S. Fish and Wildlife Service 2002). The National Strategy for Management of Invasive Species (U.S. Fish and Wildlife Service 2002) has been developed within the context of the National Invasive Species Management Plan, as called for by Presidential Executive Order 13112, and functions as the internal guidance document for invasive species management throughout the Refuge System. This plan has four goals: 1) increase the awareness of invasive species issues, both internally and externally; 2) reduce the impacts of invasive species to allow the Refuge System to more effectively meet its fish and wildlife conservation mission and purpose; 3) reduce invasive species impacts on the Refuge System's neighbors and communities; and 4) promote and support the development and use of safe and effective integrated management techniques to deal with invasive species. Refuge management strategies will support these objectives.

Numerous exotic grasses and plants, like perennial pepper weed, annual medusahead, red brome, and various non-native thistles and aquatic weeds, such as Eurasian watermilfoil, have displaced native plants and altered local plant communities (California Department of Fish and Game 2005a). The invasion of cheatgrass and other exotic plants has contributed to the wholesale conversion of thousands of acres of sagebrush, bitterbrush, and mountain mahogany plant communities to annual grasslands that are less supportive of native wildlife (Miller et al. 1994; Young 2000; Henstrom et al. 2002; Schaefer et al. 2003). This objective also helps to achieve Statewide Conservation Action F in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Non-Native, Invasive Species Control Strategies

1.9.1 Annually evaluate invasive non-native species to be controlled. Locate, map, and monitor non-native species that may trigger a management response.

1.9.2 Control invasive and non-native species using prescribed fire, herbicide and mechanical treatments, or other proven techniques as identified in the IPM plan (Appendix G).

1.9.3 Conduct, facilitate, and/or support research to identify invasive plant biology and ecology and to evaluate techniques for controlling invasive plant species.

1.9.4 Hire a full-time maintenance worker to accomplish this objective and support objectives 1.1-1.4 and 2.1.

Objective 1.10: Wildlife Sanctuary

By 2009, provide 3,845 acres (55 percent of the total Refuge acres) of wetland, sagebrush-steppe, riparian, and cropland habitats as permanent sanctuary (i.e., no public access) for general wildlife use as well as nesting and breeding sites for sensitive populations. Seasonally, an additional 2,977 acres provide sanctuary for wildlife.

Greater Sandhill Crane
Photo by Share The Road Productions

Rationale: Sanctuaries are areas on the Refuge that are closed to public use. They provide places where human-caused disturbances are reduced, thereby reducing the interruption of wildlife activities, such as foraging, resting, breeding, feeding nestlings, and other maintenance activities. Sanctuaries are especially important during high visitor use periods. They are also important for wildlife to avoid predation by other wild animals, as they can devote less energy to avoiding humans and more to avoiding predators. Sanctuaries are areas where wildlife concentrate and reproduce, resulting in increased numbers of wildlife that can lead to more wildlife-dependent public use in areas near the sanctuary.

In some cases, short-term sanctuaries may be established on the Refuge to protect a sensitive nesting colony or site. These seasonal sanctuaries may impose public access restrictions at some nesting sites for species with a low tolerance for human disturbance.

Wildlife Sanctuary Strategies

1.10.1 Provide strategically located sanctuaries on the Refuge for wildlife to feed and rest with relatively little human disturbance.

1.10.2 Provide sanctuaries to reduce human disturbance at sensitive fish, and wildlife sites during the rearing, breeding, and growing seasons.

Objective 1.11: Research and Baseline Survey

By 2024, conduct five baseline surveys to determine presence and abundance and support research on native fish, wildlife, and plants.

Rationale: Knowledge of the distribution and abundance of species, species' needs, and status is critical for the management of the Refuge. Biological monitoring is necessary to assess the status of fish and wildlife populations, as well as how they respond to management actions. Management effectiveness can be evaluated and corrected, if needed, based on a monitoring program. Monitoring will consist of both long- and short-term projects and be conducted by refuge staff, partners, contractors, and other researchers. Some monitoring efforts will be conducted to meet Refuge data needs, while others will

contribute to or be a part of larger-scale ecoregion, flyway, or national monitoring initiatives. This objective also helps to achieve Statewide Conservation Action N in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Research Strategies:

1.11.1 Conduct baseline surveys to determine the presence/abundance of native fishes, insects, small mammals, aquatic invertebrates, amphibians, reptiles, plants, and special-status species on the Refuge.

1.11.2 Support management-oriented research for fish, wildlife, and plants on the Refuge.

1.11.3 Contribute to monitoring efforts on an ecoregion, flyway, or national scale.

Goal 2: Greater Sandhill Crane Goal

Provide optimum migrating and nesting habitat for greater sandhill cranes.

Objective 2.1: Greater Sandhill Crane

Protect and enhance wet meadows (2,183 acres) to provide short-grass habitats (<4 inch) during fall and spring migration periods. Through the summer, provide shallow water habitats (approximately 2-4 inches water depth) in the wet meadows for greater sandhill cranes. Annually monitor greater sandhill cranes and the habitats upon which they depend.

Rationale: The Pacific Flyway Management Plan for the Central Valley Population of Greater Sandhill Cranes (Pacific Flyway Council 2007), Coordinated Implementation Plan for Bird Conservation in California (Intermountain West Joint Venture 2005), Intermountain West Regional Shorebird Plan (Oring et al. 2001), and Intermountain West Waterbird Conservation Plan (Ivey and Herziger 2006) address goals and objectives to maintain healthy populations, distributions, and habitats of greater sandhill cranes throughout the Intermountain West region. Refuge management strategies will support these objectives.

Wet meadows are an essential component upon which significant numbers of Greater sandhill cranes, waterfowl, waterbirds, shorebirds, and other wildlife rely. This objective also helps to achieve Modoc Plateau Region Conservation Action A in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Greater Sandhill Crane Nest
Photo by USFWS

Greater Sandhill Crane Strategies

2.1.1 Use haying and grazing in wet meadows to provide short-grass habitats (<4 inch) for greater sandhill cranes during fall and spring migration periods.

2.1.2 Conduct and evaluate wet meadow and wetland vegetation surveys to determine percent cover, species composition, and stand condition annually.
2.1.3 Use mowing, disking, deleveling, prescribed fire, and herbicides to manage and enhance wetland habitat.
2.1.4 Enhance West Pit (105 acres) wetland habitats by restoring the natural floodplain and seasonal wetlands, reduce erosion impacts to the South Fork Pit River, and control non-native reed canary grass (see Figure 15).
2.1.5 Conduct annual greater sandhill crane breeding pair survey during April-May.
2.1.6 Conduct annual greater sandhill crane nest success survey during May-June.
2.1.7 Conduct annual greater sandhill crane production survey during August.
2.1.8 Conduct greater sandhill crane colt banding. The Refuge will attempt to place Service and color marked bands on all known colts (pre-fledged subadults) produced annually.
2.1.9 Conduct greater sandhill crane banding of adult birds as opportunities arise annually.
2.1.10 Support management-oriented research on greater sandhill cranes and wet meadows. Conduct a satellite telemetry study to determine recruitment and seasonal distribution.
2.1.11 Monitor avian disease outbreaks.
2.1.12 Hire a full-time wildlife biologist to accomplish this objective and objectives 1.1-1.11.

Goal 3: Visitor Services

Provide quality wildlife-dependent recreation and interpretation to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources.

Objective 3.1: Hunting

Conduct a high quality hunting program including opportunities for approximately 1,760 annual hunting visits (depending on season length and climatic conditions) on 2,330 acres by 2010.

Rationale: Hunting is identified in the Improvement Act as a priority public use that can be allowed when compatible with other Refuge purposes. As a result, the Refuge proposes to continue hunting of waterfowl, coots, common moorhens, snipe, and ring-necked pheasant (junior hunt only). The hunting program will be conducted in a safe and cost-effective manner and will be carried out consistent with State regulations. The Hunting Plan (Appendix C) was developed to provide safe hunting opportunities while minimizing conflicts with other priority wildlife-dependent recreational uses. Other visitor uses occur on different areas, thereby minimizing potential conflicts with hunters (Figure 15). The Refuge hunting program complies with the Code of Federal Regulations (CFR) Title 50, 32.1 and is managed in accordance with Service Manual 605 FW 2, Hunting. This objective

also helps to achieve Statewide Conservation Action Q in the California Wildlife Action Plan (California Department of Fish and Game 2005a) by giving greater priority to funding and staffing of wildlife and natural resource law enforcement efforts.

Hunting Strategies

3.1.1 Implement the Hunt Plan for the Refuge.

3.1.2 Add hunt program changes to CDFG regulations and 50 CFR annually.

3.1.3 Provide the Refuge's hunting brochure at the interpretive kiosks and the Refuge Headquarters.

3.1.4 Continue to coordinate with the California Waterfowl Association, Ducks Unlimited, and Friends of Modoc Refuge on the Junior Waterfowl Hunt on the Refuge.

3.1.5 Implement a second Junior Waterfowl Hunt on the Refuge.

3.1.6 Conduct an annual Kids Hunting Skills Field Day on the Refuge in cooperation with the CDFG, Friends of Modoc Refuge, Ducks Unlimited, CWA, Rocky Mountain Elk Foundation, National Wild Turkey Federation, and National Rifle Association.

3.1.7 Monitor hunting visits and bird harvest each hunt day and annually report these hunter visits.

3.1.8 Work with the Refuge's Hunting Program Working Group to develop and improve the Refuge's hunting program, including access and facilities for hunters with disabilities.

3.1.9 Refuge staff and law enforcement officer will work cooperatively with Klamath Basin law enforcement officers and CDFG wardens to enforce CFR, State Fish and Game hunting laws, and Refuge-specific regulations to provide a quality experience for all visitors.

3.1.10 Hire a full-time law enforcement officer to accomplish this objective as well as Objectives 3.2-3.6.

3.1.11 Maintain hunter self check-in kiosks to effectively process hunters and provide hunter-related information.

3.1.12 Add a universally accessible goose hunting blind to Matney 9 and covert a portion of the free roam area to spaced blind to accommodate this addition (see Figure 15).

3.1.13 Open Grandma Tract (200 acres) to waterfowl hunting. Create four assigned ponds and one universally accessible spaced blind (see Figure 15).

Junior Waterfowl Hunter
Photo by USFWS

Objective 3.2: Fishing

Continue to provide 547 acres at Dorris Reservoir for 3,050 annual fishing visits by 2014.

Fishing Pier at Dorris Reservoir
Photo by USFWS

Rationale: Fishing is identified in the Improvement Act as a priority use for refuges when compatible with other refuge purposes. The fishing program will be conducted in a safe and cost-effective manner and carried out in accordance with State regulations. The Fishing Plan (Appendix D) was developed to provide safe fishing opportunities while minimizing conflicts with other priority wildlife-dependent recreational uses. The fishing program will comply with 50 CFR 32.4 and will be managed in accordance with Service Manual 605 FW3, Recreational Fishing.

Fishing Strategies

3.2.1 Implement the Fishing Plan.
3.2.2 Update the Dorris Reservoir general brochure.
3.2.3 Maintain information kiosks, restrooms, universally accessible fishing pier, and boat launches at Dorris Reservoir.
3.2.4 Monitor, collect, and annually report fishing visits.
3.2.5 Refuge staff and law enforcement officer will work cooperatively with Klamath Basin law enforcement officers and CDFG wardens to enforce CFR, State Fish and Game fishing laws, and Refuge-specific regulations to provide a quality experience for all visitors.
3.2.6 Conduct an annual Kids Fishing Day at Dorris Reservoir.
3.2.7 Work with CDFG to assess fishery resource in Dorris Reservoir. Repeat the 1989 gill net survey.
3.2.8 Conduct a survey to determine the presence of native fishes in Pine Creek and South Fork Pit River.
3.2.9 Update the Fishery Management Plan for Dorris Reservoir.
3.2.10 Work with CDFG to coordinate fish stocking and fish habitat enhancement of Dorris Reservoir.

Objective 3.3: Wildlife Observation

Provide quality opportunities for 6,000 annual wildlife viewing visits on 1,924 acres by 2014.

Rationale: Wildlife observation is identified in the Improvement Act as a priority public use that can be allowed when compatible with other Refuge purposes. As a result, the Refuge encourages first-hand opportunities to observe wildlife in their habitats. This activity will be managed to ensure that people have opportunities to observe wildlife in ways that minimize wildlife disturbance and damage to Refuge habitats. Wildlife viewing will be managed to foster a connection between visitors and natural resources. The Visitor Services Plan (Appendix E) was developed to provide guidance for the Refuge's

public use program. The wildlife observation program will be managed in accordance with Service Manual 605 FW 4, Wildlife Observation.

Observing Wildlife at the Refuge
Photo by USFWS

Wildlife Observation Strategies

3.3.1 Maintain and enhance the three-mile auto tour route to provide opportunities to view wildlife and their habitats.
3.3.2 Maintain the wildlife viewing facilities (e.g., observation blind and overlook on the Wigeon Trail, observation blind in the Environmental Education (EE) area, and US 395 overlook).
3.3.3 Maintain the universally accessible one-mile Wigeon Trail.
3.3.4 Open the EE area (60 acres) for wildlife observation from March 1 through August 31 including the trail, observation deck and blind, floating dock, EE shelter, boardwalk, interpretive panels, and kiosk (see Figure 15).
3.3.5 Continue to provide Birding Kits including binoculars, bird identification books, Refuge brochure and wildlife checklists, and Basin and Range Birding Trail brochure to the public for use on and off the Refuge.
3.3.6 Monitor, collect, and annually report wildlife observation visits.

Objective 3.4: Wildlife Photography

By 2014, provide quality opportunities for 50 photography blind annual visits and 900 wildlife photography annual visits on 1,924 acres.

Rationale: Wildlife photography is identified in the Improvement Act as a priority public use that can be allowed when compatible with other Refuge purposes. As a result, the Refuge encourages first-hand opportunities to observe and photograph wildlife in their habitats. This activity will be managed to ensure that people have opportunities to photograph wildlife in ways that minimize wildlife disturbance and damage to Refuge habitats. Wildlife photography

will be managed to foster a connection between visitors and natural resources. The Visitor Services Plan (Appendix E) was developed to provide guidance for the Refuge's public use program. The wildlife photography program will be managed in accordance with Service Manual 605 FW 5, Wildlife Photography.

Wildlife Photography Strategies

3.4.1 Maintain and enhance the three-mile auto tour route to provide photographic opportunities.
3.4.2 Maintain one wildlife photography blind on Lower Duck Pond.
3.4.3 Open EE area (60 acres) to wildlife photography, including observation deck and blind, from June 1 through September 1 (see Figure 15).
3.4.4 Develop and implement photographer guidelines, maps, and photography blind reports.
3.4.5 Evaluate photography blind reports and implement changes annually.
3.4.6 Maintain the Refuge's website (http://www.fws.gov/modoc) to provide information about current photographer guidelines and facilities.
3.4.7 Monitor, collect, and annually report wildlife photography visits.

Objective 3.5: Interpretation

Refuge staff will develop an interpretive program to provide 450 annual visits (300 off-site and 150 on-site) by 2024. The program will promote public awareness and support of Refuge resources and management activities.

Rationale: Interpretation is identified in the Improvement Act as a priority public use that can be allowed when compatible with other Refuge purposes. As a result, the Refuge encourages interpretation as both an educational and recreational opportunity that is aimed at revealing relationships, examining systems, and exploring how the natural world and human activities are interconnected. Participants of all ages can voluntarily engage in stimulating and enjoyable activities as they learn about the issues confronting fish and wildlife resource management on the Refuge. First-hand experiences with the environment will be emphasized, although presentations, audiovisual media, and exhibits will be necessary components of the Refuge interpretive program. The Visitor Services Plan (Appendix E) was developed to provide guidance for the Refuge's public use program.

The Blue Goose and Fans
Photo by USFWS

In 2007, the Service declared that "connecting people with nature" is among the agency's highest national priorities (U.S. Fish and Wildlife Service 2008). A connection with

nature, whether it's hiking, fishing, camping, hunting, or simply playing outside, helps children develop positive attitudes and behaviors towards the environment. Positive interactions with the environment can lead to a life-long interest in enjoying and preserving nature. People's interest in nature is crucial to the Service mission of conserving, protecting, and enhancing populations of fish, wildlife, plants, and their habitats.

The interpretive program will be managed in accordance with Service Manual 605 FW 7, Interpretation.

Effective outreach is an important component of the interpretive program. The Refuge will provide two-way communication between the Refuge and the public to establish a mutual understanding and promote involvement with the goal of improving joint stewardship of our natural resources. Outreach will be designed to identify and understand the issues and target audiences, craft messages, select the most effective delivery techniques, and evaluate effectiveness. Refuge outreach will follow the guidance of the National Outreach Strategy: A Master Plan for Communicating in the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1997).

Interpretation Strategies

3.5.1 Use the Refuge Headquarters to provide presentations and exhibits.
3.5.2 Maintain interpretive kiosks, walking trails, auto tour route, and the Refuge Headquarters for use by Refuge visitors.
3.5.3 Provide at least five tours of the Refuge annually.
3.5.4 Develop a "Sense of Wonder Zone" by creating a family oriented opportunity area where youth and people of all ages can reconnect with nature.
3.5.5 Continue to participate in or provide information to local annual events (Wings of the Warners, Children's Fair, Modoc County Fair, etc.).
3.5.6 Write news releases for local newspapers and articles for magazines. Conduct television and radio interviews upon request.
3.5.7 Maintain the Refuge's website (http://www.fws.gov/modoc).
3.5.8 Provide interpretive brochures at kiosks and in the Refuge Headquarters.
3.5.9 Maintain and upgrade the Refuge Headquarters exhibits and activities.
3.5.10 Utilize interns and volunteers to coordinate annual events on and off Refuge and assist with Refuge programs (e.g. facilitating school groups).
3.5.11 Monitor, collect, and annually report interpretation visits.

Objective 3.6: Non-wildlife Dependent Recreation

Continue to provide compatible non-wildlife dependent recreation, including horseback riding, swimming, boating, and bicycling (on 556 acres of the Refuge by 2009).

Rationale: Non-wildlife dependent recreation does not directly contribute to the public's understanding and appreciation of the Refuge's natural or cultural resources, nor is the use beneficial to the Refuge's natural or cultural resources. However, if the uses are appropriate and compatible they will not detract from them. Although their primary interest may be an activity like horseback riding, swimming, boating, or bicycling, the abundance of birdlife makes wildlife observation an opportunity as well. These opportunities will improve their experience without jeopardizing Modoc Refuge's wildlife resources or conflicting with the priority wildlife-dependent activities.

Non-wildlife Dependent Recreation Strategies

3.6.1 Continue to provide horseback riding opportunities at Dorris Reservoir from April 1 through September 30 on roads designated for motor vehicles and on the equestrian trail (9 acres), and year-round on roads designated for motor vehicles in the remaining portions of the Refuge (see Figure 15).

3.6.2 Continue to provide bicycling opportunities from April 1 through September 30 on roads designated for motor vehicles at Doris Reservoir (8 acres) and year-round on roads designated for motor vehicles in the remaining portions of the Refuge.

3.6.3 Continue to allow pedestrian use of roads designated for motor vehicles and the equestrian trail at Dorris Reservoir (9 acres) from February 1 through September 30 and year-round on roads designated for motor vehicles in the remaining portions of the Refuge.

3.6.4 Continue to provide swimming and boating opportunities at Dorris Reservoir from April 1 through September 30 (547 acres) (see Figure 15).

3.6.5 Maintain facilities and update signs and brochures regarding non-wildlife dependent recreation.

3.6.6 Prohibit waterskiing on Refuge waters within Dorris Reservoir.

3.6.7 Refuge staff and law enforcement officer will work cooperatively with Klamath Basin law enforcement officers and CDFG wardens to enforce CFR and Refuge-specific regulations to provide a quality experience for all visitors.

3.6.8 Monitor, collect, and annually report non-wildlife dependent visits.

Objective 3.7: Volunteer

By 2024, increase the number of volunteers to 200 in order to support a variety of Refuge programs.

Rationale: The National Wildlife Refuge System Volunteer and Partnership Enhancement Act of 1998 (P.L. 105-242) strengthens the Refuge System's role in developing relationships with volunteers. Volunteers possess knowledge, skills, and abilities that can enhance the scope of refuge operations. Volunteers enrich Refuge staff with their gift of time, skills, and energy. Refuge staff will initiate, support, and nurture relationships with volunteers so that they may continue to be an integral part of Refuge programs and management. The volunteer program will be managed in accordance with the Fish and Wildlife Service Manual, Part 150, Chapters 1-3, "Volunteer Services Program", and Part 240 Chapter 9 "Occupational Safety and Health, Volunteer and Youth Program".

Currently the Refuge volunteer program consists of 118 individuals who assist with wildlife-dependent recreation, maintenance, wildlife and habitat management, and environmental education programs.

Volunteer Strategies:

3.7.1 Recruit additional volunteers through a variety of community groups (e.g., Boy Scouts, Girl Scouts, and 4H).

3.7.2 Facilitate volunteer training.

3.7.3 Develop an annual work day (Brush Up Day) to clean up the Refuge's hunt areas.

Habitat Restoration
Photo by USFWS

Goal 4: Environmental Education

Provide quality environmental education opportunities focusing on fish, wildlife, and habitats of the Pit River watershed.

Objective 4.1: Environmental Education

Continue to enhance and expand the environmental education program to serve about 2,500 students (K-12) annually in cooperation with the River Center by 2024.

Rationale: Environmental education is identified in the Improvement Act as a priority public use that can be allowed when compatible with other Refuge purposes. As a result, the Refuge encourages environmental education as a process of building knowledge in students. The Refuge staff will work with schools (K-12) to integrate environmental concepts and concerns into structured educational activities. These Refuge-lead or educator-conducted activities are intended to actively involve students or others in first-hand activities that promote discovery and fact-finding, develop problem-solving skills, and lead to personal involvement and action. Refuge staff will promote environmental education that is aligned to the current Federal, State, and local standards; is curriculum-based and meets the goals of school districts adopted instructional standards; and provides interdisciplinary opportunities that link the natural world with all subject areas. The Visitor Services Plan (Appendix E) was developed to provide guidance for the Refuge's public use program. The environmental education program will be managed in accordance with Service Manual 605 FW 6 Environmental Education. This objective also helps to achieve Statewide Conservation Action J in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

Environmental Education Strategies:

4.1.1 Continue to conduct the Pit River Watershed Adoption Project. Provide an environmental education program that promotes studies of the ecological principles that are associated with the scope of habitats found within the Upper Pit River Watershed and the Refuge's natural, cultural, and historical resources. The education activities will be designed to develop awareness and understanding for Refuge resources and management activities while meeting State education standards.

4.1.2 Annually schedule and plan field trips for grades K-12 of the Alturas school system.

4.1.3 Continue to provide Birding Kits including binoculars, bird identification books, Refuge brochure and wildlife checklists, and Basin and Range Birding Trail brochure to the public for use on and off Refuge.

4.1.4 Facilitate after school programs (e.g., PIT Club from Alturas High School) involving activities such as habitat restoration

and student mentors for the Pit River Watershed Adoption Project.

4.1.5 Develop a partnership with the Boy and Girl Scouts.

4.1.6 Facilitate resource-training workshops (e.g., Wild on Wetlands) about the Refuge's environmental education program for educators.

4.1.7 Maintain the Refuge's website (http://www.fws.gov/modoc) to promote current educational opportunities.

4.1.8 Continue to enhance the partnership with the River Center to conduct the Pit River Watershed Adoption Project.

4.1.9 Hire a full-time interpretive specialist to accomplish this objective and support Objectives 3.1-3.6.

4.1.10 Explore opportunities to utilize interns and volunteers to facilitate the environmental education program.

Goal 5: Partnerships

Promote partnerships to preserve, restore, and enhance diverse, healthy, and productive ecosystems of northeastern California.

Objective 5.1: Partnership

By 2024, maintain and enhance at least 20 partnerships among Federal, Tribal, State, local agencies, organizations, schools, corporations, and private landowners to promote the understanding and conservation of resources within Upper Pit River Watershed.

Rationale: The Service recognizes that strong citizen support benefits the Refuge System. These benefits include the involvement and insight of citizen groups in Refuge resource and management issues and decisions, a process that helps managers gain an understanding of public concerns. Partners support Refuge activities and programs, raise funds for projects, are advocates on behalf of wildlife and the Refuge System, and provide support on important wildlife and natural resource issues. In Fulfilling the Promise (U.S. Fish and Wildlife Service 1999), the Service identified the need to forge new and non-traditional alliances and strengthen existing partnerships with States, Tribes, non-profit organizations, and academia to broaden citizen and community understanding and support for the National Wildlife Refuge System. This objective also helps to achieve Statewide Conservation Actions H and P in the California Wildlife Action Plan (California Department of Fish and Game 2005a).

A variety of people including, but not limited to, scientists, farmers, birders, hunters, photographers, and students have a great deal of interest in the Refuge's management, fish and wildlife species, and habitats. New partnerships will be formed as opportunities, funding, and staff are available.

Partnership Strategies:

5.1.1 Maintain good relations and open communication with partners.

5.1.2 Actively look for partnering opportunities with local and regional conservation groups, academic institutions, organizations, Tribal governments, and other local, State, and Federal agencies.

5.1.3 Pursue opportunities to cost-share mutually beneficial projects with other organizations.

5.1.4 Continue to work with Friends of the Modoc Refuge.

5.1.5 Continue to enhance the partnership with the River Center to conduct the Pit River Watershed Adoption Project.

5.1.6 Continue to work with local Chambers of Commerce to participate in local events and improve dissemination of public recreation literature about the Refuge.

5.1.7 Stay actively involved in Federal, State, and local planning processes to protect Refuge resources and foster cooperative management of those resources.

5.1.8 Continue to participate in the Northeastern California Water Association.

5.1.9 Maintain active participation with the IWJV.

5.1.10 Continue partnerships with CWA, Ducks Unlimited, and other non-governmental conservation organizations.

5.1.11 Continue Partners for Fish and Wildlife private lands program.

5.1.12 Maintain contact with adjacent neighbors to discuss and address mutual concerns and opportunities.

Great Horned Owl Chick
Photo by Share the Road Productions

Objective 5.2: Cultural Resources Objective

Over the next fifteen years, implement the following strategies to protect, preserve, evaluate, and interpret the cultural heritage and resources of the Refuge while consulting with appropriate Native American groups and preservation organizations, and comply with historic preservation legislation for the benefit of present and future generations of Refuge users and communities.

Rationale: Modoc Refuge contains 50 discovered and documented cultural resource sites. Many more sites probably occur on the Refuge, but the Refuge has not been completely or intensively survey for cultural resources. Even with the known cultural sites, the Refuge preserves thousands of years of human history, settlement, and interaction between people and the environment. A host federal historic preservation law including the National Historic Preservation Act (NHPA), Archaeological Resources Protection Act (ARPA), and the Native American Graves Protection and Repatriation Act (NAGPRA) and regulations require the Service to implement a cultural resource program that inventories, evaluates, protects and interprets the cultural and heritage resources on it lands. Modoc Refuge has active habitat, wildlife, and visitor service programs that by law must consider and protect cultural resources as the programs are implemented. In addition, Tribes, archaeologists, historians, and the public are interested in the scientific and educational value of the cultural resources and want to protect, study, and interpret them. Tribes also have a spiritual connection to cultural resources; they are important elements of individual and group identity. Cultural resources are not renewable. The primary objective is to create and implement a basic Cultural Resources Management capability at Modoc Refuge that will respond to the compliance requirements of federal cultural resources legislation and protect these resources for present and future generations.

Cultural Resource Strategies

5.2.1. Identify cultural resource sites that coincide with existing and planned roads, facilities, visitor service areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places using a research design prepared in consultation with Tribes and the scientific community. Prepare and implement activities to mitigate impacts to sites as necessary.

5.2.2. Compile baseline data on cultural resources sites, surveys, and reports within Modoc Refuge. 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.

5.2.3. Consult and partner with the Tribes, universities, and other historic preservation institutions for cultural resources inventory, evaluation, and protection.

5.2.4. Service's Cultural Resources Office, with assistance from the Refuge, will create a Cultural Resource Management Plan within ten years of completion of the CCP.

5.2.5. The Service's Cultural Resources Office, with assistance from the Refuge, will create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the NAGPRA within two years of completion of the CCP.

5.2.6. Reuse and maintain existing historic structures when compatible with Refuge facility and space needs.

5.2.7. Ensure that refuge staff receives training in historic preservation requirements and of NHPA, ARPA, and the NAGPRA.

5.2.8. Inventory and evaluate the prehistoric archaeological site that coincides with the refuge headquarters office, shop, residence, spring, and immediately adjacent area.

Greater Sandhill Cranes
Photo by Share the Road Productions

Chapter 5. Management Plan Implementation

1. Implementation

The CCP will serve as the primary management reference document for Refuge planning, operations, and management for the next 15 years or until it is formally revised or amended within that period. The Service will implement the final CCP with assistance from existing and new partner agencies and organizations and the public. The timing and achievement of the management strategies proposed in this document are contingent upon a variety of factors, including:

- funding and staffing
- completion of step-down plans
- compliance requirements
- adaptive management
- monitoring

Each of these factors is briefly discussed as it applies to the CCP.

CCPs 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. Accordingly, the plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

2. Funding and Staffing

Resources are required to operate adequately any national wildlife refuge including initial capital outlay for equipment, facilities, labor, and other expenses as well as recurring expenses. The estimated initial capital outlay to implement the strategies described in this CCP for Modoc Refuge is approximately $10.2 million (Table 7, Estimated initial capital outlay to implement the CCP). Not all of these capital expenditures would occur in the same year, as many of these expenses would most likely be implemented over the next fifteen years if approval and funding were provided by Congress. The detailed descriptions of the objectives and their associated implementation strategies serve as a guide to the ideal time frame in which to implement capital expenditures. The largest costs for initial outlays are for visitor services and habitat restoration.

Table 7. Estimated initial capital outlay to implement the CCP

Expenditure [Related Objective(s)]	Unit Cost	Unit	Quantity	Total Cost
Develop Environmental Education Area (Objective 4.1)	$650,500	ea	1.0	$650,500
Monitor Refuge water quality (Objectives 1.1 & 1.11)	$45,000	ea	1.0	$45,000
Restore riparian habitat on Pit River, South Fork of the Pit River, Pine Creek, and Matney 2 (349 acres) (Objective 1.3)	$910,000	ea	1.0	$910,000
Restore wetland and sagebrush steppe habitats (350 acres) (Objectives 1.1 & 1.2)	$218,000	ea	1.0	$218,000
Conduct greater sandhill crane research (Objective 2.1)	$50,000	annually	1.0	$750,000
Construct universally accessible hunting blinds (Objective 3.1)	$5,000	ea	2.0	$10,000
Implement RLGIS on Refuge (Goals 1-5)	$15,000	ea	1.0	$15,000
Expand Refuge Headquarters/Visitor Center (Goals 1-5)	$200,000	ea	1.0	$200,000
Replace and rehabilitate shop buildings (Goals 1-5)	$833,000	ea	1.0	$833,000
Replace bunkhouse (Goals 1-5)	$250,000	ea	1.0	$250,000
Replace restrooms (3), kiosks (2), and fishing pier at Dorris Reservoir (Goals 3 & 5)	$175,000	ea	1.0	$175,000
Replace interpretive signs (Goals 3 & 5)	$4,167	ea	12.0	$50,000
Replace boundary fencing (Goals 1-5)	$6,000	mi	10.0	$60,000
Underground existing overhead power lines (Goals 1-5)	$52,250	mi	4.0	$209,000
Construct 4,000 square foot equipment storage building (Goals 1-5)	$250,000	ea	1.0	$250,000
Replace Sharkey and South Dams (Goals 1-5)	$497,000	ea	1.0	$497,000
Repair Dorris Dam (Goals 1-5)	$142,000	ea	1.0	$142,000
Repair water delivery system (Goals 1-5)	$1,105,000	ea	1.0	$1,105,000
Resurface entrance road (Goals 3-5)	$300,000	mi	1.2	$360,000
Repair public use roads and auto tour route (Goals 3-5)	$149,530	mi	5.0	$747,649
Repair public use parking lots (Goals 3-5)	$2.36	sq ft	81,424	$192,204
Repair service roads (Goals 1-5)	$70,000	mi	5.0	$350,000
Replace existing small equipment (Goals 1-5)	$22,174	ea	23.0	$510,000
Replace existing heavy equipment backlog (Goals 1-5)	$91,667	ea	18.0	$1,650,000
Total	**$6,041,290**			**$10,179,353**

The recurring CCP implementation total is approximately $1.8 million (Table 8). Annual contracts or cooperative agreements will be needed to provide specialized services beyond the core Refuge functions for which staff are required.

Table 8. Estimated annual cost to implement the CCP

Expenditure	Unit Cost	Unit	Quantity
Salaries and Benefits			
Refuge Manager - GS13	$114,436	FTE	1.0
Deputy Refuge Manager - GS12	$84,910	FTE	1.0
Private Lands Biologist – GS9/11	$70,601	FTE	1.0
Admin. Officer – GS7/9	$58,552	FTE	1.0
Eng. Equip. Oper. - WG10	$79,370	FTE	1.0
Eng. Equip. Oper. - WG10	$79,370	FTE	1.0
Tractor Operator – WG6 (Term)	$57,000	FTE	1.0
Total Existing Staff Cost	*544,239*		
Wildlife Biologist – GS7/9/11 (Goals 1-5)	$70,842	FTE	1.0
Interpretive Specialist – GS7/9 (Goals 3-5)	$58,552	FTE	1.0
Law Enforcement Officer – GS7/9 (Goals 3-5)	$67,560	FTE	1.0
Maintenance Worker – WG6 (Invasive Species Control) (Goals 1-2)	$57,000	FTE	1.0
Total Additional Staff Cost	*$253,954*		
TOTAL STAFF COST	**$798,193**		
Project Funding			
Wildlife and Habitat Management	$344,641	ea	1.0
Invasive Species Control	$20,000	ea	1.0
Water Master fees	$20,000	ea	1.0
Maintenance	$391,028	ea	1.0
Visitor Services	$110,479	ea	1.0
Connecting Children With Nature	$50,000	ea	1.0
Law Enforcement	$16,890	ea	1.0
Partners for F&W	$80,000	ea	1.0
TOTAL PROJECT FUNDING	**$1,033,038**		
Grand Total:	**$1,831,231**		

Shading indicates position identified in the CCP
Unit Cost based on 2008 Grade level with 50 percent benefits for law enforcement and 30 percent benefits for everyone else. Staffing and funding would be sought over the 15-year life of this plan subject to approval and funding by Congress.

Figure 16 shows the current staffing organization chart. If all positions indicated in Table 8 and Figure 16 are filled, the Refuge would be able to carry out all aspects of this plan to a reasonable standard. If some positions are not filled, not all aspects of the Plan could be completed or those projects might be done over a longer period.

With the existing staffing levels for the Refuge, annual maintenance projects for habitat management and infrastructure will continue to degrade into maintenance backlogs. The current staffing of two full time and one term maintenance positions will not be able to maintain high quality habitat or provide annual maintenance on firebreaks, roads, parking lots, signage, fencing, gates, and other visitor service facilities for the Refuge.

3. Step-Down Management Plan Summaries

Some projects or types of projects require more in-depth planning than the CCP process is designed to provide; for these projects, the Service prepares step-down management plans. In essence, step-down management plans provide the additional planning details necessary to implement management strategies identified in a CCP. Included in this document are six step-down management plans.

Junior Waterfowl Hunter
Photo by USFWS

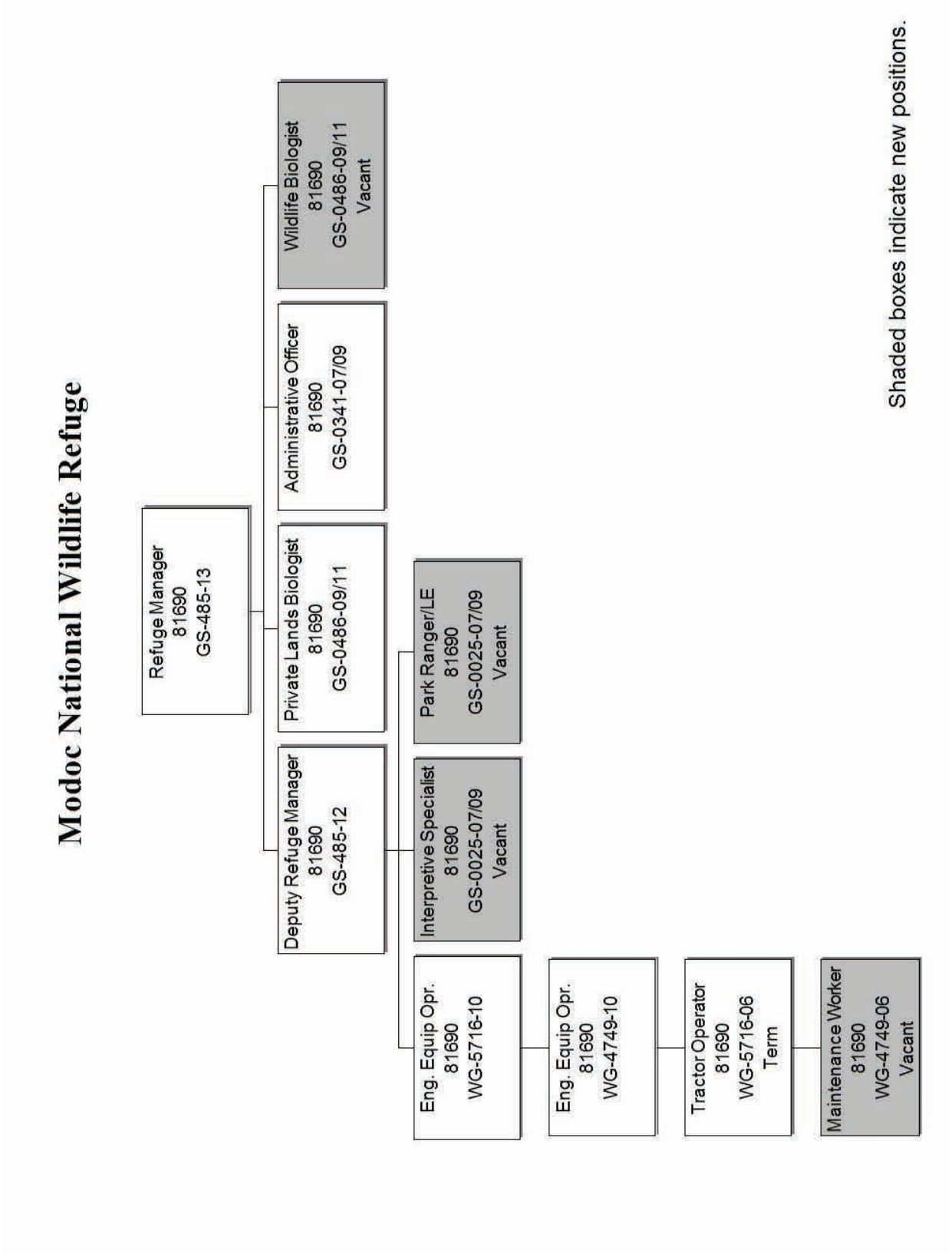
3.1 Hunting Plan

The purpose of the Hunting Plan (Appendix C) is to establish guidelines for hunting Modoc Refuge that will provide the public with a quality wildlife-dependent recreational experience, an opportunity to use a renewable resource, and the ability to maintain wildlife numbers at levels compatible with Refuge habitat. It was developed to provide safe hunting opportunities, while minimizing conflicts with other priority wildlife-dependent recreational uses. The plan will allow the hunting program to be conducted in a cost-effective manner, coordinated with the State. The hunting program will be reviewed annually by refuge staff. The activities in the Hunt Plan are evaluated in a compatibility determination located in Appendix B.

3.2 Fishing Plan

The purpose of the Fishing Plan (Appendix D) is to establish guidelines for fishing Modoc Refuge that will provide the public with a quality wildlife-dependent recreational experience, an opportunity to use a renewable resource, and the ability to maintain wildlife numbers at levels compatible with Refuge

Figure 16. Modoc Refuge staffing organization chart



habitat. It was developed to provide safe fishing opportunities while minimizing conflicts with other priority wildlife-dependent recreational uses. The plan will allow the fishing program to be conducted in a cost-effective manner, coordinated with the State. The fishing program will be reviewed annually by refuge staff. The activities in the Fishing Plan are evaluated in a compatibility determination located in Appendix B.

3.3 Visitor Services Plan

The purpose of the Visitor Services Plan (Appendix E) is to establish guidelines for public uses on Modoc Refuge that will provide the public with a quality wildlife-dependent recreational experience, an opportunity to use a renewable resource, and the ability to maintain wildlife numbers at levels compatible with Refuge habitat. It was developed to provide safe opportunities while minimizing adverse impacts to the wildlife resources. The plan will allow the visitor services program to be conducted in a cost-effective manner. The program will be reviewed annually by refuge staff. The activities in the Visitor Services Plan are evaluated in compatibility determinations located in Appendix B.

3.4 Habitat Management Plan

Refuge staff has developed an annual Habitat Management Plan for Modoc Refuge that guides the refuge manager in the decision making process (Appendix F). The plan is based on an adaptive management philosophy that allows the team to assess habitat condition and wildlife use of the units annually and make adjustments accordingly in order to meet Refuge goals and objectives.

3.5 Integrated Pest Management Plan

The Refuge has developed an IPM Plan (Appendix G) to address invasive and nuisance plants on the Refuge. The purposes of this plan are to identify mosquito control methods and materials currently approved for use on the Refuge; identify use in an IPM program that is consistent with the goals of the Refuge; and provide long-term planning to meet the Service's goal of reducing effects of pesticide use on Department of Interior (DOI) trust resources to the greatest extent possible. This plan will be reviewed and updated to include new information and policy changes as needed. It covers chemical pesticide use (aerial and ground application), mechanical eradication, and biological controls.

3.6 Cultural Resources Overview

The Refuge has developed a cultural resource overview. Cultural resources on the Refuge will be managed according to the guidelines developed in this plan and under Federal regulations listed in the National Historic Preservation Act, Archeological Resources Protection Act, and Native American Graves Protection and Repatriation Act.

4. Appropriate Use Requirements

The Appropriate Use Policy describes the initial decision process the refuge manager follows when first considering whether to allow a proposed use on a refuge. The refuge manager must find that a use is appropriate before undertaking a compatibility review of the use. An appropriate use, as defined by the Appropriate Use Policy (603 FW 1 of the Service Manual), is a proposed or existing use on a refuge that meets at least one of the following four conditions:

- The use is a wildlife-dependant recreational use as identified in the Improvement Act.
- The use contributes to the fulfilling of 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.
- The use involves the take of fish and wildlife under State regulations.
- The use has been found to be appropriate as specified in Section 1.11 (603 FW 1 of the Service Manual).

If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. If a use is determined to be an appropriate refuge use, the refuge manager will then determine if the use is compatible (see Compatibility section below). Although a use may be both appropriate and compatible, the refuge manager retains the authority to not allow the use or modify the use. Uses that have been administratively determined to be appropriate are the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation) and the take of fish and wildlife under State regulations.

A review of appropriateness of existing and proposed uses was completed for the Refuge. Commercial photography, research, bicycling, grazing, haying, horseback riding, swimming, recreational boating, and plant material gathering were found to be appropriate uses on the Refuge. Waterskiing, camping, and field dog trials were found to be not appropriate uses on the Refuge.

5. Compatibility Determinations

Federal law and policy provide the direction and planning framework to protect the Refuge System from incompatible or harmful human activities and to insure that Americans can enjoy Refuge System lands and waters. The Improvement Act is the key legislation on managing public uses and compatibility.

Before activities or uses are allowed on a refuge, uses must be found to be “compatible” through a written compatibility determination. A

compatible use is defined as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the national wildlife refuge. Sound professional judgment is defined as a decision that is consistent with the principles of the fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Improvement Act and other applicable laws. Wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety.

Compatibility determinations for hunting, fishing, wildlife observation and photography, environmental education and interpretation, commercial photography, bicycling, horseback riding, recreational boating and swimming, grazing, and haying are included in Appendix B. These uses were all found to be appropriate and compatible.

Sandhill Crane in Flight
Photo by Steve Emmons

6. Compliance Requirements

This CCP was developed to comply with all Federal laws, executive orders, and legislative acts to the extent possible. Some activities (particularly those that involve a major revision to an existing step-down management plan, or preparing a new plan) would need to comply with additional laws or regulations besides NEPA and the Improvement Act. A list of the Federal laws, executive orders, and legislative acts is in Appendix I.

7. Monitoring and Evaluation

The CCP is designed to be effective for a 15-year period. The plan will be reviewed and revised as required to ensure that established goals and objectives are still applicable and that the CCP is implemented as scheduled. The monitoring program will focus on issues involving visitor service activities, habitat management programs, wildlife inventory, and other monitoring and management activities. Monitoring and evaluation will use the adaptive management process. This process includes goal and objective setting, and applying management tools and strategies followed by monitoring and analysis to measure achievement of objectives and refine management techniques.

Collection of baseline data on wildlife populations will continue. This data will be used to update existing species lists, wildlife habitat requirements, and seasonal use patterns. Migratory and resident birds, raptors, and species of management concern will be the focus of monitoring efforts.

Where information gaps exist, a concerted effort will be made to obtain information. With new information, goals and objectives may need modification. Public involvement will be encouraged during the evaluation process.

Monitoring of public use programs will involve the continued collection of visitor use statistics. Monitoring will be done to evaluate the effects of visitor service on Refuge habitat, wildlife populations, and visitor experience.

8. Adaptive Management

Adaptive management is the process of implementing policy decisions as scientifically driven experiments that test predictions and assumptions about management plans, and using the resulting information to improve the plans. Adaptive management provides the framework within which biological measures and public use can be evaluated by comparing the results of management to results expected from objectives. Management direction is periodically evaluated within a system that applies several options, monitors the objectives, and adapts original strategies to reach desired objectives. Habitat, wildlife, and visitor service management techniques and specific objectives would be regularly evaluated as results of a monitoring program and other new technology and information become available. These periodic evaluations would be used over time to adapt both the management objectives and strategies to better achieve management goals. Such a system embraces uncertainty and provides new information for future decision-making while allowing resource use.

9. CCP Plan Amendment and Revision

The CCP is intended to evolve as the Refuge changes, and the Improvement Act specifically requires that CCPs be formally revised and updated at least every 15 years. The formal revision process would follow the same steps as the CCP creation process. In the meantime, the Service would be reviewing and updating this CCP periodically based on the results of the adaptive management program. While preparing annual work plans and updating the Refuge database, refuge staff will also review the CCP. It may also be reviewed during routine inspections or programmatic evaluations. Results of any or all of these reviews may indicate a need to modify the plan. The goals described in this CCP would not change until they are reevaluated as part of the formal CCP revision process. However, the objectives and strategies may be revised to better address changing circumstances or to take advantage of increased knowledge of the resources on the Refuge. It is the intent of the Service to have the CCP applies to any new lands that may be acquired. If changes were required, the refuge manager would determine the level of public involvement and associated NEPA documentation.

The intent of the CCP is for refuge objectives and strategies to be attained over the next 15 years. Management activities would be phased in over time and implementation is contingent upon and subject to results of monitoring and evaluation, funding through Congressional appropriations and other sources, and staffing.

Glossary

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 1.6).

Alluvial Fan: Accumulation of sediment where a stream moves from a steep gradient to a flatter gradient and suddenly loses transporting power.

Alluvial: Pertaining to clay, silt, sand, gravel, or other sedimentary matter deposited by flowing water, usually within a river valley.

Alternatives: Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the Refuge System mission, and resolving issues. (1) A reasonable way to fix the identified problem or satisfy the stated need. (40 CFR 150.2) (2) Alternatives are 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).

Animal Unit Month (AUM): The amount of forage necessary to maintain one 1,000-pound animal for one month.

Aquatic: Pertaining to water, in contrast to land. Living in or upon water.

Aquatic Habitat: The physical, chemical, and vegetative features that occur within the water of lakes, ponds, reservoirs, rivers, irrigation canals, and other bodies of water.

ATV: All Terrain Vehicle (either 3- or 4-wheeled vehicles).

Bank: The rising ground bordering a body of water or forming the edge of a cut or hollow.

Biodiversity (biological diversity): Refers to the full range of variability within and among biological communities, including genetic diversity, and the variety of living organisms, assemblages of living organisms, and biological processes. Diversity can be measured in terms of the number of different items (species, communities) and their relative abundance, and it can include horizontal and vertical variability. The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur.

Biological Control: The use of organisms or viruses to control weeds or other pests.

Biological Integrity: Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities (Service Manual 602 FW 1.6).

Categorical Exclusion (CE, CX, CATEX, CATX): 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).

CFR: Code of Federal Regulations.

Community: The combined populations of all organisms in a given area, and their interactions. For example, the frogs, fish, algae, cattails, and lily pads in a backyard pond make up a community.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge (Service Manual 603 FW 2.6).

Compatibility Determination: A written determination signed and dated by the refuge manager and Regional Chief signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. The Director makes this delegation through the Regional Director (Service Manual 603 FW 2.6).

Comprehensive Conservation Plan (CCP): A document that describes the desired future conditions of the refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (Service Manual 602 FW 1.6).

Concern: See Issue.

Coordination Area: A wildlife management area made available to a State, by "(A) cooperative agreement between the United States Fish and Wildlife Service and the State fish and game agency pursuant to Section 4 of the Fish and Wildlife Coordination Act (16 U.S.C. 664); or (B) by long-term leases or agreements pursuant to the Bankhead-

Jones Farm Tenant Act (50 Stat. 525; 7 U.S.C. 1010 et seq.)." States manage Coordination Areas, but they are part of the Refuge System. We do not require CCPs for Coordination Areas (Service Manual 602 FW 1.6).

Cultural Resource: The physical remains of human activity (artifacts, ruins, petroglyphs, etc.) and conceptual content or context of an area, such as a traditional sacred site. It includes historically, archaeologically, and architecturally significant 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).

Cultural Resource Overview: A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from a field offices background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

Diversion: A structure in a river or canal that diverts water from the river or canal to another watercourse.

Drain: A canal that collects and transports excess water from irrigated farmland.

Easement: A privilege or right that is held by one person or other entity in land owned by another.

Ecological Integrity: The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions (Service Manual 602 FW 1.6).

Ecology: The branch of biology that studies the interactions of organisms within an environment, either with other organisms (biotic factors) or with the non-living components (abiotic factors) of that ecosystem.

Ecosystem: The sum of all interacting parts of the environment and associated ecological communities within a particular area; an

ecological system. Many levels of ecosystems have been recognized. Very few, if any, ecosystems are self-contained; most influence, or are influenced by, components or forces outside the system. For administrative purposes, we have designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary.

Ecosystem Approach: Protecting or restoring the natural function (processes), structure (physical and biological patterns), and species composition of an ecosystem, recognizing that all components are interrelated.

Effect: A change in a resource caused by a variety of events, including project attributes acting on a resource attribute (direct), not directly acting on a resource attribute (indirect), another project's attributes acting on a resource attribute (cumulative), and those caused by natural events (e.g., seasonal change).

Emergent Vegetation: Rooted, aquatic plants that have most of their vegetative (nonroot) parts above water.

Endemic Species: Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

Endangered Species: Any species that is in danger of extinction throughout all or a significant portion of its range and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973. Endangered species are afforded protection under the Act as amended and under various State laws for State-listed species.

Entitlement: The annual maximum amount of water that can be delivered to a parcel of land, a product of eligible acres and water duty (expressed in acre-feet).

Environment: The sum total of all biological, chemical, and physical factors to which organisms are exposed; the surroundings of a plant or animal.

Environmental Assessment (EA): 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).

Environmental Education: A process designed to develop a citizenry that has the awareness, concern, knowledge, attitudes,

skills, motivation, and commitment to work toward solutions of current environmental problems and the prevention of new ones. Environmental education within the National Wildlife Refuge System incorporates materials, activities, programs, and products that address the citizen's course of study goals, the objectives of the refuge/field station, and the mission of the Refuge System.

Environmental Health: Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment (Service Manual 602 FW 1.6).

Environmental Impact Statement (EIS): A detailed written statement required by Section 102(2) (C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Evapotranspiration: The collective processes by which water is transferred from the surface of the earth, including from the soil and the surface of water-bodies (through evaporation) and from plants (through transpiration).

Exotic and Invading Species (Noxious Weeds): 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 insects or disease; or nonnative, 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 has 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.

Fallow: Allowing land that normally is used for crop production to lie idle.

Federal Trust Resources: A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States of America as a result of Federal Acts and treaties. Examples are species listed under the Endangered Species Act, migratory birds protected by the Migratory Bird Treaty Act and other international treaties, and native plant or wildlife species found on the Refuge System.

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).

Floodplain: The relatively flat area along the sides of a river that is naturally subjected to flooding.

Fluvial: Pertaining to a river.

Flyway: A route taken by migratory birds between their breeding grounds and their wintering grounds. Four primary migration routes have been identified for birds breeding in North America: the Pacific, Central, Mississippi, and Atlantic Flyways.

Foraging: The act of feeding; another word for feeding.

Forbs: Herbaceous dicotyledonous plants.

Fragmentation: The process of reducing the size and connectivity of habitat patches.

GIS: Geographic Information System. Refers to such computer mapping programs as ArcView, ArcInfo, ERDAS, etc.

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: Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Habitat Restoration: Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy forestlands, rangelands, and aquatic systems.

Hydrograph: A graph of the local pattern and magnitude of water flow influenced by season and dam releases.

Hydrologic Regime: The local pattern and magnitude of water flow influenced by season.

Hydrology: The science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere. The distribution and cycling of water in an area.

Impoundment: A body of water created by collection and confinement within a series of levees or dikes, thus creating separate management units although not always independent of one another.

Impact: See effect.

Indigenous: Native to the area.

Integrated Pest Management (IPM): Methods of managing undesirable species, such as weeds, including education; prevention, physical or mechanical methods or control; biological control; responsible chemical use; and cultural methods.

Interpretation: Interpretation can be an educational and recreational activity that is aimed at revealing relationships, examining systems, and exploring how the natural world and human activities are interconnected.

Invertebrate: Animals that do not have backbones. Included are insects, spiders, mollusks (clams, snails, etc.), and crustaceans (shrimp, crayfish, etc.).

Irrigation Drainwater: Ideally, subsurface water that flows from irrigated land and generally transports higher concentrations of dissolved salts than the water applied to the land.

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 602 FW 1.6).

Landowner: A person or entity indicated as the owner of property on the various ownership maps maintained by the Office of the County Assessor.

Landscape Ecology: A sub-discipline of ecology, which focuses on spatial relationships and interactions between patterns and processes. This emerging science integrates hydrology, geology, geomorphology, soil science, vegetation science, wildlife science, economics, sociology, law, engineering, and land use planning to conserve, enhance, restore, and protect the sustainability of ecosystems on the land.

Lease: A legal contract by which water rights are acquired for a specified period for a specified rent or compensation.

Levee: An embankment along the river to prevent water from overbank flooding.

Marsh: A periodically wet or continually flooded area where the water is shallow enough to allow the growth of emergent vegetation such as sedges, rushes, and cattails.

Meander: The bend of curve in a river or stream channel. Migration of the river or stream channel.

Migration: The seasonal movement from one area to another and back.

Migratory Bird: A bird that seasonally moves between geographic areas. In reference to birds in the Great Basin, a bird that breeds in the Great Basin and subsequently moves south of the Great Basin for the winter months. Birds that migrate south of Mexico for the winter are considered Neotropical migrants.

Mission Statement: Succinct statement of the unit's purpose and reason for being.

Mitigation: To avoid or minimize impacts of an action by limiting the degree or magnitude of the action; to rectify the impact by repairing, rehabilitating, or restoring the affected environment; to reduce or eliminate the impact by preservation and maintenance operations during the life of the action.

Model: A mathematical formula that expresses the actions and interactions of the elements of a system in such a manner that the system may be evaluated under any given set of conditions.

Moist-Soil: A process where water is drawn down intentionally or naturally to produce mudflats (i.e., moist soil), which are required for germination of many desirable plants.

Monitoring: Data collected and analyzed periodically for comparing trends in that which is being monitored. Monitoring is necessary to identify, track, and analyze results of management actions at the refuge so that future management actions may be adapted to obtain the best benefits to wildlife and habitat (see adaptive management).

Mud Flat: Expanses of mud contiguous to a water body often covered and exposed by tides.

National Environmental Policy Act (NEPA): An act that encourages productive and enjoyable harmony between humans and their environment to promote efforts that will prevent or eliminate damage to the environment and atmosphere and to stimulate the health and welfare of humans. The act also established the Council on Environmental Quality (CEQ). Requires all 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 (from 40 CFR 1500).

National Wildlife Refuge (Refuge or NWR): A designated area of land or water or an interest in land or water within the system, including national wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas (except coordination areas) under the Service jurisdiction for the protection and conservation of fish and wildlife. A complete listing of all units of the Refuge System may be found in the current A Report of Lands Under Control of the U.S. Fish and Wildlife Service (Service Manual 602 FW 1.6).

National Wildlife Refuge System, Refuge System, or System: Various categories of areas that are administered by the Secretary for the conservation of fish and wildlife, including species that are threatened with extinction; all lands, waters, and interest 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 or waterfowl production areas.

National Wildlife Refuge System Mission (mission): "The mission of the 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" (Service Manual 602 FW 1.6).

Natural Recruitment: Plant establishment through natural processes. In riparian systems, these processes include flooding, sediment deposition, erosion, and seed dispersal from local or upstream plant sources.

Native Species: Species that normally live and thrive in a particular ecosystem.

Neotropical Migratory Birds: Migratory birds that breed in North American and winter in Central and South America.

NEPA: National Environmental Policy Act of 1969.

Niche: An organism's "place," or role, in an ecosystem. This involves many components of the organism's life: where it lives (habitat), what it eats, by whom it is eaten, when it migrates or breeds, etc. All of these factors combine to determine the role of the organism in its ecosystem.

No Action Alternative: An alternative under which existing management would be continued.

Non-Priority Public Uses, or Non-wildlife Dependent Uses: Any use other than a compatible wildlife-dependent recreational use.

Notice of Intent (NOI): A notice that an environmental impact statement will be prepared and considered (40 CFR 1508.22). Published in the Federal Register.

NWR: National Wildlife Refuge.

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 602 FW 1.6).

One-hundred-year Floodplain: The relatively flat portion of the river channel that has a one percent chance of being inundated by floodwater in any given year.

Opportunities: Potential solutions to issues.

Outreach: Outreach is two-way communication between the Service and the public to establish mutual understanding, promote involvement, and influence attitudes and actions, with the goal of improving joint stewardship of our natural resources.

Overbank Flooding: River flows that exceed the boundaries of the existing river channel and flood the adjacent riparian areas and bottomlands.

Passerine Bird: A songbird or other perching bird that is in the order Passeriformes. Blackbirds, crows, warblers, sparrows, and wrens for example.

Perennial: In reference to a body of water, one that contains water year-to-year and that rarely goes dry.

Peak Flow: The maximum discharge of a stream during a specified period of time.

PILT: Payment-in-Lieu-of-Taxes.

Planning Area: The area upon which the planning effort will focus. A planning area may include lands outside existing planning unit boundaries currently studied for inclusion in the Refuge System and/or partnership planning efforts. It also may include watersheds or ecosystems outside of our jurisdiction that affect the planning unit. At a minimum, the planning area includes all lands within the authorized boundary of the refuge (Service Manual 602 FW 1.6).

Planning Team: A team or group of persons working together to prepare a document. 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). We also will ask other Federal and Tribal natural resource agencies to provide team members, as appropriate. The planning team prepares the CCP and appropriate NEPA documentation (Service Manual 602 FW 1.6).

Planning Team Leader: The planning team leader typically is a professional planner or natural resource specialist knowledgeable of the requirements of NEPA and who has planning experience. The planning team leader manages the refuge planning process and ensures compliance with applicable regulatory and policy requirements (Service Manual 602 FW 1.6).

Planning Unit: A single refuge, an ecologically or administratively related refuge complex, or distinct unit of a refuge. The planning unit also may include lands currently outside refuge boundaries (Service Manual 602 FW 1.6).

Plant Community: An assemblage of plant species of a particular composition. The term can also be used in reference to a group of one or more populations of plants in a particular area at a particular point in time; the plant community of an area can change over time due to disturbance (e.g., fire) and succession.

Pollutant: Any introduced gas, liquid, or solid that makes a resource unfit for a specific purpose.

Population: All the members of a single species coexisting in one ecosystem at a given time.

Preferred Alternative: This is the alternative determined (by the decision maker) to best achieve the refuge purpose, vision, and goals; contributes to the Refuge System mission, addresses the significant issues; and is consistent with principles of sound fish and wildlife management. The Service's selected alternative at the Draft CCP stage.

Prescribed Fire: The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, etc., that allows confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

Priority Public Uses: Compatible wildlife-dependent recreation uses (i.e., hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

Proposed Action: The Service's proposed action for Comprehensive Conservation Plans is to prepare and implement the CCP.

Public: Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

Public Involvement: A process that offers impacted and interested individuals and organizations an opportunity to become informed about, and to express their opinions on, Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

Public Scoping: See public involvement.

Purposes of the Refuge: "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 602 FW 1.6).

Raptor: A bird of prey, such as a hawk, eagle, or owl.

Record of Decision (ROD): A concise public record of decision prepared by the Federal agency, pursuant to NEPA, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

Recruitment: The annual increase in a population as determined by the proportion of surviving offspring produced during a specific period (usually expressed per year).

Refuge: Short got National Wildlife Refuge.

Refuge Goal: See goal.

Refuge Purposes: See purposes of the Refuge.

Refuge Revenue Sharing Program or RRSP: Proves payments to counties in lieu of taxes using revenues derived from the sale of products from refuges.

Refuge Use: Any activity on a refuge, except administrative or law enforcement activity carried out by or under the direction of an authorized Service employee.

Restoration: The return of an ecosystem to an approximation of its former unimpaired condition.

Restoration, Active Restoration: Restoration that uses horticultural and agricultural techniques for plant establishment. Common practices of cultural restoration include propagating seeds, acorns, and cuttings in a greenhouse and planting these propagules in rows so that irrigations systems may be installed and maintained and weeds can be sprayed and mowed. Specific human actions taken to reestablish the natural processes, vegetation, and resultant habitat of an ecosystem.

Restoration, Passive Restoration: Restoration that relies on natural processes for plant establishment. These processes include flooding, sediment deposition, erosion, and seed dispersal from local or upstream plant sources. Allowing an ecosystem to restore its natural processes, vegetation, and resultant habitat without human actions.

Riparian Area: Riparian areas are transitional between terrestrial and aquatic ecosystems and are distinguished by gradients in biophysical conditions, ecological processes, and biota. They are areas through which surface and subsurface hydrology connect waterbodies with their adjacent uplands. They include those portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems (i.e., a zone of influence). Riparian areas are adjacent to perennial, intermittent, and ephemeral streams, lakes, and estuarine-marine shorelines.

Riparian Habitat: Gravel bars, sand dunes, non-vegetated riverbanks, herbaceous, scrub, and forested vegetation, which provides habitat for plants, macro-invertebrates, fish, and wildlife.

Riverine: Pertaining to rivers and floodplains.

Secretary: Short for the Secretary of the Interior.

Sediment: Any material, carried in suspension by water, which ultimately settles to the bottom of watercourses. Sediments may also settle on stream banks or flood plains during high water flow.

Service or USFWS: Short for U.S. Fish and Wildlife Service.

Shorebirds: Birds, also known as waders, belonging to the Order Charadriiformes that use shallow wetlands and mud flats for foraging and nesting.

Slough: A naturally occurring side or overflow channel that holds water.

Soil Erosion: The wearing away of the land's surface by water, wind, ice, or other physical process.

Sound Professional Judgment: 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 the requirements of the Refuge Administration Act of 1966 (16 U.S.C. 668dd-668ee) and other applicable laws. Included in the finding, determination, or decision is a refuge manager's field experience and knowledge of the particular refuge's resources (Service Manual 603 FW 2.6).

Spatial Distribution: The pattern of frequency of a specific habitat type over a larger area.

Species: A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Species Composition: A group of species that inhabit a specific habitat type in its healthy state. To enhance species composition is to ensure that all or as many species as possible inhabit the appropriate habitat by improving the quality of that habitat.

Step-Down Management Plan: A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, or safety) or groups of related subjects. It describes strategies and implementation schedules for meeting CCP goals and objectives (Service Manual 602 FW 1.6).

Strategy: A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Service Manual 602 FW 1.6).

Submergent Vegetation: Plants that grows completely submerged except when flowering.

Succession: The replacement of one plant community by another over time.

Surface Water: A body of water that has its upper surface exposed to the atmosphere.

System or Refuge System: National Wildlife Refuge System.

Threatened Species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and one that has been designated as a

threatened species in the Federal Register by the Secretary of the Interior. Threatened species are afforded protection under the Endangered Species Act of 1973.

Tiering: The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference, the general discussions and concentrating on specific issues (40 CFR 1508.28).

Transient Species: Animals that migrate through a locality without breeding or overwintering.

Trust Species: Species for which the Service has primary responsibility, including, most Federally listed threatened and endangered species, anadromous fishes once they enter inland U.S. waterways, migratory birds, and certain marine mammals.

Understory: Shrubs and herbaceous plants that typically grow beneath larger trees in a woodland.

Upland: An area where water normally does not collect and where water does not flow on an extended basis. Uplands are non-wetland areas.

USFWS or Service: Short for U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service Mission: Our mission is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people (Service Manual 602 FW 1.6).

Vegetation: The composition of plant species, their frequency of occurrence, density, and age classes at a specified scale.

Vegetation Community: See plant community.

Vegetation Type or Habitat Type: A land classification system based upon the concept of distinct plant associations.

Vernal Pool: Seasonally flooded depressions on soils with an impermeable layer such as a hardpan, claypan, volcanic basalt, or saturated alkali clays. The impermeable layer allows the pools to retain water much longer then the surrounding uplands; nonetheless, the pools are shallow enough to dry up each season. Vernal pools often fill and empty several times during the rainy season. Only plants and animals that are adapted to this cycle of wetting and drying can survive in vernal pools over time.

Vertebrate: An animal having a segmented backbone or vertebral column; includes mammals, birds, fish, amphibians, and reptiles.

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. We will tie the vision statement for the refuge 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 602 FW 1.6).

Waterfowl: A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Water-righted Acreage: The land base for which there are water rights.

Water Rights: A grant, permit, decree, appropriation, or claim to the use of water for beneficial purposes, and subject to other rights of earlier date of use, called priority, or prior appropriation.

Watershed: The entire land area that collects and drains water into a river or river system.

Wetland: Land that is transitional between upland (terrestrial) and aquatic systems (greater than about 6-feet deep), where the water table is usually at or near the surface or the land is covered by shallow water... wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes (plants that require wet conditions); (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

Wetland Habitat: Habitat provided by shallow or deep water (but less than 6-feet deep), with or without emergent and aquatic vegetation in wetlands. Wetland habitat only exists when and where a wetland or portion of a wetland is covered with water (visible surface water). Consequently, the size and shape of "wetland habitat" will fluctuate from season-to-season and year-to-year while the size and shape of the "wetland" within which wetland habitat occurs will remain constant from season to season and from year to year. Wetlands only provide habitat for waterfowl, shorebirds, muskrats, aquatic insects, and other wetland-dependent wildlife when they contain surface water (i.e., when they provide wetland habitat).

Wildfire: A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

Wildland fire: A free burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands. Often referred to as wildfire.

Wildlife: All nondomesticated animal life; included are vertebrates and invertebrates.

Wildlife Corridor: A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic, including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required for long-term survival of reproduction of its migrants.

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. We also will consider these other uses in the preparation of refuge CCPs; however, the six priority public uses always will take precedence (Service Manual 602 FW 1.6).

Bibliography

Brown, S. C., C. Hickey, B. Harrington, and R. Gill, eds. 2001. *The U.S. shorebird conservation plan*. 2nd ed. Manomet, Massachusetts: Manomet Center for Conservation Sciences.

California Air Resources Board. 2005. Characterization of ambient PM0 and PM2.5 in California. Technical report. California Air Resources Board. June 2005.

California Air Resources Board. 2006. *The California almanac of emissions and air quality - 2006 edition*: California Air Resources Board.

California Department of Finance. 2002. Census 2000 California profile.

California Department of Finance. 2007a. E-1 population estimates for cities, counties, and the State with annual percent change - January 1, 2006 and 2007. Sacramento, California.

California Department of Finance. 2007b. E-8 historical population and housing estimates for cities, counties, and the state, 1990-2000. Sacramento, California.

California Department of Fish and Game. 2005a. California wildlife conservation challenges, California's wildlife action plan. Prepared by the U.C. Davis Wildlife Health Center.

California Department of Fish and Game. 2005b. CWHR version 8.1 personal computer program: California Department of Fish and Game, California Interagency Wildlife Task Group.

California Department of Fish and Game. 2005c. The status of rare, threatened, and endangered plants and animals of California 2000-2004.

California Department of Fish and Game, and University of California at Davis. 2006. California Swainson's hawk inventory: 2005-2006, 2005 progress report.

California Department of Parks and Recreation. 2003. Public opinions and attitudes on outdoor recreation in California 2002. California Department of Parks and Recreation.

California Department of Transportation. 2005. California 2005 - 2025 county-level economic forecast. September 2005.

California Herps. 2007. California reptiles and amphibians. http://www.californiaherps.com/index.html (cited June 21, 2007

California Partners in Flight. 2005. Version 1.0. The sagebrush bird conservation plan: A strategy for protecting and mapping sagebrush habitats and associated birds in California. PRBO Conservation Science.

California Regional Water Quality Control Board, C. V. R. 1998. Fourth edition of the water quality control plan (basin plan) for the Sacramento River and San Joaquin River basins. September 1998, amended September 2004.

California State Parks. 2005. Park and recreation trends in California 2005.

Center for Economic Development. 2007. *2007 Modoc County economic & demographic profile*: Center for Economic Development, CSU, Chick Research Foundation.

Cooper, D. S. 2004. *Important bird areas of California*. Pasadena, California: Audubon California.

Cordell, H. K., C. Betz, J. M. Bowker, D. B. K. English, S. H. Mou, B. J. C., R. J. Teasley, M. A. Tarrant, and J. Loomis. 1999. *Outdoor recreation in American life: A national assessment of demand and supply trends*. Champaign, Illinois: Sagamore, Inc.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. http://www.npwrc.usgs.gov/resource/1998/classwet/classwet.htm (cited 2004).

Dahl, T. E. 1990. Wetlands - losses in the United States, 1780s to 1980s. U.S. Fish and Wildlife Service Report to Congress.

Dahl, T. E., and C. E. Johnson. 1991. Wetlands - status and trends in the conterminous United States, mid-1970s to mid-1980s. U.S. Fish and Wildlife Service.

Dahl, T. E., and G. J. Allord. 1996. Technical aspects of wetlands. History of wetlands in the conterminous United States. In *National water summary on wetland resources. U.S. Geological Survey water supply paper 2425*: U.S. Geological Survey.

Davis, F. W., D. M. Stoms, A. D. Hollander, K. A. Thomas, P. A. Stine, D. Odion, M. I. Borchert, J. H. Thorne, M. V. Gray, R. E. Walker, and J. Graae. 1998. The California gap analysis project: Final report. http://www.biogeog.ucsb.edu/projects/gap/gap_rep.html (cited 2008).

duVair, P. 2003. Climate change and California. Staff report of the California Energy Commission. http://www.energy.ca.gov/reports/2003-11-26_100-03-017F.pdf (cited 2008).

Employment Development Department. 2006. Modoc County snapshot. http://www.calmis.ca.gov/file/cosnaps/modocSnap.pdf (cited June 25, 2007

Environmental Statistics Group. 2003. Hydrologic unit project. http://www.esg.montana.edu/gl/huc/index.html (cited June 17, 2007

Euliss, N. H., Jr., and S. W. Harris. 1987. Feeding ecology of northern pintails and green-winged teal wintering in California. *Journal of Wildlife Management* 51(4):724-732.

Green, A. G., H. L. Bombay, and M. L. Morrison. 2003. Conservation assessment of the willow flycatcher in the Sierra Nevada. USDA Forest Service.

Grinnell, J., and A. H. Miller. 1944. The distribution of the birds of California. *Pacific Coast Avifauna* 27:1-608.

Halterman, M. D., D. S. Gilmer, S. A. Laymon, and G. A. Falxa. 2001. Status of the yellow-billed cuckoo in California: 1999-2000. Report to the USGS-BRD.

Hayhoe, K., D. Cayan, C. B. Field, P. C. Frumhoff, E. P. Maurer, N. L. Miller, S. C. Moser, S. H. Schneider, K. N. Cahill, E. E. Cleland, L. Dale, R. Drapek, R. M. Hanemann, L. S. Kalkstein, J. Lenihan, C. K. Lunch, R. P. Neilson, S. C. Sheridan, and J. H. Verville. 2004. Emissions pathways, climate change, and impacts on California. *Proceedings of the National Academy of Sciences* 101(34):12422-12427.

Heitmeyer, M. E., and D. G. Raveling. 1988. Winter resource use by three species of dabbling ducks in California. Final report to Delta Waterfowl and Wetlands Research Center.

Henstrom, M. A., M. J. Wisdom, W. J. Hann, M. M. Rowland, B. C. Wales, and R. A. Gravenmier. 2002. Sagebrush-steppe vegetation dynamics and restoration potential in the interior Columbia Basin, U.S. A. *Conservation Biology* 16:1242-1255.

Intermountain West Joint Venture. 2005. Coordinated implementation plan for bird conservation in California (BCRs 9, 15, and 33).

Ivey, G. L., and C. P. Herziger. 2006. Intermountain West waterbird conservation plan, version 1.2. A plan associated with the Waterbird Conservation for the Americas Initiative. U.S. Fish and Wildlife Service Pacific Region.

Kushlan, J. A., M. J. Steinkamp, K. C. Parsons, J. Capp, M. A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R. M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J. E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird conservation for the Americas: The North American waterbird conservation plan, version 1. Waterbird Conservation for the Americas.

Littlefield, C. D., and G. L. Ivey. 2000. Conservation assessment for greater sandhill cranes wintering on the Consumnes River floodplain and delta regions of California. The Nature Conservancy.

Littlefield, C. D., and G. L. Ivey. 2002. Washington State recovery plan for the sandhill crane. Washington Department of Fish and Wildlife.

Loft, E. R. 1998. Economic contribution of deer, pronghorn antelope, and sage grouse hunting to northeastern California and implications to the overall "value" of wildlife. *California Wildlife Conservation Bulletin* 11:42.

Miller, M. R. 1987. Fall and winter foods of northern pintails in the Sacramento Valley, California. *Journal of Wildlife Management* 51(2):405-414.

Miller, R. F., T. J. Svejcar, and N. E. West. 1994. Implications of livestock grazing in the intermountain sagebrush region: Plant composition. In *Ecological implications of livestock herbivory in the west*: Society for Range Management.

Mills, Terry J. 1980. Life history, status, and management of the Modoc sucker, Catostomus microps (Rutter) in California, with a Recommendation for Endangered Classification. Inland Fisheries Endangered Species Program, Department of Fish and Game. Sacramento, California. 30+pp.

Mintier Harnish and Associates. 1998. Modoc County general plan: Background report. September 1988.

Modoc County. 1998. Modoc County general plan: Background report. September 1998.

Modoc National Forest, and Alturas Field Office Bureau of Land Management. 2007. Sage steppe ecosystem restoration strategy draft environmental impact statement.

National Audubon Society. 2002. Cooling the hotspots: Protecting America's birds, wildlife and natural heritage from invasive species. National Audubon Society.

National Audubon Society. 2008. Important bird areas. http://www.audubon.org/bird/iba (cited 2008).

Oakeshott, G. B. 1971. *California's changing landscapes: A guide to the geology of the state*. New York: McGraw-Hill.

Oring, L. W., L. Neel, and K. E. Oring. 2001. Intermountain West shorebird plan. Version 1.0. http://shorebirdplan.fws.gov/RegionalShorebird/downloads/IMWEST4.doc (cited 2008).

Pacific Flyway Council. 2007. Pacific Flyway Council. http://pacificflyway.gov/Management.asp (cited 2008).

Parmesan, C., and H. Galbraith. 2004. Observed impacts of global climate change in the U.S. http://www.pewclimate.org/docUploads/final%5FObsImpact%2Epdf (cited 2008).

Remsen, J. V. 1978. Bird species of special concern in California. California Department of Fish and Game.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Iñigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Roseberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology.

Riparian Habitats Joint Venture. 2004. The riparian bird conservation plan: A strategy for reversing the decline of riparian associated birds in California. http://www.prbo.org/calpif/pdfs/riparian_v-2.pdf (cited October 16, 2007).

Schaefer, R. J., D. J. Thayer, and T. S. Burton. 2003. Forty-one years of vegetation change on permanent transects in northeastern California: Implications for wildlife. *California Fish and Game* 89(2):55-71.

Schlorff, A. R. 2000. Report to the Fish and Game Commission on bank swallow populations. California Department of Fish and Game.

Schneider, S. H., and K. Kuntz-Suriseti. 2002. Uncertainty and climate change policy. In *Climate change policy*, edited by S. H. Schneider, A. Rosencranz and J. O. Niles. Washington, D.C.: Island Press.

Sedgwick, J. A. 2000. Willow flycatcher (*Empidonax traillii*). In *The birds of North America*, edited by A. Poole and F. Gill. Philadelphia: The Birds of North America, Inc.

Serena, M. 1982. The status and distribution of the willow flycatcher (*Empidonax traillii*) in selected portions of the Sierra Nevada, 1982. Report No. 82-5. California Department of Fish and Game, Wildlife Management Branch.

The Nature Conservancy. 2001. *Great Basin: An ecoregion-based conservation blueprint*. Reno, Nevada.

Turman, E. G. 2002. Regional impact assessments: A case study of California. In *Climate change policy*, edited by S. H. Schneider, A. Rosencranz and J. O. Niles. Washington, D.C.: Island Press.

U.S. Fish and Wildlife Service. 1963. Master plan Modoc National Wildlife Refuge, Modoc County, California. Part I development and management and part II engineering. U.S. Fish and Wildlife Service Region 1.

U.S. Fish and Wildlife Service. 1985. Determination of Endangered Status and Critical Habitat for the Modoc Sucker. Federal Register (50) 112: 24523-24530.

U.S. Fish and Wildlife Service. 1997. National outreach strategy: A master plan for communicating in the U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service. 1999. Fulfilling the promise: The National Wildlife Refuge System. Visions for wildlife, habitat, people, and leaders. USFWS Division of Refuges.

U.S. Fish and Wildlife Service. 2002. National strategy for management of invasive species. Report by Fulfilling the Promise National Invasive Species Management Strategy Team. September 10, 2002.

U.S. Fish and Wildlife Service. 2003. Wildland fire management plan and environmental assessment. Modoc National Wildlife Refuge. U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service. 2005. Banking on nature: The economic benefits to local communities of National Wildlife Refuge visitation. U.S. Fish and Wildlife Service. September 2005.

U.S. Fish and Wildlife Service. 2007a. Fire management. Wildlife fire history project 1936-2005. http://www.fws.gov/klamathbasinrefuges/fire/whp.html (cited 2008).

U.S. Fish and Wildlife Service. 2007b. Banking on nature: The economic benefits to local communities of National Wildlife Refuge visitation. Division of Economics. September.

U.S. Fish and Wildlife Service. 2007c. Species Assessment and Listing Priority Assignment Form for Oregon spotted frog *(Rana pretiosa).* March 2007.

U.S. Fish and Wildlife Service. 2009. Draft Rising to the Challenge. Strategic Plan for Responding to Accelerating Climate Change.

U.S. Fish and Wildlife Service, and Canadian Wildlife Service. 1986. North American waterfowl management plan. U.S. Department of Interior.

U.S. Fish and Wildlife Service, U.S. Department of Commerce, and U.S. Census Bureau. 1996. 1996 National survey of fishing, hunting, and wildlife-associated recreation - California survey.

U.S. Fish and Wildlife Service, Canadian Wildlife Service, and Mexican National Institute of Ecology. 1998. Expanding the vision: 1998 update - North American waterfowl management plan. U.S. Department of Interior.

U.S. Fish and Wildlife Service, U.S. Department of Commerce, and U.S. Census Bureau. 2006. 2006 National survey of fishing, hunting, and wildlife-associated recreation - California survey.

U.S. Fish and Wildlife Service. 2008. Connecting people with nature: Action plan sharing the spark. California Nevada Region.

U.S. Fish and Wildlife Service. Unpublished. Regular wildlife surveys, 1989-2007.Willows, California: Sacramento National Wildlife Refuge.

USDA Forest Service. 1991. Modoc National Forest land and resource management plan. Modoc National Forest.

USDA Forest Service. 2001. Sierra Nevada forest plan amendment, final impact statement. Volumes 1-6. Pacific Southwest Region.

USDA Soil Conservation Service. 1980. *Soil survey of Modoc County, California, Alturas area*: National Cooperative Soil Survey.

VESTRA. 2004. Upper Pit River Watershed assessment. Prepared for Pit River Alliance.

Watson, J.W., K.R. McAllister, and D.J. Pierce. 2003. Home ranges, movements, and habitat selection of Oregon spotted frogs (Rana pretiosa). Journal of Herpetology 37:292–300.

White, C. M., N. J. Clum, T. J. Cade, and W. G. Hunt. 2002. Peregrine falcon (*Falco peregrinus*). In *The birds of North America*, edited by A. Poole and F. Gill. Philadelphia: The Birds of North America, Inc.

Young, J. 2000. *Bromus tectorum*. In *Invasive plants of California's wildlands*, edited by C. C. Bossard, J. M. Randall and M. C. Hoshovsky. Berkeley, California: University of California Press.