

Draft Comprehensive Conservation Plan and Environmental Assessment

Red Rock Lakes National Wildlife Refuge

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Prepared by

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Abbreviations

ARM	adaptive resource management
Administration Act	National Wildlife Refuge System Administration Act
ATV	all-terrain vehicle
AUM	animal unit months
BP	before present
BLM	Bureau of Land Management
CCP	comprehensive conservation plan
CFR	Code of Federal Regulations
CWCS	comprehensive wildlife conservation strategy
districts	wetland management districts
DNRC	Montana Department of Natural Resources and Conservation
EA	environmental assessment
FMP	fire management plan
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
GS	general pay schedule
IBA	Important Bird Area
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
MFWP	Montana Fish, Wildlife, and Parks
MTNHP	Montana Natural Heritage Program
NEPA	National Environmental Policy Act
NOI	notice of intent
PL	public law
PM₁₀	Particulate matter
refuge	Red Rock Lakes National Wildlife Refuge
Refuge System	National Wildlife Refuge System
RONs	Refuge Operating Needs System
RMP	Rocky Mountain population
SAV	submerged aquatic vegetation
sandhills	Centennial Sandhills
Service	U.S. Fish and Wildlife Service
U.S.	United States
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCS	water control structure
WG	wage grade pay schedule
WMD	wetland management district
WPA	waterfowl production area
WPA	Works Progress or Project Administration
WUI	wildland-urban interface

Definitions of these and other terms are in the glossary, located after Chapter 6.

Summary

The following summary provides a brief overview of this draft comprehensive conservation plan and environmental assessment for Red Rock Lakes National Wildlife Refuge, including (1) a general description; (2) purposes of the refuge; (3) vision and goals; (4) alternatives considered, including the proposed action; and (5) the decision to be made regarding the proposed comprehensive conservation plan.

GENERAL DESCRIPTION

The U.S. Fish and Wildlife Service has developed this draft comprehensive conservation plan to provide a foundation for the management and use of Red Rock Lakes National Wildlife Refuge. This refuge is one of the most remote in the lower 48. It is located in the Centennial Valley in southwestern Montana in Beaverhead County, 47 miles west of West Yellowstone and 38 miles east of the town of Lima. This 47,756-acre refuge sits at 6,670 feet above sea level and lies east of the Continental Divide near the uppermost reach of the Missouri drainage.

Historically, management focused on protecting and enhancing the trumpeter swan population at the refuge. In the 1930s, the refuge was their last known breeding location. Today, swans can still be seen breeding in the valley, but the intensive management of swan populations (through feeding and raising young) has been altered in favor of allowing the swans to thrive under mostly natural conditions.

The refuge has one of the most naturally diverse areas in the National Wildlife Refuge System. The refuge boasts the largest wetland complex within the Greater Yellowstone ecosystem as well as expansive tracts of grassland and sagebrush-steppe habitats and a small amount of midelevation forested areas. These habitats support over 200 species of birds, including peregrine falcons, bald eagles, short-eared owls, sandhill cranes, sage grouse, and numerous species of waterfowl and waterbirds. Common mammals include Shiras moose, elk, mule and white-tailed deer, badger, coyote, and red fox. In addition, wolves and grizzly bears have been documented using the refuge in recent years. There is also a remnant population of native lacustrine/adfluvial Arctic grayling that occur on the refuge. This population lives in the lake and breeds in the river.

A full-time staff of five employees and various summer temporaries manage and study the refuge habitats and maintain visitor facilities. Domestic livestock grazing and prescribed fire are the primary management tools used to maintain and enhance upland habitats. Currently, four grazing cooperators are using refuge lands. Water level manipulation occurs in some areas of the refuge to improve wetland habitats.

Approximately 12,000 people visit the refuge annually. Two refuge roads and three county roads that pass through the refuge account for the majority of visitor use. The refuge is open to limited fishing, with the majority of fishing occurring on Red Rock Creek. In addition, the refuge is open to limited hunting of ducks, geese, coots, elk, pronghorn, moose, mule deer, and white-tailed deer.

ESTABLISHMENT HISTORY

On April 22, 1935, President Franklin D. Roosevelt established the Red Rock Lakes Migratory Waterfowl Refuge (later named “Red Rock Lakes National Wildlife Refuge” on July 19, 1961) under Executive Order 7023 “as a refuge and breeding ground for wild birds and animals.” On September 4, 1935, President Roosevelt enlarged the refuge under Executive Order 7172 “provided, that any private lands within the areas described shall become a part of the refuge upon the acquisition of title or lease thereto by the United States.”

During the 70 years since the executive boundary was established, the U.S. Fish and Wildlife Service has continued to acquire lands from willing landowners or receive land donations. The Service currently owns 47,756 acres within this approved boundary.

LEGISLATIVE PURPOSES

Every refuge has a purpose for which it was established. The purpose is the foundation upon which to build all refuge programs, from biology and visitor services, to maintenance and facilities. No action undertaken by the U.S. Fish and Wildlife Service or public may conflict with this refuge purpose. The refuge purposes are found in the legislative acts or administrative orders that provide the authorities to either transfer or acquire a piece of land for a refuge. Over time, an individual refuge

may contain lands that have been acquired under a variety of transfer and acquisition authorities, giving a refuge more than one purpose. The goals, objectives, and strategies identified in the draft comprehensive conservation plan are intended to support individual purposes for which the refuge was established.

The legislative purposes for Red Rock Lakes National Wildlife Refuge include the following:

1. “As a refuge and breeding ground for wild birds and animals.” (Executive Order 7023, dated April 22, 1935)
2. “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (Migratory Bird Conservation Act)
3. “Suitable for (a) incidental fish and wildlife-oriented recreational development, (b) the protection of natural resources, (c) the conservation of endangered species or threatened species ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors.” (Refuge Recreation Act)
4. “The conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions.” (Emergency Wetlands Resources Act)
5. “For the development, advancement, management, conservation, and protection of fish and wildlife resources ... 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.” (Fish and Wildlife Act)

REFUGE VISION

The vision for Red Rock Lakes National Wildlife Refuge is based on the establishing purposes of the refuge, resource conditions and potential, and the issues identified during the planning process (see Section 2.2).

The majestic Centennial Valley of southwest Montana is an expansive mosaic of mountain wetlands, grasslands, shrub lands, and forests framed by dramatic mountain peaks. Through partnerships and conservation programs, the valley has maintained its biological integrity and is a working landscape that remains largely undeveloped.

To this end, the Red Rock Lakes National Wildlife Refuge is a conservation leader in the valley

working to maintain and restore natural processes to create and sustain native habitat for migratory and resident fish and wildlife. Visitors have a sense of solitude and wildness that lifts their spirits and stirs their souls. This first-hand experience with the refuge encourages people to participate as stewards, not only of the refuge, but also of the natural resources in their own communities.

REFUGE GOALS

The goals described below help the staff achieve the vision for Red Rock Lakes National Wildlife Refuge.

LAKE, POND, AND MARSH HABITAT GOAL

Provide habitat for breeding and migrating birds, native fishes, and resident wildlife that maintains the biological diversity and integrity of montane wetland systems.

RIPARIAN HABITAT GOAL

Maintain the processes necessary to sustain the biological diversity and integrity of native riparian vegetation for breeding birds, native fishes, and wintering ungulates.

WET MEADOW, GRASSLAND, AND SHRUB-STEPPE HABITAT GOAL

Provide structurally complex native meadow, grassland, and shrub-steppe habitats, within a watershed context, for sagebrush-dependent species, upland-nesting migratory birds, rare plant species, and other resident wildlife.

ASPEN FOREST, MIXED CONIFEROUS FOREST, AND WOODLAND HABITAT GOAL

Create and maintain aspen stands of various age classes within a mosaic of coniferous forest and shrub land for cavity-nesting birds and other migratory and resident wildlife.

VISITOR SERVICES AND CULTURAL RESOURCES GOAL

Provide quality wildlife-dependent recreation, interpretation, and outreach opportunities that nurture an appreciation and understanding of the unique natural and cultural resources of the Centennial Valley, for visitors and local community members of all abilities, while maintaining the primitive and remote experience unique to the refuge.

REFUGE OPERATIONS GOAL

Prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, and volunteer programs.

ALTERNATIVES

ALTERNATIVE A: NO ACTION

Alternative A, the no-action alternative, reflects the current habitat management of the refuge. It provides the baseline against which to compare other alternatives. It is also a requirement of the National Environmental Protection Act that a no-action alternative be addressed in the planning process.

ALTERNATIVE B: PROPOSED ACTION

Management under alternative B acknowledges the importance of naturally functioning ecological communities on the refuge. However, changes to the landscape (for example, human alterations to the landscape, created wetlands, and species in peril requiring special management actions) prevent management of the refuge solely as a naturally functioning ecological community. Because some of these changes can be significant, some refuge habitats would require “hands on” management actions during the life of this plan. Visitor services programs (such as hunting, fishing, wildlife observation and photography, outreach, and interpretation programs) would be improved and expanded while maintaining the wilderness characteristics of the refuge.

ALTERNATIVE C: WETLAND RESTORATION

Management under alternative C acknowledges the importance of a naturally functioning ecosystem. Management action emphasis would be placed on allowing wetland and riparian habitats to function naturally through the restoration of most created and all modified wetlands and elimination of all water management structures. Visitor services programs (such as hunting, fishing, wildlife observation and photography, environmental education, outreach, and interpretation programs) would be improved and expanded while maintaining the wilderness characteristics of the refuge.

ALTERNATIVE D: ECOLOGICAL RESTORATION

Management under alternative D further acknowledges the importance of a naturally functioning ecosystem. Management action emphasis would be placed on the restoration of all natural processes, including the restoration of all wetland and riparian habitats. The refuge would participate in state programs to reintroduce bison if they become designated as free-ranging wildlife. Also, the refuge

would place emphasis on creating a wilderness setting in all areas away from refuge headquarters. Visitor services programs would promote a wilderness experience with little to no signage or interpretation

DECISION TO BE MADE

The environmental assessment describes and analyzes four alternatives for achieving the above goals. Based on this analysis, the U.S. Fish and Wildlife Service's regional director for region 6 (Mountain-Prairie Region) will decide which alternative will be selected to manage the refuge for the next 15 years.

1 Introduction



USFWS

Sunset over Upper Red Rock Lake.

This document presents an environmental assessment (EA) that evaluates alternatives for, and expected consequences of, managing Red Rock Lakes National Wildlife Refuge (NWR). Alternative B is the proposed action of the U.S. Fish and Wildlife Service (Service) and is presented in chapter 6 as the draft comprehensive conservation plan (CCP) for the refuge. This chapter provides an introduction to the CCP process and describes the involvement of the Service, the state of Montana, the public, and others, as well as conservation issues and plans that affect the refuge. The remaining chapters provide more specific information on the refuge and planning issues (chapter 2), its resources (chapter 4), and the alternatives (chapter 3) and related consequences (chapter 5) considered for this plan. Chapter 6 provides objectives and strategies for the proposed action.

The Service has developed this draft CCP to provide a foundation for the management and use of Red Rock Lakes National Wildlife Refuge. This refuge is one of the most remote in the continental United States. It is located in the Centennial Valley in southwestern Montana in Beaverhead County, 47 miles west of West Yellowstone and 38 miles east of the town of Lima. (Figure 1. Location of Red Rock Lakes National Wildlife Refuge, Montana). When finalized, the CCP will serve as a working guide for management programs and actions over the next 15 years.

This draft CCP was developed in compliance with the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and Part 602 (National Wildlife Refuge System Planning) of “The Fish and Wildlife Service Manual.” The actions described in this draft CCP and EA meet the requirements of the Council on Environmental Quality regulations that implement the National Environmental Policy Act of 1969 (NEPA). This project also complies with NEPA public involvement requirements.

The final CCP will specify the necessary actions to achieve the vision and purposes of the Red Rock Lakes National Wildlife Refuge. Wildlife is the first priority in refuge management, and visitor services (wildlife-dependent recreation) are allowed and encouraged as long as they are compatible with the refuge’s purposes.

The draft CCP and EA have been prepared by a planning team composed of representatives from various U.S. Fish and Wildlife Service programs. The planning team also incorporated public input—public involvement and the planning process are described in section 1.6, “The Planning Process.”

After reviewing a wide range of public comments and management needs, the planning team developed alternatives for managing the refuge. The team recommended one alternative to be the Service’s proposed action, which addresses all substantive issues and best achieves the purposes of the refuge.



Figure 1. Location of Red Rock Lakes National Wildlife Refuge, Montana.

The proposed action is the U.S. Fish and Wildlife Service's recommended course of action for managing the refuge. The proposed action is summarized in chapter 3, "Alternatives," with its predicted effects described in chapter 5, "Environmental Consequences." The details of the proposed action compose the draft CCP (chapter 6).

1.1 PURPOSE AND NEED FOR THE PLAN

The purpose of this draft CCP is to identify the role that the refuge will play in support of the mission of the National Wildlife Refuge System (Refuge System) and to provide long-term guidance for managing refuge programs and activities. The CCP is needed to

- communicate with the public and other partners in efforts to carry out the mission of the Refuge System;
- provide a clear statement of direction for managing the refuge;
- provide neighbors, visitors, and government officials with an understanding of the Service's management actions on and around the refuge;
- ensure that the Service's management actions are consistent with the mandates of the Improvement Act;
- ensure that management of the refuge is consistent with federal, state, and county plans;
- provide a basis for development of budget requests for the refuge's operation, maintenance, and capital improvement needs.

Sustaining the nation's fish and wildlife resources is a task that can be accomplished only through the combined efforts of governments, businesses, and private citizens.

1.2 THE U.S. FISH AND WILDLIFE SERVICE AND THE REFUGE SYSTEM

The U.S. Fish and Wildlife Service is the principal federal agency responsible for fish, wildlife, and plant conservation. The Refuge System is one of the Service's major programs.

U.S. FISH AND WILDLIFE SERVICE

The mission of the U.S. Fish and Wildlife Service, working with others, is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

Over a century ago, America's fish and wildlife resources were declining at an alarming rate. Concerned citizens, scientists, and hunting and angling groups joined together to restore and sustain America's national wildlife heritage. This was the genesis of the U.S. Fish and Wildlife Service.

Today, the Service enforces federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores vital wildlife habitat, protects and recovers endangered species, and helps other governments with conservation efforts. In addition, the Service administers a federal aid program that distributes hundreds of millions of dollars to states for fish and wildlife restoration, boating access, hunter education, and related programs across America.

U.S. FISH AND WILDLIFE SERVICE ACTIVITIES IN MONTANA (2006)

Service activities in Montana contribute to the state's economy, ecosystems, and education programs. The following list highlights the Service's presence and activities:

- employed 142 people in Montana
- 407 volunteers donated more than 21,131 hours to Service projects on refuge lands
- managed two national fish hatcheries, one fish and wildlife management assistance office, one fish health center, four ecological services offices, and one fish technology center
- managed 23 national wildlife refuges encompassing 1,195,828 acres (1.27% of the state)
- managed 5 wetland management districts
 - managed 47,884 acres of fee waterfowl production areas
 - managed 135,320 acres under various leases or easements
- hosted more than 629,950 annual visitors to Service-managed lands
 - 112,835 hunting visits
 - 71,665 fishing visits
 - 419,062 wildlife observation visits
 - 9,905 students (8,944 in on-site programs) participated in environmental education programs
- provided \$6.9 million to Montana Fish, Wildlife and Parks (MFWP) for sport fish restoration and \$6.3 million for wildlife restoration and hunter education
- since 1988, the Service's Partners for Fish and Wildlife Program has helped private landowners restore more than 27,402 wetland acres on 2,141 sites; 320,124 upland acres on 298 sites; and 1,138 miles of river habitat
- paid Montana counties \$315,271 under the Refuge Revenue Sharing Act (money used for schools and roads)

NATIONAL WILDLIFE REFUGE SYSTEM

In 1903 President Theodore Roosevelt designated the 5.5-acre Pelican Island in Florida as the nation's first wildlife refuge for the protection of brown pelicans and other native nesting birds. This was the first time the federal government set aside land for wildlife. This small but significant designation was the beginning of the Refuge System.

One hundred years later, the Refuge System has become the largest collection of lands in the world specifically managed for wildlife, encompassing over 96 million acres within 547 refuges and over 3,000 small areas for waterfowl breeding and nesting. Today, there is at least one refuge in every state, including Puerto Rico and the U.S. Virgin Islands.

The Improvement Act of 1997 established a clear mission for the Refuge System.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Improvement Act states that each national wildlife refuge (that is, each unit of the Refuge System, which includes wetland management districts) shall be managed to

- fulfill the mission of the Refuge System;
- fulfill the individual purposes of each refuge and district;
- consider the needs of fish and wildlife first;
- fulfill the requirement of developing a CCP for each unit of the Refuge System and fully involve the public in preparation of these plans;
- maintain the biological integrity, diversity, and environmental health of the Refuge System;
- recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority visitor services;
- retain the authority of refuge managers to determine compatible visitor services.

In addition to the mission for the Refuge System, the wildlife and habitat vision for each unit of the Refuge System maintains the following principles:

- Wildlife comes first.
- Ecosystems, biodiversity, and wilderness are vital concepts in refuge and district management.

- Habitats must be healthy.
- Growth of refuges and districts must be strategic.
- The Refuge System serves as a model for habitat management with broad participation from others.

Following passage of the Improvement Act, the U.S. Fish and Wildlife Service immediately began to carry out the direction of the new legislation, including preparation of CCPs for all national wildlife refuges and wetland management districts (WMDs). Consistent with the Improvement Act, the Service prepares all CCPs in conjunction with public involvement. Each refuge and each district is required to complete its CCP within the 15-year schedule (by 2012).

PEOPLE AND THE REFUGE SYSTEM

The nation's fish and wildlife heritage contributes to the quality of American lives and is an integral part of the country's greatness. Wildlife and wild places have always given people special opportunities to have fun, relax, and appreciate the natural world.

Whether through bird watching, fishing, hunting, photography, or other wildlife pursuits, wildlife recreation contributes millions of dollars to local economies. Approximately 37 million people visited the Refuge System in 2004, mostly to observe wildlife in their natural habitats. Visitors are most often accommodated through nature trails, auto tours, interpretive programs, and hunting and fishing opportunities. Significant economic benefits are being generated to the local communities that surround refuges and wetland management districts. Economists report that Refuge System visitors contribute more than \$1.4 billion annually to local economies.

1.3 NATIONAL AND REGIONAL MANDATES

Refuge System units are managed to achieve the mission and goals of the Refuge System, along with the designated purpose of the refuges and districts (as described in establishing legislation, executive orders, or other establishing documents). The key concepts and guidance of the Refuge System are contained in the Refuge System Administration Act of 1966 (Administration Act), Title 50 of the Code of Federal Regulations (CFR), "The Fish and Wildlife Service Manual," and the Improvement Act.

The Improvement Act amends the Administration Act by providing a unifying mission for the Refuge System, a new process for determining compatible visitor services on refuges and districts, and a requirement that each refuge and district be managed under a CCP. The Improvement Act

states that wildlife conservation is the priority of Refuge System lands and that the Secretary of the Interior will ensure that the biological integrity, diversity, and environmental health of refuge lands are maintained. Each refuge and district must be managed to fulfill the Refuge System’s mission and the specific purposes for which it was established. The Improvement Act requires the Service to monitor the status and trends of fish, wildlife, and plants in each refuge and district.

A detailed description of these and other laws and executive orders that may affect the CCP or the Service’s implementation of the CCP is found in Appendix A. Service policies on planning and day-to-day management of refuges and districts are in the “Refuge System Manual” and “The Fish and Wildlife Service Manual.”

1.4 REFUGE CONTRIBUTIONS TO NATIONAL AND REGIONAL PLANS

The Red Rock Lakes National Wildlife Refuge contributes to the conservation efforts described here.

FULFILLING THE PROMISE

A 1999 report, “Fulfilling the Promise, The National Wildlife Refuge System” (U.S. Fish and Wildlife Service 1999), is the culmination of a yearlong process by teams of Service employees to evaluate the Refuge System nationwide. This report was the focus of the first national Refuge System conference (in 1998)—attended by refuge managers, other Service employees, and representatives from leading conservation organizations.

The report contains 42 recommendations packaged with three vision statements dealing with wildlife and habitat, people, and leadership. This CCP deals with all three of these major topics. The planning team looked to the recommendations in the document for guidance during CCP planning.

PARTNERS IN FLIGHT

The “Partners in Flight” program began in 1990 with the recognition of declining population levels of many migratory bird species. The challenge is, according to the program, maintaining functional natural ecosystems in the face of human population growth. To meet this challenge, Partners in Flight worked to identify priority land bird species and habitat types. Partners in Flight activity has resulted in 52 bird conservation plans covering the continental United States.

The primary goal of Partners in Flight is to provide for the long-term health of bird life of this continent.

The first priority is to prevent the rarest species from going extinct. The second priority is to prevent uncommon species from descending into threatened status. The third priority is to “keep common birds common.”

There are 58 physiographic areas, defined by similar physical geographic features, wholly or partially contained within the contiguous United States and several others wholly or partially in Alaska. The Red Rock Lakes National Wildlife Refuge lies within the physiographic area known as the Central Rocky Mountains (see figure 2). It is a huge physiographic area, extending from northwest Wyoming over all of western Montana, the northern two-thirds of Idaho, large areas of eastern Oregon and Washington, much of southeast British Columbia, and a sliver of west Alberta. It is an area of high mountains, with elevations exceeding 10,000 feet. Glaciation has left broad flat valleys between mountain ranges. Elevation determines the dominant vegetation. The highest areas are alpine tundra. The subalpine zone is dominated by Engelmann spruce and subalpine fir, with ponderosa pine and Douglas-fir in the montane zone below that. Stand-replacing fire can change forests in either of those zones to lodgepole pine or aspen. Grass and sagebrush occur under open pine forests that grade downslope into grasslands, wetlands, woodlands, or shrub-steppe.

Approximately 28 species of birds have a larger population in the Central Rocky Mountains than in any other physiographic area. This is the largest such number of any physiographic area in the lower 48 states, and it seems to represent the huge size of the area and the vast amount of quality bird habitat that still exists. The habitat characteristics, however, are not unique to just this area but represent the heart of the mountainous West and the center of distribution for many birds, particularly those of coniferous forests, which range more widely.

Fire in higher elevation coniferous forests of the central Rocky Mountains tends to be of high intensity and low frequency. After such stand-replacing fires, either aspen or lodgepole pine occupy a site until a century or more of succession results in redominance of the site-specific hemlock, spruce, or fir species. Many birds track this process—both black-backed and three-toed woodpeckers specialize in foraging on charred post-fire trees. Dusky grouse and Williamson’s sapsucker are among those species most abundant in aspen.

A huge percentage of the central Rockies in the United States are in public ownership, mostly managed by the Forest Service. Maintenance or restoration of healthy forest ecosystems on public and private industrial lands will be the most important factor in keeping the central Rocky Mountains a healthy ecosystem for so many forest birds.

The priority bird species and habitats of the central Rocky Mountains found on the refuge include the following:

Shrub-steppe

greater sage-grouse

Wetland

American white pelican
trumpeter swan
Barrow's goldeneye
Franklin's gull

Riparian

calliope hummingbird

Coniferous forest

Dusky grouse
black-backed woodpecker

Aspen

Williamson's sapsucker
red-naped sapsucker

NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

Written in 1986, the "North American Waterfowl Management Plan" envisioned a 15-year effort to achieve landscape conditions that could sustain waterfowl populations. Specific plan objectives are to

increase and restore duck populations to the average levels of the 1970s—62 million breeding ducks and a fall flight of 100 million birds.

By 1985 waterfowl populations had plummeted to record lows. Habitat that waterfowl depend on was disappearing at a rate of 60 acres per hour. Recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation to help in the recovery of a shared resource, the United States and Canadian governments developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. Mexico became a signatory to the plan in 1994.

The plan is innovative because of its international scope and its implementation at the regional level. Its success depends on the strength of partnerships called "joint ventures," involving federal, state, provincial, tribal, and local governments; businesses; conservation organizations; and individual citizens.

Joint ventures are regional self-directed partnerships that carry out science-based conservation through a wide array of community participation. Joint ventures develop implementation plans that focus on areas of concern identified in the plan. Red Rock Lakes National Wildlife Refuge lies within the Intermountain West Joint Venture.

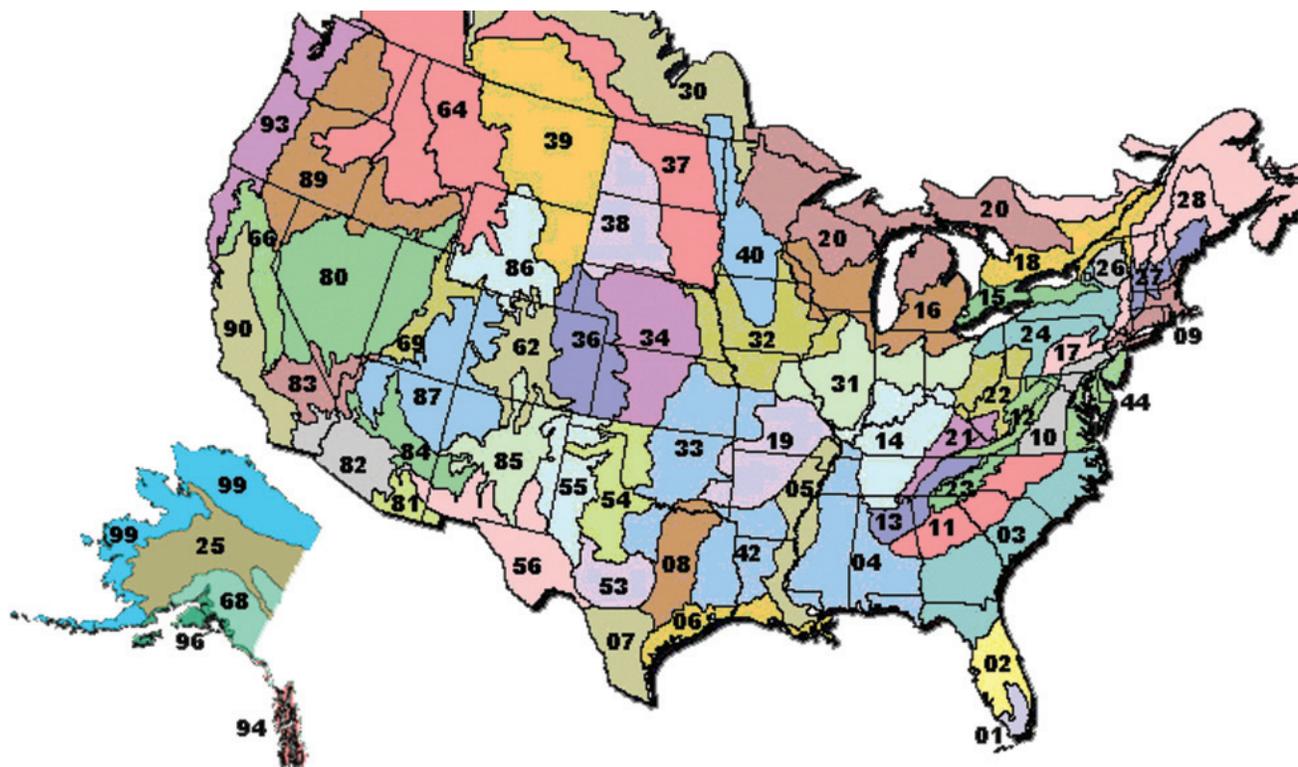


Figure 2. Physiographic area map of the United States. (Source: Partners in Flight)



Laura King/USFWS

Glossy ibis.

INTERMOUNTAIN WEST REGIONAL SHOREBIRD PLAN

The Intermountain West Regional Shorebird Plan was released in 2000. The plan notes that perhaps 1 million shorebirds breed in the Intermountain West region and that millions more migrate through the area each year. The plan recognizes that finding ample high-quality fresh water will be the greatest challenge faced by shorebirds in the Intermountain West region. The shorebird plan articulates seven goals, plus associated objectives and strategies related to habitat management, monitoring and assessment, research, outreach, and planning. The planning goal includes objectives to coordinate shorebird planning and projects with other migratory bird initiatives and specifically with the Intermountain West Joint Venture. The shorebird plan identifies 11 species of shorebirds that regularly breed in the region, as well as 23 additional species that are annual migrants. Red Rock Lakes National Wildlife Refuge is recognized in the plan as one of the 79 managed shorebird sites.

STATE COMPREHENSIVE FISH AND WILDLIFE CONSERVATION STRATEGY

Montana's Comprehensive Fish and Wildlife Conservation Strategy includes all vertebrate species known to exist in Montana, including both game and nongame species, as well as some invertebrate species, such as freshwater mussels and crayfish. From the early years of fish and wildlife management, the focus has been placed on game animals and their related habitats because most of the agency's funding has been provided by hunters and anglers.

Montana Fish, Wildlife and Parks does not intend to reduce its focus on important game species and

maintains that conserving particular types of habitats will benefit a variety of game and nongame species. With this new funding mechanism and conservation strategy in place, the MFWP believes that managing fish and wildlife more comprehensively is a natural progression in the effective conservation of Montana's remarkable fish and wildlife resources (MFWP 2005). Although game species are included in MFWP's conservation strategy, the priority is species and their related habitats "in greatest conservation need." This means focus areas, community types, and species that are significantly degraded or declining, federally listed, or where important distribution and occurrence information used to assess the status of individuals and groups of species are lacking. Because management of game species has been largely successful over the last 100 years, most species have populations that are stable or increasing, and fewer are identified as "in greatest conservation need" (49 nongame, 11 game). MFWP's conservation strategy uses five ecotypes to describe the broad areas of Montana's landscape that have similar characteristics. Red Rock Lakes National Wildlife Refuge is located in the intermountain/ foothill grassland ecotype, a mosaic of private and public land that extends from the glaciated Flathead River Valley to the north, south to the Centennial Valley, and east to the Little Belt Foothills. This western Montana ecotype harbors more wildlife communities than any other in Montana.

Within each of the ecotypes, Tier 1 (greatest need of conservation) geographic focus areas were identified for all terrestrial and aquatic areas of the state. Red Rock Lakes National Wildlife Refuge is located within the Southwest Montana Intermontane Basin and Valley focus area. The Tier 1 priority species for this area include the western toad, common loon, trumpeter swan, bald eagle, greater sage-grouse, long-billed curlew, flammulated owl, Townsend's big-

eared bat, pygmy rabbit, great basin pocket mouse, gray wolf, grizzly bear, and Canada lynx.

The "Montana Comprehensive Fish and Wildlife Conservation Strategy" (MFWP 2005) outlines five conservation concerns and strategies for the Southwest Montana Intermontane Basin and Valley Focus Area. The key concerns are:

- Habitat fragmentation and loss of connectivity as a result of human population growth/development
- Invasive or exotic plant species
- Altered fire system
- Range or forest management practices
- Streamside residential development

FISHERIES PROGRAM, VISION FOR THE FUTURE

The Fisheries Program of the U.S. Fish and Wildlife Service has played a vital role in conserving and managing fish and other aquatic resources since 1871. Today, the Fisheries Program is a critical partner with states, tribes, other governments, other Service programs, private organizations, public institutions, and interested citizens in a larger effort to conserve these important resources. The nation's fish and other aquatic resources are among the richest and most diverse in the world. These resources have helped support the nation's growth by providing enormous ecological, social, and economic benefits. Despite efforts by the Service and others to conserve aquatic resources, a growing number are declining at alarming rates. Loss of habitat and invasive species are the two most significant threats to the diversity of aquatic systems. One-third of the nation's freshwater fish species are threatened or endangered, 72% of freshwater mussels are imperiled, and the number of threatened and endangered species has tripled in the last 20 years. Clearly, there is increasing urgency to identify and carry out actions that will reverse these alarming trends before it is too late (USFWS 2002a).

In order to better conserve and manage fish and other aquatic resources in the face of increasing threats, the Service worked with partners to refocus its Fisheries Program and develop a vision outlined in the document, "Fisheries Program, Vision for the Future" (USFWS 2002b). The vision of the Service and its Fisheries Program is working with partners to restore and maintain fish and other aquatic resources at self-sustaining levels and to support federal mitigation programs for the benefit of the American public. To achieve this vision, the Fisheries Program will work with its partners to

- protect the health of aquatic habitats;
- restore fish and other aquatic resources;
- provide opportunities to enjoy the benefits of healthy aquatic resources.

One of the objectives in this document states:

Objective 2.2: Restore declining fish and other aquatic resource populations before they require listing under the Endangered Species Act. The Fisheries Program will increase its support and assistance in stopping and reversing declines of native fish and other aquatic resources, including restoring fish passage and rebuilding populations.

Red Rock Lakes National Wildlife Refuge has one of the only native lacustrine/adfluvial (live in the lake and breed in the river) populations of Arctic grayling in the lower 48 states, along with a native population of Westslope cutthroat trout. Both of these populations are imperiled due to a significant loss of habitat, disease, sedimentation, and impacts from other nonnative fish species. In order to achieve this objective of restoring declining fish populations, the refuge will need to take management actions to enhance these species and their habitats, while ensuring that the purposes of the refuge are being met.

1.5 ECOSYSTEM DESCRIPTION AND THREATS

Red Rock Lakes National Wildlife Refuge is located within the Upper Missouri, Yellowstone, and Upper Columbia rivers ecosystem. This ecosystem lies within the Rocky Mountain and Great Plains physiographic provinces and includes a large part of Montana, northern Wyoming, and a small section of western North Dakota (see figure 3). Some of the wildest and most unpopulated country in the lower 48 states occurs within this 185,000 square mile area, including such significant protected areas as Yellowstone and Glacier National Parks, the Charles M. Russell National Wildlife Refuge, the Bob Marshall Wilderness, and the Upper Missouri River. Wildlife in these areas is abundant and diverse.

Threatened and endangered species are actively protected and managed within various areas of this ecosystem; those species include grizzly bear, gray wolf, black-footed ferret, bull trout, pallid sturgeon, piping plover, least tern, and water howellia. Some of these species, such as the grizzly bear, are only listed in certain areas. Of these species, only the gray wolf has been observed visiting the refuge. Sitting astride the Continental Divide, the ecosystem gives rise to the Columbia and Missouri rivers. Three main habitat groups are predominant throughout the ecosystem: mountain habitat, river habitat, and prairie habitat. Mountain habitat groups contain a number of habitat types. Arid lands in the valleys have mixed wheatgrass and fescue grasslands along with considerable acreages of sagebrush stands. Surrounding mountains are of moderate elevation and are cloaked with conifer forests. The

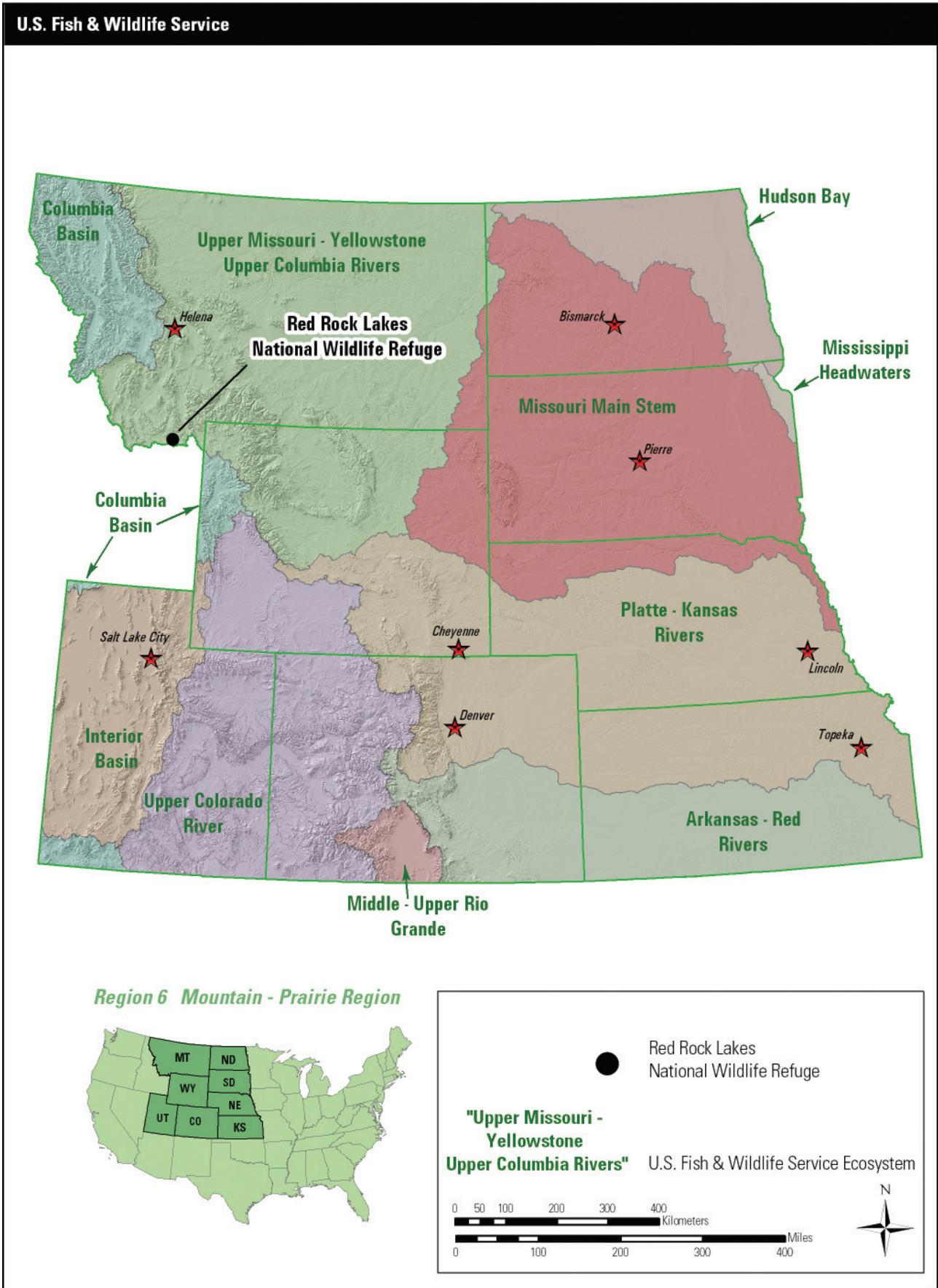


Figure 3. Upper Missouri, Yellowstone, and Upper Columbia rivers ecosystem map.

highest elevations have Douglas-fir or spruce-fir forests or alpine vegetation. Gray wolves, grizzly bears, wolverines, and different species of trout occur in these habitat groups. River habitat groups are comprised of a mix of native prairie grass and sagebrush-steppe, along with the riparian zone of larger rivers and their tributaries. Cottonwood- and shrub-dominated communities are also common. Many of the same animals that are present in the mountain habitat are present in the river habitat as well. Prairie habitat groups include woodlands and grass- or sage-dominated areas where adequate moisture for a forest canopy is not available. Higher elevation is home to subalpine communities and rock outcrops. Prairie grasslands or shrub-steppe dominates at lower elevations, with riparian areas along watercourses. Black-tailed prairie dogs, bald eagles, ferruginous hawks, and a diverse group of fish can be found in this habitat.

Key threats to the ecosystem include invasive plant species, conversion of native prairie to agriculture, and habitat fragmentation from development and population growth. Priorities for the Upper Missouri, Yellowstone, and Upper Columbia rivers ecosystem include ensuring natural and healthy ecological processes for the area, and making sure that economic development complements environmental protection.

1.6 PLANNING PROCESS

This draft CCP and EA for the refuge are intended to follow the Improvement Act and NEPA and the implementing regulations of both acts. The U.S. Fish and Wildlife Service issued its Refuge System planning policy in 2000. This policy established requirements and guidance for refuge and district plans—including CCPs and step-down management

plans—to ensure that planning efforts follow the Improvement Act. The planning policy identified several steps of the CCP and environmental analysis process (see figure 4).

Table 1 lists the specific steps in the planning process, to date, for the preparation of this draft CCP and EA. The Service began the pre-planning process in August 2005 with the establishment of a planning team. The planning team is comprised primarily of Service personnel from the refuge and representatives from Montana Fish, Wildlife and Parks. Some other contributors included other Service divisions, U.S. Geological Service, Montana State University, Bureau of Land Management, and The Nature Conservancy (see “Appendix B: List of Preparers, Consultation, and Coordination”). During pre-planning, the team developed a mailing list, internal issues, and a special qualities list. The planning team identified and reviewed current refuge programs, compiled and analyzed relevant data, and determined the purpose of the refuge.

A notice of intent (NOI) to prepare the draft CCP and EA was published in the Federal Register on June 12, 2006. Public scoping began with publication of the notice, and information was distributed through news releases, issuance of the first planning update, and holding two public scoping meetings in August 2006. Public scoping concluded on September 15, 2006, when the comment period closed.

Over the course of pre-planning and public scoping, the planning team collected available information about the resources of the refuge and the surrounding areas. This information is summarized in “Chapter 4. Affected Environment.”

COORDINATION WITH THE PUBLIC

A mailing list of more than 250 names, including private citizens; local, regional, and state government representatives and legislators; other federal agencies; and interested organizations was prepared during pre-planning (see “Appendix C: Public Involvement”).

The first planning update issue was sent in July 2006 to everyone on the mailing list. Information was provided on the history of the refuge and the CCP process, along with an invitation to a public scoping meeting.

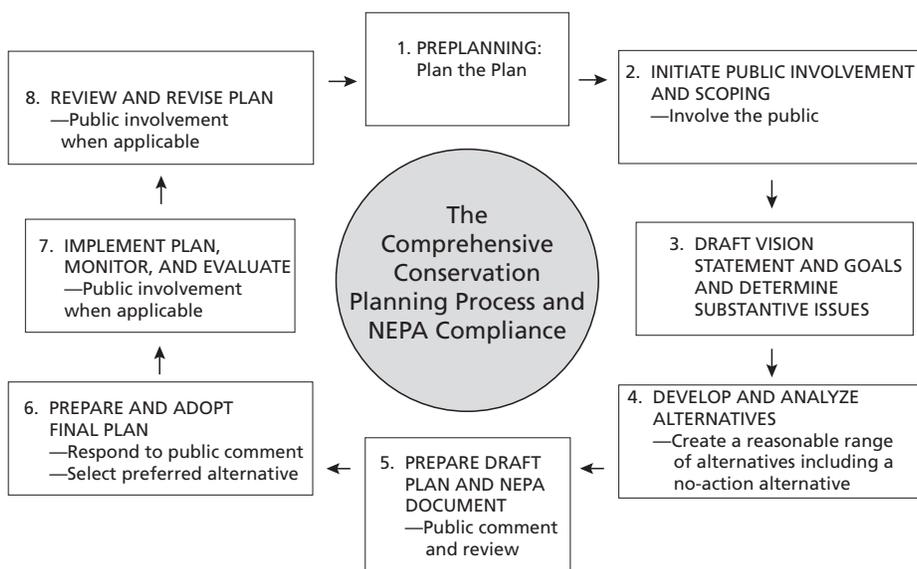


Figure 4. CCP and environmental analysis process steps.

Table 1. Planning process summary and timeline for Red Rock Lakes National Wildlife Refuge.

<i>Date</i>	<i>Event</i>	<i>Outcome</i>
August 16, 2005	Kickoff meeting	CCP overview developed, planning team list developed, purposes identified, initial issues and qualities list developed, development of mailing list initiated.
September 20, 2005	Visitor services review	Visitor services programs and facilities evaluated by education and visitor services staff.
February 21, 2006	Biological review	Gathered information from a team of researchers and biologists on the natural processes that formed and continue to influence Red Rock Lakes National Wildlife Refuge.
May 17, 2006	Biological review	Worked with contracted U.S. Geological Survey researcher to evaluate current biological programs and needs.
June 12, 2006	Notice of intent	Published notice of intent in <i>Federal Register</i> to initiate public scoping.
August 1, 2006	Planning update	First planning update sent to mailing list describing planning process and announcing upcoming public scoping meetings.
August 15, 2006	Public scoping meeting	Offered public opportunity to learn about the CCP and provide comments.
August 16, 2006	Public scoping meeting	Offered public opportunity to learn about the CCP and provide comments.
August 15, 2006	Vision and goals workshop	Developed draft vision and goals statements.
September 9, 2006	Public scoping meeting	Offered public opportunity to learn about the CCP and provide comments.
September 11, 2006	Biological review	Panel of biologists and researchers gathered to review and evaluate biological program and issues.
January 5, 2007	Focus group meeting (realty issues)	Staff and realty specialists discussed boundary and conservation easement program issues.
January 10, 2007	Alternatives netmeeting workshop	Developed alternatives table.
February 12, 2007	Objectives and strategies workshop	Finalized alternatives table, selected proposed action, and began writing objectives/strategies.
April 2007	Draft CCP	Began writing draft CCP/EA.
July 11-25, 2008	Internal review of draft CCP	Draft CCP is reviewed by Service, state, and other federal partners.

Each planning update included a comment form and postage-paid envelope to give the public an opportunity to provide written comments. Emails were also accepted at the refuge's email address: redrocks@fws.gov.

Three public scoping meetings were held within 2 hours of the refuge office. There were 33 attendees, primarily local citizens, including surrounding ranchers. Following a presentation about the refuge and an overview of the CCP and NEPA processes, attendees were encouraged to ask questions and offer comments. Verbal comments were recorded, and each attendee was given a comment form to submit additional thoughts or questions in writing.

All written comments were due September 15, 2006. A total of 55 additional written comments were received throughout the scoping process. All comments were shared with the planning team and considered throughout the planning process.

STATE COORDINATION

At the start of the planning process, the U.S. Fish and Wildlife Service's region 6 director sent a letter to MFWP, inviting them to participate in the planning process. Numerous state biologists have since been involved in the planning process and have also participated in biological reviews of the refuge's management program. At the start of the process, the offices of each of the three state members of Congress (then Senator Conrad Burns, Senator Max Baucus, and Representative Dennis Rehburg) were sent letters notifying them of the planning process and inviting them to comment on the plan. Four other Montana State senators and representatives and Governor Brian Schweitzer were sent similar letters. To date, the state has been supportive of the planning process.

TRIBAL COORDINATION

Early in the planning process, the U.S. Fish and Wildlife Service's region 6 director sent a letter to tribes identified as possibly having some interest in participating in the planning efforts at Red Rock Lakes National Wildlife Refuge. Those contacted were the Northern Cheyenne, Crow, Eastern Shoshone, and Arapaho tribal councils. The tribal councils did not submit responses to the region 6 letter; nevertheless, the councils were provided planning updates and opportunities to comment.

RESULTS OF SCOPING

Comments collected from scoping meetings and correspondence were used in the development of a final list of issues to be addressed in this draft CCP and EA.

The U.S. Fish and Wildlife Service determined which alternatives could best address these issues.

The planning process ensures that issues with the greatest effect on the refuge are resolved or given priority over the life of the final CCP. Identified issues, along with a discussion of effects on resources, are summarized in chapter 2.

In addition, the Service considered suggested changes to current refuge management presented by the public and other groups.

SELECTING AN ALTERNATIVE

The Service's region 6 director will consider the environmental effects of each alternative and select an alternative to implement—this alternative will then become the Red Rock Lakes National Wildlife Refuge CCP. The regional director's decision will be disclosed in a finding of no significant impact (FONSI) included in the final CCP. Implementation of the CCP will begin following the regional director's signature and publication of the final CCP. The final CCP will provide long-term guidance for management decisions; support achievement of the goals, objectives, and strategies needed to accomplish refuge purposes; and identify the Service's best estimate of future needs. This draft CCP details program planning levels that are sometimes substantially above current budget allocations and, thus, are primarily for Service strategic planning purposes. This CCP does not constitute a commitment for staffing increases, operation and maintenance increases, or funding for future land acquisitions.

2 The Refuge



Mike Parker/USFWS

Grass and sage habitats looking east into the Centennial Mountains.

This chapter explains the purposes, establishment, management history, and special values of Red Rock Lakes National Wildlife Refuge, as well as the proposed vision and goals and a discussion of the planning issues.

2.1 ESTABLISHMENT, ACQUISITION, AND MANAGEMENT HISTORY

PURPOSES

Every refuge has a purpose for which it was established. This purpose is the foundation upon which to build all refuge programs, from biology and visitor services, to maintenance and facilities. No action undertaken by the Service or public may conflict with this refuge purpose. The refuge purposes are found in the legislative acts or administrative orders that provide the authorities to either transfer or acquire a piece of land for a refuge. Over time, an individual refuge may contain lands that have been acquired under a variety of transfer and acquisition authorities, giving a refuge more than one purpose. The goals, objectives, and strategies identified in this draft CCP are intended to support individual purposes for which the refuge was established.

The legislative purposes for Red Rock Lakes National Wildlife Refuge include the following:

1. “As a refuge and breeding ground for wild birds and animals.” (Executive Order 7023, dated April 22, 1935)
2. “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (Migratory Bird Conservation Act 1929)
3. “Suitable for (a) incidental fish and wildlife-oriented recreational development, (b) the protection of natural resources, (c) the conservation of endangered species or threatened . . . species . . . The Secretary . . . may accept and use . . . real . . . property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors.” (Refuge Recreation Act 1962)
4. “The conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions.” (Emergency Wetlands Resources Act 1986)
5. “For the development, advancement, management, conservation, and protection of fish and wildlife resources . . . 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.” (Fish and Wildlife Act 1956)

ESTABLISHMENT AND ACQUISITION HISTORY

It is impossible to speak of the Red Rock Lakes National Wildlife Refuge history without first addressing some of the history of the Centennial Valley within which the refuge lies.

The Centennial Valley was well known by Native Americans long before the homestead era, as evidenced from the journal writing of explorer Osborne Russell. Upon entering the Centennial Valley in 1835, Russell wrote that the valley from which “flows the head stream of the Missouri . . . was full of Buffaloe when we entered it and large numbers of which were killed by hunters . . . We repeatedly saw signs of Blackfeet about us to waylay the Trappers . . . We stopped at this place to feast on fat Buffaloe.” (Russell and Haines 1965)

In 1876, Mrs. William C. Orr, one of the partners in the P&O Ranch, named this 60-mile long, east-west running valley the Centennial Valley to commemorate the nation’s Centennial. Along with other ranches, the P&O Ranch summered livestock in the valley. In the late 1890s, the Centennial Valley was homesteaded. In addition, the valley, and in particular the area that was to become the refuge, was used by hunting clubs, with people traveling long distances to hunt waterfowl in the area (Beaverhead County History Book Association 1990).

The Centennial Valley provided good seasonal trapping and hunting grounds and was a favored route between the headwaters of the upper Bighole River and the Yellowstone area. The long winters and great distances to market made subsistence difficult at best, with few homesteaders remaining after the Great Depression. Many sold their land back to the Federal Resettlement Administration during the 1930s.

Nearly 100 years after Russell Osborne had entered the Centennial Valley, the Bureau of Biological Survey (a precursor to the U.S. Fish and Wildlife Service) conducted an evaluation and suggested that the area should become a migratory bird refuge. In 1935 Mr. Basyl Kercheval wrote a report and indicated that:

“The economic situation is grave. A large part of the land is mortgaged. Taxes are delinquent in many cases. Livestock in very [sic] instance is mortgaged to various agencies for feed. It is conceded by every one that the Red Rock Lakes area has been the foremost breeding, nesting and resting place for migratory waterfowl with the state of Montana.” (Project of the Bureau of Biological Survey 1935)

On April 22, 1935, President Franklin D. Roosevelt established the Red Rock Lakes Migratory Waterfowl Refuge (later named “Red Rock Lakes National Wildlife Refuge” on July 19, 1961) under Executive Order 7023, “as a refuge and breeding ground for wild birds and animals.” On September 4, 1935, President Roosevelt enlarged the refuge under Executive Order 7172, “provided, that any private lands within the areas described shall become a part of the refuge upon the acquisition of title or lease thereto by the United States.”

During the 70 years since the executive boundary was established, the Service has continued to acquire lands from willing landowners or receive land donations. The Service currently owns 47,756 acres within this approved boundary (see figure 5). Table 2 summarizes the acquisition history and the means of acquisition between 1935 and 2007.

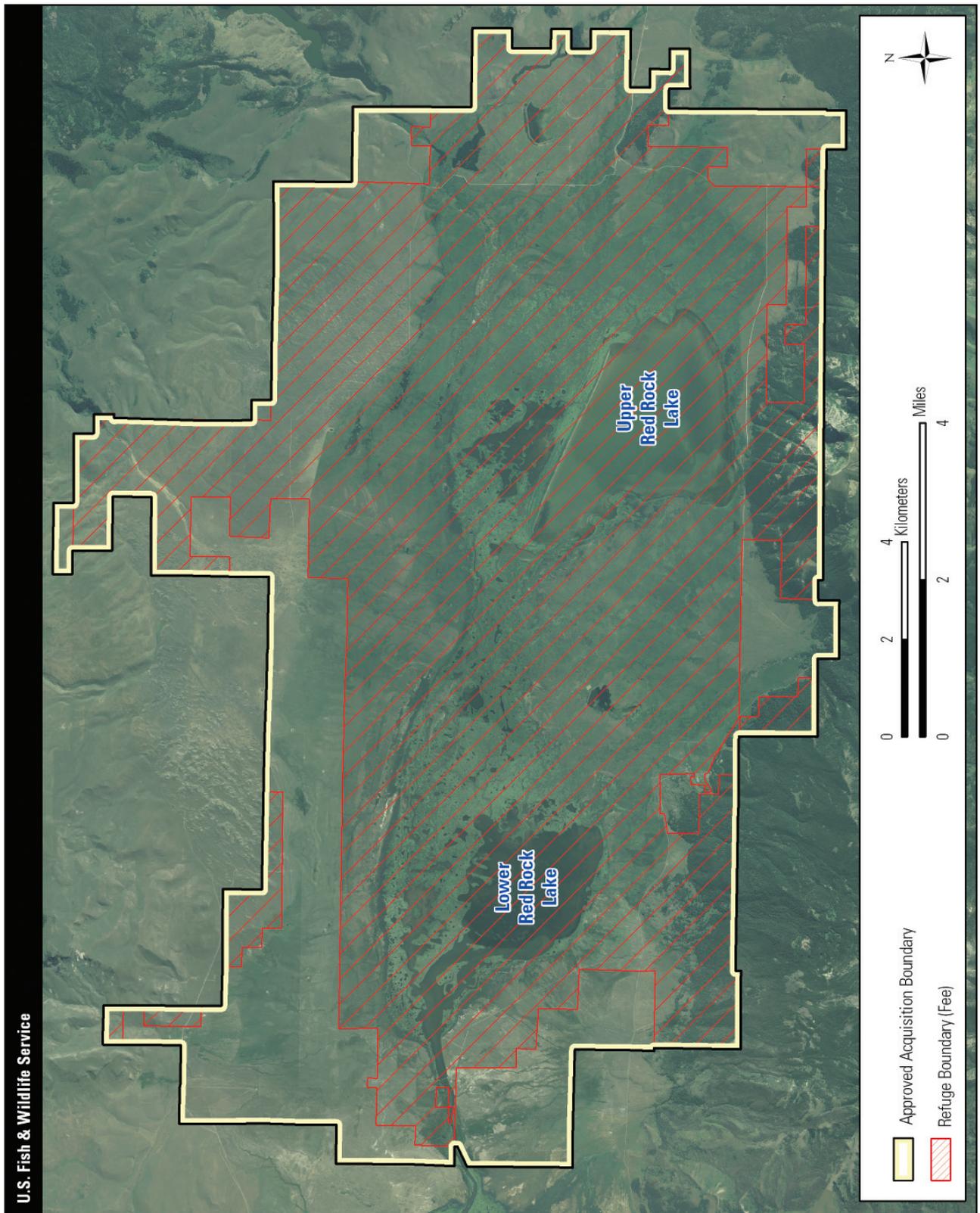


Figure 5. Red Rock Lakes National Wildlife Refuge approved acquisition boundary and acquired lands—refuge base map.

Table 2. Land acquisition history of Red Rock Lakes National Wildlife Refuge, 1935–2007.

<i>Date Acquired</i>	<i>Acres Acquired</i>	<i>Means of Acquisition</i>
4/22/35	9,218	Reserved from Public Domain
4/23/35	594	Reserved from Public Domain
12/2/35	160	Acquired by Resettlement Administration
12/5/35	929	Acquired by Resettlement Administration
12/6/35	212	Acquired by Resettlement Administration
12/7/35	1,912	Acquired by Resettlement Administration
12/12/35	3,209	Acquired by Resettlement Administration
12/17/35	160	Acquired by Resettlement Administration
12/18/35	880	Acquired by Resettlement Administration
12/21/35	1,030	Acquired by Resettlement Administration
12/31/35	480	Acquired by Resettlement Administration
1/14/36	360	Acquired by Resettlement Administration
1/20/36	352	Acquired by Resettlement Administration
1/18/36	254	Acquired by Resettlement Administration
3/3/36	1,033	Acquired by Resettlement Administration
7/30/36	60	Acquired by Resettlement Administration
10/10/36	680	Acquired by Resettlement Administration
4/2/37	320	Acquired by Resettlement Administration
6/10/37	202	Acquired by Resettlement Administration
6/10/37	1,515	Acquired by Resettlement Administration
7/7/37	519	Acquired by Resettlement Administration
8/11/37	231	Migratory Bird Conservation Fund
8/19/37	517	Migratory Bird Conservation Fund

Table 2. Land acquisition history of Red Rock Lakes National Wildlife Refuge, 1935–2007.

<i>Date Acquired</i>	<i>Acres Acquired</i>	<i>Means of Acquisition</i>
8/19/37	254	Migratory Bird Conservation Fund
10/2/37	12	Acquired by Resettlement Administration
11/17/37	1,292	Acquired by Resettlement Administration
5/16/38	3	Acquired by Resettlement Administration
7/18/39	390	Acquired by Resettlement Administration
7/18/39	307	Acquired by Resettlement Administration
7/18/39	3,447	Acquired by Resettlement Administration
7/18/39	648	Acquired by Resettlement Administration
7/18/39	296	Acquired by Resettlement Administration
7/18/39	499	Acquired by Resettlement Administration
7/18/39	820	Acquired by Resettlement Administration
7/18/39	195	Acquired by Resettlement Administration
7/18/39	8	Acquired by Resettlement Administration
7/18/39	398	Acquired by Resettlement Administration
7/19/39	4	Acquired by Resettlement Administration
3/6/40	42	Acquired by Resettlement Administration
2/25/54	1	Migratory Bird Conservation Fund
12/31/56	1	Migratory Bird Conservation Fund
9/30/76	6,855	Other
2/14/79	1	Other
12/15/86	1,673	Land and Water Conservation Fund
2/2/88	431	Land and Water Conservation Fund
2/28/88	120	Land and Water Conservation Fund

Table 2. Land acquisition history of Red Rock Lakes National Wildlife Refuge, 1935–2007.

<i>Date Acquired</i>	<i>Acres Acquired</i>	<i>Means of Acquisition</i>
2/1/90	320	Land and Water Conservation Fund
4/4/90	280	Land and Water Conservation Fund
4/9/90	352	Land and Water Conservation Fund
2/3/91	320	Land and Water Conservation Fund
5/20/91	320	Gifted to the U.S. Fish and Wildlife Service
4/14/94	960	Land and Water Conservation Fund
4/30/97	480	Land and Water Conservation Fund
10/10/99	20	Migratory Bird Conservation Fund
10/11/99	20	Gifted to the U.S. Fish and Wildlife Service
12/15/07	2,159	Migratory Bird Conservation Fund and Federal Land Transaction Facilitation Fund
Total	47,756	

CENTENNIAL VALLEY CONSERVATION EASEMENT PROGRAM

The refuge expanded its conservation efforts in the Centennial Valley in March 2001 through the initiation of a Centennial Valley Conservation Easement Program. This work is outlined in an environmental assessment and land protection plan (USFWS 2001). The purposes of the Centennial Valley Conservation Easement Program are to

- protect native wet meadows, wetlands, uplands, and mountain foothills from future conversions to second and recreational home uses;
- protect habitat integrity by preventing fragmentation;
- preserve key wilderness values and views throughout and adjacent to the Red Rock Lakes National Wildlife Refuge;
- promote landscape integrity in order to maintain, sustain, and enhance the historic plant, animal, and insect biodiversity of native prairie habitats and associated ranching heritage;
- minimize invasive plant infestations from soil disturbance, road building, and increased traffic resulting from rural housing development;

- minimize, to a lesser extent, future demands on local government resources necessitated by providing services associated with increasing rural development.

Today, the refuge manages nine conservation easements for a total of 20,219 acres (see figure 6). Table 3 summarizes the acquisition history of this program since 2001.

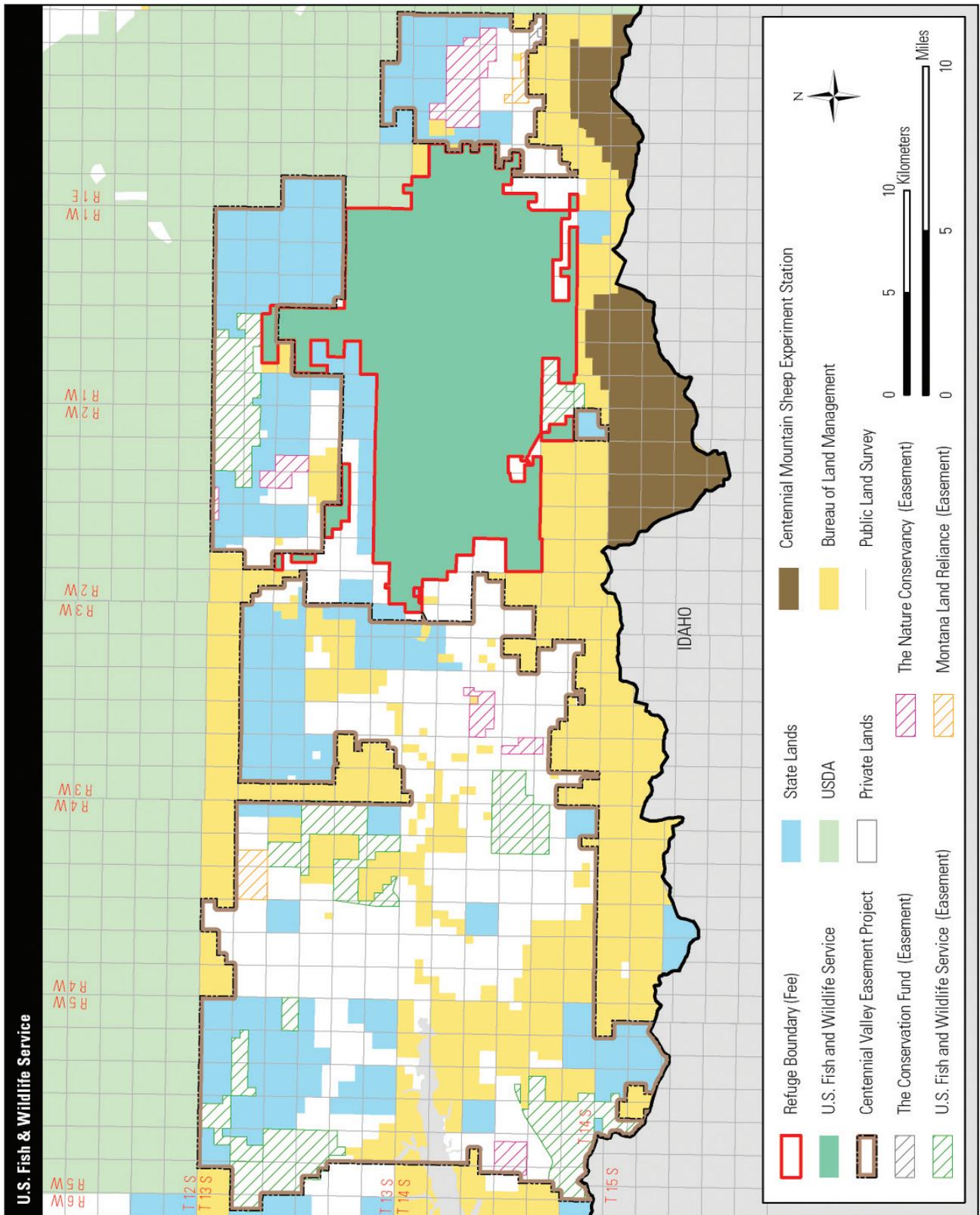


Figure 6. Conservation easements within the Centennial Valley.

Table 3. Conservation easement acquisition history within the Centennial Valley, 2001–2006.

<i>Year Acquired</i>	<i>Means of Acquisition</i>	<i>Total Acres</i>
2001	Land and Water Conservation Fund	2,376
2002	Land and Water Conservation Fund	3,771
2003	Land and Water Conservation Fund	188
2003	Land and Water Conservation Fund	1,361
2003	Land and Water Conservation Fund	640
2004	Land and Water Conservation Fund	990
2004	Land and Water Conservation Fund	3,404
2005	Land and Water Conservation Fund	4,137
2006	Gifted	3,353
Total		20,219

MANAGEMENT HISTORY

Red Rock Lakes NWR is one of the most remote refuges in the lower 48. It is located in the Centennial Valley in southwestern Montana in Beaverhead County, 47 miles west of West Yellowstone and 38 miles east of the town of Lima. This 47,756-acre refuge sits at 6,670 feet above sea level and lies east of the Continental Divide near the uppermost reach of the Missouri drainage.

Historically, management focused on protecting and enhancing the trumpeter swan population at the refuge. In the 1930s the refuge was their last known breeding location. Management actions included hatching eggs, raising cygnets to fledging age, and feeding adult swans during the winter months. Trumpeter swans were studied intensively at the refuge, and much of what is known about their breeding biology was published in *The Trumpeter Swan*, written by former refuge manager Winston E. Banko (Banko 1960). Today, swans can still be seen breeding in the valley, but the intensive management of swan populations (through feeding and raising of young) has been altered in favor of allowing the swans to thrive under mostly natural conditions.

The refuge has one of the most naturally diverse areas in the Refuge System. The refuge boasts the largest wetland complex within the Greater Yellowstone ecosystem, as well as expansive tracts of grassland and sagebrush-steppe habitats and a small amount of midelevation forested areas. These habitats support over 230 species of birds, including peregrine falcons, bald eagles, short-eared owls, sandhill cranes, sage grouse, and numerous species of waterfowl and waterbirds (see “Appendix D: Species List”). Common mammals include Shiras moose, elk, mule and white-tail deer, badger, coyote, and red

fox. In recent years, wolves and grizzly bears have been documented using the refuge. There is also a remnant population of native lacustrine/adfluvial Arctic grayling that occurs on the refuge.

A full-time staff of five employees and various summer temporaries manage and study the refuge habitats and maintain visitor facilities. Domestic livestock grazing and prescribed fire are the primary management tools used to maintain and enhance upland habitats. Currently, four grazing cooperators are using refuge lands. Water level manipulation occurs in some areas of the refuge to improve wetland habitats.

Approximately 12,000 people visit the refuge annually. Two refuge roads and three county roads that pass through the refuge account for the majority of visitor use. Visitors also use the trails at Sparrow Pond and Odell Creek to access the refuge. The refuge is open to limited fishing, with the majority of fishing occurring on Red Rock Creek where anglers can catch Arctic grayling, rainbow trout, Yellowstone cutthroat trout, and brook trout. In addition, the refuge is open to limited hunting of ducks, geese, coots, elk, pronghorn, moose, mule deer, and white-tail deer.

2.2 VISION AND GOALS

VISION STATEMENT

A vision is a concept, including desired conditions for the future, that describes the essence of what the U.S. Fish and Wildlife Service is trying to accomplish at the refuge. The vision for the refuge is a future-oriented statement designed to be achieved through refuge management throughout the life of this

CCP and beyond. The following is the draft vision statement developed by the planning team for Red Rock Lakes National Wildlife Refuge.

The majestic Centennial Valley of southwest Montana is an expansive mosaic of mountain wetlands, grasslands, shrub lands, and forests framed by dramatic mountain peaks. Through partnerships and conservation programs, the valley has maintained its biological integrity and is a working landscape that remains largely undeveloped.

To this end, the Red Rock Lakes National Wildlife Refuge is a conservation leader in the valley working to maintain and restore natural processes to create and sustain native habitat for migratory and resident fish and wildlife. Visitors have a sense of solitude and wildness that lifts their spirits and stirs their souls. This first-hand experience with the refuge encourages people to participate as stewards, not only of the refuge, but also of the natural resources in their own communities

GOALS

The U.S. Fish and Wildlife Service developed a set of goals for the refuge based on the National Wildlife Refuge System Improvement Act, the refuge's purposes, and information developed during project planning. The goals direct efforts toward achieving the vision and purposes of the refuge and outline approaches for managing refuge resources. The Service established six goals for the refuge.

Lake, Pond, and Marsh Habitat Goal—Provide habitat for breeding and migrating birds, native fishes, and resident wildlife that maintains the biological diversity and integrity of montane wetland systems.

Riparian Habitat Goal—Maintain the processes necessary to sustain the biological diversity and integrity of native riparian vegetation for breeding birds, native fishes, and wintering ungulates.

Wet Meadow, Grassland, and Shrub-steppe Habitat Goal—Provide structurally complex native meadow, grassland and shrub-steppe habitats within a watershed context, for sagebrush-dependent species, upland-nesting migratory birds, rare plant species, and other resident wildlife.

Aspen Forest, Mixed Coniferous Forest, and Woodland Habitat Goal—Create and maintain aspen stands of various age classes within a mosaic of coniferous forest and shrub land for cavity-nesting birds and other migratory and resident wildlife.

Visitor Services and Cultural Resources Goal—Provide quality wildlife-dependent recreation,

interpretation, and outreach opportunities that nurture an appreciation and understanding of the unique natural and cultural resources of the Centennial Valley for visitors and local community members of all abilities, while maintaining the primitive and remote experience unique to the refuge.

Refuge Operations Goal—Prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, and volunteer programs.

SPECIAL VALUES OF THE REFUGE

Early in the planning process, the planning team and public identified the outstanding qualities of Red Rock Lakes National Wildlife Refuge. Refuge qualities are the characteristics and features of the refuge that make it special, valuable for wildlife, and worthy of refuge status. It was essential to identify these special values and ensure that they are conserved, protected, and enhanced through the planning process. Refuge qualities can be unique biological values, as well as something as simple as, “a quiet place to see a variety of birds and enjoy nature.” There are many attributes that make Red Rock Lakes National Wildlife Refuge unique and valued because it

- is located in the middle of an important wildlife corridor linking the Greater Yellowstone and Bitterroot ecosystems (Merrill and Mattson 2003, Servheen and Sandstrom 1993, Walker and Craighead 1999);
- protects over 62,000 acres of the Centennial Valley in southwest Montana—the least developed valley of its size in the state;
- encompasses the largest wetland complex in the Greater Yellowstone ecosystem;
- contains 3,300 acres of sandhills habitat—one of only two places this habitat can be found in Montana;
- represents one of the most diverse refuges in the contiguous United States, with 45 identified vegetation associations according to the National Vegetation Classification System (Anderson et al. 1998);
- played an integral role in the continental restoration of trumpeter swans;
- continues to provide critical nesting habitat for a tri-state flock of trumpeter swans;
- supports the last native lacustrine/adfluvial population of Arctic grayling in the contiguous United States;
- provides habitat for one of the highest-density wintering moose populations in Montana;
- is in an area that has been a gathering spot for people and wildlife throughout time;
- occurs in an area with rich paleohistory, early exploration, and settlement;

- has historic buildings originally constructed by the Works Progress Administration;
- has potential for a broad range of partnerships that are integral to every aspect of refuge management (that is, hunting, fishing, research, and research);
- provides visitors with a multitude of wildlife-dependent recreational opportunities in a remote, peaceful, beautiful setting;
- encompasses a 32,500-acre designated wilderness area

PLANNING ISSUES

Several key issues were identified following the analysis of comments collected from refuge staff and the public and a review of the requirements of the Improvement Act and NEPA. Substantive comments (those that could be addressed within the authority and management capabilities of the U.S. Fish and Wildlife Service) were considered during formulation of the alternatives for future management. Challenges abound within the National Wildlife Refuge System, and these issues will have to be reviewed, changed, and added to as management actions are put into place and as environmental and social issues interact with refuge purposes and plans.

The key issues identified during this planning process are summarized below.

Habitat And Wildlife Management

Habitat Loss and Fragmentation Caused by Residential Development

Habitat loss is the greatest threat faced by North American wildlife. Maintaining the integrity of existing habitats and providing linkage zones between existing habitats is a key wildlife conservation strategy. Centrally situated between the Greater Yellowstone and Bitterroot ecosystems, two of the most intact, biologically diverse ecosystems in the contiguous United States, the refuge is ideally located to be a conservation leader to protect the Centennial Valley from fragmentation and residential development.

Successful conservation leadership is attained through the development of partnerships. Partnering with conservation partners, local residents, and the Service's Partners for Fish and Wildlife Program, the refuge works to preserve the integrity of the Centennial Valley through conservation easements. These easements prevent further residential or commercial development while fostering the relationships necessary to pursue habitat improvements on adjacent private lands. The refuge also partners with state and other federal agencies and nongovernmental organizations to address local and regional wildlife management challenges. Recent efforts to improve the current status of Arctic grayling in the Red Rock Creek watershed have

led to partnerships with the MFWP, The Nature Conservancy, and U.S. Fish and Wildlife Service Management Assistance Office.

Grazing

Demonstrating good stewardship of refuge lands is another example of how the refuge can be a conservation leader. Managing refuge resources based on the best available knowledge should be the starting point for management actions. This does not ensure success or lack of controversy due to the uncertainties regarding relationships among wildlife, habitat, and management activities. For example, the current grazing program on the refuge draws considerable criticism. It is known that Centennial Valley grasslands evolved with grazing by large native ungulates. The refuge currently provides that disturbance via cattle grazing, a controversial practice on public lands in the American West. While several public comments were supportive of a scientifically-based grazing system designed to benefit wildlife, there was also support for the termination of the grazing program and repatriation of bison on the refuge.

Currently, the refuge has an Upland Management Plan that was written in 1994. The selected alternative was Adaptive Management by Prescription. Although details of how this management alternative would be implemented are described, this plan was never fully actualized. The grazing program is currently run on what is basically a 3-year rest or rotation schedule with very little monitoring of grazing impacts on habitats. In addition, fences have been removed or allowed to deteriorate, resulting in large units that preclude the prescribed "short duration—high intensity" grazing. Changes in the grazing program must take place in order for this to be an effective management tool for habitat manipulation and wildlife benefit.



Sage thrasher.

Red Rock Lakes Management

Wetlands in the Intermountain West provide important habitat for migratory birds and other wetland-dependent wildlife. Similar to wetland habitats in other regions of North America, agriculture and development have resulted in the loss of approximately 57 % of Intermountain West wetlands to drainage. The significance of this loss is magnified due to the region's largely arid landscape. However, management of these habitats is hindered by the relative scarcity of information on the ecology of montane wetlands, making it difficult to predict the response of these habitats to management actions intended to improve habitat quality for migratory birds. Greater understanding of montane wetland ecology would therefore improve the ability of managers to make sound science-based decisions regarding management of these important flyway resources.

“Red Rock Lakes” management is a broad priority encompassing Lower and Upper Red Rock lakes, Swan Lake, the River Marsh, and associated wetland areas. Species (such as swans, ibis, waterfowl, gulls, cormorants, and fishes) using this system of wetlands are inherently included in this priority. Current refuge objectives for wetland habitat management are to mimic disturbance processes believed necessary for maintaining ecological function of montane wetlands. The primary process of management interest is the dynamic wet/dry hydrological cycle, a key driver of wetland productivity and vegetation community structure.

Lower Red Rock Lake and the lower River Marsh have been influenced by a series of water control structures (WCSs) at the western boundary of the refuge since 1930. There are concerns that the WCSs may be negatively affecting the hydrological system of Lower Red Rock Lake and the River Marsh. Increasing temperatures and decreasing precipitation have also raised concerns regarding reduced water resources in the future and the impact on refuge wetland habitats. There is a question as to whether this structure would need to be used as a management tool to capture depleting water resources or if it should be removed.

Arctic Grayling

The restoration of wildlife populations and habitats has been a common theme of the planning process and public comments, and Arctic grayling are a particularly poignant example. The refuge population of Arctic grayling represents the only naturally-occurring lacustrine/adfluvial population in the lower 48 states. Currently, spawning numbers are very low. In addition, Arctic grayling are not spawning in most of their traditional spawning creeks (such as Tom Creek). Spawning only occurs in Red Rock and Odell creeks, putting this population at additional risk.

Shiras Moose

Shiras moose, a subspecies of moose found in Montana, Idaho, and Wyoming, commonly occur on the refuge. The state permits hunting of moose in Montana through a drawing for limited permits, some of which are issued in the unit encompassing the refuge. Numerous comments were received from the public addressing the refuge's moose management and hunting programs. Many believed that moose populations have declined, stating that it is more difficult to view a moose on the refuge than in the past. MFWP winter survey data indicate moose numbers are relatively high and increasing on the refuge. Conversely, recent assessment of key moose habitat on the refuge indicates that there has been a reduction in willow browse intensity. This change in browse activity could be due to an undetected decline of moose or a redistribution of moose during nonwinter periods. Like many ungulates, moose will move into areas that have been recently disturbed by fire. A wildland fire in the Centennial Mountains in 2003 burned over 14,000 acres, stimulating new aspen growth, a favorite food source of moose. If moose are capitalizing on this new growth during the summer, this would lead to their dispersion, a reduction in observation opportunities for visitors, and the perception of an overall decline in moose abundance.

Refuge moose management is coordinated with the state to manipulate harvest for population regulation. Although the refuge comprises only a small proportion of the hunting district, a high percentage (approximately 90%) of moose harvested in the district is taken on refuge lands. Currently, three demes (resident, summer migrants, and winter migrants) are thought to comprise the refuge moose population. A deme is a local population which interbreed and share a distinct gene pool. Basic information regarding population status and trends, population structure, and landscape-level habitat use patterns is needed to assess the possible impacts of current management on both consumptive and nonconsumptive uses on the refuge.

Willow and Aspen Habitats

Herbivory frequently produces a landscape that would not have been created by the physical environment alone. Browsing by large mammalian herbivores can reduce the survival and competitive reproductive capacity of trees and shrubs, resulting in alterations to the structure and dynamics of plant communities. For example, Berger et al. (2001) found willows to be taller and have greater volume where moose densities were limited by predation (in the form of hunting). Similarly, elk overabundance has been linked to reduced regeneration of aspen in the Rocky Mountains (Romme et al. 1995).

Winter surveys conducted by MFWP between 1966 and 2006 show that winter moose abundance in and around the refuge has increased by more

than 2% annually throughout the period surveyed. Elk populations in southwestern Montana have experienced similar population growth. High browse intensity on aspen and willow has been documented in portions of the Centennial Valley, including refuge riparian habitats. This has led to concerns regarding possible impacts on the breeding migratory land bird community. Many western land bird populations are sensitive to diminution of aspen and willow due to their reliance on riparian habitats, and many riparian bird species are experiencing regional declines. Both bird species composition and community diversity in riparian habitats are broadly associated with vertical structural diversity of woody vegetation. The reduction of structural diversity due to high levels of browsing may alter the attractiveness of riparian habitats to some birds.

There is general agreement among managers that browse intensity should be reduced in these habitats. However, there is uncertainty regarding the appropriate means to reach the desired habitat condition for breeding migratory land birds.

Centennial Sandhills

The Centennial Sandhills are one of only two significant sandhill areas in Montana. It is the highest sandhill system in the northern Rocky Mountains. Five plant species found in the sandhills are listed as rare in Montana. Two of these plant species (Idaho painted milkvetch and Idaho evening-primrose) only occur in the Centennial Sandhills and the sandhills located in southeast Idaho. The continued existence of these rare plant species depends on the existence of early successional habitat, which is currently lacking in the Centennial Sandhills on the refuge. Fire and grazing are two tools that may be used to improve conditions for the rare plants. The sandhills also contain rare fauna. Four state mammal species of special concern have been documented: Preble's shrew, black-tailed jackrabbit, Great Basin pocket mouse, and pygmy rabbit. Four Montana Partners in Flight priority II bird species (Casey 2000) also use the sandhill habitat: long-billed curlew, sage thrasher, Brewer's sparrow, and grasshopper sparrow.

While much of the refuge's history has been focused on reducing the negative impacts of human activities on habitats (through reduced grazing and water diversion, elimination of haying), the management of the Centennial Sandhills may take a disparate path. The long-term reduction of disturbances (such as fire and grazing) has resulted in loss of early seral stage habitats, such as blowouts. Early seral sandhill habitat supports a variety of rare flora and fauna. This is evident by the species of plants and wildlife using the heavily-disturbed sandhills found on neighboring lands managed by the Bureau of Land Management. The refuge needs to determine the frequency and intensity of disturbance to achieve a desired mosaic while minimizing impacts on species

such as sage grouse and Brewer's sparrow, both dependent on late-seral sagebrush growth.

Mixed Conifer Management

Woodlands cover approximately 3,745 acres of the refuge. Little or no management has occurred in this habitat. Condition assessments and potential management actions need to be investigated.

Stream Restoration

There are several creeks/streams on the refuge that have been rerouted from their original streambeds. In addition, there are several streams where the riparian habitats have been degraded due to overgrazing, but have not been restored. Restoring these streams would be beneficial to wildlife using the refuge.

Invasive Plant Species

Integrated pest management is an important focus to minimize infestations due to the relatively natural state of the refuge. Although the refuge does have most native plant species represented, some of the areas that have historically been heavily grazed have converted to nonnative grasses, such as Kentucky bluegrass. Other invasive grass species were planted for increased forage, such as smooth brome. While these grasses provide some structure for grassland nesting birds, native grasses are much more desirable for their varied structure and rich nutrients in the seeds they produce. The refuge will be challenged to eradicate these hearty, widespread invasive grasses and restore treated sites.

Wilderness

Over 68% of the refuge (32,350 acres) is congressionally-designated wilderness. This designation recognizes the remote setting and relatively untrammeled nature of the refuge, while protecting these very attributes for future generations. This designation does add complexity to the management of the refuge. Habitat management may seem "inefficient" at times due to wilderness restrictions that prohibit the use of mechanized tools commonly used elsewhere. However, the Wilderness Act was designed to protect the attributes of, and not the efficiencies of managing wilderness areas.

Prescribed Fire Program

There is limited use of prescribed fire on the refuge. Only two burns have been conducted since 2004. A fire management plan (FMP) for the refuge was approved in 2002, but very little work has been done to carry out prescribed fire on the refuge for habitat management.

Visitor Services Program

During the planning process it was clear that many people greatly appreciate the refuge for its wildlife, remoteness, and solitude. Designated both as a National Wilderness Area and National Natural Landmark, the refuge provides quiet, uncrowded wildlife-dependent recreation in a breath-taking setting. Many of the comments supported preserving the pristine character of the refuge.

Overall, many participants and visitors identified a need for greater public understanding and appreciation of the refuge and the recreational opportunities it offers. Many comments included poor directional signage, “unfriendly” boundary signage, inadequate brochures, outdated interpretive panels, confusing regulations, and minimal visitor center information. A number of other recreational issues became apparent during the planning process and deserve further discussion. Specific recreational concerns and issues are summarized as follows.

Hunting

Hunting for waterfowl and big game, including elk, mule and white-tailed deer, pronghorn, and moose, is a popular activity for visitors. Certain portions of the refuge are closed to big game hunting. Waterfowl hunting is limited to Lower Red Rock Lake. The remaining waterbodies are designated as sanctuaries for migratory waterbirds. All hunting seasons (except for moose) follow state regulations and limits. There is no commercial guiding or trapping permitted. Hunting on the refuge is important not only as a wildlife-dependent recreational activity but as a management tool to control large game that become concentrated in protected areas, damaging habitat.

The public expressed many different points of view on whether to permit hunting on the refuge. The greatest concern was over moose hunting. Many commentators believed that the moose population is being impacted by the 11 permits (on average) issued by the state each year for the hunting district in which the refuge is located. Some commentators requested that all moose hunting be stopped.

Overall, there are concerns about what species should be hunted and knowing the refuge’s goals and objectives with respect to management of game species. All commentators agreed that law enforcement is needed to better monitor and regulate this use.

The illegal shooting of game from roads is a major concern on the refuge and in the valley. Because of the expansive views, many hunters drive up and down the road until they find an animal near the road. Instead of giving fair chase and moving off of the road past the right-of-way fence, it has been witnessed several times that the hunter(s) jump out of their vehicles and shoot from the road. Aside from



Laura King/USFWS

The refuge office, one of several historical structures.

being illegal, shooting from the road is unethical and unsafe for other hunters in the field and visitors driving the road.

Fishing

Fishing is a popular recreational activity on the refuge and is permitted on Red Rock, Odell, and Elk Springs creeks and Culver, MacDonald, and Widgeon ponds. Some of the most popular fishing is for nonnative, invasive species such as brook trout, Yellowstone cutthroat trout, and rainbow trout. The habitat alterations on the refuge, such as damming streams to create ponds, have supported these nonnative game fish. These habitat alterations and invasive fish have had a negative impact on the populations of native lacustrine/adfluvial Arctic grayling and Westslope cutthroat trout, both species of concern and found in refuge waters. Fishing these nonnative game fish has become a popular refuge activity. A few public comments requested expanding fishing opportunities on the lakes, creating ponds, and other creeks but imposing restrictive regulations. There are concerns of potential impacts of increasing fishing pressure (especially on Red Rock Creek) on native fish species and the visitor experience.

Wildlife Observation and Photography

The breath-taking scenery and abundant wildlife make wildlife observation and photography two of the most popular visitor service activities on the refuge. Most visitors independently explore the refuge, but many visitors request guidance on the best areas to view wildlife. Many of these areas are along the roads which are not improved for parking. There are two interpreted sites on the refuge, but no interpreted trails. Trails on the refuge and trails to access other public lands are minimal, in poor condition, are not interpreted, or are not listed in the general brochure. The refuge does not have an auto tour route. Numerous comments received during public scoping were in support of identifying hiking trails and other infrastructure to

make wildlife observation and photography easier. Most emphasized that activities should not impact wildlife habitats or wilderness values, including the undeveloped qualities (limited and primitive signs, minimal roads, and abounding wildlife) of the refuge.

Winter time wildlife viewing is particularly challenging, given the extreme winter weather and the unmaintained county gravel roads

Environmental Education, Interpretation, and Outreach

Environmental education programs are almost nonexistent. The closest schools are over 45 miles away and it can be challenging for buses to maneuver the county access roads during the school year. The refuge does not have an outdoor recreation or education specialist, and refuge-specific programs or kits are limited. The refuge's website does provide information about the refuge, its management and resources, and wildlife-dependent recreational opportunities. It does not provide any interactive activities. The refuge's remote location offers minimal opportunities to educate students and about the refuge's purposes, current management programs, issues, and the importance of conserving the Centennial Valley.

The refuge interpretive program is limited. A significant portion of the refuge is wilderness, and to protect the wilderness characteristic of the refuge, signage and trails are limited. There are four kiosks located at the office, entrance areas along county roads, and Upper Lake campground. There are two interpreted sites on the refuge but no interpreted trails. The refuge's general brochure has been updated and meets Service standards. There is a need for an accurate fish and wildlife observation list that meets Service standards. Interpretive displays in the visitor contact area found in the refuge office have recently been updated and expanded to provide information on the refuge's role within the Greater Yellowstone Area and the Refuge System and to acquaint visitors with the natural and recreational resources at the refuge.

Campgrounds

The refuge has two primitive campgrounds, one at Upper Red Rock Lake (Upper Lake campground) and one at Lower Red Rock Lake (River Marsh campground). Although camping is not a wildlife-dependent recreational activity, these campground areas are important for refuge visitors engaged in wildlife observation, photography, fishing, and hunting. The remote location, minimally maintained county road condition, and lack of local lodging facilities have made these campgrounds essential to those visitors who wish to stay for multiple days. Most campground visitors have come to the refuge to bird watch, photograph wildlife, fish, hunt, and hike or bike the Continental Divide trails found in

and around the refuge. There was overwhelming support and concern from the public to keep these campgrounds open. The refuge campgrounds are unique in that they require little maintenance by refuge staff. Visitors keep campsites clean, collect their trash, and cause little disturbance to other campers and visitors.

Cultural Resources

The refuge has only limited inventories of cultural resources, known primarily through investigations initiated by refuge activities that required compliance with Section 106 of the National Historic Preservation Act. The refuge has several historical structures, most of which are still being used, including the refuge office, staff housing, and maintenance facilities. It can be challenging to keep these structures functional while maintaining their historical characteristics.

Law Enforcement

The refuge has no law enforcement staff and is almost 5 hours from the nearest station with region 6 Service law enforcement staff. The refuge has always been a very popular hunting area for both big game and waterfowl. While most visitors respect the refuge and its resources, there will always be those who will "step outside" the laws and regulations. It is very difficult to prevent or respond to these violations without law enforcement staff on-site. The refuge has been contacted by numerous visitors and neighbors reporting suspected violators. The main issues include off-road use, illegal hunting, and trespass. Many public comments identified the need for law enforcement for all visitor service programs to protect wildlife, visitors, and wildlife habitat.

Facilities, Staff, and Administration

The refuge is responsible for managing over 62,000 acres, both in fee title and conservation easements, all within the Centennial Valley. Current staff, funding levels, and facilities available to manage this large land base is inadequate. The refuge currently has a full-time staff of five, including two managers, a biologist, an administrative assistant, and a maintenance worker. Supporting facilities include an office, four refuge houses, one maintenance building, a bunkhouse, and one outbuilding for storage. Although the refuge has been able to conduct many refuge programs through existing resources and partnerships, visitor services programs have been limited, and there have been missed opportunities for greater understanding, conservation, and enhancement of refuge resources. Some of the specific needs include: additional baseline data for some species, more effective management and enhancement of refuge habitats, monitoring of management actions, and orienting and educating visitors. In addition there is no on-site law

enforcement presence to ensure the safety of staff, visitors, wildlife, and facilities.

The refuge headquarters was recently expanded, to provide additional offices and a larger visitor contact area. Interpretive displays are being designed, highlighting the resources and wildlife that use this refuge and the Centennial Valley. Most of the remaining facilities are in need of repair, including the refuge residences, maintenance, other visitor facilities, signs, and fencing. The refuge has several historical structures including the refuge office, fire tower, maintenance buildings, and two refuge houses. These structures are occupied, used daily, and require maintenance to not only keep them functional, but to preserve their historical character and integrity. This can be costly and time-consuming. Universal accessibility can also be an issue with historical structures. Currently, only the office visitor contact area and restrooms are designated as universally accessible. The public also asked for proper maintenance of refuge facilities, but most requested that any changes to the refuges

infrastructure be complimentary to the refuge's rugged, undeveloped character. Due to a lack of private housing surrounding this remote refuge, most current refuge employees rent government housing. There are currently four refuge houses, built between the 1930s and 1950s. The lack of adequate housing has limited the recruitment of added staff and the expansion of refuge programs.

Most refuge roads currently open to the public are in need of repair, some due to failed bridges. Many county roads that provide access through the refuge are not recommended for passenger vehicles due to a lack of regular maintenance and inadequate drainage. There are areas with insufficient visitor parking throughout the refuge.

Directional, interpretive, boundary, and entrance signs are also in need of updating.



Pronghorn are native to the refuge.

3 Alternatives



Angler on Odell Creek.

This chapter describes the management alternatives considered for the Red Rock Lakes National Wildlife Refuge. Alternatives are different approaches to planning unit management that are designed to achieve the refuge purposes, vision and goals, the mission of the Refuge System, and the mission of the U.S. Fish and Wildlife Service. Alternatives are developed to address the substantive issues, concerns, and problems identified by the Service, the public, and other partners during public scoping and throughout the development of the draft CCP.

3.1 ALTERNATIVES DEVELOPMENT

The alternatives represent different approaches for permanent protection and restoration of fish, wildlife, plants, habitats, and other resources. The planning team assessed the planning issues identified in chapter 2, the existing biological conditions, and external relationships affecting the refuge. This information contributed to the development of alternatives. As a result, each alternative presents different approaches for meeting long-term goals. Each alternative was evaluated according to how well it would advance the vision and goals of the refuge and the Refuge System and how it would address the planning issues.

All of the alternatives incorporate concepts and approaches intended to achieve the goals outlined in chapter 2 and are discussed in terms of how they could meet each goal.

Alternative A, the no-action alternative, describes ongoing refuge management activities. This alternative might not meet all the CCP goals. It is provided as a basis for comparison with the other alternatives.

3.2 ALTERNATIVES CONSIDERED BUT ELIMINATED

There were some requests from the public for the Service to evaluate reintroducing bison to the refuge. The Service has considered this in the past as free-ranging bison historically used the Centennial Valley. Currently, cattle are used as a tool to mimic this historic disturbance. In the state of Montana, bison are designated as livestock. As livestock, bison reintroduction is not desirable for various reasons including the need to keep bison from roaming onto neighboring land, which requires a substantial, electrified fence. The refuge is located in an area that is relatively undeveloped. In addition, 68% of the refuge is designated as wilderness. With little development in the valley and with more private and public landowners constructing wildlife-friendly fences, wildlife, such as elk, pronghorn, and the occasional grizzly bear and wolf are able to roam freely across the valley floor. The Centennial Valley is a large wilderness area and large electrified fences are counterproductive to the progress that has been made in making the eastern portion barrier-free for wildlife movement. A captive bison herd would not

mimic historical grazing patterns. Bison migrated through the valley, particularly during the winter months when heavy snows blanketed the valley, making it difficult for them to survive. Captive bison could have undesirable impacts on refuge habitats and would most likely require relocation or supplemental feeding during winter months. Other issues related to installing a large electrical fence would be the significant initial cost and maintenance. The Service has an obligation to ensure that such expenditures are necessary and result in the greatest benefit. Such an expenditure could not be justified.

3.3 ELEMENTS COMMON TO ALL ALTERNATIVES

This section identifies key elements included in the CCP regardless of the alternative selected. Each alternative contains key elements that are the same:

- All alternatives, including the no-action alternative, emphasize the same priority species and protection of endangered species.
- The U.S. Fish and Wildlife Service would ensure that refuge management complies with all other federal laws and regulations that provide direction for managing units of the Refuge System.
- Each alternative would attempt to eradicate invasive species through an integrated pest management approach, including biological, chemical, and mechanical treatment methods.
- No adjacent landowners would be adversely impacted by any action taken by the U.S. Fish and Wildlife Service without a mutual agreement and adequate compensation.
- All alternatives would provide equal protection and management of cultural resources.

3.4 DESCRIPTION OF ALTERNATIVES

The following section summarizes the alternatives considered by the planning team to achieve the proposed vision and goals and address issues. These alternatives include not only the current management, alternative A, but also the planning team's proposed action, alternative B. This proposed action is further described in chapter 6. There are additional details for these alternatives and the consequences of each in both table 4. within this chapter, and in "Chapter 5. Environmental Consequences."

ALTERNATIVE A: NO ACTION (CURRENT MANAGEMENT)

Alternative A, the no-action alternative, reflects current management of Red Rock Lakes National Wildlife Refuge. It provides the baseline against which to compare other alternatives. It is also a

requirement of NEPA that a no-action alternative be addressed in the planning process.

These are the key elements of alternative A:

- Habitat and wildlife management actions to benefit migratory birds and other wildlife would continue at present levels unless funding or staffing levels change. Refuge habitat would continue to be managed using existing water control structures, grazing, and prescribed fire opportunities. Results of management actions may or may not be able to be interpreted because monitoring of management actions would continue to be limited due to current funding levels. The refuge would continue to divert water from streams and impound water.
- The refuge would continue to coordinate with adjacent agencies and partners, as well as willing landowners, to manage on a larger (landscape) scale. In particular, management of forested habitats and sand dune systems would be coordinated with neighboring private and public landowners whenever possible.
- Wildlife-dependent compatible priority uses (such as hunting, fishing, wildlife observation, wildlife photography, and interpretation) would continue to occur at current levels (see figure 7). There would continue to be minimal outreach and education programs and insufficient resources to update signs, informational kiosks, and brochures, as well as improve hiking trails, access roads, and campgrounds.
- Duck, goose, and coot hunting would remain permitted near Lower Red Rock Lake under state and federal regulations (see figure 7).
- Big game hunting for elk, pronghorn, deer, and moose would continue to be allowed on the refuge (see figure 7). All seasons coincide with the state except for the shortened moose season.
- Visitation would likely remain at current levels of approximately 12,000 visitor days per year.

ALTERNATIVE B: PROPOSED ACTION

Management proposed under alternative B acknowledges the importance of naturally functioning ecological communities on the refuge. However, changes to the landscape from human alterations to the landscape, past refuge management creating wetlands, and species in peril requiring special management actions prevent managing the refuge solely as a naturally-functioning ecological community. Because some of these changes are

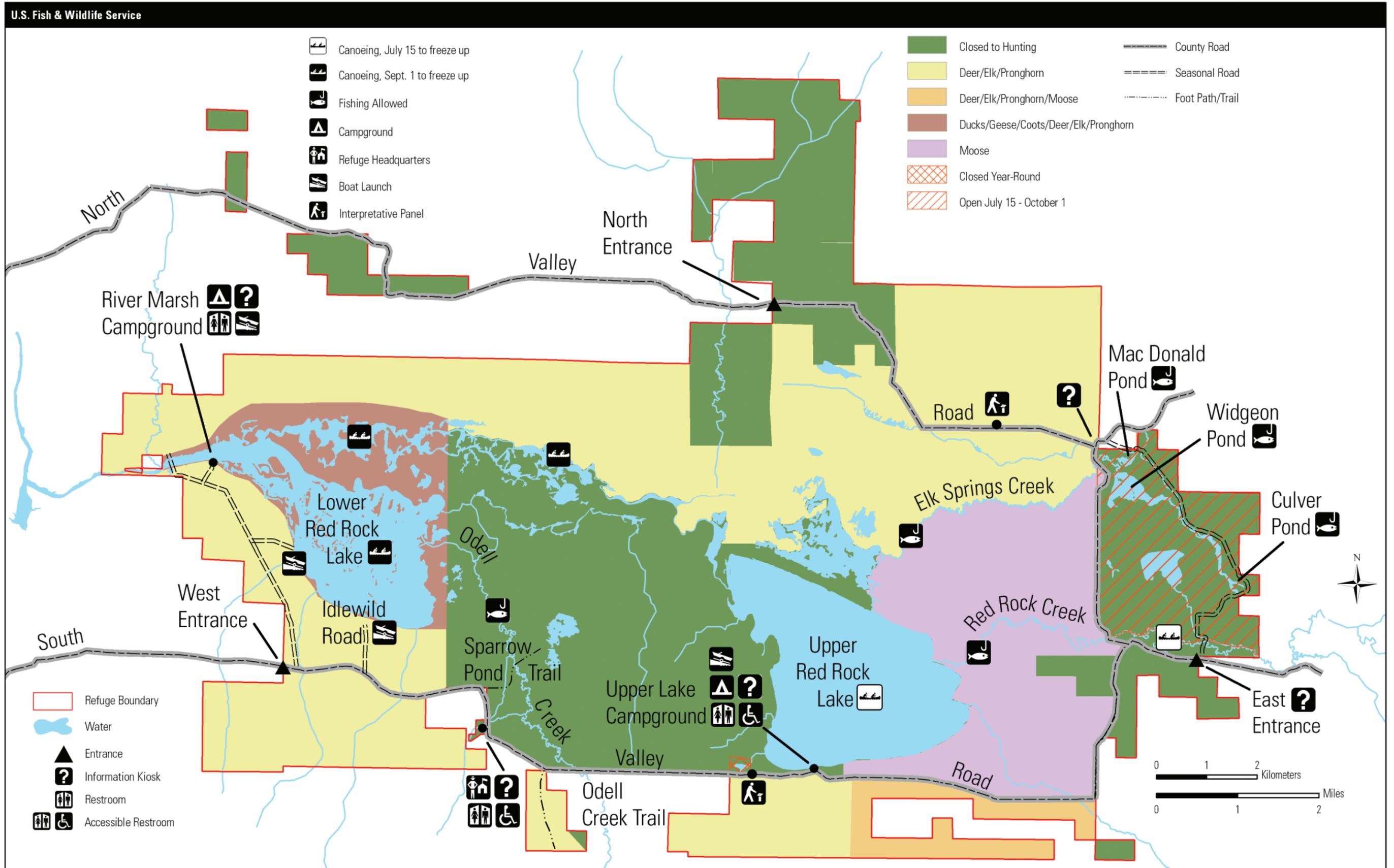


Figure 7. Alternative A, current visitor service areas and facilities map.

significant, some refuge habitats would require “hands on” management actions during the life of the CCP. Visitor services programs would be expanded, both on and off refuge.

These are the key elements of alternative B:

- Improved management of riparian habitats to benefit Arctic grayling and migratory bird species dependent on these habitats. Restoration of some modified wetlands (such as Culver Pond) back to riparian corridors would occur.
- Management actions (such as grazing and prescribed fire) would be directed toward specific habitat and wildlife objectives, with increased and improved oversight, monitoring, and research (when appropriate) being conducted to assess if management objectives are being met.
- There would be improved environmental education, outreach, and interpretation opportunities in order to better garner support, understanding, and awareness of refuge values. These offerings are expected to increase visitation to 15,000 visitor days per year, an increase of 3,000 visitor days.
- Facilities and signage on the refuge would be improved to better orient and educate visitors, including added kiosks and interpretive panels (both on the refuge and in the visitor contact area). An auto tour route along an existing refuge road would be designated and interpreted. Minimal signage would be used to retain the refuge’s wildland characteristics.
- The manager and assistant manager positions would be upgraded, and the assistant manager would be required to maintain law enforcement credentials. Added staff would include a full-time biological science technician, a permanent seasonal park ranger (visitor services manager), and maintenance worker.
- To create a contiguous hunting area and eliminate hunting boundary confusion, moose hunting would be open in the area west of the Centennial Valley Road near “Saier Corrals.” The area south of South Valley Road (Red Rock Pass Road) would be closed to eliminate a road hunting issue south of the road (see figure 8).
- Closed areas in the northern section of refuge would be opened to deer, elk, and pronghorn hunting.
- Fishing opportunities would be expanded, and visitors would be encouraged to keep nonnative fish.
- An apartment and refuge house would be constructed to accommodate added staff.

ALTERNATIVE C: WETLAND RESTORATION

Management under alternative C acknowledges the importance of a naturally functioning ecosystem. Management action emphasis would be placed on allowing wetland and riparian habitats to function naturally through the restoration of most created and all modified wetlands.

These are the key elements of alternative C:

- All modified and most created wetlands would be restored to their original state (stream, shallow wetland, and upland habitats).
- Prescribed fire and grazing by native ungulates would be used as the primary disturbance for sagebrush-steppe and grassland habitats. Cattle grazing would be eliminated.
- A full-time visitor services specialist would be recruited to design and expand environmental education and interpretive programs for adults and school children and conduct annual refuge events. These expanded offerings are expected to increase visitation to 16,000 visitor days, an increase of 4,000 visitor days.
- Outreach would be expanded to garner support and understanding of the refuge issues and management programs, including working with the surrounding landowners and other partners to protect the Centennial Valley from habitat loss and residential development.
- Moose hunting would follow state seasons.
- Hunting boundaries will be modified and expanded to eliminate boundary confusion, address law enforcement issues, and provide additional opportunities (see figure 9).
- The River Marsh (commonly referred to as Lower Lake) campground would be closed while accessibility to the campground at Upper Lake would be improved.
- A full-time wildlife biologist, full-time range technician, and permanent seasonal maintenance worker would be recruited. At least three temporary seasonal biological science technicians would be recruited.
- Up to five residences would be constructed for current and added staff.

ALTERNATIVE D: ECOLOGICAL RESTORATION

Management under alternative D further acknowledges the importance of a naturally functioning ecosystem. Management action emphasis would be placed on the restoration of all natural processes, including the restoration of wetland and riparian habitats and working with adjacent landowners and the state to reintroduce bison should they become designated as free-ranging wildlife in this part of Montana. The refuge would place emphasis on creating a wilderness setting in all areas away from the visitor contact station. Visitor

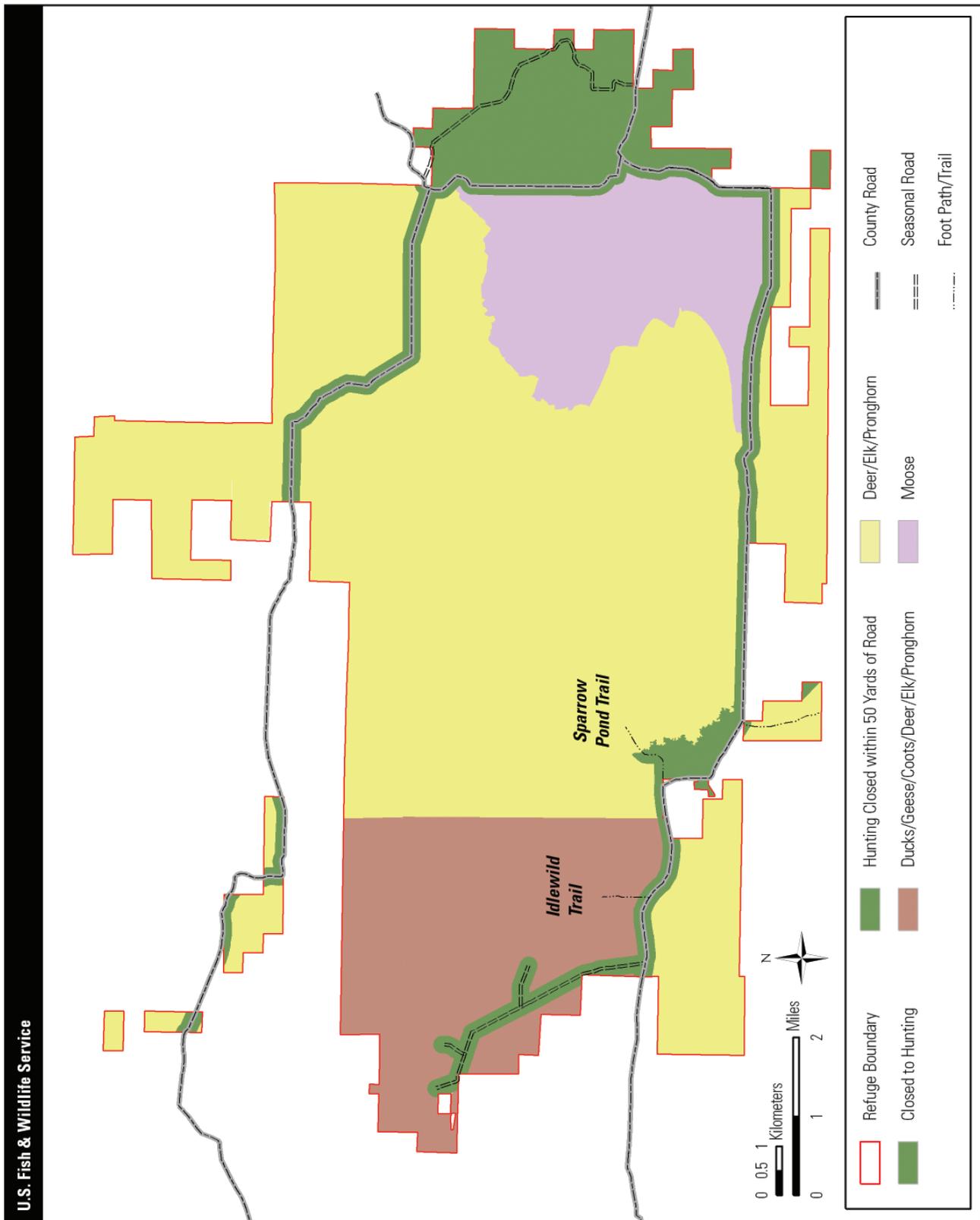


Figure 8. Hunting program boundaries proposed in alternative B.

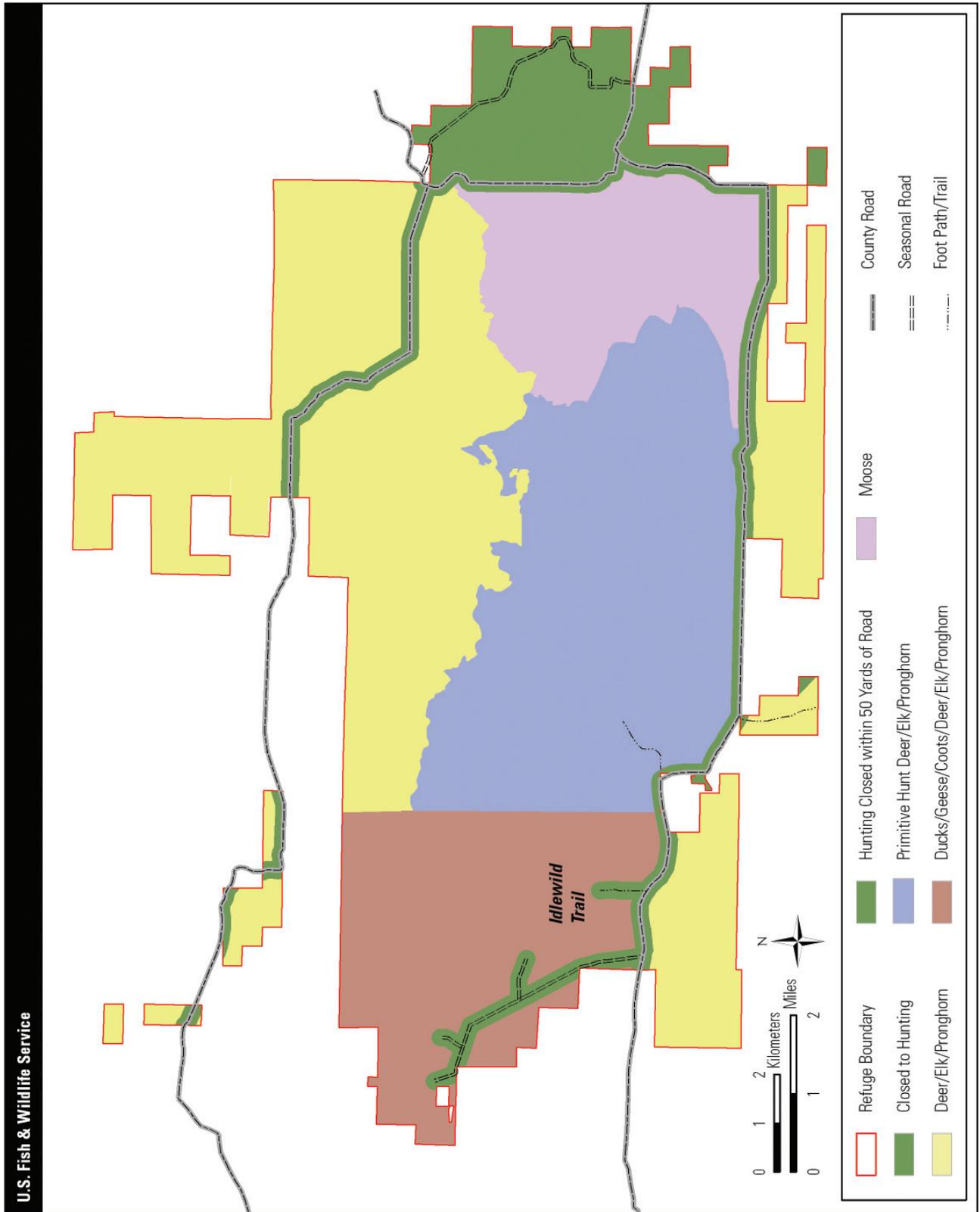


Figure 9. Hunting program boundaries proposed in alternative C.

programs would remain at current levels or be reduced.

These are the key elements of alternative D:

- To the extent possible, management would focus on the restoration of all natural processes including the removal of all structures currently used for impounding and managing waters.
- If bison become designated as free-ranging in Montana, the Service would work with the state and neighboring landowners to repatriate bison to the refuge. Cattle grazing and interior fences would be eliminated.
- Hunting boundaries will be modified and expanded to eliminate boundary confusion, address law enforcement issues, and provide additional opportunities.
- Interpretation would be concentrated at the visitor contact station to reduce the need for signage and interpretative kiosks.
- All trails would be eliminated, and off-trail hiking would be emphasized to visitors using the refuge.
- All moose hunting would be eliminated on the refuge (see figure 10).
- Both River Marsh and Upper Lake campgrounds would be closed.

Table 4 provides additional information for each alternative including an evaluation of the consequences.

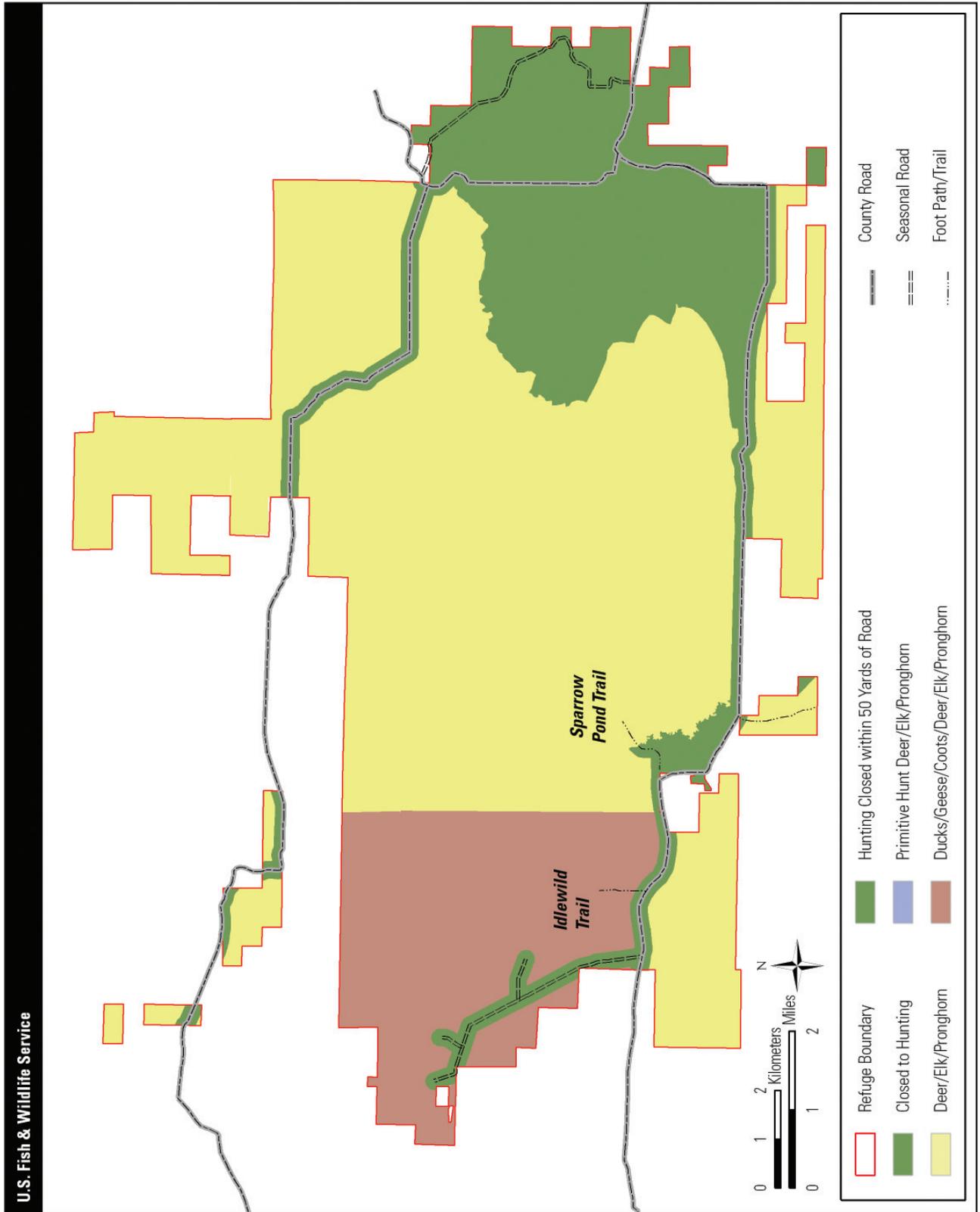


Figure 10. Hunting program boundaries proposed in alternative D.

U.S. Fish & Wildlife Service

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Lake, Pond, and Marsh Habitat Goal			
Provide habitat for breeding and migrating birds, native fishes, and resident wildlife that maintains the biological diversity and integrity of montane wetland systems.			
Natural Lakes (Upper Lake and Swan Lake)—Management Actions			
The lakes would be allowed to function naturally with no monitoring or management intervention.	<i>Same as alternative A, except:</i> Monitoring would be conducted to ensure management of adjacent habitats is not adversely affecting the lakes (for example, through increased levels of nitrogen due to upstream grazing practices).	<i>Same as alternative B.</i>	<i>Same as alternative B, including:</i> If bison become designated as free-ranging wildlife in Montana the refuge will work with the state and neighboring landowners to reintroduce them. Livestock grazing would be eliminated and interior fences would be removed.
Natural Lakes (Upper Lake and Swan Lake)—Environmental Consequences			
Intact refuge wetlands would function naturally, maintaining the biodiversity of native species and the biological integrity of this intact wetland system. Lack of monitoring could preclude detection of habitat degradation from actions conducted in the upper watershed.	Monitoring would provide an understanding of the natural variation in the system and allow the refuge to detect when system functions fall outside that range.	<i>Same as alternative B.</i>	<i>Same as alternative B, except:</i> If free-ranging bison wintered in the valley there could be increased grazing of sedge habitats, which could reduce residual cover for nesting waterfowl.
Modified Wetlands (Culver, Widgeon, McDonald, Shoveler Ponds, Shambow, Shorebird, Antelope Ponds and Sparrow Pond and Slough)—Management Actions			
All of the modified wetlands would remain impounded with various types of water management structures and would be maintained at a static level year-round to preserve open-water habitat. Unlike the other modified wetlands, Antelope, Shoveler, Shorebird, and Sparrow ponds, and Sparrow Slough are not spring fed; therefore, water levels of these ponds would fluctuate due to changing climatic conditions.	Culver and McDonald ponds would be restored to free-flowing streams and associated riparian corridors to benefit Arctic grayling. Widgeon Pond would be maintained at a high, static water level for Arctic grayling brood habitat. The remaining modified wetlands would be managed at dynamic water levels to increase productivity for the benefit of migratory birds.	<i>Same as alternative B, except:</i> All remaining modified wetlands would be reverted, to the extent possible, back to riparian habitat, or other natural hydrological states.	<i>Same as alternative C.</i>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Modified Wetlands (Culver, Widgeon, McDonald, Shoveler Ponds, Shambow, Shorebird, Antelope Ponds and Sparrow Pond and Slough)—Environmental Consequences			
<p>Nonnative fish species would continue to impact native populations, in particular, Arctic grayling and Westslope cutthroat trout. Historical spawning areas would remain unavailable to Arctic grayling.</p> <p>Wintering habitat for waterfowl would be provided.</p> <p>Nesting habitat for swans would be maintained.</p>	<p>Spawning habitat for Arctic grayling and other native fishes would be provided in restored free-flowing streams and associated riparian habitat.</p> <p>Created winter habitat would be eliminated, encouraging waterfowl to migrate to historical wintering areas.</p> <p>The primary productivity of the wetlands would improve, providing quality habitat for nesting and staging migratory birds.</p>	<p><i>Same as alternative B, except:</i></p> <p>Open-water habitat (such as ponds) would be replaced by restored stream habitat.</p> <p>Restored streams would provide additional spawning habitat for native fish species.</p> <p>Four known trumpeter swan nesting territories would be lost.</p> <p>There would be an increase in riparian habitat but a net loss of wetland acres.</p>	<p><i>Same as alternative C.</i></p>
Created Wetlands (North Tuck Slough, West Pintail Ditch Wetlands)—Management Actions			
<p>Water would continue to be diverted to these created wetlands through a series of water management structures.</p> <p>North Tuck Slough would continue to be managed for breeding waterbirds, while the other wetlands will not receive diverted water.</p>	<p>Diversion of water to North Tuck Slough would be limited to years when diversion of water from Red Rock Creek would not adversely affect riparian habitat or spawning Arctic grayling.</p> <p>As part of the restoration of Culver Pond (see above), Mallard Canal and Pintail Ditch would also be restored, precluding diversion of water to the West Pintail Ditch wetlands.</p>	<p>Water management structures would be removed from all created wetlands and the habitat would be reverted to riparian habitat.</p>	<p><i>Same as alternative C, plus the following:</i></p> <p>All diversion infrastructures (ditches, dikes, WCSs, dams) would be removed and areas returned to a more natural hydrologic state.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Created Wetlands (North Tuck Slough, West Pintail Ditch Wetlands)—Environmental Consequences			
<p>Water diversions from Red Rock Creek would continue to create migratory waterbird habitat. These diversions would continue to alter the creek’s hydrology and potentially affect the water and soil chemistry of the area.</p>	<p>Diverting water less frequently would create fewer impacts to the hydrology of Red Rock Creek, and the water and soil chemistry of these created wetlands.</p> <p>Reduced frequency of water diversion from Red Rock Creek would allow this stream to function more naturally.</p> <p>Migratory waterbird habitat would be created during above average water years.</p> <p>One swan nesting territory would be lost.</p>	<p>103 acres of created wetland habitat for migratory waterbirds would be lost.</p> <p>Areas would be created that could be susceptible to invasion by pest plant species.</p> <p>The riparian system would be returned to a more natural hydrological state.</p> <p>One additional swan nesting territory would be lost (in addition to the loss of four in the modified wetlands areas).</p>	<p><i>Same as alternative C, except:</i></p> <p>There would be a complete loss of created wetland habitats.</p> <p>Additional areas would be created that could be susceptible to invasion by pest plant species.</p> <p>Surface water runoff patterns would be restored.</p> <p>A more natural appearance would be created, reflecting the wilderness character of this refuge.</p> <p>Altered upland habitats would be reestablished.</p>
Lower Red Rock Lake/River Marsh—Management Actions			
<p>The WCS on Lower lake would continue to be kept open to allow for a naturally-fluctuating hydrological cycle.</p> <p>The Lower Lake structure would continue to be maintained to permit manipulation of water levels, most specifically for ecological experiments designed to improve the understanding and management of the system.</p>	<p><i>Same as alternative B, except:</i></p> <p>The impacts and benefits of the structure would be analyzed to determine its future.</p> <p>Ecological experiments would be expanded to improve the understanding and management of the system.</p>	<p>The WCS would be removed systematically as it deteriorates.</p>	<p>The WCS on Lower Lake would be removed to restore the system to a natural hydrologic state.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Lower Red Rock Lake/River Marsh—Environmental Consequences			
This wetland system would continue to provide productive and diverse habitat for migratory waterbirds.	<p><i>Same as alternative A, except:</i></p> <p>Ability to provide enhanced waterbird habitat during drought years would be maintained, because the structure could continue to be used to capture water if necessary.</p> <p>The effect of the WCS on the hydrology and ecology of the system would be better understood, allowing a more informed decision on the need for its retention or removal.</p>	<p>The slow removal of the water control structure would permit ecological experiments to be conducted. Its eventual removal would allow the hydrological state of the system to be restored, but the ability to manipulate water levels would be lost.</p> <p>The ability to capture water during drought years would be lost.</p>	The immediate removal of the water constructure would not permit ecological experiments to determine the effects of removing the dam or developing a better understanding of the hydrology of the refuge.
Riparian Habitat Goal			
Maintain the processes necessary to sustain the biological diversity and integrity of native riparian vegetation for breeding birds, native fishes, and wintering ungulates.			
Stream Corridor—Management Actions			
<p>Browse studies on willow would continue to determine habitat quality for moose and migratory land birds.</p> <p>Annual water diversions to protect Arctic grayling habitat and to preserve the hydrologic function of the system would continue to be limited.</p> <p>Riparian fences would continue to be maintained along larger corridors (such as Odell and Red Rock creeks) to protect them from grazing livestock.</p>	<p>The refuge would work with MFWP to monitor moose abundance and browse levels, as well as breeding land bird composition and abundance.</p> <p>The frequency of water diversions to created and modified refuge wetlands would be reduced to provide healthy stream corridor riparian habitat to support breeding migratory land birds, Arctic grayling, and native ungulates.</p> <p>The refuge would work with adjacent landowners to reduce effects of livestock grazing on upstream sections of Red Rock Creek to protect and improve Arctic grayling spawning habitat.</p>	<p><i>Same as alternative B, except:</i></p> <p>All water management structures would be removed from all created and modified wetlands, returning these areas (including native streams) to their natural hydrologic state.</p> <p>Livestock grazing would be eliminated and all interior fences would be removed.</p>	<p><i>Same as alternative C, including:</i></p> <p>All water diversions would be removed and the hydrologic state restored, to the extent possible.</p> <p>If bison become designated as free-ranging wildlife in Montana the refuge will work with the state and neighboring landowners to reintroduce them.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
	<p>Diversion of water to North Tuck Slough would be limited to years when diversion of water from Red Rock Creek would not adversely affect riparian habitat or spawning Arctic grayling.</p> <p>Existing riparian fences would be maintained and additional temporary fencing would be used, as needed, to protect stream corridors from grazing livestock.</p> <p>Irrigation ditches found to affect the hydrology of adjacent areas would be restored. Some ditches may be needed for proposed restoration of grassland habitats.</p>		

Stream Corridor—Environmental Consequences

<p>Valuable riparian habitat would continue to be protected for wildlife. Studies would expand the refuge’s knowledge of relationships among moose abundance, willow browse, and breeding migratory land birds. Most riparian corridors would be protected from the effects of grazing, except for some of the smaller creeks.</p>	<p><i>Same as alternative A, except:</i></p> <p>Reduced frequency of water diversion from Red Rock Creek would allow this stream to function more naturally. There may be some loss of created and modified wetland habitat in years where water resources are limited. Stream corridor habitats would be improved throughout the valley, providing naturally functioning systems for the benefit of native wildlife dependent on stream habitat.</p>	<p><i>Same as alternative B, except:</i></p> <p>Open-water habitat (such as ponds) would be replaced by restored stream habitat, providing naturally functioning systems for the benefit of wildlife dependent on stream habitat. Restored streams would provide additional spawning habitat for native fish species. Four known trumpeter swan nesting territories would be lost. There would be an increase in riparian habitat but a net loss of wetland acres. Possible conflicts between native browsers and livestock would be eliminated.</p>	<p><i>Same as alternative C, except:</i></p> <p>Hydrological function of these stream corridors would be protected by elimination of all water diversions on refuge streams. If bison were to replace cattle it is possible that stream corridor impacts normally caused by cattle would be reduced, but not eliminated.</p>
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Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
		Removal of interior fences would eliminate the potential for wildlife impacts, including altering wildlife movements.	
Woody Dominated Wetlands (willow, aspen, cinquefoil)—Management Actions			
Browse studies on willow would continue in order to determine habitat quality for moose and migratory land birds. The majority of this habitat would remain protected from livestock grazing by interior fences.	The refuge would work with MFWP to monitor moose abundance and browse levels, along with breeding land bird composition and abundance. Additional fencing would be used, as needed, to protect these habitats from grazing livestock. The refuge would work with adjacent landowners to protect and restore these habitats to support moose and breeding land bird populations.	<i>Same as alternative B, except:</i> Livestock grazing would be eliminated and the interior fences removed.	<i>Same as alternative C.</i>
Woody Dominated Wetlands (willow, aspen, cinquefoil)—Environmental Consequences			
Valuable riparian habitat would continue to be protected for wildlife.	Expanding and improving riparian habitats throughout the Centennial Valley would increase the area available for breeding migratory birds and native ungulates and improve water quality.	<i>Same as alternative B, including:</i> Browsing of woody species by livestock would be eliminated. Possible conflicts between native browsers and livestock would be eliminated. Removal of interior fences would eliminate impacts on wildlife.	<i>Same as alternative C.</i>
Wet Meadow, Grassland and Shrub-steppe Habitat Goal (wet meadow)			
Provide structurally complex native meadow, grassland and shrub-steppe habitats within a watershed context, for sagebrush-dependent species, upland-nesting migratory birds, rare plant species, and other resident wildlife.			
Wet Meadow, Grassland and Shrub-steppe (wet meadow)—Management Actions			
Meadows would be grazed by livestock under the current upland habitat management plan (USFWS 1994).	Same as alternative A, except: Livestock grazing and prescribed fire would continue to be used,	Fire would be used as the primary disturbance, complimented by native grazers, to meet wildlife habitat objectives, reduce invasive grasses	If bison become classified as wildlife in Montana, the Service would work with the state and

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
<p>Hydrologically, these wet meadows would continue to be allowed to function naturally.</p> <p>Livestock grazing and prescribed fire would be used, (per the refuge’s current upland management plan) to mimic historical disturbance systems and to control the spread of invasive grasses while enhancing native species.</p> <p>Annual monitoring of response of vegetation and land birds to management actions would continue.</p>	<p>with increased management oversight, to meet wildlife habitat objectives, reduce invasive grasses, enhance native species, and to reduce hazardous fuels.</p> <p>Temporary fencing within current management units would be used to localize and better control grazing.</p> <p>The Service would work with the state to determine the effects of any future initiatives to reintroduce bison should they become designated as wildlife. This would not be considered if a fence were still required.</p>	<p>and to reduce hazardous fuels, minimizing the threat to life and property.</p> <p>Livestock grazing would be phased-out as permittees retire grazing operations, and interior fences would be removed.</p> <p>Annual monitoring of vegetation and land bird response to management actions would continue.</p>	<p>neighboring landowners to repatriate bison to the refuge.</p> <p>Cattle grazing would be eliminated.</p> <p>Prescribed fire would continue to be a component of upland management and for control of hazardous fuels.</p> <p>Reduction of nonnative invasive grasses and hazardous fuels would continue.</p> <p>Interior fences would be eliminated.</p> <p>Fire would be used to manage grazing by native ungulates to meet wildlife habitat objectives.</p> <p>Annual monitoring of vegetation and land bird response to management actions would continue.</p>

Wet Meadow, Grassland and Shrub-steppe (wet meadow)—Environmental Consequences

<p>Moderately grazed and idled areas, complemented by adjacent lands grazed at higher levels, would continue to be provided for wildlife.</p> <p>The refuge would continue to expand their understanding of habitat and wildlife response to grazing.</p> <p>Continued presence of fencing may negatively impact wildlife.</p> <p>The diversity of native plant species would be enhanced while reducing invasive plant species.</p> <p>Reducing hazardous fuels would minimize threats to life and property on the refuge and the surrounding private lands.</p>	<p><i>Same as alternative A, except:</i></p> <p>Grazing management would be directed more toward specific wildlife and habitat objectives.</p> <p>The diversity of native plant species would be improved even more while reducing invasive plant species.</p> <p>Conducting a thorough analysis of the potential impacts of reintroducing free-ranging bison would ensure that the consequences are clearly understood by the refuge, neighboring landowners, and other partners prior to any repatriating efforts.</p>	<p>Conflicts between native grazers and cattle would be eliminated.</p> <p>Removal of interior fences would eliminate impacts to wildlife.</p> <p>In the absence of cattle grazing, fire may not provide adequate disturbance to reduce nonnative invasive grasses.</p> <p>Reducing hazardous fuels would minimize threats to life and property on the refuge and the surrounding private lands.</p>	<p>If bison assumed historical grazing patterns, this could return an important, historic ecological process to the refuge and, consequently, the Centennial Valley.</p> <p>Bison have the potential to transmit brucellosis to cattle. This would have to be addressed.</p> <p>Bison could become concentrated on the refuge, causing overgrazing of grassland habitats needed by nesting migratory birds.</p>
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Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
			<p>There could be cumulative habitat impacts as a result of introducing bison into an already active cattle and native ungulate grazing community within in the valley.</p> <p>Fences that currently exist on neighboring lands in the valley could inhibit natural migration of these bison, particularly in the winter. This could cause concentrated habitat impacts and loss of animals during deep snow years.</p> <p>Reducing hazardous fuels would minimize threats to life and property on the refuge and the surrounding private lands.</p>

**Meadow, Grassland and Shrub-steppe (grasslands, sagebrush, steppe, and Centennial Sandhills)—
Management Actions**

<p>The refuge would continue coordinating with adjacent landowners, including the Nature Conservancy and Bureau of Land Management (BLM), to determine the efficacy of maintaining and increasing early seral stage habitat in the sandhills using prescribed fire and grazing. Resulting data would be used to determine management of this unique area.</p> <p>Annual monitoring of the response of vegetation and land birds to management actions would continue.</p>	<p><i>Same as alternative A, except:</i></p> <p>Livestock grazing and prescribed fire would be used with increased management oversight to meet wildlife habitat objectives, reducing invasive grasses and hazardous fuels.</p> <p>Fencing within current management units would be used to localize and better control grazing.</p>	<p><i>Same as alternative B, except:</i></p> <p>To meet wildlife habitat objectives and to reduce nonnative invasive grasses, prescribed fire would be used as the primary disturbance, complimented by native grazers.</p> <p>Livestock grazing would be phased-out as permittees retire grazing operations.</p> <p>Interior fences would be removed as they become unnecessary.</p> <p>Fuels treatment (including prescribed fire or other mechanical means) would also be used to reduce hazardous fuels.</p>	<p><i>Same as alternative C , except:</i></p> <p>Livestock grazing would be replaced with free-ranging bison if the state classifies bison as wildlife.</p> <p>A Memorandum of Understanding would be established with adjacent public land agencies to make movement of bison into Alaska and Antelope basins, and other areas easier.</p>
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Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
<p>Livestock grazing and prescribed fire would be used, per the refuge’s current upland management plan (USFWS 1994), to mimic historical disturbance systems, control the spread of invasive grasses, and reduce hazardous fuels.</p>			
<p>Meadow, Grassland and Shrub-steppe (grasslands, sagebrush, steppe, and Centennial Sandhills)— Environmental Consequences</p>			
<p>Management actions would provide early seral habitat required by rare plant species in the Centennial Sandhills.</p> <p>Moderately grazed and idled areas, complemented by adjacent lands grazed at higher levels, would continue to be provided for wildlife.</p> <p>The refuge would continue to expand their understanding of habitat and wildlife response to grazing.</p> <p>Continued presence of fencing would negatively impact wildlife.</p> <p>Reducing hazardous fuels would minimize threats to life and property on the refuge and the surrounding private lands.</p>	<p><i>Same as alternative A, except:</i></p> <p>Grazing and prescribed fire management would be directed more towards specific wildlife and habitat objectives, making the best use of resources while ensuring habitats are not negatively impacted.</p> <p>The diversity of native plant species would be enhanced while reducing invasive plant species.</p>	<p><i>Same as alternative A, except:</i></p> <p>Conflicts between native grazers and cattle would be eliminated.</p> <p>Removal of interior fences would eliminate impacts to wildlife.</p> <p>In the absence of cattle grazing, prescribed fire may not provide adequate disturbance to reduce invasive nonnative grasses.</p>	<p>If bison assumed historical grazing patterns, this could return an important, historic ecological process to the refuge and, consequently, the Centennial Valley.</p> <p>Bison have the potential to transmit brucellosis to cattle. This would have to be addressed.</p> <p>Bison could become concentrated on the refuge causing overgrazing of grassland habitats needed by nesting migratory birds.</p> <p>There could be cumulative habitat impacts as a result of introducing bison into an already active cattle and native ungulate grazing community within in the valley.</p> <p>Fences that currently exist on neighboring lands in the valley could inhibit natural migration of these bison, particularly in the winter. This could cause concentrated habitat impacts and loss of animals during deep snow years.</p> <p>Reducing hazardous fuels would minimize threats to life and property on the refuge and the surrounding private lands.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Aspen Forest, Mixed Coniferous Forest, and Woodlands Goal			
Create and maintain aspen of various age classes within a mosaic of coniferous forest and shrub land for cavity-nesting birds and other migratory and resident wildlife.			
Aspen Woodlands and Forests—Management Actions			
Staff would continue to coordinate with The Nature Conservancy and BLM to determine current and historical extent of aspen on and adjacent to the refuge and to quantify browse intensity	<i>Same as alternative A, including:</i> Aspen would be managed on a landscape scale in coordination with adjacent BLM land managers.	<i>Same as alternative B.</i>	<i>Same as alternative B.</i>
Aspen Woodlands and Forests—Environmental Consequences			
Understanding of the relationships between native ungulate browsing and aspen regeneration would be developed.	<i>Same as alternative A, except:</i> Management actions would reduce or reverse the loss of aspen habitats in the Centennial Valley.	<i>Same as alternative B.</i>	<i>Same as alternative B.</i>
Coniferous Woodlands and Forests—Management Actions			
In coordination with the BLM, prescribed fire would continue to be used for protection of structures around the Lakeview community.	<i>Same as alternative A, including:</i> A fire use plan would be developed in conjunction with BLM to allow minimal suppression of wildland fires.	<i>Same as alternative B.</i>	<i>Same as alternative B.</i>
Coniferous Woodlands and Forests—Environmental Consequences			
Fire intensity and severity would be reduced around Lakeview.	<i>Same as alternative A, including:</i> Minimal wildland fire suppression would prevent a buildup of fuels which could cause catastrophic fires.	<i>Same as alternative B.</i>	<i>Same as alternative B.</i>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Visitor Services and Cultural Resources Goal			
Provide quality wildlife-dependent recreation, interpretation, environmental education, and outreach opportunities that nurture an appreciation and understanding of the unique natural and cultural resources of the Centennial Valley for visitors and local community members of all abilities while maintaining the primitive and remote experience unique to the refuge.			
Hunting—Management Actions			
<p>Duck, goose, and coot hunting would continue to be permitted in the vicinity of Lower Red Rock Lake (approximately 10% of entire refuge) under state and federal regulations and seasons (see figure 7, page 31).</p> <p>Big game hunting for elk, pronghorn antelope, deer, and moose would continue to be allowed on 59% of the refuge (see figure 7, page 31). All seasons coincide with the state except for the shortened moose season.</p> <p>No trapping would be permitted on the refuge.</p> <p>Commercial guiding would continue to be prohibited.</p>	<p><i>Same as alternative A except:</i></p> <p>Big game hunting boundaries would be modified and expanded to eliminate boundary confusion, address law enforcement issues, and to expand current big game hunting opportunities (see figure 8, page 34).</p> <p>Moose hunting seasons would follow state regulations.</p> <p>To address illegal road hunting, no big game hunting would be permitted within 50 yards from the centerline of any county or refuge road.</p> <p>Other wildlife-dependent recreational activities would be permitted in areas closed to hunting.</p> <p>The refuge would monitor any potential conflicts between hunters and nonconsumptive visitors.</p> <p>A hunting regulations brochure would be developed to meet Service standards.</p>	<p><i>Same as alternative B except:</i></p> <p>Primitive-only hunting would be permitted (such as archery or black powder) in the central portion of the refuge east of the Lower Lake hunting boundary, south of the River Marsh, west of Upper Lake and north of South Valley Road (Red Rock Pass Road) (see figure 9, page 35).</p>	<p><i>Same as alternative C except:</i></p> <p>All moose hunting would be eliminated on the refuge.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Hunting—Environmental Consequences			
<p>Refuge hunting would continue at current levels and areas. The current hunting boundaries would continue to limit additional hunting opportunities and be confusing to hunters, increasing violations and making enforcement difficult.</p>	<p><i>Same as alternative A, except:</i></p> <p>Hunting area boundary changes would simplify hunting area boundaries and reduce road hunting, while providing additional hunting acres.</p> <p>Opening additional areas to big game hunting would disperse ungulates that become unnaturally concentrated in protected areas, impacting refuge habitats.</p> <p>Nonconsumptive visitors will be provided opportunities to safely conduct wildlife observation and other activities during hunting seasons.</p> <p>There would be a reduction in browsing impacts on habitat because ungulates would become more dispersed throughout the refuge.</p> <p>The hunting brochure would assist hunters in identifying areas open to hunting and in understanding refuge regulations.</p>	<p><i>Same as alternative B, except:</i></p> <p>Primitive-only hunting would offer additional opportunities and a quality hunting experience for primitive weapon hunters.</p>	<p><i>Same as alternative C, except:</i></p> <p>Moose might be less dispersed than they would if hunting is allowed.</p> <p>An increase in the moose population would negatively impact a wide variety of species that use willow habitats, including migratory birds and the moose themselves. This impact may increase as moose become concentrated on the newly-created closed area during the hunting season.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Fishing—Management Actions			
<p>Fishing would continue to be permitted on Odell, Red Rock, and Elk Springs creeks (west of Elk Lake Road) under state seasons. Other refuge ponds and creeks would remain open seasonally (July to October 1).</p> <p>Shambow Pond would remain closed to all visitor services.</p> <p>Motorized watercraft would continue to be prohibited east of the Lower Lake structure.</p> <p>The refuge would continue to not stock fish.</p> <p>Commercial guiding would remain prohibited.</p>	<p><i>Same as alternative A except:</i></p> <p>All refuge streams would be open to fishing in compliance with state and refuge regulations.</p> <p>The staff will work with the state and neighboring landowners to address impacts to off-refuge Arctic grayling habitat upstream of the refuge.</p> <p>Until Arctic grayling are restored, MacDonald, Widgeon, and Culver ponds would be open under state regulations to fishing from the bank, but closed if necessary to protect nesting swans and Arctic grayling.</p> <p>A fishing brochure would be developed, meeting Service standards.</p> <p>To protect native Arctic grayling and Westslope cutthroat populations, visitors would be encouraged to keep all nonnative fish they catch in accordance with state regulations.</p> <p>Red Rock Creek west of the Lower Lake structure would be opened to fishing.</p>	<p><i>Same as alternative B, except:</i></p> <p>To protect spawning Arctic grayling, the fishing season would be shortened. Fishing would be open on refuge streams where currently allowed (Odell, Red Rock, and Elk Springs creeks) on June 15 in accordance with state regulations.</p> <p>Tom Creek, and MacDonald and Culver ponds would be opened to fishing on June 15.</p> <p>Grayling Creek, Widgeon Pond, and east Shambow Creek would be opened to fishing on July 15.</p>	<p><i>Same as alternative C.</i></p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Fishing—Environmental Consequences			
<p>Visitors would continue to enjoy the limited fishing opportunities in the current areas and seasons.</p> <p>Protection would be provided to breeding birds on a majority of the wetlands within the refuge.</p>	<p><i>Same as alternative A, except:</i></p> <p>There would be increased fishing opportunities on creeks within the refuge.</p> <p>A fishing brochure would provide a clearer understanding of regulations at fishing access points.</p> <p>There may be an increase in wildlife disturbance.</p> <p>Nonnative fish populations would be reduced, which may benefit native fish species.</p>	<p>Delaying the opening of creek fishing on the refuge may provide for better protection of Arctic grayling spawning areas.</p> <p>By designating a shorter fishing season (different from state seasons) there would be a need for increased law enforcement to ensure these special restrictions are being followed.</p>	<p><i>Same as alternative C.</i></p>
Wildlife Observation and Photography—Management Actions			
<p>Wildlife observation and photography would continue to be permitted with seasonal closures (including various refuge roads and trails) to protect sensitive wildlife values. A year-round closure would continue to exist at Shambow Pond.</p> <p>Some trails would continue to be unidentified on a visitor services map.</p> <p>Trailhead parking would remain insufficient.</p>	<p>Wildlife observation and photography opportunities would be maintained during hunting seasons using boundaries.</p> <p>The east portion of the refuge would be open to year-round foot travel. Culver Springs Road would be opened May 15 to December 2, or when weather permits, to allow for wildlife observation and photography.</p> <p>To eliminate confusing regulations, all designated refuge roads would be open to vehicles from May 15 to December 2. All roads may be closed at anytime due to weather conditions. The only exception is Widgeon Pond Road which would be closed until July 15 to minimize disturbance to nesting swans.</p>	<p><i>Same as alternative B, except:</i></p> <p>The east portion of the refuge would be opened June 15 to coincide with the opening of fishing on the refuge.</p>	<p>Refuge trails would not be designated or maintained, and off-trail wildlife observation and photography would be promoted.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
	<p>An auto tour route, including Culver Springs Road, would be developed for wildlife observation. This would require replacing Red Rock Creek bridge.</p> <p>The refuge would work with Beaverhead County to provide accessible pulloff(s) for the safe viewing of wildlife and photography. The site would be interpreted through the auto-tour brochure and minimal signage.</p>		
Wildlife Observation and Photography—Environmental Consequences			
<p>A lack of year-round access, a lack of designated trails and blinds, and unmarked trails, would result in missed opportunities for visitors to view and photograph wildlife.</p>	<p>Expanding and providing year-round access to designated interpretive trails would create more opportunities for visitors of all abilities to view and photograph wildlife.</p> <p>Expanded trail use and designation may increase disturbance to wildlife.</p> <p>An auto tour route would provide additional interpretive opportunities and make wildlife observation and photography available to visitors of all abilities. Increased use of this road may cause some limited disturbance to wildlife. There would be initial costs associated with replacing the Red Rock Creek bridge.</p>	<p><i>Same as alternative B, except:</i></p> <p>There would be fewer wildlife-viewing opportunities in the eastern portion of the refuge.</p> <p>Coinciding permitted access to this portion of the refuge with the late fishing season (June 15) would assist law enforcement officers in enforcing the limited fishing season.</p>	<p>A lack of designated trails would make it difficult for visitors to explore and orient themselves to the refuge for the purposes of viewing and photographing wildlife.</p> <p>There would be no accessible refuge trails.</p> <p>A lack of designated trails would provide visitors with a more “wilderness” experience.</p> <p>There would be increased disturbance across a wider area of the refuge because visitor use would not be focused on specific trails or areas of the refuge.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Environmental Education—Management Actions			
<p>Due to the refuge's remote location, the environmental education program would continue to be opportunistic as time and staff allows. Student groups would continue to not visit the refuge due to road conditions and distance.</p> <p>No current staff would be dedicated to environmental education.</p> <p>There would continue to be no refuge-specific programs or events for students or adults.</p>	<p><i>Same as alternative A.</i></p>	<p>The refuge website would be expanded to include educational tools, including Centennial Valley resource information, classroom projects, and online exercises.</p> <p>On-site summer educational programs would be offered to schools.</p> <p>Environmental education kits would be developed to address conservation of the Centennial Valley resources that meet teacher curriculum needs.</p> <p>Educational programs for adults would be developed for visitors and surrounding neighbors and communities on the values of the refuge resources and importance of conserving these and the resources of the Centennial Valley.</p>	<p><i>Same as alternative A.</i></p>
Environmental Education—Environmental Consequences			
<p>There would be a continual loss of opportunities to educate youth and adults in surrounding areas about the unique resources in the Centennial Valley and why it should be conserved and protected.</p>	<p><i>Same as alternative A.</i></p>	<p>Students in the surrounding communities would have opportunities to learn about the refuge resources, the refuge system, and the importance of conserving the Centennial Valley and other resources in Montana.</p> <p>Providing information to the surrounding landowners and communities on the value and importance of conserving the Centennial Valley would lead to an increase in</p>	<p><i>Same as alternative A.</i></p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
		conservation efforts on surrounding lands. This could reduce off-refuge impacts to the refuge’s resources.	
Interpretation—Management Actions			
<p>Interpretive panels and maps would continue to be updated in the visitor center as funding allows. Kiosks and signs would remain outdated and in insufficient quantities to reach visitors. Refuge brochures would not meet Service standards. There would continue to be no established interpreted trails or auto tour routes.</p>	<p>A comprehensive exhibit One temporary seasonal visitor services specialist would be recruited annually to develop and implement the visitor services program.</p> <p>A comprehensive exhibit package would be developed and installed in the rehabilitated visitor contact area.</p> <p>Interpretative panels for existing kiosks would be updated. More interpretive kiosks would be constructed at entry points (west entrance at Lower Lake Road, east entrance at Red Rock Creek, and the northwest corner entrance) in a design that complements the rustic nature of the landscape.</p> <p>All current and future brochures and other refuge literature would meet Service standards and consistently emphasize the refuge’s purposes and the mission of the Refuge System. All designated trails and roads would be identified.</p> <p>The visitor contact area would be staffed on weekends during months of high visitor use.</p> <p>The auto tour route would be adequately interpreted with a brochure and minimal signage that retains the primitive visitor experience.</p>	<p><i>Same as alternative B, plus the following:</i></p> <p>A full-time permanent visitor services specialist would be recruited to develop and conduct visitor services and outreach programs.</p> <p>A refuge-specific portable exhibit would be developed.</p> <p>There would be annual events surrounding refuge week, international migratory bird day, fishing week, and other events.</p> <p>A video would be developed highlighting the refuge resources and the values of the Centennial Valley.</p>	<p>Interpretation would be concentrated at the visitor contact station, refuge, and on the web, using limited signage and focusing on naturally functioning ecosystems.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
	Refuge signage would ensure that all visitors are oriented and understand refuge-specific regulations.		
Interpretation—Environmental Consequences			
There would continue to be missed opportunities to educate refuge visitors and garner support and understanding of the refuge's purposes and current programs.	This up-to-date, expanded, and comprehensive interpretive program would reach additional visitors, enhancing their appreciation for and understanding of the resources of the refuge and Centennial Valley. Updating and installing additional signage may affect some visitors' wilderness experience. The refuge visitor services program would better orient visitors to the refuge and more effectively teach them about the values and purposes of refuge resources.	<i>Same as alternative B, including:</i> Full-time staff, a portable refuge exhibit, video, and expanded website would reach a larger number of individuals. Annual events would build a constituency who have a greater understanding of the refuge's resources and programs, the values of the Centennial Valley and the Refuge System.	Minimal interpretive signage and limiting interpretation to the visitor contact station would preserve a more wilderness setting, but only a minimum number of visitors would independently understand and be oriented to the refuge and its resources.
Outreach—Management Actions			
The outreach program would continue to be opportunistic as time and staff allows. No current staff would be dedicated to outreach.	Through the addition of added staff the refuge would be able to greatly expand it's outreach program. An outreach section would be included in the refuge's visitor services plan.	<i>Same as alternative B, including:</i> Outreach methods and materials would be developed for user groups and congressional staffers, outlining the refuge's purposes and issues. Outreach methods would be expanded to ensure that local governments, surrounding communities, visitors, and neighbors better understand the refuge programs and issues, and the values of conserving the resources of the Centennial Valley.	<i>Same as alternative A.</i>

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<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Outreach—Environmental Consequences			
<p>Having no organized, concerted outreach program would continue to result in a lack of support and understanding of Red Rock Lakes as part of the Refuge System.</p> <p>There would be a potential loss of partnerships to carry out mutually beneficial projects.</p>	<p>Added staff would provide more time and opportunities to interact with refuge neighbors, surrounding communities, governments, and other partners.</p> <p>Expanding outreach may result in providing stakeholders a better understanding of refuge programs and issues resulting in additional support and partnerships for the conservation of the resources of the refuge and the Centennial Valley.</p>	<p>A more systematic outreach program would result in strengthening current partnerships and developing new partnerships, garnering support for refuge programs while addressing refuge issues.</p> <p>There would be a greater understanding and level of support of the refuge and the protection of the resources of the Centennial Valley.</p>	<p><i>Same as alternative A.</i></p>
Campgrounds—Management Actions			
<p>Two primitive campgrounds would be retained, providing up to 14 sites, including two outhouses at each campground, fire rings, and some picnic tables.</p>	<p><i>Same as alternative A, except:</i></p> <p>Campground tables, fire rings, and access roads would be improved.</p> <p>An accessible camp site would be developed at the River Marsh campground. The current accessible site at Upper Lake would be improved.</p> <p>Two outhouses, one at each campground, would be replaced and designed to meet requirements of the Americans with Disabilities Act, including accessible parking and access routes.</p> <p>A recreational fee would be charged to help offset the maintenance of the campgrounds.</p>	<p>The River Marsh campground would be eliminated.</p> <p>The outhouse at Upper Lake campground would be replaced and made universally accessible.</p> <p>The current accessible site at Upper Lake campground would be improved.</p>	<p>Both campgrounds would be closed.</p>

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<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
Campgrounds—Environmental Consequences			
<p>Refuge campgrounds would continue to provide visitors the opportunity to enjoy wildlife-dependent recreational activities on extended stays without excessive driving on minimally-maintained roads.</p> <p>The Upper Lake campground would continue to have an inaccessible outhouse and the campground at River Marsh would continue to be inaccessible.</p>	<p><i>Same as alternative A, except:</i></p> <p>Rehabilitating the refuge campsites would improve the enjoyment and safety of visitors of all abilities using the campgrounds to explore the refuge for multiple days.</p>	<p>Closing one campground would result in fewer opportunities for visitors to enjoy extended stays on the refuge, particularly during high-use periods such as holidays, weekends, and opening of hunting seasons.</p>	<p>Closing the refuge campgrounds would eliminate extended stays on the refuge. Due to the long driving distances, visitor services programs would have to be adapted to half-day activities only.</p> <p>Closing the campgrounds would have the greatest effect on hunters who typically hunt from sunrise to sundown.</p> <p>There would be an increase in road traffic as visitors drive from distant areas to enjoy wildlife-dependent opportunities such as wildlife viewing, fishing, and hunting.</p>
Cultural Resources—Management Actions			
<p>Several historical properties exist on the refuge. The refuge would continue maintaining historical properties that are in use.</p> <p>A cultural resource interpretive panel would be installed at Shambow Way Station, as already planned, budgeted, and approved.</p> <p>Cultural resource evaluations would be done to fulfill compliance with historical preservation laws.</p>	<p><i>Same as alternative A, including:</i></p> <p>Through partnerships, the refuge would expand on current cultural resource inventories in high probability areas.</p> <p>The visitor contact area would contain additional interpretation of the cultural resources of the refuge and Centennial Valley.</p>	<p><i>Same as alternative B, except:</i></p> <p>The refuge would actively pursue partnerships to conduct a more comprehensive survey to identify, evaluate, and develop management plans for all cultural resources on the refuge.</p>	<p><i>Same as alternative B.</i></p>
Cultural Resources—Environmental Consequences			
<p>Cultural resources that would be potentially affected by an undertaking are identified and, if significant, preserved when possible.</p>	<p>Increasing the refuge knowledge and understanding of the cultural history of the refuge and Centennial Valley would aid in planning and research.</p>	<p><i>Same as alternative B, including:</i></p> <p>The addition of a comprehensive survey would further aid in planning and research by identifying all sensitive areas.</p>	<p><i>Same as alternative B.</i></p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
<p>There would be minimal interpretation of refuge cultural resources.</p> <p>The refuge would not have a comprehensive understanding of where cultural resources exist, making it more difficult to protect these areas.</p>	<p>Refuge visitors would have a greater understanding of the history and cultural resources of the refuge and Centennial Valley.</p>		
<p>Refuge Operations Goal</p> <p>Prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, and volunteer programs.</p>			
<p>Staff and Funding—Management Actions</p>			
<p>The refuge would continue to be managed by the existing five permanent full-time staff, including a refuge manager, refuge operations specialist, wildlife biologist, maintenance worker, and administrative support assistant.</p> <p>There would be no on-site law enforcement staff.</p> <p>The refuge would provide accommodations for two volunteers, who will be able to complete about 700 hours per year.</p>	<p>A permanent seasonal maintenance worker would be recruited.</p> <p>One permanent full-time wildlife biologist, one full-time range technician, and at least three temporary seasonal biological science technicians would be recruited to implement a science-based comprehensive biological program.</p> <p>One temporary seasonal visitor services specialist would be annually recruited to develop and carry out the visitor services programs.</p> <p>One temporary seasonal office assistant (generalist) would be recruited.</p> <p>Given the proposed expansion of refuge program, the grade levels of current staff positions would be evaluated.</p> <p>One refuge staff person would be required to maintain law enforcement credentials.</p>	<p><i>Same as alternative B, except:</i></p> <p>A full-time permanent visitor services specialist would be hired to expand, develop, and carry out the refuge's visitor services program.</p>	<p><i>Same as alternative B, except:</i></p> <p>The refuge would not recruit a seasonal visitor services specialist.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
	Talented and enthusiastic volunteers would be recruited to perform approximately 3,000 hours of work per year to support all refuge programs.		
Staff and Funding—Environmental Consequences			
<p>The current staffing and discretionary funding would continue to limit the refuge’s ability to conduct adaptive resource management and provide expanded wildlife-dependant recreation opportunities, and maintain current facilities.</p> <p>With no on-site law enforcement staff, violations would continue to occur without consequence.</p>	<p>The condition of facilities would improve and only require routine maintenance instead of major repairs.</p> <p>The refuge’s ability to understand and conduct necessary management actions and monitor results would be expanded.</p> <p>The seasonal visitor services specialist would develop limited on-site interpretive programs that would result in increasing visitor’s knowledge and appreciation of the refuge and its resources.</p> <p>Upgrading refuge positions would recruit experienced staff that would effectively lead the development of these expanded refuge programs.</p> <p>Additional volunteers would assist the refuge in expanding biological, maintenance, and visitor services programs.</p>	<p><i>Same as alternative B, except:</i></p> <p>The refuge visitor services programs, including outreach, interpretation, and environmental education, would be greatly expanded. This would allow the refuge to interact and educate the maximum number of children and adults. This would result in garnering support for the refuge and its mission of preserving the unique qualities of the Centennial Valley.</p>	<p><i>Same as alternative B, except:</i></p> <p>Visitor services programs would be maintained at the current level.</p>
Facilities and Maintenance—Management Actions			
<p>The refuge would continue to develop interpretive displays at the recently upgraded office and visitor contact area.</p> <p>Four refuge houses would be maintained for four of the five existing refuge staff. These</p>	<p><i>Same as alternative A, except:</i></p> <p>Up to four residences would be constructed for current and future staff.</p> <p>Three trailer pads would be constructed to recruit and provide lodging for seasonal volunteers.</p>	<p><i>Same as alternative B, except:</i></p> <p>Up to five residences would be constructed for current and future staff.</p>	<p><i>Same as alternative A, except:</i></p> <p>Up to four residences would be constructed for current and future staff.</p> <p>Three trailer pads would be constructed to recruit and provide lodging for seasonal volunteers.</p>

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<p>houses are necessary due to the lack of available housing surrounding this remote refuge.</p> <p>The refuge bunkhouse would continue to be maintained for seasonal biological and fire staff.</p> <p>One maintenance shop and the historical log barn would be upgraded to meet safety and workplace standards.</p> <p>Directional, boundary, and entrance signs would remain insufficient or in poor condition.</p>	<p>Parking would be improved at the headquarters, Odell Creek trailhead, and the entrance to Lower Lake Road and Sparrow Pond Trailhead.</p> <p>The old vault toilets at the campgrounds would be replaced to meet requirements of the Americans with Disabilities Act. The campgrounds would also have accessible parking and routes to all restrooms.</p> <p>An accessible boat launch would be provided at Lower Lake for persons with disabilities (hardened surfaces would be provided for both access and use).</p> <p>Interpretive trails, an auto tour route, kiosks, and viewing areas would be developed to expand wildlife observation and photography opportunities. The Red Rock Creek bridge would be replaced to allow for the development of the auto tour route.</p> <p>Directional and boundary signs would be updated to ensure all visitors are oriented.</p> <p>Boundary signs would be replaced with the simply stated "Refuge Boundary" language to ensure visitors feel welcome.</p> <p>Sparrow Pond Trail Bridge at Odell Creek would be replaced to provide safe access for foot traffic and heavy equipment to maintain dams.</p>		<p>Only those roads and trails necessary for administrative use would be maintained. All other roads and trails would be restored.</p> <p>All campground facilities would be removed.</p> <p>Idlewild Road (and the associated boat ramp) and the north entrance spur roads would be permanently closed to public vehicle access to reduce maintenance costs.</p>

Table 4. Summary of alternatives for the comprehensive conservation plan, Red Rock Lakes National Wildlife Refuge.

<i>Alternative A (Current Management)</i>	<i>Alternative B (Proposed Action)</i>	<i>Alternative C (Wetland Restoration)</i>	<i>Alternative D (Ecological Restoration)</i>
	<p>The road and parking area at Upper Lake campground would be rehabilitated.</p> <p>Idlewild Road (and the associated boat ramp) and the north entrance spur roads would be permanently closed to public vehicle access to reduce maintenance costs.</p>		
Facilities and Maintenance—Environmental Consequences			
<p>Inadequate housing would continue to make it difficult to recruit additional staff needed to keep up with the maintenance backlog, demand for visitor services, law enforcement issues, and support for the biological program.</p> <p>Inadequate signage would continue to make it difficult for visitors to find and navigate around refuge.</p>	<p>Improved facilities, signage, and accessibility would provide visitors of all abilities with improved access to refuge resources and improve the interpretation and professional appearance of the refuge.</p> <p>Additional housing would address minimal staff housing needs and facilitate the expansion of refuge management and visitor services programs.</p> <p>Additional visitor services facilities would better orient visitors of all abilities and enhance their safety and enjoyment while visiting the refuge.</p> <p>Closing selected roads would result in the loss of vehicle access to one boat ramp. There would only be a minimal loss of direct access to refuge lands and waters due to the availability of alternate routes.</p>	<p><i>Same as alternative B, except:</i></p> <p>The ability to house even more staff, would allow the refuge’s visitor services, biological monitoring, law enforcement, and maintenance programs to be expanded.</p>	<p>There would be a reduction in visitor services facility maintenance costs.</p> <p>There would be little focus on accommodating visitors that were unable to hike off-trail. This and the loss of the refuge campgrounds would result in a substantial decrease in visitor use on the refuge.</p> <p>A wilderness and backcountry experience would be promoted.</p> <p>Additional housing would address minimal staff housing needs and facilitate the expansion of refuge management and visitor services programs.</p> <p>Closing selected roads would result in the loss of vehicle access to one boat ramp. There would only be a minimal loss of direct access to refuge lands and waters due to the availability of alternate routes.</p>

4 Affected Environment



Mike Parker/USFWS

Staff working with neighboring landowners to conduct sage grouse surveys on their lands.

This chapter describes the characteristics and resources of the Red Rock Lakes National Wildlife Refuge. It specifically addresses physical, biological, cultural, and socioeconomic resources, as well as recreational opportunities.

4.1 PHYSICAL ENVIRONMENT

The following sections describe physical environmental resources that may be impacted by the implementation of the CCP. Physical characteristics include climate, physiography, geography, soils, water resources, and the effects of global warming.

CLIMATE

The climate in the Centennial Valley is characterized by long, cold winters and short, mild summers. Climatic data have been collected by refuge staff at Lakeview, Montana (6,690 feet mean sea level) since July 1, 1948. The data presented below was analyzed through December 31, 2005. This data was submitted to and compiled by the National Oceanic and Atmospheric Administration—Western Regional Climate Center. Information and data (such as precipitation and temperature) presented below are based on this long-term dataset as analyzed by refuge staff.

Annual precipitation is highly variable, both temporally and spatially, in the Centennial Valley.

Mean annual precipitation at Lakeview, Montana, is 19.69 inches (range: 10.26 inches in 2002 to 27.0 inches in 1970). Mean annual precipitation has declined significantly between 1948 and 2005 (figure 11). In addition, precipitation in the months of December and January has declined significantly during this same time period (figure 11); no other months showed statistically significant changes in precipitation. May and June are typically the wettest months. Precipitation during these months comprises 27% of the annual average.

Air temperature is similarly variable throughout the Centennial Valley. Mean annual air temperature at Lakeview, Montana is 34.8 degrees Fahrenheit (°F) (range: 31.49° in 1985 to 37.68° in 1981) (figure 12). January is typically the coldest month (mean air temperature 11.21°F) and July is the warmest month (mean air temperature 58.59°F). Mean annual air temperature between 1948 and 2005 did not change significantly. However, mean temperatures in March and April have increased significantly (figure 12); no other months showed significant changes during this time period. This indicates that spring temperatures are warmer sooner than in recent decades. The statistically significant increase in March and April temperatures may be an indication of the climate change being documented globally.

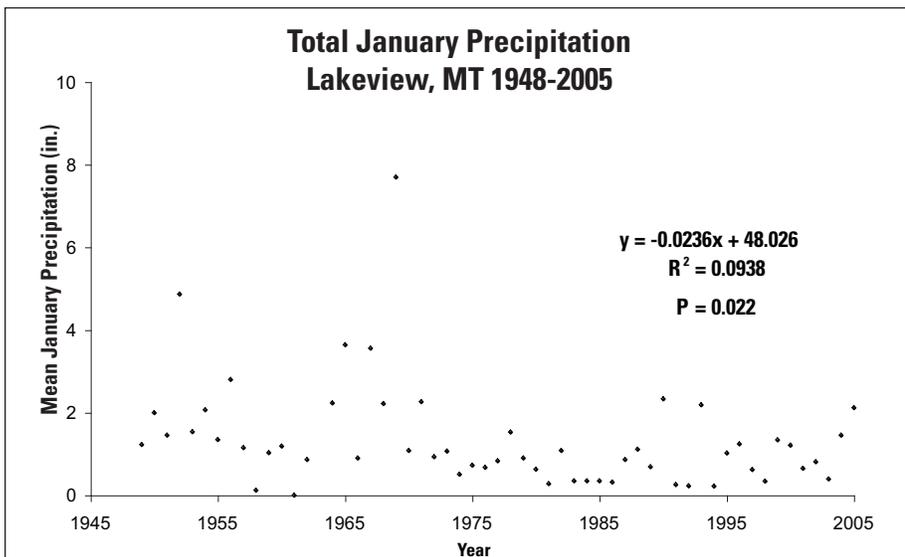
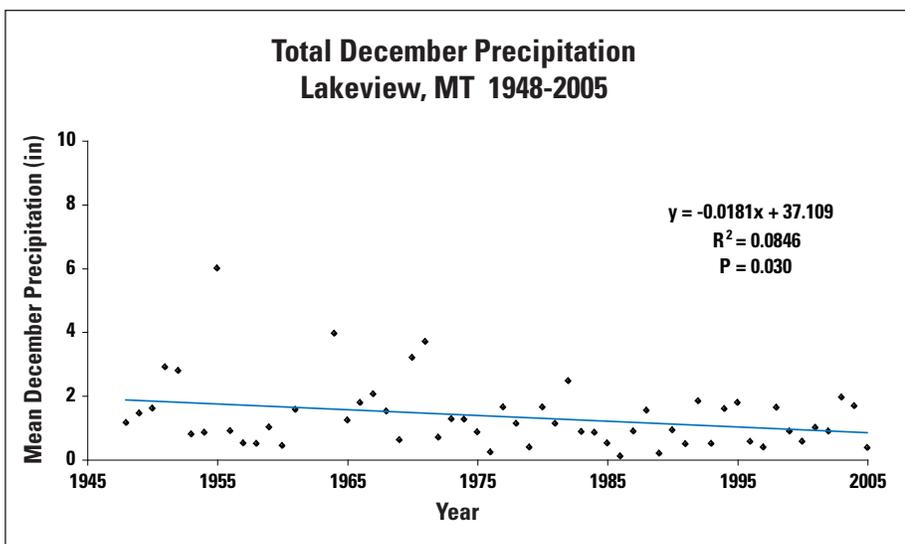
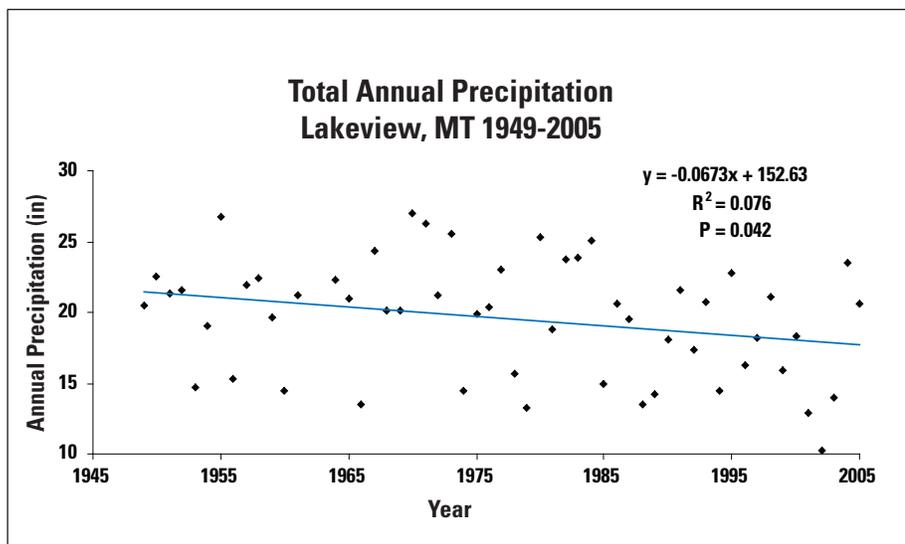


Figure 11. Significant declines in annual, December, and January precipitation totals between 1945 and 2005. (Service data)

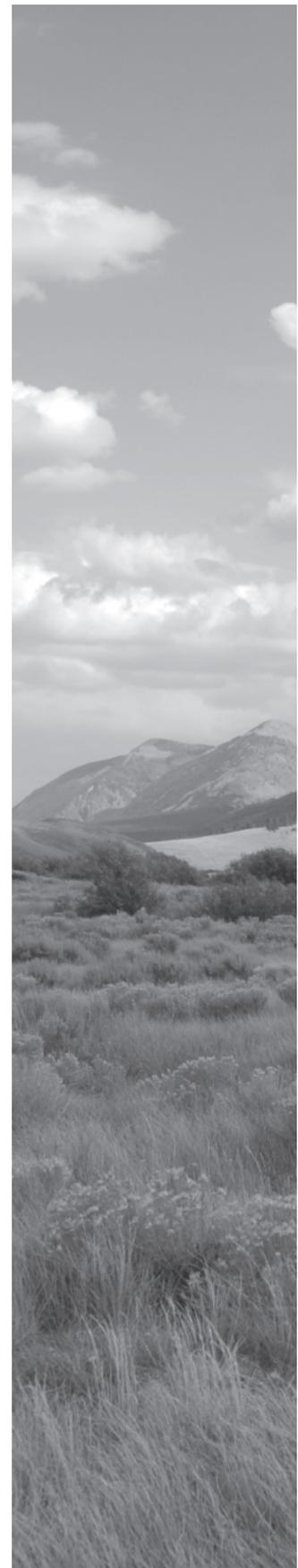
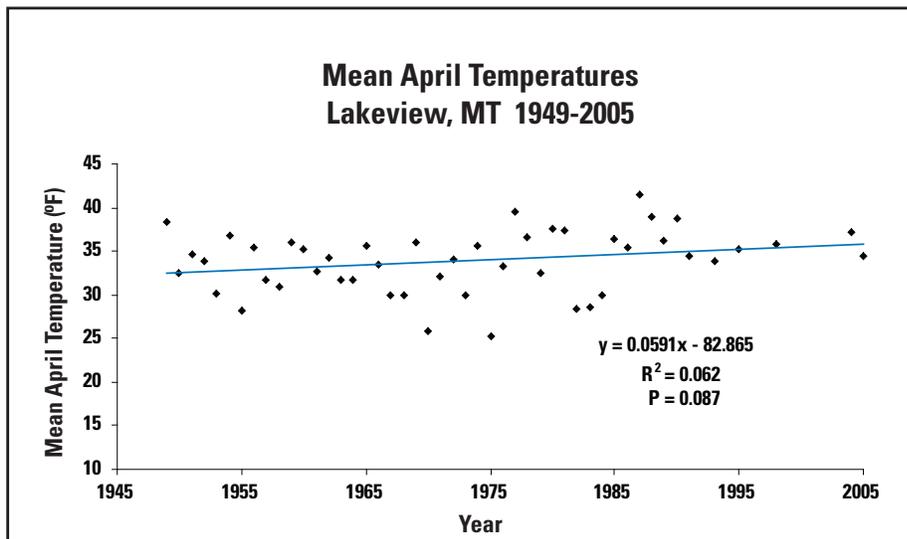
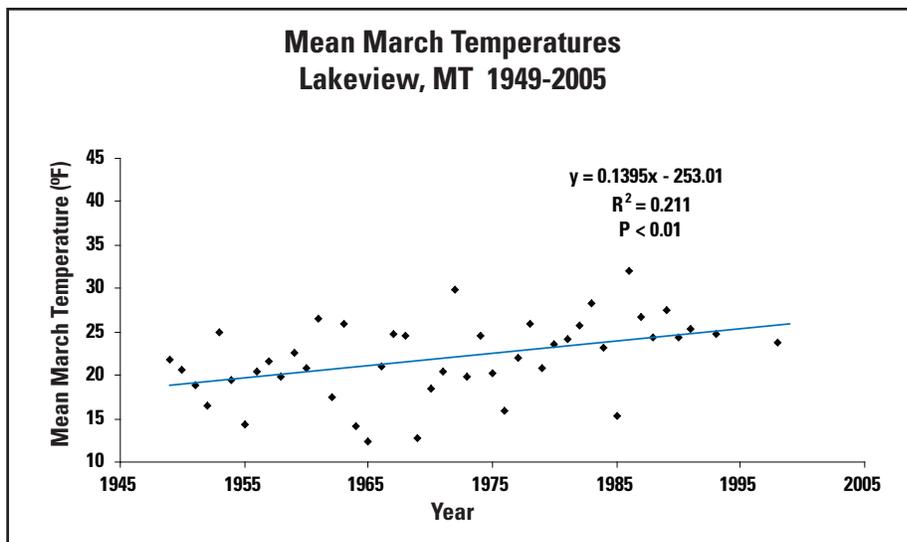
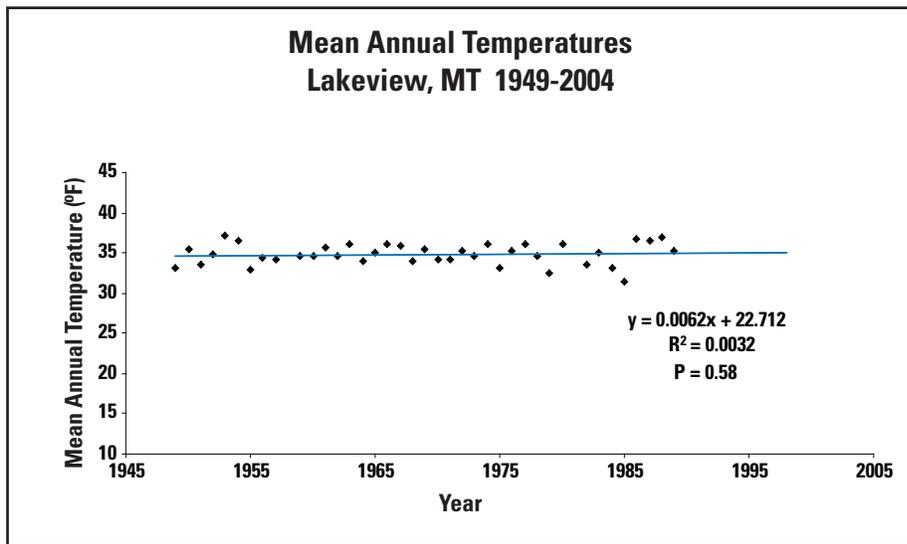


Figure 12. Mean annual, March, and April air temperatures at Lakeview, Montana, between 1949 and 2005. Significant increases are shown for the months of March and April. (Service data)

PHYSIOGRAPHY AND GEOLOGY

The information contained in this section was taken from “Centennial Valley 1820–1930 Volume 1” (Centennial Valley Historical Society 2006) and information obtained from Dr. Ken Pierce. A detailed geologic history of the Centennial Valley Region was written by Mr. Rob Thomas for the Centennial Valley Historical Society. Portions of Mr. Thomas’ narrative are re-written here with the permission of the Centennial Valley Historical Society.

The Centennial Mountains and the adjacent Centennial Valley are very recent topographic features that formed from extension and uplift of the earth’s crust over the last 2 million years. The crust of the earth in the Centennial region was heated, causing it to rise, spread, and crack into mountains and valleys. The resulting uplift of the land (and formation of the Centennial Mountains) has exposed rocks that record over 2.5 billion years of Earth history.

The oldest rocks exposed in the Centennial region are metamorphic and igneous rocks (known by geologists as “basement” rocks) that formed from the high pressures and temperatures produced by collisions of continents between 2.7 and 1.7 billion years ago (Archean and early Proterozoic Eons) (O’Neill and Christiansen 2002). Roughly during this time, the Centennial region was part of an area geologists call the Dillon Block. The basement rocks of the Dillon Block continued to erode until about 600 million years ago (late Proterozoic Eon). At this time, the western part of the North American continent began to break apart to form a new ocean basin.

Approximately 520 million years ago (Cambrian period), a global sea-level rise flooded the Centennial region with shallow water, covering the eroded basement rocks with oceanic sedimentary deposits. During the Cambrian period, the North American continent was located near the Earth’s equator; as such, the water was tropical and teemed with animal and plant life. The hard shells of the organisms that lived in these waters were buried and cemented together to form thousands of feet of sedimentary rock called limestone. This limestone can be observed today on the steep light-colored walls on the north-facing side of the Centennial Mountains.

Over the next 320 million years, fluctuations in sea level caused the deposition of marine and nonmarine sediment in the Centennial region. The intermittent tropical waters that covered the Centennial region finally withdrew about 200 million years ago (Jurassic period). Marine and nonmarine deposition resumed again during the remainder of the Mesozoic era, but the marine waters were contained in an interior seaway that was north/south trending (connecting the Gulf of Mexico to the Arctic Ocean). The mountains along the western margin of this interior

seaway consisted, in part, of a chain of volcanoes. The collision of the continental crust and the Pacific Ocean floor caused the production of liquid rock (magma and lava) in a process called subduction.

Approximately 80 million years ago (Cretaceous period), the sedimentary rocks that were deposited above the basement rocks were compressed by this collision between the continental crust and the Pacific Ocean floor, forming features known as thrust faults. In the Centennial region, the basement rocks were also included in this folding and faulting, which helped to expose these deeply buried rocks at the surface. As the compression continued during the Cretaceous period, streams and alluvial fans carried gravel eastward away from the mountains and toward the interior seaway. The mountains also migrated eastward over time, causing the gravel to be buried and crushed by the weight of the overlying rock. The weight of the moving mountains caused the cobbles to be cemented back together—geologists call these deposits the Beaverhead Group. The deposits are well exposed near Lower Red Rock Lake.

The last 50 million years (Cenozoic era) marks a transition from compression to extension of the Earth’s crust and ultimately the formation of the valley (or basin) and range topography that are the Centennial Valley and Centennial Mountains today. This formation of the valley and range topography of the Centennial region started at least 17 million years ago (Miocene Epoch). This type of topography is formed when the crust of the Earth rises and is pulled apart or extended to form linear mountains and valleys along high-angle fractures in the crust called normal faults. The Odell Creek Fault is an example of a normal fault in the Centennial Valley.

Over the last 4 million years, westward movement of the North American continent caused the Yellowstone hot spot to move eastward and formed west to northwest trending mountains, like the Centennial Mountains (Sears and Fritz 1998; Thomas et al. 2000). The Centennial Mountains present today may have started to uplift as recently as 2 million years ago (Pliocene Epoch). The timing of the uplift is constrained by the Huckleberry Ridge Tuff, a ground-hugging volcanic ash flow that erupted from the Yellowstone and Island Park area around 2.05 million years ago (Christiansen 2001, Lanphere et al. 2002). The distribution pattern of this particular ash flow suggests that the Centennial Mountains could not have existed at the time of the eruption. As a result, the Centennial Mountain range has probably risen over 5,000 feet in the last 2.0 million years (Sonderregger et al. 1982). The faults in the area remain active today, with an average of 40 earthquakes recorded each year in the Centennial Valley (Stickney, personal communication. through Mr. Thomas, 2006).

The topography of the Centennial region was significantly modified by glacial action over the last 200,000 years (Pleistocene Epoch). Alpine glaciers deeply eroded the mountains to produce the rugged landscape of the high country and deposited glacial outwash gravels that built large alluvial fans along the northern flank of the Centennial Mountains (for example, the Odell Creek alluvial fan) (O'Neill and Christiansen 2002).

The Red Rock lakes are pluvial lakes (formed from rainfall) that formed during the last glacial period due, in part, to increased moisture. The lakes have shrunk as the climate became warmer and drier during the last 10,000 years. As the sandy shorelines of the lakes became exposed, the sand was windblown into sand dunes, forming the sandhills area in the northeast corner of the Centennial Valley. Hot springs activity in the valley is the result of groundwater that is heated by the high geothermal gradient in the area. The heated groundwater migrates to the surface following active faults. During this glacial period, the valley was home to an array of Pleistocene mammals, including mammoths, camels, bison, horses, and saber-toothed cats. Many of these animals went extinct near the end of the Pleistocene Epoch. The first humans were in the valley by at least 10,500 years ago, as shown by radiocarbon dating of artifacts found in the valley (Albanese et al. 1995).

SOILS

Information contained in this section is taken from a soil survey that was conducted by the Soil Conservation Service in cooperation with the Red Rock Lakes National Wildlife Refuge. The survey was completed in 1965.

Characteristics of the soils on the refuge are extremely varied due to changes in parent material, vegetation, and the effect of climatic forces such as wind, water, and ice. Topography and time have also had important influences. Soils range in texture from loamy sand in the Breca series to heavy clay of the Castle series. The better drained soils on the fans are predominately loamy-textured containing variable amounts of gravel, cobble and stone. Soils in the glaciated and mountainous region vary considerably in depth and have a high percentage of rock fragment in the profile. The soil in the Centennial Mountains east of the Odell Creek drainage consists principally of carbonitic mineral. The mountainous area west of Odell Creek is both igneous and sedimentary in origin, and the soils are more clayey with less lime carbonate. The soils north of the Red Rock lakes become more sandy and have considerably less gravel in the profile.

Eleven soil association descriptions were developed for the Red Rock Lakes National Wildlife Refuge as reported in the 1965 soil survey report.

Group 1. Peat and Marsh associations:

These are very poorly drained soils on the bottomlands that lie adjacent to the open water areas and live streams. These are represented in the soils survey by marshland, peat and muck, Centennial clay, and alluvial lands and have a 5–12 inch layer of peat over a clay mineral soil that is strongly gleyed (greenish-gray in color and oxygen-deprived due to high water content).

Group 2. Lamoure and Ching associations:

These are imperfectly to poorly drained soils on the bottomlands that are not as wet as the soils in group 1. The soils are deep and vary in texture from clay to sandy loam. They are calcareous (consisting of or containing calcium carbonate), slightly to moderately alkaline, and have water tables within moderate depths of 2–5 feet from the surface. The soils common to this group are Bug sandy loam, Centennial clay, Ching loam, and Lamoure loam.

Group 3. Arvada and Beckton associations:

These are imperfectly drained saline-alkaline soils that occur on the bottomlands but usually occupy a slightly higher position than the associated soils in groups 1 and 2. The soils are fine-textured and have a high sodium saturation at shallow depths, which makes them strongly alkaline and toxic to many plants. Strong columnar or prismatic structure in the subsoil is common to these sodic soils (containing sodium). They are frequently found in complex with many of the imperfectly drained soils in group 2.

Group 4. Breca and Breece associations:

These are well-drained sandy soils that occupy the fans and dune topography to the north of the Red Rock lakes. The majority of the soil is loamy sand in texture and erodes very easily if not protected with vegetative cover. They are rapidly permeable and responsive to light showers.

Group 5. Sangrey and Big Elk associations:

These are well-drained soils that occupy the footslopes and fans at the base of the Centennial Mountains. They are predominately loamy-textured and contain variable amounts of gravel, cobble, and stone. They are the most maturely developed of all the soils in the survey. Other soils common to this group are the Melville, Adel, and loamy type of Breece. The Adel and Breece soils are less developed than other soils in this group.

Group 6. Castle soil associations:

These are imperfectly to well-drained heavy clay soils that occupy both smooth fans and buckled or slumped landscapes in the very southwest portion of the refuge. They are limited in area and very slowly permeable.

Group 7. Hanson and Raynesford associations:

These are well-drained, high lime soils that occupy

the fans, footslopes, and glacial moraines to the south and east of Upper Red Rock Lake. They are predominately loamy textured and have a high percentage of limestone, gravel, and cobble in the profile. The Snowcrest soils in this group have a thick dark surface.

Group 8. Gilispie and Merino associations:

These are well-drained upland soils that are <20 inches deep to igneous rock (primarily Rhyolite with some Basalt scarps). They occupy moderately steep to steep rolling upland and occur in the northeast portion of the survey area, close to Elk Lake.

Group 9. Skaggs soil associations:

These are well-drained upland soils that are <20 inches deep to limestone rock and have a high percentage of rock outcrop. They occupy steep to very steep mountainous areas to the east and south of Upper Red Rock Lake.

Group 10. Loberg-Little Horn associations:

These are well-drained forest soil areas that occupy steep north-facing slopes of the Centennial Mountains. Douglas-fir and lodepole pine are the dominant tree species. The soils are predominately more than 20 inches deep and are both loamy- and clayey-textured, having variable amounts of gravel, cobble, and stone. Other soils common to this group are the Whitefish soils on the glacial moraines, Wishard, Sapphire, Carnet, and Worock series.

Group 11. Rockland areas:

These are very steep mountainous areas having more than 50% rock outcrop that occupy the steep scarps of the Centennial Mountains.

WATER RESOURCES

Surface Water Resources

The refuge is located in the upper (headwaters) end of the Red Rock River watershed. This watershed is the headwaters of the Missouri River. The refuge encompasses approximately 25,000 acres of natural, enhanced, and created wetlands. Upper and Lower Red Rock lakes have a surface water area of approximately 6,300 acres. These two lakes, along with Swan Lake and the River Marsh area, are remnants of a post-glacial lake that is believed to have covered most of the valley floor at one time (Ken Pierce, 2005, personal communication). This wetland complex has many sources of surface and groundwater inputs. Spring runoff plays an important role in the hydrology of the mountain creeks that flow into this wetland complex (see figure 13). Major sources of input into the Upper Red Rock Lake include Red Rock and Tom creeks. In addition, Elk Springs Creek (which originates from Elk and Picnic springs) ultimately provides surface water to the Upper Red Rock Lake after the water flows

through Swan Lake. The River Marsh, a wetland area that connects Upper and Lower Red Rock lakes, receives surface water input from Teepee Creek. Lower Red Rock Lake has Odell Creek as a major source of input. The outlet of the Lower Red Rock Lake, known as Red Rock River, flows west toward Lima Reservoir and eventually becomes the Beaverhead River.

Most Upper Red Rock Lake tributaries have their origins to the south at the east end of the Centennial Mountains. Red Rock Creek begins at an elevation of about 8,400 feet mean sea level (here this creek is known as Hell Roaring Creek) and flows north and west about 13 miles to the east shore of Upper Red Rock Lake. Tom Creek, about 6.2 miles long, originates at an elevation of 7,910 feet mean sea level and flows northwesterly toward its junction with the eastern shore of Upper Red Rock Lake. Picnic Creek, formerly known as Hackett Creek, originates at two large springs on the eastern boundary of the refuge. In the late 1800s, homesteaders dammed Picnic Creek, creating Culver Pond; this pond was enlarged by the refuge in 1959 to 27 acres. Widgeon Pond (132 acres), which was created by impounding Picnic Creek downstream of Culver Pond in 1964, flows into Elk Springs Creek. MacDonald Pond (5 acres) was created by impounding Elk Springs Creek near the spring heads. Elk Springs Creek flows into Swan Lake and then into the Upper Red Rock Lake.

Odell Creek, the major source of surface water input for Lower Red Rock Lake, originates at an elevation of 9,200 feet mean sea level and flows north approximately 12 miles to the east shore of the lake. Other sources of input into Lower Red Rock Lake that originate in the Centennial Mountains and flow north into the valley include Humphrey, Duff, and Matsingale creeks.

There are a few surface water inputs that flow from the north side of the Centennial Valley into this wetland complex. Teepee Creek originates on lands owned by the state of Montana and flows onto the refuge. This creek is an important source of groundwater recharge to the lands north of River Marsh (Steve Custer, Montana State University, personal communication). In addition, Metzel Creek flows into the Red Rock River just west of the Lower Red Rock Lake. This creek is also an important source to the high water table that exists north of Lower Red Rock Lake.

Water Rights Chronology

When Red Rock Lakes National Wildlife Refuge was established in 1935, with a checkerboard of acquired private land and land reserved from public domain, there were numerous notices of appropriation that had been filed in the county courthouse. Early inspection reports documented evidence of ditches and headgates built to put water to use. Apparently,

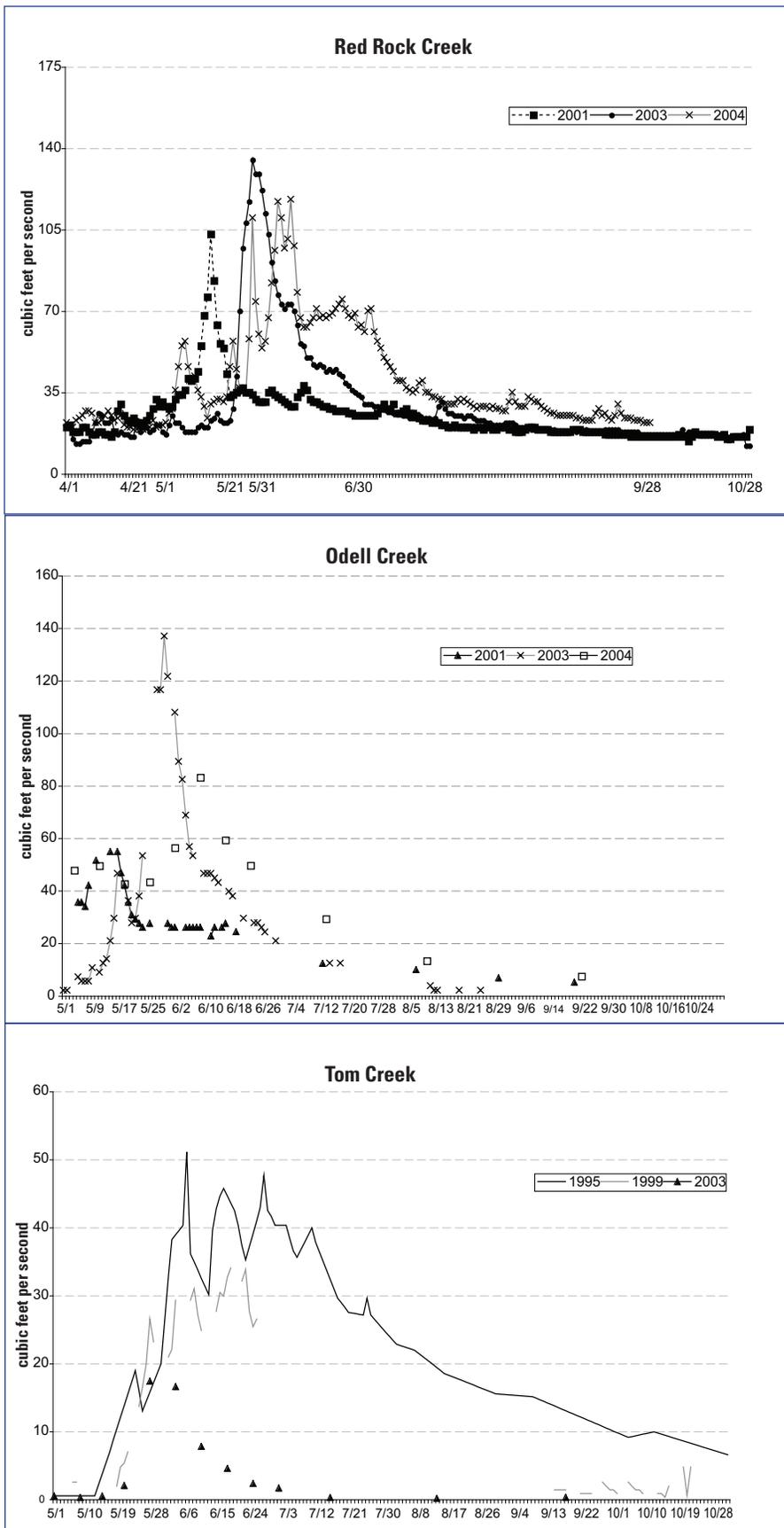


Figure 13. Representative flow rates for Red Rock, Odell, and Tom creeks at Red Rock Lakes National Wildlife Refuge. (Service data)

those facilities were allowed to deteriorate and refuge staff did not irrigate most of the areas for approximately 30 years.

In the 1960s the refuge manager and region 1 regional office engineers researched the water rights appurtenant to lands within the boundary and compiled a list of water rights (USFWS [No date]). At the same time, refuge staff began to rehabilitate the existing irrigation systems. Between 1963 and 1971 stream measurement devices were installed and points of diversion were surveyed (USFWS files). There are records of measured water use for the years 1963–1971 (USFWS files).

Most of the refuge was designated as a wilderness area in 1976. There are no records of water use for irrigation after 1973. Many of the diversion structures were removed before the actual designation of wilderness (Gene Stroops, former refuge manager, personal communication).

Lower Red Rock Lake Dam

The original dam was built in 1930 by MFWP to stabilize the water level of Lower Red Rock Lake. In 1957 the Service constructed a second structure just upstream of the original dam. A dam safety inspection in 1982 found several serious problems. The Service developed a plan to rehabilitate the dam and change the operation to meet biological requirements. That plan included raising the lake's water level 2 feet for part of the year.

A new water right was needed to cover the additional storage. Anticipating objections from downstream water users whose rights were filed earlier than Red Rock Lakes rights, the Service worked with the Water Users Irrigation Company (Lima Reservoir) and East Bench Irrigation District to develop a memorandum of understanding acknowledging that the additional water to be stored was actually their water, which would be held temporarily by the refuge. In the memorandum of understanding, the Service agreed to coordinate with them about the timing of releases. Rehabilitation of the structure was completed by Ducks Unlimited in 1988.

Tucks Slough

This project was constructed in 1989 by Ducks Unlimited. Anticipating that an application for a new water right would receive objections from downstream users, the Service filed an application to change the place and purpose of use of 9.5 cubic feet per second of existing Red Rock Creek water rights from irrigation to storage. After a contested case hearing, the Montana Department of Natural Resources and Conservation (DNRC) approved the application and a permit was issued. As part of the change process, 750 acres were permanently retired from irrigation to offset the consumptive use associated with the new ponds.

Montana Statewide Water Rights Adjudication (Basin 41A)

In 1982 the Service filed use rights for 32,952 acre-feet for open-water areas and 25,979 acre-feet for marsh areas. These amounts were calculated from surface acreage multiplied by 3.3 foot average depth for open water and one foot average depth for shallow water and marsh habitat. In addition, based on the early notices of appropriation appurtenant to the acquired lands, claims were submitted for 32,073 acre-feet for irrigation of 12,829 acres and for fish and wildlife purposes. There were several other minor claims as well.

As of 2004, only 9% of basin 41A (located in the drainage area above the Clark Canyon Reservoir) has been examined in preparation for issuing a temporary preliminary decree. The Service could have waited for the state process to be completed. However, given the potential for objections alleging abandonment of irrigation rights, and little ability to protect streamflows for fish and riparian (river) purposes under state law, the Service opted to negotiate for federal reserved water rights. Negotiations began in 1984 and were discontinued in early 1986, due to personnel changes and conflicting priorities for the state and federal parties. In 1997 the state of Montana requested that negotiations be resumed. Numerous meetings, technical work, and coordination with local water users culminated in approval of the Water Rights Compact (compact) between the state of Montana and the United States of America, U.S. Fish and Wildlife Service, for the Red Rock Lakes NWR and Wilderness Area. The compact was signed by the state, the U.S. Department of the Interior and the U.S. Department of Justice in 1999. A second bill correcting errors in the consumptive use table was passed in the Montana legislature in 2001.

Technical Work

Before and during negotiations, Service hydrologists installed gauges, and refuge staff took water measurements for 3 years. Hydrologic analysis predicted high, average, and low flows for each creek and the frequency with which those flows occurred. The Service's Montana Fish and Wildlife Management Assistance Office, confirmed that the minimum streamflows (see below) identified by MFWP for Red Rock, Odell, and Tom creeks were sufficient to support Arctic grayling (Kaeding and Boltz 1999). Water rights claimed by upstream users were evaluated by DNRC to determine how much water was actually being used. In some cases, owners agreed to reduce their claims to reflect actual use. Several owners also signed management agreements describing how a refuge call for water would occur.

Major Compact Provisions

The compact includes the following major provisions:

1. Protects natural flows of all streams for wildlife habitat maintenance and enhancement, subordinate to diversion rights actually existing in 1999;
2. Maintains senior minimum streamflows of 1.4 cubic feet per second in Tom Creek, 11 cubic feet per second in Odell Creek, and 15 cubic feet per second in Red Rock Creek;
3. Recognizes the natural outlet elevation of 6607.5 feet mean sea level for Lower Red Rock Lake;
4. Confirms consumptive use rights for maintenance of refuge lakes, marshes, and ponds;
5. Confirms existing uses of 8 acre-feet for the campground spring, 8 acre-feet of groundwater for residence and headquarters use, and 1.5 cubic feet per second from Shambow Creek for irrigation of the headquarter lawn;
6. Confirms that the Service retains the right to develop an additional 8 acre-feet of groundwater for future headquarters and visitor use;
7. Allows for future diversion of 3,000 acre-feet from Odell Creek for irrigation purposes;
8. The compact specifies that there will be no changes in use for the natural and minimum flows, and that changes in consumptive use are constrained to the purposes of the refuge. Any changes must be made in accordance with applicable state law;
9. Montana DNRC imposed an administrative closure on the drainage basins above the refuge and will not issue any new ground permits >35 gallons per minute and 10 acre-feet per year. Small stock and domestic use from springs and wells are exempt from the closure;
10. The Service retains the right to object to inaccurate claims in the preliminary decree and may also petition courts for relief in the event of a conflict over water

AIR QUALITY

Air quality is a global concern. The U.S. Environmental Protection Agency has lead responsibility for the quality of air. Through the 1990 Clean Air Act, the agency sets limits on the amount of pollutants that can be discharged into the air. Nationally, more than 170 million tons of pollution are emitted annually into the air within the United States borders, through either stationary sources (such as industrial and power plants) or mobile sources (such as automobiles, airplanes, trucks, buses, and trains). There are also natural sources of air pollution, such as fires, dust storms, volcanic activity, and other natural processes. The agency



W. Steve Sherman/USFWS

Odell Creek north of county road.

has identified six principal pollutants that are the focus of its national regulatory program: lead, carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, and particulate matter.

Air quality problems in Montana are usually related to urban areas and mountainous topography, or river valleys that are sensitive to temperature inversions. Particulate matter and carbon monoxide are the air pollutants that have the greatest adverse impact on Montana's air quality. Particulate matter (PM₁₀) is a measure of tiny liquid or solid particles in the air that are respirable in the lungs. In the area of the refuge, carbon from automobiles (including all-terrain vehicles and snowmobiles) and diesel engines; soot from slash burning, forest fires, fireplaces, and wood stoves; and dust associated with windblown sand and dirt from roadways and fields may all contribute to particulate matter. The major sources of particulate matter are vehicles traveling on unpaved roads and forest fires.

The refuge has a designated Class I air quality area as defined under the Clean Air Act of 1977. Air quality in the area of the refuge is considered good, with no nearby manufacturing sites or major air pollution sources. Throughout the year, occasional widespread regional caused by large-scale forest fires located to the west (in Idaho, Oregon, Washington, and Montana) and annual agricultural burning that occurs in Idaho (just south of the Centennial Mountains) causes haze, which results in reduced visibility. The small particles and aerosols resulting from these fires are carried long distances in the air and cause haze in this remote location. In addition, concern has been raised that increased snowmobile traffic, especially on the east end of the Centennial Valley, may be contributing to reduced air quality. A wintertime study of snowmobile emissions indicated that particulate emissions from two-stroke snowmobile engines have a potential for visibility impacts in the Yellowstone National Park airshed (Sive et al. 2003). Investigations would need to be conducted to determine if air quality and visibility are being impacted by increased snowmobile use in the area.

GLOBAL WARMING

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change effects as part of long-range planning endeavors. The Department of Energy's report, "Carbon Sequestration Research and Development," concluded that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. The report defines carbon sequestration as "the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

The increase of carbon dioxide (CO²) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as "global warming." In relation to comprehensive conservation planning for Refuge System units, carbon sequestration constitutes the primary climate-related effect to be considered in planning.

Vegetated land is a tremendous factor in carbon sequestration. Large, naturally occurring communities of plants and animals that occupy major habitats—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and in acting as biological "scrubbers" of atmospheric CO².

One Service activity in particular—prescribed fire—releases CO² directly to the atmosphere from the biomass consumed during combustion. However, there is no net loss of carbon because new vegetation quickly germinates to replace the burned-up biomass. This vegetation sequesters an approximately equal amount of carbon as was lost to the air (Dai et al. 2006).

Several other effects of climate change may need to be considered in the future:

- Habitat available in lakes and streams for cold-water fish such as trout and salmon could be reduced.
- Climate change could reduce water resources available to refuge wetland and riparian habitats.
- Forests may change, with some plant species shifting their range northward or dying out and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat because of stronger and more frequent droughts.
- Changes in the timing of migration and nesting could put some birds out of synchronization with the life cycles of their prey.



Mike Parker/USFWS

The refuge has collected weather data for over 50 years.

4.2 BIOLOGICAL RESOURCES

The following sections describe the biological resources that may be impacted by the implementation of the CCP. Biological characteristics include vegetation communities, birds, mammals, insects, reptiles, and amphibians. Unless otherwise noted, much of the following information is from unpublished Service data located in files at the refuge office.

Figure 14 displays the vegetation associations and figure 15 shows the location and composition of the various habitat types described in this section and found on the refuge, as defined by the National Vegetation Classification System (Anderson et al. 1998). Data for these figures were collected during 2005-07 by refuge staff (Newlon 2007).

SHALLOW LAKE WETLANDS

Shallow lake (lacustrine) wetland habitats are defined as >20 acres in total area and having more than 30% cover of emergent vegetation. These habitats often exhibit alternative stable states (Bayley and Prather 2003). One state is characterized by hypereutrophic conditions (frequent algal blooms and low transparency), turbid water, and pelagic (open water) phytoplankton (microscopic plants). The second state, and the current state of refuge lacustrine habitats, is characterized by clear water and submerged aquatic vegetation (SAV). Within the refuge, lacustrine wetlands cover more than 6,300 acres of habitat (USFWS 1999a) (see figure 16).

The most abundant SAV species in refuge lacustrine habitats, in order of decreasing magnitude, are Richardson's pondweed, sago pondweed, and shortspike watermilfoil (Paullin 1973); however, the abundance of SAV species is highly variable. For

U.S. Fish & Wildlife Service

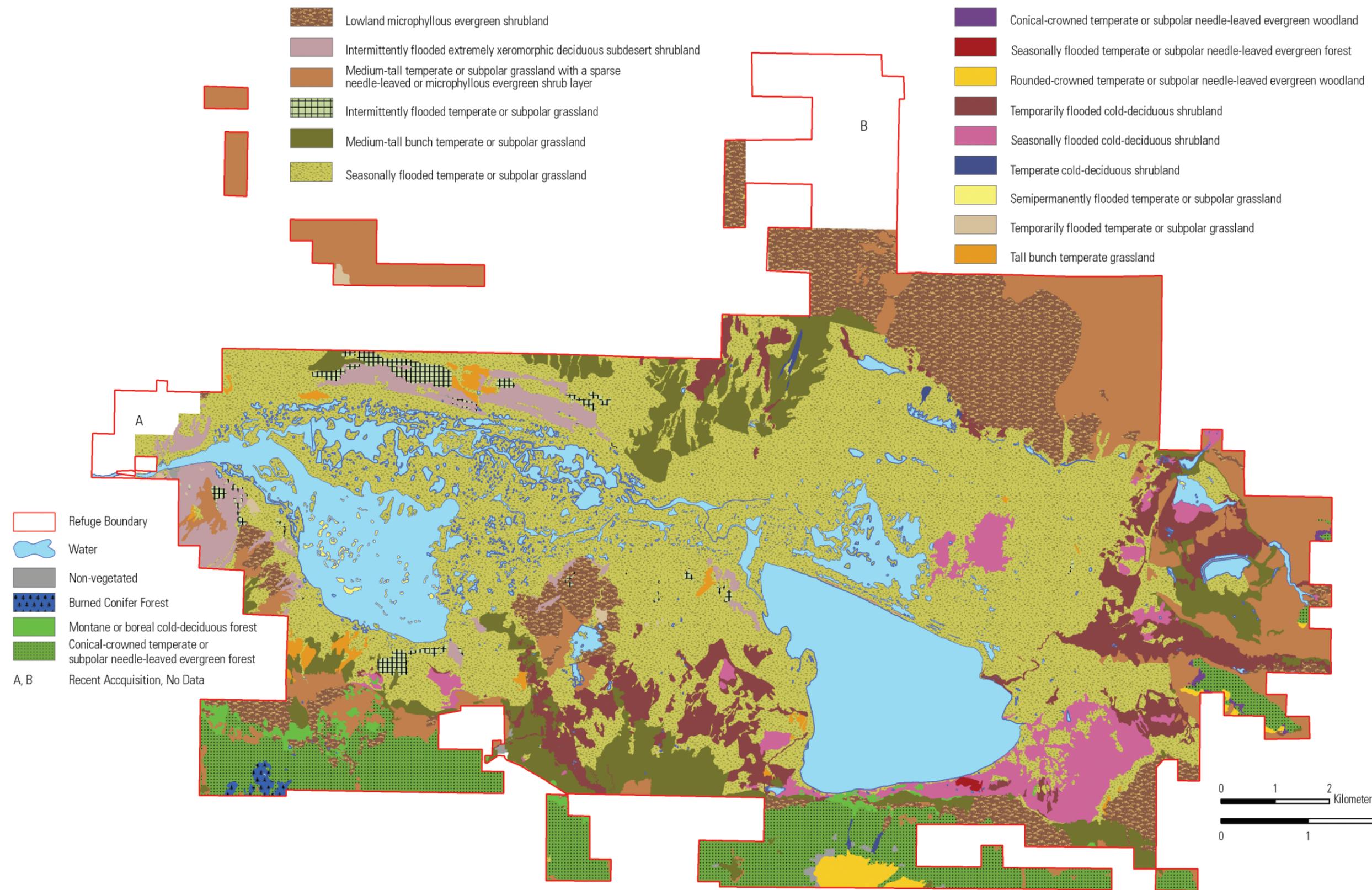


Figure 14. Vegetation classifications found in Red Rock Lakes National Wildlife Refuge.

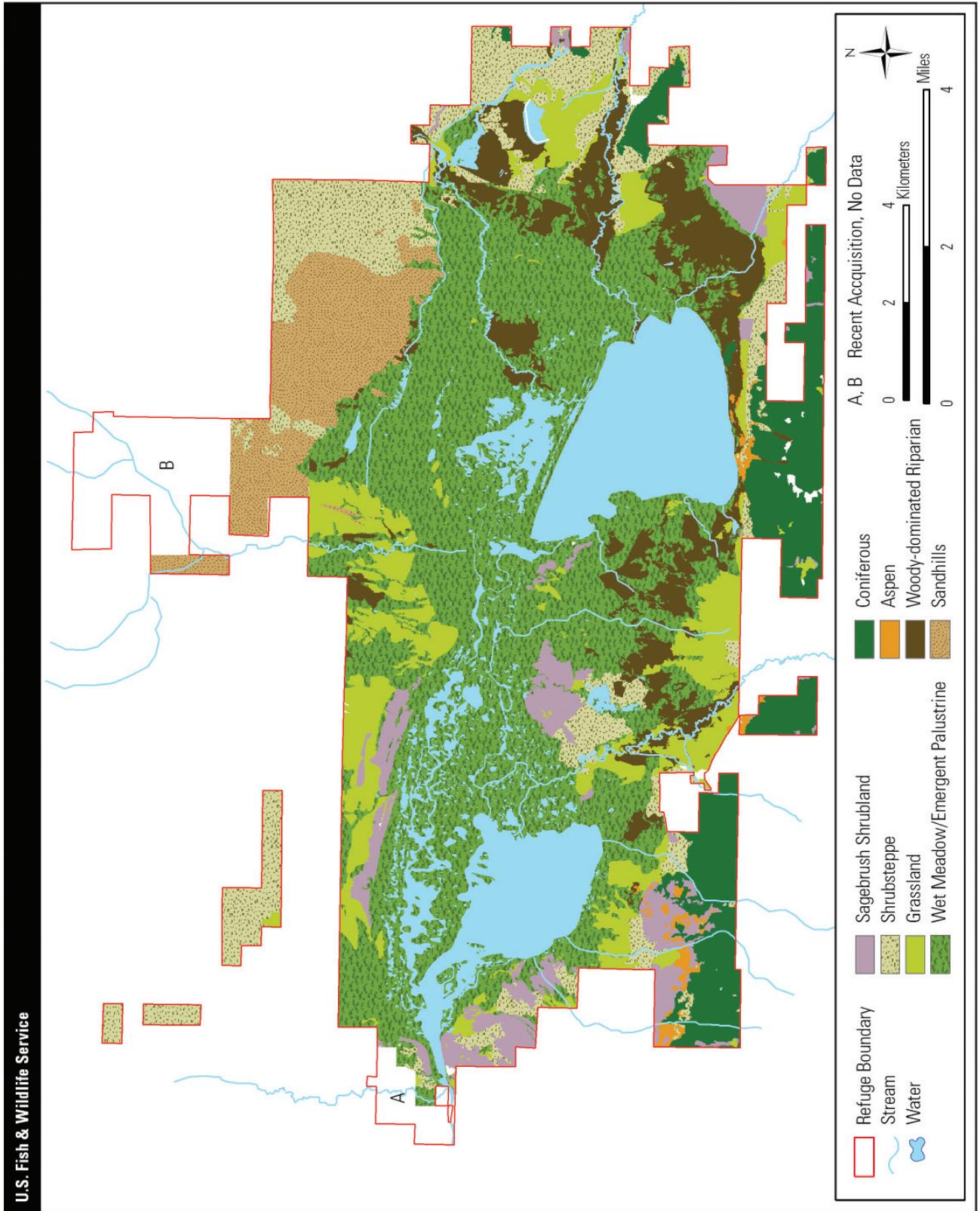


Figure 15. Habitat types found in Red Rock Lakes National Wildlife Refuge.

example, the abundance of shortspike watermilfoil in Lower Red Rock Lake has varied in abundance from <2% of species composition in 1955–56 (Beed 1957) to nearly 60% in 2002 (USFWS 2004). Canadian waterweed comprised nearly 40% of the SAV community in Lower Red Rock Lake during 1955–56 (Beed 1957) but was reduced to trace amounts by 2002 (USFWS 2004). Confounding the shifts in Lower Red Rock Lake SAV communities are the series of water control structures built at the lake's outflow beginning in 1930.

Although many factors determine the distribution of plant species within lacustrine habitats, water depth is perhaps the most significant. Water depths of refuge lacustrine habitats typically do not exceed 7 feet, with the exception of Widgeon Pond. At the greatest water depths experienced on the refuge, SAV may be sparse, especially in more turbid waters. SAV species that can be found at depths >2.5 feet include whitestem, flatstem, and sheathed pondweeds, Canadian waterweed, coon's tail, and star duckweed. At shallower water depths (<2.5 feet), sago, Richardson's, Fries, small, and fineleaf pondweeds, shortspike watermilfoil, common stonewort, longbeak buttercup, quillworts, wapato, and slender naiad are common. Emergent vegetation in refuge lacustrine habitats is dominated by hardstem bulrush islands within Lower Red Rock Lake (more than 50 acres). Beaked sedge and broadleaf cattail can also be found on these islands. Within Swan Lake and River Marsh, islands of beaked sedge are prevalent. Rush, spike rush, American sloughgrass, smartweed, and common mare's-tail commonly germinate on exposed mud flats during low-water years.

Characteristic Wildlife

Native fishes found in lacustrine habitats include Arctic grayling, Westslope cutthroat trout, burbot, white sucker, longnose sucker, and mottled sculpin. Of these species, Arctic grayling and Westslope cutthroat trout have been listed as species of concern by the state of Montana. However, Westslope cutthroat trout in Upper Red Rock Lake are primarily hybrids with Yellowstone cutthroat trout and rainbow trout (Mogen 1996). Nonnative fishes introduced to refuge lacustrine habitats include Yellowstone cutthroat trout, rainbow trout, and brook trout. Yellowstone cutthroat trout are considered a species of concern by the state of Montana within its native habitat, primarily the Yellowstone River and tributaries.

Waterbird species use lacustrine habitats on the refuge primarily for foraging, with the exception of nesting that occurs within the bulrush islands of Lower Red Rock Lake. Species nesting in these islands include trumpeter swan, canvasback, redhead, lesser scaup, coot, grebes (pied-billed, western, Clark's, red-necked, eared, and horned),

Franklin's gull, Forster's tern, white-faced ibis, double-crested cormorant, and great blue and black-crowned night herons. Marsh wrens and yellow-headed blackbirds are also common nesters on the bulrush islands. American white pelicans are commonly seen on the refuge, although no breeding colony exists.

Mammals common to lacustrine habitats include muskrat, mink, and river otter. Additionally, little brown bats commonly forage over lacustrine habitats at night. Blotched tiger salamander is the primary amphibian of these habitats.

SEASONALLY-FLOODED WETLANDS

Seasonally-flooded (palustrine) emergent wetlands are typically inundated each spring and dominated by persistent emergent vegetation, often on peat-forming soils. The frequency and duration of flooding is highly variable and a major determinant of vegetation communities in this dynamic habitat. Soil characteristics (physical and chemical) are also important. More than 9,000 acres of the refuge are palustrine emergent wetlands (USFWS 1999a).

Relatively homogenous stands of beaked sedge represent over 80% of palustrine emergent wetlands on the refuge. These extensive areas of seasonally flooded sedge are largely associated with Upper Red Rock, Lower Red Rock, and Swan lakes and River Marsh. Moving upslope, much of the sedge-dominated habitat is rung by the second most common palustrine emergent wetland vegetation on the refuge, Baltic rush. As noted for lacustrine habitats, other emergent vegetation species often germinate on exposed mud flats during low-water years. These include spike rush, American sloughgrass, smartweed, and common mare's-tail.

Characteristic Wildlife

Palustrine emergent wetlands provide extensive habitat for breeding migratory waterbirds. Species known to nest in this habitat include trumpeter swan, canvasback, redhead, lesser scaup, ruddy duck, mallard, northern shoveler, blue-winged and cinnamon teal, gadwall, northern pintail, coot, sandhill crane, Wilson's snipe, sora, Virginia rail, American avocet, marsh wren, and northern harrier. Other birds common to palustrine habitats, but which typically nest in drier areas, include willet, Wilson's phalarope, spotted sandpiper, and killdeer.

Mammal species common to palustrine emergent habitats on the refuge include meadow and montane voles, muskrat, and mink. Striped skunk, coyote, and red fox also commonly forage in these habitats. These habitats also support all of the amphibian and reptile species that occur on the refuge: western toad, boreal chorus and Columbia spotted frogs; blotched tiger salamander; and western terrestrial garter snake.

SHRUB-DOMINATED WETLANDS

Soils in these habitats range from poorly drained peat or muck meadows to saline to calcareous. The refuge has three major wetland shrub communities: shrubby cinquefoil dominated, low-statured willow dominated, and tall-statured willow dominated.

Shrubby Cinquefoil

The shrubby cinquefoil community is dominated by this low-statured (<2 feet in height) shrub with low to moderate (10%–60%) canopy cover. Topography in these wetlands is often hummocky. The surface is saturated into early summer, but the water table typically drops by mid- to late summer. Dominant graminoids include Baltic rush, tufted hairgrass, clustered field sedge, and mat muhly. Forbs are diverse and may be abundant with up to 35% cover. Common forb species include meadow zizia, weak groundsel, pleated gentian, meadow thistle, and wild chives. Dandelion, Rocky Mountain iris, and Kentucky bluegrass may be common to abundant in stands that have been heavily impacted by grazing.

Low-statured Willow

Low-statured willow habitats on the refuge are dominated by the low (<3 feet in height) Wolf's willow. Willow canopy cover is typically moderate to high (30%–80%). Soils are generally histosols, entisols, or mollisols (Hansen et al. 1995). This habitat occurs on both subirrigated flats and adjacent to low-gradient streams. Generally, this habitat remains saturated until late summer. Other shrubs present include bog birch and diamondleaf willow. The understory is a dense graminoid layer dominated by beaked sedge, Baltic rush, and tufted hairgrass. Forb cover is low and slender cinquefoil, northern bedstraw, and largeleaf avens are common.

Tall-statured Willow

Tall-statured willow habitats are dominated by Booth's and Geyer willows, with Booth's willow having higher canopy cover. Total willow canopy cover ranges from 10%–30%. On the refuge, these habitats are found along streams as well as in an extensive willow fen (an area of low, flat, marshy land) in the southeastern portion of the refuge. Along streams, soils are generally from alluvium, whereas willow fen soils are derived from peat. These sites generally remain saturated throughout the growing season. The understory is dominated by graminoids, typically tufted hairgrass, northern reedgrass, and various sedge species. Forbs are diverse but often have low canopy cover (10%–20%). Common forb species include largeleaf avens, wild chives, fringed willow herb, slender cinquefoil, elephanthead lousewort, and false lily of the valley.



Steve Sherman/USFWS

Wilson's phalarope.

In all three shrub-dominated habitats, disturbed areas typically also have smooth brome, Kentucky bluegrass, and Canada thistle.

Characteristic Wildlife

Shrub-dominated wetlands on the refuge support a diverse breeding bird community. According to refuge surveys, the most common species include yellow warbler, song sparrow, common yellowthroat, white-crowned and Lincoln's sparrows. Common mammal species include moose, elk, white-tailed deer, striped skunk, meadow and montane voles, and long-tailed weasel. Amphibian and reptile species observed include western terrestrial garter snake, western toad, boreal chorus and Columbia spotted frogs, and blotched tiger salamander. Native fishes found in refuge creeks include Arctic grayling, Westslope cutthroat trout, mountain whitefish, white sucker, longnose sucker, and mottled sculpin. Nonnative fishes include brook trout, rainbow trout, and Yellowstone cutthroat trout.

WET MEADOWS

Wet meadow habitat occurs over 7,000 acres of the refuge. Topography of wet meadows on the refuge varies from level to undulating or hummocky. Soils are poorly drained loam, sandy loam, or clay. These habitats are dominated by a dense layer of graminoids (sedges, rushes, and grasses) with low to moderate forb diversity and low forb canopy cover. These areas are flooded early in the growing season, but soils are dry by midsummer. Dominant graminoids include Baltic rush, clustered field sedge, and mat muhly. Tufted hairgrass is common on more mesic sites, whereas basin wildrye,

Sandberg bluegrass, and meadow and foxtail barley are common on drier or more alkaline sites. Forb coverage and diversity varies with moisture gradient and level of disturbance, mainly grazing. Native forbs in more mesic portions of this habitat include northern bedstraw, darkthroat shooting star, pleated gentian, meadow zizia, meadow thistle, slender thelypody, hooded lady's tresses, weak groundsel, and hookedspur violet. Rocky Mountain iris, common dandelion, and Kentucky bluegrass are common in areas influenced by grazing. Bare ground is rare. The amount of residual cover is variable depending upon the species composition and subsequent vegetative growth of the previous growing season. Differences in species composition and moisture gradients result in a mosaic of relatively short (<1 foot in height) and relatively tall (>2 feet in height) vegetation. On average, vegetation is <20 inches in height by late summer.

Montane wet meadows undergo a rapid wet/dry cycle, with complete inundation in the spring and early summer followed by two to three months of little to no precipitation. Groundwater flow, surface runoff, and spring/early summer precipitation are important water sources for these habitats (Windell et al. 1986). Hydrologic cycles in these habitats are strongly influenced by snowpack, and water table levels can undergo extreme fluctuations both within a single growing season and annually (Svejcar and Riegel 1998). Variation in the depth to water table has a strong influence on plant species distribution (Allen-Diaz 1991, Castelli et al. 2000, Dwire et al. 2006). Soil characteristics are also important drivers of plant species composition and distribution, in particular the soil redox potential (Dwire et al. 2006). Soil redox potential is the ability of the soil to gain or lose electrons. When soils are inundated with water, pore spaces in the soil are depleted of oxygen, and an anaerobic soil layer develops. The soil redox potential varies temporally and spatially and is strongly tied to water table depth (Castelli et al. 2000). The composition and distribution of plant species reflects, in part, their tolerance of these anaerobic conditions.

The majority of wet meadow habitats on the refuge are grazed by cattle 1 out of every 3 years. Cattle typically arrive in mid-July and remain until mid- to late September. Nonnative plants, including smooth brome, Canada thistle, and Kentucky bluegrass, have invaded portions of this habitat, particularly areas that were historically-hayed. Prescribed fire has been used to reduce cover of smooth brome.

Characteristic Wildlife

Wet meadow habitats on the refuge support a diverse breeding bird community, including long-billed curlew, willet, sandhill crane, northern harrier, short-eared owl, Savannah sparrow, and western meadowlark. Common mammal species include pronghorn, coyote, striped skunk, meadow and

montane voles, long-tailed weasel, and American badger. Amphibian and reptile species observed include western toad, boreal chorus and Columbia spotted frogs, blotched tiger salamander, and western terrestrial garter snake.

SHRUB-STEPPE AND GRASSLANDS

Upland shrub-steppe habitats, or habitats where both shrubs and grasses share dominance, occur on over 9,200 acres of the refuge. Several shrub-steppe habitats occur on the refuge, with areas dominated by threetip sagebrush. These habitats typically have <20% sagebrush canopy cover. Threetip sagebrush is very localized in Montana, occurring only in the extreme southwestern portion of the state. This species typically occurs on gentle alluvial slopes or benches with moderately deep soils (Mueggler and Stewart 1980). Other common species include green rabbitbrush, fringed sagewort, and spineless horsebrush. Bunchgrasses dominate the understory with an average of 70% cover. Idaho fescue, needle and thread, and prairie junegrass are the most common bunchgrass species. Typically, <10% of the soil is bare. Forb cover and diversity are low with silvery lupine, spiny phlox, sticky geranium, rosy pussytoes, old man's whiskers, and common yarrow being the most common. Mountain big sagebrush shrub lands occur on the southern edge of the refuge on the foothills of the Centennial Mountains, as well as within snowmelt drainages and north-facing aspects. Again, grasses are the most common plant form in the understory with Idaho fescue, basin wildrye, western needlegrass, and nodding brome being the most common. Forb coverage and diversity are moderate with sticky geranium, flax, and slender cinquefoil being common. Basin big sagebrush shrub lands occur only within the Centennial Sandhills (see "Centennial Sandhills" on the following page). Two shrub-steppe habitats, mountain silver sagebrush and greasewood, are considered wetland habitats. Silver sagebrush shrub lands occur on alluvial fans on the refuge and typically have <20% sagebrush canopy cover. Idaho fescue, basin wildrye, and western wheatgrass are the dominant understory species. Greasewood shrub lands also occupy alluvial fans on saline or alkaline soils. Most examples occur on the north and south sides of Lower Red Rock Lake. Grasses dominate the understory and include basin wildrye, western wheatgrass, Nuttall's alkaligrass, inland saltgrass, and Sandberg bluegrass.

Grasslands on the refuge occur primarily north of Lower Red Rock Lake and make up over 2,000 acres. The bunchgrass, Idaho fescue, has by far the most coverage at over 1,500 acres. On more alkaline soils, basin wildrye, Nuttall's alkaligrass, and Sandberg bluegrass are common. Forb coverage and diversity is variable depending upon soil moisture and type. Silvery lupine, rosy pussytoes, and common yarrow are the most widely occurring forbs.

Soil type is the primary determinant of vegetation distribution. Secondly, fire and herbivory are important drivers of sagebrush and grassland structure, composition, and seral stage. High-intensity fires can result in replacement of sagebrush species by subdominant shrubs such as green rabbitbrush, rubber rabbitbrush, and spineless horsebrush. With heavy grazing by livestock during the growing season, native bunchgrasses associated with Idaho fescue-dominated grasslands can be reduced or replaced by nonnative rhizomatous grasses such as smooth brome and Kentucky bluegrass.

Grassland and shrub-steppe communities on the refuge are relatively intact and contiguous. The largest disturbance to these habitats resulted from seeding of nonnative forage for hay production, which occurred before refuge ownership. These haying operations resulted in the replacement of native vegetation with nonnative, rhizomatous grasses, particularly smooth brome, Kentucky bluegrass, and meadow foxtail. Other invasive species, including cheatgrass, Canada thistle, and common tansy, occur in localized patches throughout these communities.

Characteristic Wildlife

Grassland and shrub-steppe habitats provide important nesting habitat for numerous migratory land birds, waterbirds, and raptors. These habitats also provide critical calving/fawning grounds for native ungulates and support a relatively intact predator and prey community. The value of these habitats to wildlife is enhanced by their relatively unfragmented character. Common birds of shrub-steppe and grassland habitats include Brewer's sparrow, vesper sparrow, western meadowlark, Savannah sparrow, long-billed curlew, greater sage-grouse, and short-eared owl. Mammal species occurring in this habitat include white-tailed jackrabbit, coyote, badger, red fox, pronghorn, elk, mule deer, and Wyoming ground squirrel. Gray wolves have also been observed in these habitats. Amphibian and reptile species include western terrestrial garter snake, blotched tiger salamander, and boreal chorus frog.

CENTENNIAL SANDHILLS

The Centennial Sandhills (sandhills) cover the northeastern portion of the Centennial Valley and make up over 3,500 acres of refuge habitat. This is 44% of the 7,907 total acres that occur in the valley. These well-vegetated, relatively stable sand dunes are in various states of activity. The western dunes, located outside of the refuge boundary, are the most active and topographically varied, whereas those on refuge lands to the east are well stabilized with less topographic relief. Soils in the sandhills are highly erodible, well-drained, and sandy. Vegetative communities in these sandhills occur nowhere else

in Montana (Lesica and Cooper 1999). Basin big sagebrush is the dominant shrub with 5%–40% canopy cover. Such dominance of basin big sagebrush is rare in Montana (Morris et al. 1976). Threetip sagebrush, rubber rabbitbrush, green rabbitbrush, and spineless horsebrush are other common shrubs. Bunchgrass canopy cover ranges from 5%–90% with needle-and-thread dominant and Idaho fescue codominant in some portions. Other common grasses include prairie junegrass, Sandberg's bluegrass, and thickspike wheatgrass. Forbs have 5%–45% cover and moderate to high diversity. Hoary tansyaster, silvery lupine, granite prickly phlox, buckwheat, silverleaf phacelia, tarragon, slimflower scurfpea, and brittle pricklypear are common. Ten to 70% of the soil surface is bare sand, although the nonnative pale madwort is common in some portions of the sandhills, subsequently reducing the amount of bare sand. Several rare plant species are found in areas of open sand in early seral portions of this habitat. Two species are critically imperiled (painted milkvetch and sand wildrye), and one species (Fendler cat's-eye) is imperiled in Montana due to limited range and habitat in the state. The status of a fourth species, pale evening primrose, is currently under review by the network of Natural Heritage Programs. The sandhills contain several unique vegetation associations, one of which, the threetip sagebrush and needle-and-thread grass vegetation association, is critically imperiled globally (MTNHP 2002).

Characteristic Wildlife

The Centennial Sandhills support several sagebrush obligate breeding birds, including Brewer's sparrow and sage thrasher. Greater sage-grouse use the sandhills from early spring through fall; early refuge records show how grouse migrated to lower elevations for winter, including the western Centennial Valley and Camas Flats in Idaho. Other common breeding species include vesper sparrow, western meadowlark, long-billed curlew, and willet. Mammal species observed in the sandhills include four mammal species of concern in Montana: Preble's shrew, black-tailed jackrabbit, pygmy rabbit, and Great Basin pocket mouse (Hendricks and Roedel 2001). Other common mammals include white-tailed jackrabbit, coyote, badger, red fox, pronghorn, elk, mule deer, Wyoming ground squirrel, northern pocket gopher, and several shrew species. Gray wolf has also been observed in this habitat. Amphibian and reptile species observed in the sandhills include western terrestrial garter snake, blotched tiger salamander, and boreal chorus frog. Several invertebrate species have been observed in the sandhills, including four species of tiger beetle and several butterfly species including Rocky Mountain parnassian, sooty hairstreak, and the common branded skipper (Hendricks and Roedel 2001).

ASPEN WOODLANDS AND FORESTS

Aspen communities on the refuge occur as relatively small patches located within wetlands in the southeastern portion of the refuge near Upper Red Rock Lake, within mixed stands of aspen and conifer, and as larger patches on the fringe of Douglas-fir forests on the southern edge of the refuge. These larger patches are typically associated with old earthflows and landslides on the northern flank of the Centennial Range. The vegetation in these communities is variable, ranging from two-layered quaking aspen overstory and grassland understory communities (quaking aspen and mountain brome, quaking aspen and pinegrass) to multilayered quaking aspen and tall forb; and quaking aspen and tall willow vegetation associations. The upper elevation limit for aspen within the Centennial Valley is about 8,500 feet.

Reproduction in these aspen communities is most likely vegetative via root suckering, forming clonal (genetically identical) stands. Aspen are shade intolerant and regeneration cannot occur under a dense tree canopy (Jones and Debyle 1985). Historically, many of these stands were maintained through disturbances, such as fire, that removed the overstory and promoted root suckering. Large-scale declines of aspen across the western United States have been widely distributed, likely caused by a combination of factors, including global climate change, high levels of ungulate herbivory, and conifer encroachment due to fire suppression (Brown et al. 2006).



Mike Parker/USFWS

There is minimal aspen habitat within the refuge boundary.

Recent work suggests that aspen loss at the scale of the Greater Yellowstone ecosystem has averaged 10% in the last 50 years—much less than previous studies have suggested (Brown et al. 2006). Much local variability exists in changes in aspen extent, likely based on biophysical setting and climatic conditions (Brown et al. 2006). In the Centennial Mountains of Idaho, vegetation models show a 75% decline in aspen coverage since the mid-1800s (Gallant et al. 2003). A 45% decline in coverage of aspen and mixed aspen/conifer stands over the past 50 years was estimated in the Gravelly Mountains of southwestern Montana (Wirth et al. 1996). A recent study conducted on the refuge found successful aspen regeneration throughout the twentieth century along the sagebrush-grassland and forest ecotone (transition zone between two different plant communities) (Sankey et al. 2006). Preliminary results of a second study conducted in the Centennial Valley show some aspen expansion, but most sites exhibited loss of aspen due to conifer encroachment (Korb et al. 2008). Fire suppression has likely promoted the encroachment of Douglas-fir into aspen stands, potentially reducing their extent. Surveys conducted by The Nature Conservancy showed that where aspen are successfully regenerating, aspen stems are undergoing moderate to heavy browsing by elk and moose, with few stems growing above browse height.

Characteristic Wildlife

Aspen is often considered a keystone species, and aspen habitats, aside from riparian corridors, are the most biologically diverse habitats in the Rocky Mountains (Dobkin et al. 1995). Several bird species breed in aspen woodlands more than in any other habitat (Dobkin et al. 1995, Finch and Reynolds 1987, Turchi et al. 1995, Winternitz 1980), and some species may be aspen obligates (species which must occupy a certain niche or behave in a certain way in order to survive) (Finch and Reynolds 1987, Turchi et al. 1995). Aspen habitats are particularly important to cavity-nesting birds such as woodpeckers (Dobkin et al. 1995, Martin et al. 2004). The susceptibility of aspen to fungal heartrot creates ideal conditions for cavity excavation, creating nesting and roosting sites for several bird and mammal species (Dobkin et al. 1995). Bird species that breed in aspen habitats on the refuge include red-naped sapsucker, northern flicker, hairy woodpecker, American three-toed woodpecker, American kestrel, tree swallow, house wren, ruffed grouse, warbling vireo, lazuli bunting, western tanager, and great gray owl. Aspen stands on the refuge also provide valuable browse for native ungulates (moose, elk, and mule deer). Gray wolves have also been observed in these areas. Amphibian and reptile species include western toad, boreal chorus and Columbia spotted frogs, and western terrestrial garter snake.

CONIFEROUS WOODLANDS AND FORESTS

Coniferous woodlands (evergreen trees having <60% canopy cover) and forests (evergreen trees having >60% canopy cover) cover over 3,500 acres on the refuge. The primary natural disturbance in these habitats is fire. Several sawmills operated in the Centennial Valley during the early 1900s, but the extent of logging that occurred in the area that is now part of the refuge is unknown.

At the forest and grassland ecotone, open woodlands dominated by Douglas-fir occur. Understory vegetation is dominated by mountain big and threetip sagebrush, bunchgrasses, bluebunch wheatgrass, and Idaho fescue. Historically, these woodlands underwent frequent (annual to every few years), low-severity fires, which killed sapling and small-diameter trees and maintained the open tree canopy. Since settlement of the Centennial Valley, fires in these woodlands have been actively suppressed because most homes and other buildings occur in this habitat. Cattle grazing occurs in these woodlands, reducing fine grassy fuels. As a result, tree densities have increased and forests have expanded into the adjacent sagebrush/grassland habitat (Heyerdahl et al. 2006, Korb 2005, Sankey et al. 2006).

Open woodlands (tree canopy cover <60%) of limber pine are found on mostly south- and southwest-facing slopes. The ground is mostly bare and gravelly and understory vegetation is sparse. Scattered common juniper and bluebunch wheatgrass are the most common understory species although their coverage is typically <10%. Fire is infrequent due to the lack of fuels. Trees in these sites may be several hundred years old (Cooper 1999).

Coniferous forests flank the north-facing slopes of the Centennial Mountains, ranging in elevation from 6,700 to 9,600 feet. Common tree species include Douglas-fir, subalpine fir, lodgepole pine, Engelmann spruce, whitebark pine, and limber pine. Shrubs make up a minor component of the vegetative community with mountain snowberry and white spiraea. The undergrowth can be sparse depending upon tree canopy cover. The forb understory can be diverse, but no species are particularly common except heartleaf arnica, timber milkvetch, and western showy aster. Western meadowrue, showy aster, northern valerian, and mountain sweet-cicely are common forbs on more mesic sites. In more open forests, the understory is dominated by graminoids, with Geyer's sedge and pinegrass being most common.

Douglas-fir dominates the tree canopy at elevations up to 8,200 feet. Historically, these relatively mesic lower-elevation forests experienced mixed-severity fires; supporting both frequent (years to decades) low-severity fires, which typically killed individual or small clumps of small-diameter trees, and infrequent

(one to many centuries), high-severity crown fires, which killed large areas (thousands of acres) of canopy trees (Korb 2005, Schoennagel et al. 2004). Accordingly, the fire systems in these forests are the most complex and least understood of the major fire systems of Rocky Mountain forests. A complex interaction of both fuels and climate affect the frequency, severity, and size of fires under mixed-severity fire systems (Schoennagel et al. 2004). Historic fire suppression efforts in these forests were likely few due to their remoteness; thus, current conditions in these forests are likely to be within their historic range of variability.

Above 7,200 feet, moist, high-elevation forests are dominated by subalpine fir, Engelmann spruce, and lodgepole pine. These forests experience infrequent (one to many centuries), high-severity, stand-replacing crown fires (Schoennagel et al. 2004), and the thin bark of these tree species make them easily killed by fire. Tree density is high in these forests and tree canopy typically exceeds 70%, thus undergrowth vegetation is sparse and fuels are few.

A small (19 acres) seasonally flooded Engelmann spruce forest exists on the south shore of Upper Red Rock Lake. Soils within this association typically remain wet well into the growing season. Old growth Engelmann spruce dominates the canopy. The understory is dominated by a moderate cover of field horsetail and a dense layer of moss. Other forbs include arrowleaf ragwort, starry false lily of the valley, and claspleaf twistedstalk. This forest type is rare in southwest Montana.

Characteristic Wildlife

Birds of coniferous forests and woodlands on the refuge include northern goshawk, bald eagle, great-horned owl, dusky grouse, Clark's nutcracker, gray jay, Steller's jay, hairy woodpecker, olive-sided flycatcher, hermit thrush, ruby-crowned kinglet, mountain chickadee, brown creeper, yellow-rumped warbler, dark-eyed junco, western tanager, pine siskin, and Cassin's finch. Mammal species that inhabit coniferous forests on the refuge include elk, mule deer, moose, black bear, grizzly bear, wolverine, mountain lion, lynx, marten, short-tailed weasel, golden-mantled ground squirrel, yellow-bellied marmot, and red tree squirrel. Gray wolves have also been observed in these areas. Amphibians and reptiles of these habitats include western toad, boreal chorus and Columbia spotted frogs, and western terrestrial garter snake.

4.3 CULTURAL RESOURCES

Due to its unique location offering access to wetland and mountain ecotones, Red Rock Lakes National Wildlife Refuge has likely supported native people for the last 12,000 years. The area has abundant natural springs and game along with stone suitable

for tool manufacture, including obsidian, ignimbrite, cherts, and Quadrant quartzite. The east to west trending valley and low pass over the Continental Divide would also have been a natural travel route. Because of deep winter snow, it is likely that summer use by prehistoric peoples was more common (Taylor 1991).

Little excavation work has been conducted near the refuge so models for understanding the lifeways of native peoples are not well formed. Being situated at the Continental Divide, Red Rocks Lakes National Wildlife Refuge borrows from both the Basin Plateau Model and Plains Model. In the Basin Plateau model, artifacts and other technologies are similar to the region west of the refuge. While in Plains model, the cultures are archaeologically similar to the plains to the east. According to a major survey of federal lands in the Centennial Valley conducted by the Bureau of Land Management, prehistoric people inhabited promontories along the Red Rock River and in the forested timberline along south slopes. Springs at the base of the slopes, near the valley floor, have also been documented to be important locations for prehistoric people.

The valley has several prehistoric sites recorded as part of reviews for federal projects. The most important of these (24BE279) is located near a spring on the refuge. This site is a multicomponent prehistoric living floor with at least three components. The researchers observed indications of hearths with charcoal, bone and obsidian artifacts suggesting the site is largely intact. Artifacts observed at the site that are of known time period include: Folsom (10,500 BP), Hannah (3,000 BP) and Late Prehistoric period (500 AD to 1800 AD) documenting that the site has potential to yield information concerning adaptation to the area from Paleo-Indian to historic times.

Osborn Russell, a trapper who visited the area in 1835 noted the presence of the Blackfoot tribe. Russell followed a well established trail that was recorded by Lewis and Clark in their 1805 visit to the area. The trail follows the Blacktail drainage and crosses the Centennial Valley. In 1938 Julian Steward noted the presence of Shoshone in the Centennial Valley although, by this time, it is difficult to discern whether this area was part of their aboriginal homelands.

In 1876, in honor of the nation's 100th birthday, the valley was named Centennial Valley by Ms. William Orr (Beaverhead County History Book Association 1990). Reports of abundant waterfowl, fish, game, water and feed for livestock spurred homesteading efforts. Between 1876 and 1892, development within the refuge went from one cabin to 21 ranches and cabins, including a post office, which was the seed for present day Lakeview. This growth was spurred by the Utah and Northern Railway linking Monida to Idaho and Utah in 1880 and to Butte in 1881 (Ferrel

et al. 1981). A stage route linking Monida with West Yellowstone also influenced development, including that at Culver Springs and Shambow Pond. An article published in August 1902, reported, "the Monida and Yellowstone stage line has carried over 12,000 passengers to Yellowstone National Park this season and are having all they can handle every day" (Beaverhead County History Book Association 1990). Hunting clubs were also established on the shores of Upper and Lower Red Rock lakes.

Transportation route development elsewhere, drought, long winters, and great distances to market made life difficult in the Centennial Valley. By the Great Depression of the 1930s, few remained in the valley. Many sold their land back to the Federal Resettlement Administration during the 1930s. The refuge supports several historic homesteads left by the early Anglo settlers including the Shambow, Buck, and Hanson Homesteads.

In 1935, the Bureau of Biological Survey (a precursor to the U.S. Fish and Wildlife Service) sent Basyll Kercheval to conduct an evaluation of the area's natural resources in which he suggested these lands should become a migratory bird refuge. The tremendous natural resources and impacts of unregulated hunting and collecting of waterfowl, especially trumpeter swans, helped spur the establishment of Red Rock Lakes National Wildlife Refuge. He stated, "The economic situation is grave. A large part of the land is mortgaged. Taxes are delinquent in many cases. Livestock in very [*sic*] instance is mortgaged to various agencies for feed. It is conceded by every one that the Red Rock Lakes area has been the foremost breeding, nesting and resting place for migratory waterfowl with the state of Montana" (Project of the Bureau of Biological Survey 1935). Soon after, on April 22, 1935, President Franklin D. Roosevelt established the Red Rock Lakes Migratory Waterfowl Refuge (renamed Red Rock Lakes National Wildlife Refuge on July 19, 1961).

The refuge was critical in protecting the last known trumpeter swan population in the world. Long before the refuge was established, concern for the trumpeter swan was apparent as noted in a letter to the Dillon Tribune on August 21, 1895; "It is wicked the way the young swan are being caught at the



One of several pre-establishment duck hunting clubs.

Red Rock Lakes. A man from Lima has made three trips and we are told by good authority he got from 25 to 30 young ones to sell. This ought to be put a stop to or we will soon have none of the sacred birds on our lakes” (Beaverhead County History Book Association 1990).

The Works Progress Administration constructed the original shop/office, barn, residence, oil storage shed, and fire tower in 1936 and 1938. All of the buildings have undergone some modifications with the office having major changes over the years. Although several other buildings and structures have been added to the headquarters site, it is still considered eligible for inclusion into the National Register of Historic Places.

A comprehensive cultural resource inventory has not been completed. Only site-specific inventories for project areas or buildings have been done. The area is rich in cultural resources, and a comprehensive inventory would help the refuge in protecting these sites.

4.4 SPECIAL MANAGEMENT AREAS

WILDERNESS DESIGNATION

Congress designated 32,350 acres of the refuge as the Red Rock Lakes wilderness area in 1976 (figure 17). The wilderness is one of 71 such areas managed by the U.S. Fish and Wildlife Service. In 1964, Congress passed and the president signed the Wilderness Act, which established the National Wilderness Preservation System. The legislation set aside certain federal lands as wilderness areas. Four federal agencies of the United States government administer the National Wilderness Preservation System, which includes 702 designated areas and more than 107 million acres. Wilderness, as defined by the Wilderness Act, is untrammeled (free of human’s control), undeveloped, and natural and offers outstanding opportunities for solitude and primitive recreation. The Refuge System manages refuge wilderness to secure an enduring resource of wilderness and to accomplish refuge purposes in a way that preserves wilderness character. People value wilderness for its wildlife, scenery, clean air and water, opportunities for solitude, and a sense of connection with nature. Wilderness policy permits hunting, fishing, wildlife observation, wildlife photography, environmental education, interpretation, hiking, backpacking, cross-country skiing, canoeing, and kayaking on national wildlife refuges where these activities are deemed compatible with the purposes of the refuge.

WILDERNESS REVIEW

A wilderness review is the process used to determine whether to recommend Service lands or waters to Congress for designation as wilderness. The Service

is required to conduct a wilderness review for each refuge as part of the CCP process. Land or waters that meet the minimum criteria for wilderness are identified in a CCP and further evaluated to determine whether they merit recommendation for inclusion in the Wilderness System. To be designated a wilderness area, lands must meet certain criteria as outlined in the *Wilderness Act of 1964*:

- generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable.
- has outstanding opportunities for solitude or primitive and unconfined type of recreation.
- has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unimpaired condition.
- may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

As stated earlier, 32,350 acres of the refuge are already designated as wilderness. This encompasses over 68% of the refuge. The planning team examined other portions of the refuge for inclusion into the wilderness area. Expanding this wilderness area into other portions of the refuge would make management and enhancement of the refuge difficult. This could result in a net loss of habitat and continued spread of invasive plants. The planning team is not recommending any further additions or expansions to this existing wilderness boundary.

NATIONAL NATURAL LANDMARK

The National Natural Landmarks Program was established in 1962 by the Secretary of the Interior “to identify and preserve natural areas that best illustrate the biological and geological character of the United States, enhance the scientific and educational values of preserved areas, strengthen public appreciation of natural history, and foster a greater concern for the conservation of the nation’s natural heritage” (36CFR62.1(b)). It is the only natural areas program of national scope that identifies and recognizes the best examples of biological and geological features in both public and private ownership. To date, there are about 600 sites designated as National Natural Landmarks.

Portions of the Red Rock Lakes National Wildlife Refuge were designated as a National Natural Landmark in May 1976. Designation was granted because the refuge contains a “series of relatively undisturbed, high-altitude ecosystem types, representative of pre-settlement conditions in this region including various wetland types as well as upland meadows and forests.” The evaluation also commented on the outstanding waterfowl production that occurs on the refuge, as well as the occurrence of several “uncommon species” at the time of

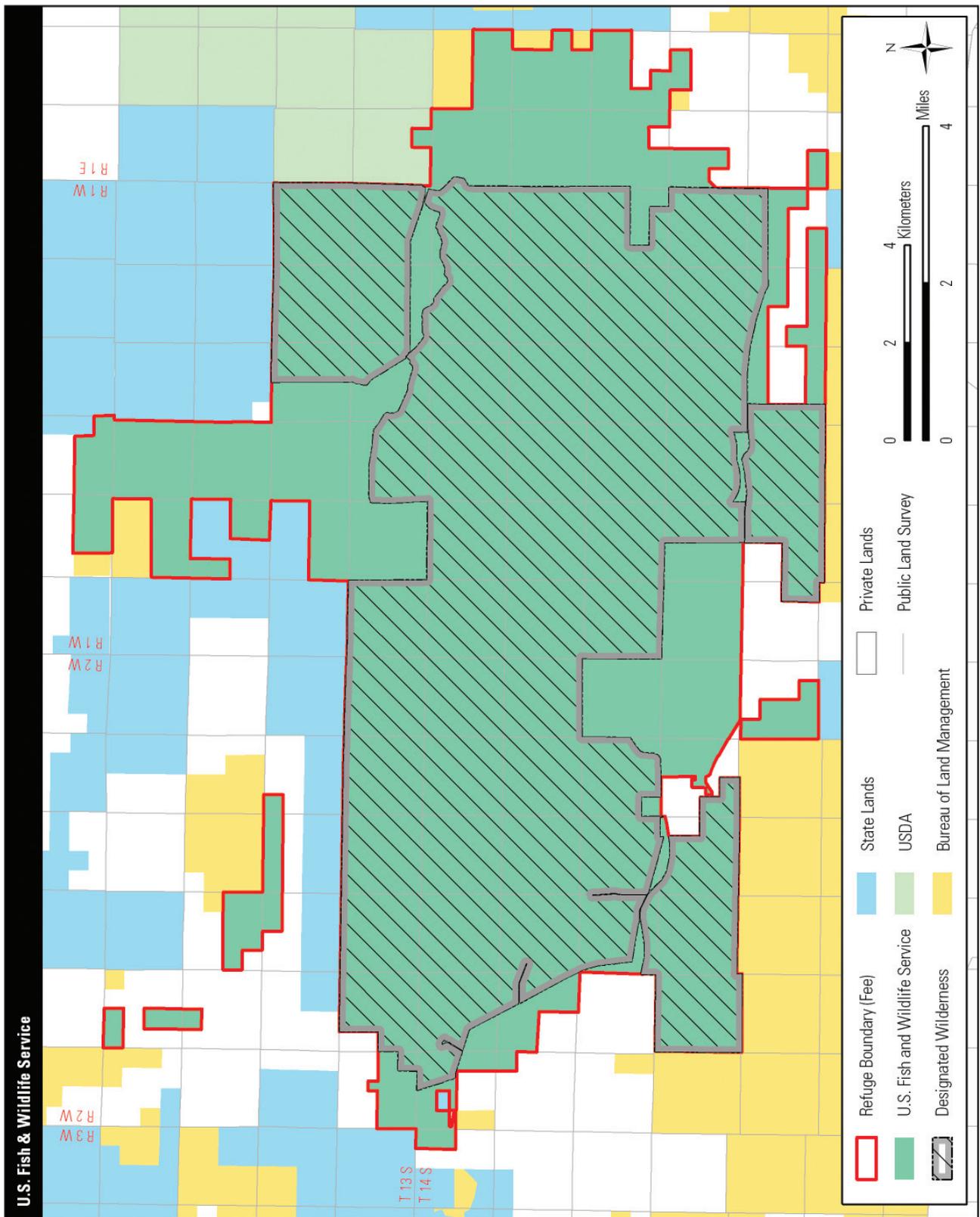


Figure 17. Designated wilderness within the acquisition boundary of Red Rock Lakes National Wildlife Refuge.

designation (some of the uncommon species include peregrine falcon and bald and golden eagles).

RESEARCH NATURAL AREA

Research Natural Areas are part of a national network of reserved areas under various ownerships where natural processes are allowed to predominate and which are preserved for the primary purpose of research and education.

The U.S. Fish and Wildlife Service administratively designates research natural areas on refuges. Currently, there are 210 research natural areas on national wildlife refuges. Research natural areas have these objectives:

- to help in the preservation of examples of all significant natural ecosystems for comparison with those influenced by man.
- to provide educational and research areas for scientists to study the ecology, successional trends, and other aspects of the natural environment.
- to serve as gene pools and preserves for rare and endangered species of plants and animals.

On Red Rock Lakes National Wildlife Refuge, the Douglas-fir forest that occurs on Sheep Mountain was designated a research natural area. The entire research natural area is 85 acres in size.

IMPORTANT BIRD AREA

The American Bird Conservancy's Important Bird Area Program concentrates on identifying and documenting the top important bird sites throughout all 50 states. For a site to be designated as an Important Bird Area (IBA), it must, during at least some part of the year, contain critical habitat that supports (1) significant numbers of an endangered or threatened species such as piping plover, red-cockaded woodpecker, or Kirtland's warbler; (2) a watch list species such as black rail, cerulean warbler, or Henslow's sparrow; (3) a species with a limited range such as tricolored blackbird, yellow-billed magpie, or brown-capped rosy-finch; or (4) a significantly large concentration of breeding, migrating, or wintering birds, including waterfowl, seabirds, wading birds, raptors, or land birds.

Red Rock Lakes National Wildlife Refuge received designation as an Important Bird Area by the American Bird Conservancy in July 2001. More than 230 species of birds have been documented on the refuge, which is well known for its breeding trumpeter swans and other wetland species. An estimated 2,000 pairs of Franklin's gulls nest here, as do more than 200 pairs of white-faced ibises. A pair of peregrine falcons and three pairs of bald eagles have nested on the refuge for many years. Thirteen species of breeders are of global (long-billed curlew, olive-sided flycatcher, Cassin's finch)

or continental (trumpeter swan, bald eagle, northern harrier, Swainson's hawk, peregrine falcon, Wilson's phalarope, short-eared owl, Williamson's sapsucker, red-naped sapsucker, and willow flycatcher) conservation concern. Numerical data is unavailable for most of these species but trumpeter swan surveys document that numbers exceed threshold values to classify the refuge as an IBA of continental significance.

4.5 VISITOR SERVICES

Visitors to Red Rock Lakes National Wildlife Refuge enjoy a variety of activities, including priority visitor services such as hunting, fishing, wildlife observation, wildlife photography, wildlife interpretation, and environmental education.

The annual number of visits to the refuge is around 12,000. This estimate is loosely based on visitors entering the visitor contact station, campground sign-in sheets, and general observation. The small visitor contact station, housed with administrative offices, is open Monday through Friday. Information, regulations, and universally accessible restrooms are available.

The refuge has a general brochure that contains a refuge map, describes the refuge and its management, identifies habitats and common wildlife, lists recreational activities, and cites regulations. Two other leaflets provide information for visitors who are hunting or observing birds. These two leaflets are produced by the refuge and do not meet Service standards. Brochures are generally available at the visitor contact station, Upper Lake and River Marsh campgrounds, and at kiosks located at headquarters, the east side of the refuge, and on Elk Lake Road.

HUNTING

Various forms of hunting are allowed in selected units of the refuge. Hunting seasons can start as early as August for archery seasons and generally go through the end of November. Species hunted include elk, white-tailed deer, mule deer, moose, pronghorn, ducks, coots, and geese. Certain areas are closed to hunting to provide resting and feeding habitat for migratory birds, to protect refuge facilities, and to separate user groups. The limited moose hunting (currently an average of 11 permits annually) on the refuge is confined to the willow fen area (southeast corner of the refuge) and begins later than the state regulations. Boat launches are provided on Lower Lake for waterfowl hunters.

FISHING

Fishing primarily focuses on three introduced trout species (rainbow, brook, and Yellowstone cutthroat). Native sport fish species include Arctic grayling, mountain whitefish, and Westslope cutthroat

trout, although the latter has hybridized with the introduced Yellowstone cutthroat. The Arctic grayling and Westslope cutthroat are both species of special management concern. Fishing generally follows state regulations, with some areas closed to fishing seasonally or year-round. Fishing is allowed on Red Rock, Odell, and Elk Springs creeks, and Culver, MacDonald, and Widgeon ponds.

WILDLIFE OBSERVATION AND PHOTOGRAPHY

Wildlife observation and photography is the most popular visitor service on the refuge. Most visitors view wildlife from the public roads and refuge campgrounds. There are two designated hiking trails, but no auto tour route or overlook. Foot travel is permitted throughout the refuge, and visitors are encouraged to take a hike into the wilderness. Boat launches are provided at Upper Lake and River Marsh campgrounds and Lower Red Rock Lake to allow visitors to explore the refuge and the wildlife by canoe or kayak during certain times of the year.

ENVIRONMENTAL EDUCATION, OUTREACH, AND INTERPRETATION

Staff-led environmental education, outreach, and interpretation programs are very limited, with refuge staff conducting talks or tours on an “as-needed” basis. Due to the refuge’s distance from local schools (minimum 45 miles, one way) and remote location, there is minimal contact with students in the surrounding communities. Visitors may explore the refuge independently and are provided some interpretation of refuge resources through informative panels in kiosks located at the headquarters, Upper Lake campground, east entrance, and along Elk Lake Road. There are also displays, interpretive panels, and maps in the visitor contact area in the headquarters office. Interpretive panels are also located at Shambow Pond and the sandhills.



Upper Lake campground.

USFWS

CAMPING

Due to its remote location, the refuge provides two campgrounds for visitors to participate in wildlife-dependent recreational activities on and off the refuge. River Marsh campground is located at Lower Red Rock Lake and the other campground is at Upper Red Rock Lake. Both are primitive sites with toilets, fire rings, and some picnic tables. Water is only available at Upper Lake campground. One campsite at the Upper Lake campground is universally accessible, but the outhouses are not.

4.6 SOCIOECONOMIC ENVIRONMENT

A socioeconomic study prepared by BBC Consulting (2007) is the source for the information in this section.

Red Rock Lakes National Wildlife Refuge is open to the public and offers hunting, fishing, and wildlife observation and photography. These recreational opportunities attract outside visitors and bring in dollars to the community. The refuge primarily draws visitors from nearby Henry’s Lake in Idaho, but some come from Yellowstone National Park to the east. Ancillary visitor activity, such as spending on food, gasoline, and overnight lodging in the local area, provides local businesses with supplemental income and increases the local tax base. Management decisions regarding visitor services, expansion of services, and habitat improvement measures may either increase or decrease visitation to the refuge and thus affect the amount of visitor spending in the local economy.

STUDY AREA

Red Rock Lakes National Wildlife Refuge is located in Beaverhead County in southwestern Montana, near the Idaho border. The study area also includes neighboring Madison and Gallatin counties as well as Fremont County, Idaho, because they are in close proximity to the refuge and could potentially be affected by management decisions. Gallatin County is different than the other counties because it has a much greater population and larger urban centers located far from the refuge; however, it is included in the study area because the city of West Yellowstone, located in the southern arm of the county near the refuge, serves as a base for overnight accommodation and commercial activity among visitors to the refuge. Fremont County in Idaho is also included because many visitors to the refuge stay in the area surrounding Henry’s Lake and towns to the south.

POPULATION AND DEMOGRAPHICS

The estimated 2005 population of the four-county study area was almost 106,500. Due to the large urban center of Bozeman and surrounding communities, Gallatin County is by far the most populous county in the region, with a population of

78,200 in 2005; followed by Fremont County, Idaho (12,200); Beaverhead County, Montana (8,800); and Madison County, Montana (7,300). The population of the study area grew by over 26% between 1990 and 2000 from 75,800 to 95,700. The population of Montana grew by 13% from 800,000 to 900,000 over the same period. Future growth rates for the study area and the state overall are expected to follow historical trends.

About 32% of the population in 1990 was between 35 and 64 years old, while that same demographic constituted 37% of the population in 2000. Gallatin County, with a large student population, and Fremont County, Idaho, have younger populations, with a median age of 32 in 2000, compared to a median age of 39 in Beaverhead County, and 43 in Madison County.

EMPLOYMENT

Employment in the four-county study area grew significantly between 2001 and 2005, from 43,000 to 50,800, an increase of 18%. Gallatin County had by far the largest workforce with 42,102 employees, followed by Beaverhead County (3,380); Fremont County, Idaho (2,890); and Madison County (2,390). Estimates from 2005 calculated the unemployment rate for Fremont County at 3.9%, Beaverhead County at 3.4%, Madison County at 3.1%, and Gallatin County at 2.8%. These compare favorably to a statewide unemployment level of 4% in Montana and Idaho.

The study area primarily employs individuals in retail trade, accommodations and food services, and educational services. Retail establishments employed 15% of the workforce, while accommodation and food services, and educational services each employed 14% of the workforce. The agricultural industry in the study area is small, employing only 2% of the workforce.

This data is largely driven by the large workforce of Gallatin County. When Beaverhead, Madison, and Fremont (Idaho) counties are examined alone, significantly greater proportions of the workforce are employed in agriculture (6.8%) and public administration (13.5%), and a significantly smaller proportion of the workforce is employed in educational services (9.4%).

CURRENT CONDITIONS

Red Rock Lakes National Wildlife Refuge affects the local economy through the visitor spending it generates and the employment it supports. The refuge currently supports five full-time permanent employees.

The refuge sees approximately 12,000 visitor days annually, of which an estimated 85%, or 10,200 visitor days, are not from the local area. Considering that

expenditures can vary greatly among campers, lodgers, and passers-by, it is estimated that on average, a visitor to the refuge will spend \$25 in the local area per day, for an annual total of about \$260,000.

4.7 OPERATIONS

STAFFING

Red Rock Lakes National Wildlife Refuge has been managed as a “stand alone” refuge since its establishment in 1935. Over the past 70 years, there have been a wide variety of staffing levels. In fiscal year 2007, the refuge was provided base funding for one full-time permanent refuge manager (GS-12), one full-time permanent assistant refuge manager (GS-11), one full-time permanent biologist (GS-11), one full-time permanent maintenance worker (WG-08), and one full-time permanent administrative assistant (GS-7) (table 5). In recent years, the refuge has used grants and other “soft” funding sources in order to hire seasonal staff (such as seasonal biological technicians) and cover the cost of volunteer services. Over the past 5 years, seasonal staffing levels have varied depending on the amount of funding acquired through “soft” funding sources. Seasonal staff have been essential for collecting biological data, maintaining equipment and facilities (for example, signs, buildings, and fences), and orienting and educating refuge visitors. The hiring of seasonal staff has been invaluable to accomplishing biological and visitor service goals each year.

Staff located at the refuge headquarters are responsible for Red Rock Lakes National Wildlife Refuge as well as the Centennial Valley Conservation Easement program (see “Centennial Valley Conservation Easement” on following page).

Table 5. Current base funded staff at Red Rock Lakes National Wildlife Refuge, Montana.

<i>Staff Group</i>	<i>Position</i>
Management	Refuge manager, GS-12, assistant refuge manager, GS-11
Biology	Wildlife biologist, GS-9/11
Administration	Administrative assistant, GS-7
Maintenance	Maintenance worker, WG-8
Total Salaries and Benefits = \$309,365	

FACILITIES

The refuge used the Works Progress Administration (WPA) between 1936 and 1938 to build one log home, one log administrative and maintenance building (since converted solely to an administrative and visitor contact station), two log storage barns, and

one metal fire tower. The refuge has since added several structures to help with management and operation activities. These additional structures include three 3-bedroom residences, one 4-bedroom bunkhouse, one metal maintenance shop, three vehicle and equipment storage structures, one trailer pad, and one 2-bedroom cabin. These structures were obtained through land acquisitions or built by the refuge staff.

The infrastructure for these buildings includes two wells (supplying potable water to the residences, administrative building, bunkhouses, and maintenance shop) and six operational septic systems. The refuge also has an operable cistern that draws water from Shambow Creek. This was the main source of water for the residences until 1956 when a well was established. The cistern now serves as a back-up water supply system and is used occasionally by the refuge staff. The cistern was also used to supply water to the surrounding town of Lakeview. The current year-round population of Lakeview is between five and 15, including the refuge staff and their families.

There are several unused log buildings and structures that were obtained through various land acquisitions. Several of these serve as reminders of the homesteading era (for example, the Buck and Hanson homesteads), and the *Compañeros* house is eligible for listing under the National Historic Preservation Act.

There are numerous water control structures, diversion ditches, culverts, and cattle guards (of various ages and condition) located throughout the refuge. There are approximately 12 miles of public and service roads maintained by the refuge staff and 23 miles of county-maintained roads that bisect the refuge. The South Valley Road (also known as Red Rock Pass Road) is maintained during the winter only from Monida, Montana, to the refuge headquarters. Depending on local weather conditions, this road can be impassable for several days to months at a time during the late fall, winter, and early springtime periods. No other county roads are maintained during the winter months.

CENTENNIAL VALLEY CONSERVATION EASEMENT AND LAND ACQUISITION PROGRAM

Most valleys and foothills in the Greater Yellowstone Area and near the Centennial Valley are being developed or subdivided to provide homes for people wanting to live in more rural settings. During the 1960s, demographers documented that for the first time in American history, higher proportions of people were leaving cities for parts rural than were making the return trip (Fuguitt 1985). “Exurbanization” accelerated in the 1990s, drawing people still further out into the rural west. In the 1990s, the West’s “beachfront property”—rural lands

adjacent to national parks and forests—were the fastest growing areas (Rudzitis 1996). In the Greater Yellowstone area, fully one-third of all private lands have already been subdivided for development, with a majority of new lots locating outside existing towns (Harting and Glick 1994). In Gallatin County, 17,000 acres of farmland were subdivided between 1993 and 1999 alone. Madison Valley recorded 16,000 acres subdivided into 685 lots between 1994 and 1998—most of this into 20-acre “ranchettes” (Johnson 1999). Even in counties with slow growth rates, loss of agricultural land continues. The state of Montana, as a whole, is consuming land four times faster than the population growth rate (U.S. Census Bureau 1999).

The Centennial Valley, in which the refuge lies, remains biologically intact and has not been converted to housing developments. Almost 100,000 acres in the Centennial Valley are privately owned, and the majority of this land remains as large working ranches. The Service recognized the opportunity to partner and compensate these landowners for keeping their lands intact and in 2001 the Service approved the Centennial Valley Conservation Easement Program. An approved acquisition boundary was determined at that time. Since this program began, the refuge has acquired perpetual conservation easements on 20,219 acres from nine landowners (see figure 6, page 19). There are approximately 20,000 acres of additional ranch lands in the Centennial Valley protected by perpetual easements acquired by nongovernmental organization. Given the current trends of low cattle prices and a strong market for scenic western properties, the remaining unprotected Centennial Valley ranches may be vulnerable to sale and subdivision for development.

To achieve Service goals for fish, wildlife, and habitats (including providing large tracts of unfragmented habitats), the Service will pursue acquisition or protection, or both, of inholdings from willing sellers within the approved refuge and Centennial Valley conservation easement boundaries using both fee title and perpetual conservation easements (USFWS 2001). Key areas to acquire and protect include, but are not limited to

- lands that protect and augment existing large tracts of undeveloped and unfragmented habitats (for example, Centennial livestock);
- lands that would protect wetland or riparian habitats, or both (such as those along Red Rock Creek);
- lands that would protect source waters into the refuge to maintain or improve water quality and quantity of the refuge’s wetland habitats (such as Alaska Basin and Red Rock Creek) (Note: the reach of Red Rock Creek through the area known as Alaska Basin is the largest input of water into the refuge remaining unprotected. It is key spawning habitat for Arctic grayling and

arguably the most important input of water into the refuge's wetland complex).

Staff located at the refuge headquarters are responsible for the Red Rock Lakes National Wildlife Refuge and for managing and monitoring lands protected under the Centennial Valley Conservation Easement program (see preceding page). No additional staff or operational funding was added to the refuge when the conservation easement program was established in 2001.

PARTNERSHIPS

The refuge has a history of fostering partnerships that help the refuge accomplish its mission and goals. The refuge actively sought and fostered partnerships with organizations and individuals with whom a

common goal was shared. These partners include county, state, and federal agencies; nongovernmental organizations and conservation groups; schools, colleges, and universities; and local landowners and private citizens. Private lands and significant acres of federal and state lands surround the refuge. These neighboring landowners and agencies have been and will continue to be partners in achieving the refuge's vision in the Centennial Valley, while sharing ideas and resources

The refuge's partners have assisted in wildlife and habitat management, visitor services and recreational opportunities, land protection and acquisition, fire protection, law enforcement, and community outreach. Several of these relationships have developed into formalized partnerships with written agreements or memorandums of understanding, while others remain more informal.

5 Environmental Consequences



Mike Parker/USFWS

Subirrigated wetlands.

This chapter provides an analysis of the potential effects on environmental resources associated with the implementation of the management alternatives for the refuge. The U.S. Fish and Wildlife Service assessed the environmental consequences of implementing each of the alternatives on the biological, physical, social, economical, cultural, and historical resources of the refuge.

5.1 ANALYSIS METHODS

The determination of effects is evaluated at several levels, including whether the effects are adverse or beneficial and whether the effects are direct, indirect, or cumulative with other independent actions. The duration of effects also is used in the evaluation of environmental consequences.

Direct effects are those where the impact on the resource is immediate and is a direct result of a specific action or activity. Examples of a direct effect include the effect of trail construction on vegetation along the trail or the effect of hunting on wildlife.

Indirect, or secondary, effects are those that are induced by implementation actions but occur later in time or farther removed from the place of action through a series of interconnected effects. Examples of indirect effects include the downstream water quality effects from an upstream surface disturbance, or the impact that recreational use along a trail may have on nearby plant communities.

A cumulative effect is defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR 1508.7).

Impacts are often described in terms of their context, intensity, and duration. The duration of effects are described as either short-term or long-term. Short-term effects would persist for a period of 3 to 5 years, and would consist primarily of temporary disturbance to habitat restoration or facility construction and subsequent revegetation efforts. Long-term effects would last more than 5 years after project initiation and may outlast the 15-year lifespan of the CCP. Many long-term effects consist of long-term benefits to wildlife habitat resulting from habitat management actions.

5.2 EFFECTS COMMON TO ALL ALTERNATIVES

A few potential effects would be similar under each of the alternatives:

- The implementation of any of the alternatives would follow the refuge’s best management practices.

- The alternatives would avoid and minimize impacts to federally threatened and endangered species, to the extent possible and practicable.
- The refuge, contractors, researchers, and other consultants would continue to acquire all applicable permits, such as those for future construction activities.

The sections below describe other effects expected to be similar for each alternative.

REGULATORY EFFECTS

As indicated in chapter 1 of this draft CCP, the U.S. Fish and Wildlife Service must follow a number of federal laws, administrative orders, and policies in the development and implementation of its management actions and programs. Among these mandates are the *National Wildlife Refuge System Improvement Act of 1997*, the *Endangered Species Act of 1973*, the *Clean Water Act of 1977*, and compliance with Executive Orders 11990 (Protection of Wetlands) and 11988 (Floodplain Management). The implementation of any of the alternatives described in this draft CCP and EA would not lead to a violation of these or other mandates.

ENVIRONMENTAL JUSTICE

Within the spirit and intent of Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,” no actions being considered in this draft CCP and EA would disproportionately place any adverse environmental, economic, social, or health effects on minority or low-income populations compared to the general public.

The U.S. Fish and Wildlife Service is committed to ensuring that all members of the public have equal access to America’s fish and wildlife resources, as well as equal access to information that would enable them to participate meaningfully in activities and policy shaping.

CULTURAL RESOURCES

As a whole, cultural resources would be enhanced through protecting existing resources and extending protections to newly-discovered cultural resources.

There have been limited cultural resource surveys performed on the refuge; to fully satisfy provisions of NEPA and applicable acts and policies related to historical and archaeological resources, additional surveys would be required before any new construction or excavation.

Potentially negative effects from construction of trails or facilities would require review by the regional archaeologist (region 6) and consultation with the Montana State Historic Preservation Office.

GLOBAL WARMING

The actions proposed in this draft CCP and EA would conserve or restore land and habitat, thus retaining existing carbon sequestration at the refuge. This action would contribute positively to efforts to mitigate human-induced global climate change.

The use of prescribed fire, which releases carbon dioxide, would result in no net loss of carbon because new vegetation would quickly replace the burned-up biomass. Overall, there should be little to no net change for carbon sequestered at the refuge from any of the management alternatives. As it relates to global climate change, documenting the long-term changes in vegetation, species, and hydrology is an important part of research and monitoring. Adjustments in management may be necessary over time to adapt to a changing climate.

GEOLOGY AND SOILS

All alternatives would positively affect soil formation processes on the refuge lands. Some disturbances to surface soils and topography would occur at those locations selected for (1) administrative, maintenance, and visitor facilities; (2) introduced and invasive species removal and eradication; and (3) restoration of native habitat.

WATER QUALITY, WETLANDS, AND FLOODPLAINS

All alternatives would positively affect water quality. Positive effects are anticipated from protecting groundwater recharge, preventing runoff, retaining sediment, and minimizing nonpoint source pollution. The management alternatives are not anticipated to have any adverse effects on the area’s wetlands and floodplains.

5.3 DESCRIPTION OF CONSEQUENCES BY RESOURCE

Management actions are prescribed through various alternatives as a means for achieving the refuge’s vision and goals, while responding to issues raised by Service managers, the public, and governmental partners. Because management would differ for each alternative, the environmental and social effects resulting from implementation would likely differ as well. The environmental consequences discussed in this chapter are the potential effects on a resource as a result of carrying out the actions of an alternative. Chapter 3 (alternatives) presents the management scenario for each alternative, which could create the consequences described here. This chapter discusses the effects common to alternatives and provides a summary of the environmental consequences.

The following section provides an analysis of the effects estimated to result from implementing alternative A (no action), and alternatives B (the proposed action), C (wetland restoration), and D (ecological restoration). A summary of this narrative is also contained in “Chapter 3: Alternatives.” The estimated potential effects of each alternative are described by the major resource topics (issues) described throughout this document.

HABITAT AND WILDLIFE

Alternative A: No Action

Lakes, Ponds, and Marshes

Maintaining the current wetland management would continue to provide a diverse submerged aquatic vegetation community for waterbirds, fishes, amphibians, and invertebrates, as well as extensive areas of sedge and other emergent vegetation for nesting birds and other wildlife.

Natural Lakes

These lakes would continue to function naturally, with little management intervention. Natural climatic variation is the primary driver of annual habitat changes as there are no water control structures on these lakes.

Modified Wetlands

Passive management of modified wetlands would continue under this alternative. Each of the wetlands has a water control structure that permits manipulation of water levels; however, current management maintains relatively static “full pool” water levels, resulting in periodic lowering of water levels (drawdowns) occurring serendipitously during drought periods. Picnic and Elk Springs creeks would not be restored under this alternative. Alternative A would maintain winter habitat for trumpeter swans but preclude restoration of Arctic grayling spawning habitat.



Great gray owl.

Mike Parker/USFWS

Created Wetlands

North Tuck’s Slough would continue to be filled each spring by diverting water from Red Rock Creek until Arctic grayling fry are observed within the creek. Filling the slough creates 103 acres of waterbird breeding habitat.

Lower Red Rock Lake / River Marsh

The Lower Red Rock Lake water control structure has been kept open since 2004 to allow, within the constraints imposed by the structure, a naturally fluctuating hydrological cycle. This will continue under alternative A, providing more than 5,700 acres of highly productive and diverse wetland habitat for waterbirds. The structure would be maintained to permit manipulation of water levels. The refuge staff would continue to conduct limited ecological experiments designed to improve the understanding and management of the system.

Shrub-dominated Wetlands

These habitats would continue to be protected from livestock grazing by maintaining and, in some areas, the construction of fences. More than 1,600 acres of shrub-dominated habitat would be maintained for breeding migratory land birds, wintering ungulates, and other native wildlife. Monitoring of browse levels by native ungulates would continue, providing information for the collaborative management of ungulate populations by MFWP and the refuge. Restoration of streams would occur as resources permitted, increasing the area of shrub-dominated wetland habitats on the refuge.

Wet Meadows

Wet meadows would continue to be managed with grazing and prescribed fire, with an emphasis on providing nesting and foraging habitat for breeding birds. This would maintain more than 7,000 acres of ungrazed to moderately grazed nesting habitat for ground-nesting migratory birds.

Shrub-steppe, Grasslands, and Centennial Sandhills

These habitats would continue to be managed with grazing and prescribed fire, with an emphasis on providing nesting and foraging habitat for breeding birds. Nearly 13,000 acres of shrub-steppe, grasslands, and Centennial Sandhills habitat would be provided for breeding birds, other native wildlife, and rare plants. Coordination with the BLM, The Nature Conservancy, and DNRC would continue to explore the need and opportunities to increase early seral habitat in the Centennial Sandhills.

Aspen Woodlands and Forests

The refuge would continue to work with The Nature Conservancy on projects investigating historical and current extent of, and browse levels on, aspen

in the Centennial Valley. Collaborative efforts with other major landholders in the valley would work toward increasing the reduced regeneration of aspen, improving existing stands of aspen and encouraging aspen expansion throughout the valley. The existing aspen enclosure would be maintained to demonstrate browse effects on reduced regeneration of aspen.

Coniferous Woodlands and Forests

The refuge would continue to coordinate with the BLM to use prescribed fire to reduce fuel loads around Lakeview, decreasing the severity of future wildland fire.

Alternative B: Proposed Action

Lakes, Ponds, and Marshes

Under alternative B, more active management of wetland habitats would provide a diverse submerged aquatic vegetation community for waterbirds, fishes, amphibians, and invertebrates, as well as extensive areas of sedge and other emergent vegetation for nesting birds and other wildlife. Increased oversight of habitat response to management actions would (1) increase understanding of montane wetland systems, (2) improve the refuge's ability to maintain these systems within the range of natural variation, and (3) provide a greater diversity of wetland conditions within and among years. Restoration activities under this alternative would result in a conversion of approximately 40 acres of lacustrine (Culver and MacDonald ponds) and about 92 acres of palustrine (West Pintail Ditch Wetlands) wetland habitats back to stream and other riparian habitats.

Natural Lakes

Upper Red Rock and Swan lakes would continue to function naturally, with little management intervention. Natural climatic variation would continue to be the primary driver of annual habitat changes because there are no water control structures on these lakes. Water-quality monitoring would be conducted to ensure management of adjacent habitats would not adversely affect the lakes. Grazing and fire are known to increase the nutrient cycling of nitrogen and phosphorous (Burke et al. 2005, Hauer and Spencer 1998, McEachern et al. 2000), therefore, management of upland habitats adjacent to Upper Red Rock or Swan lakes could result in elevated levels of these nutrients in the lakes. Elevated levels of phosphorous and nitrogen can lead to increases in algae and turbidity in shallow lakes, which may ultimately lead to significant losses of submerged aquatic vegetation communities (Egertson et al. 2004).

Modified Wetlands

The upper reaches of Elk Springs and Picnic creeks would be restored to provide spawning habitat for

Arctic grayling. This would eliminate about 20 acres of trumpeter swan winter habitat further assisting in efforts to reestablish more southerly wintering areas for swans (USFWS 1992). Restoration of these creeks would also restore 92 acres of wet meadow habitat along West Pintail Ditch. Widgeon Pond water levels would continue to be maintained at full pool in order to provide nonbreeding season habitat for Arctic grayling that spawn in Picnic Creek. The active management of remaining modified wetlands to achieve a more dynamic water level would increase the productivity of these wetlands for the benefit of migratory birds and other wetland wildlife.

Created Wetlands

Water would be diverted from Red Rock Creek to fill North Tuck's Slough only in years when snow-water equivalent is above the 30-year average by the last day of snow-pack accumulation, as measured by the Lakeview Ridge (SNOpack TELEmetry) site (USDA Natural Resources Conservation Service). This would minimize negative hydrological effects of diverting water from Red Rock Creek, while providing 103 acres of waterbird breeding habitat as conditions allow.

Lower Red Rock Lake/River Marsh

Similar to alternative A, except ecological experiments would be greatly expanded not only to advance the understanding of the system and its management, but also to determine if the structure should be maintained or replaced.

Shrub-dominated Wetlands

In addition to activities conducted under alternative A, efforts to reduce effects of livestock grazing on upstream (off-refuge) riparian corridors would be conducted, resulting in the protection and improvement of Arctic grayling spawning habitat. Water diversion from Red Rock Creek for North Tuck's Slough would be limited (see "Created Wetlands"). This would reduce potential for loss of fry during spring, as well as an increased probability of overbank streamflows in Red Rock Creek to encourage willow germination. Irrigation ditches would be restored if they were found to affect the hydrology of adjacent areas. Existing irrigation infrastructure may be used for native grassland restoration. This infrastructure would remain until other restoration activities were completed.

Wet Meadows

Additional emphasis would be placed on improving habitat diversity through management. This would include an adaptive management plan to investigate the effects of grazing, fire, and climate on vegetation, small mammal, and bird communities. Improving habitat diversity in wet meadows would increase the number of migratory bird species using this

habitat. Currently, refuge wet meadows support relatively low bird diversity, with Savanna sparrows and western meadowlarks being predominant. Habitat could be improved for target species, such as long-billed curlews, through the use of grazing and prescribed fire. Studying state bison reintroduction initiatives would permit the refuge to thoroughly investigate the benefits and impacts of repatriating bison on the refuge and in the valley.

Shrub-steppe, Grasslands, and Centennial Sandhills

Management emphasis would be placed on improving habitat diversity. This would include an adaptive management plan to investigate the effects of grazing, fire, and climate on vegetation, small mammal, and bird communities. This would provide improved habitat conditions for target species across nearly 13,000 acres of shrub-steppe, grasslands, and Centennial Sandhills. Additionally, actions would be undertaken to restore areas currently dominated by nonnative grasses. This would likely necessitate plowing and herbicide application to remove nonnative grasses; however, the long-term benefit of native grasslands would include greater structural and species diversity, as well as creating areas more resistant to nonnative plant invasion.

Studying state bison reintroduction initiatives would permit the refuge to thoroughly investigate the benefits and impacts of repatriating bison on the refuge in the valley.

Aspen Woodlands and Forests

In addition to alternative A, the refuge would work with the BLM, The Nature Conservancy, and MFWP to manage aspen at a landscape scale. This would include efforts to increase the reduced regeneration of aspen by increasing disturbance and reducing browse levels, with the ultimate goal of creating and maintaining various-age aspen stands for the benefit of cavity-nesting birds and other migratory and resident wildlife.

Coniferous Woodlands and Forests

Same as alternative A, except a fire use plan, developed in conjunction with BLM, would allow for minimal suppression of wildland fires, thus creating a more natural fire system while saving resources on fires that do not threaten properties.

Alternative C: Wetland Restoration

Lakes, Ponds, and Marshes

Under alternative C, restoration of wetland habitats would eliminate all modified and most created wetlands on the refuge, while increasing stream corridor riparian habitat. The hydrology of refuge lakes, marshes, and streams would be restored to

the extent possible, reducing the need for direct management of water resources.

Natural Lakes

Same as alternative B.

Modified Wetlands

Same as alternative B, except that all modified wetlands would be restored. This would result in the restoration of nearly 3 miles of stream corridor riparian habitat, but 355 acres of lacustrine and palustrine emergent wetland habitat would be lost, including four trumpeter swan nesting territories.

Created Wetlands

Most created wetlands would be restored, precluding diversion of water from Red Rock Creek. This would maintain instream flows, thus eliminating negative effects of this practice on riparian habitat. However, 103 acres of wetland habitat would be lost.

Lower Red Rock Lake/River Marsh

The water control structure at the outflow of Lower Red Rock Lake would be removed as it deteriorates. The slow removal of the water control structure would permit ecological experiments to be conducted to determine its effects and anticipate the changes that would occur once it is removed. Its eventual removal may restore the hydrological system. The ability to manipulate water levels for management would be lost as well as opportunities to capture water that may be needed as water resources become depleted by climate change.

Shrub-dominated Wetlands

Similar to alternative B, except that all water management structures on the refuge would be eliminated, as would all interior fencing. This would, to the extent possible, restore the hydrology of Red Rock Creek and several small streams on the refuge.

Wet Meadows

Under this alternative, fire would be used as the primary disturbance, complemented by native grazers. Livestock grazing would be eliminated. Interior fences would be removed, which would benefit wildlife, especially migratory ungulates like pronghorn, because fences act as a barrier and can entangle wildlife, sometimes leading to death. Additionally, with the removal of cattle from the refuge, native ungulates, such as elk, may use these habitats more, especially the recently burned areas. However, termination of the grazing program would also limit the flexibility to manage target species, including invasive plants.

Shrub-steppe, Grasslands, and Centennial Sandhills

Same as under “Wet Meadows” above, including that termination of the grazing program would limit the flexibility to manage target species, including rare plants found in the Centennial Sandhills.

Aspen Woodlands and Forests

Same as alternative B.

Coniferous Woodlands and Forests

Same as alternative B.

Alternative D: Ecological Restoration**Lakes, Ponds, and Marshes**

Same as alternative B, including if bison become designated as free-ranging wildlife in Montana the refuge will work with the state and neighboring landowners to reintroduce them. Livestock grazing would be eliminated and interior fences would be removed. If free-ranging bison are introduced, they would most likely migrate out of the valley in the winter, due to typically deep snow conditions. It is uncertain where they would travel to, or what the impacts to those wintering grounds would be. However, if bison did winter in the valley this could result in increased grazing of sedge habitats which could reduce residual cover for nesting waterfowl. As generalist grazers, diets of free-ranging bison closely approximate proportions of available grasses and sedges (Meagher 1973, Reynolds et al. 1978). Beaked sedge, the predominant sedge of emergent habitats on the refuge (6,999 acres), is an especially important winter forage plant for bison (Reynolds et al. 1978). Winter grazing of sedge habitats would reduce the amount of residual cover available for early nesting waterfowl species. However, the response of beaked sedge to grazing has varied, making it difficult to predict the response to increased grazing (Allen and Marlow 1994, Clary 1995).

Natural Lakes

Same as alternative B, including if bison become designated as free-ranging wildlife in Montana the refuge will work with the state and neighboring landowners to reintroduce them. Livestock grazing would be eliminated and interior fences would be removed.

Modified Wetlands

Same as alternative C.

Created Wetlands

Same as alternative C, except there would be a complete loss of created wetland habitats, caused by removal of all diversion structures. Additional areas would be created that could be susceptible

to invasion by invasive plant species. Surface water runoff patterns would be restored. A more natural appearance would be created, reflecting the wilderness character of this refuge and altered upland habitats would be reestablished.

Lower Red Rock Lake/River Marsh

Same as alternative C, except the immediate removal of the WCS would not permit ecological experiments to develop a better understanding of effects of this structure and the hydrologic system of the refuge.

Shrub-dominated Wetlands

Same as alternative C.

Wet Meadows

Livestock grazing would be phased out under this alternative. Additionally, the refuge would work with adjacent landowners and the state to reintroduce bison (if re-classified as wildlife). If bison assumed historical grazing patterns, this could return an important, historic ecological process to the refuge and, consequently, the Centennial Valley. There could be cumulative habitat impacts as a result of introducing bison into an already active cattle and native ungulate grazing community within the valley. Bison could become concentrated on the refuge causing overgrazing of grassland habitats needed by nesting migratory birds. Bison have the potential to transmit brucellosis to cattle. This would have to be addressed before reintroduction. Management would focus on increasing heterogeneity within meadows through a combination of fire and grazing by native wildlife, primarily bison (Fuelendorf and Engle 2001). Interior fences would be removed, facilitating wildlife movement within the refuge. Annual or biennial prescribed fire would be used to focus grazing by wildlife in refuge meadows. The fire return interval for focal areas would be 10–15 years, providing a mosaic of different disturbance levels across refuge meadow habitats. The increased heterogeneity would likely result in a greater diversity of breeding birds (Fuelendorf et al. 2006). Reduction of nonnative invasive grasses would continue.

Shrub-steppe, Grasslands, and Centennial Sandhills

Livestock grazing would be phased out under this alternative. Additionally, the refuge would work with adjacent landowners and the state to reintroduce bison. If bison assumed historical grazing patterns, this could return an important, historic ecological process to the refuge and, consequently, the Centennial Valley. There could be cumulative habitat impacts as a result of introducing bison into an already active cattle and native ungulate grazing community within the valley. Bison could become concentrated on the refuge causing overgrazing of grassland habitats needed by nesting migratory birds. Bison have the potential

to transmit brucellosis to cattle. This would have to be addressed before reintroduction. Management would focus on increasing heterogeneity within grasslands through a combination of fire and grazing by native wildlife, primarily bison (Fuelendorf and Engle 2001). Interior fences would be removed, facilitating wildlife movement in the refuge. Annual or biennial prescribed fire would be used to focus grazing by wildlife within refuge grasslands. The fire return interval for focal areas would be 10–15 years, providing a mosaic of different disturbance levels across refuge grassland habitats. The increased heterogeneity would likely result in a greater diversity of breeding birds (Fuelendorf et al. 2006).

Shrub-steppe habitats would similarly be managed by a combination of fire and grazing, but with a greater emphasis on maintaining canopy cover levels of sage sufficient for sage-obligate species such as Brewer's sparrow, greater sage-grouse, and pygmy rabbits. Reduction of nonnative invasive grasses would continue.

Aspen Woodlands and Forests

Same as alternative B.

Coniferous Woodlands and Forests

Same as alternative B.

VISITOR SERVICES AND CULTURAL RESOURCES

Alternative A: No Action

Management strategies under alternative A would not change, so visitor services would continue at the present level. The refuge would continue to provide quality recreational opportunities to visitors. As funding allows, the refuge would continue to replace outdated interpretive panels, directional and boundary signs, and update brochures to better orient and inform visitors. The refuge would continue to support partnerships with the BLM and MFWP that provide the refuge with limited law enforcement coverage; however, due to the large areas the officers are responsible for, violations would continue to occur.

Hunting

The refuge would continue to provide quality hunting opportunities to visitors.

Fishing

The fishing program on the refuge would continue to be valued as one of the compatible wildlife-dependent recreational activities. Currently, fishing is allowed in limited areas to protect breeding birds. Birds or mammals feeding or resting may be disturbed by anglers when fishing, but the current visitor use is often low enough that disturbance by anglers has

minimal impact on most wildlife species.

Wildlife Observation and Photography

Wildlife observation and photography would continue to play an important part in visitors' recreational experience at the refuge. No new infrastructure would be added to provide a higher quality, interactive experience, resulting in missed opportunities to educate refuge visitors.

Environmental Education, Interpretation, and Outreach

Tours and talks would continue to be provided by refuge staff on an opportunistic basis. As funding allows, the refuge would continue to replace outdated interpretive panels, directional and boundary signs, and update brochures to better orient and inform visitors. The refuge would continue to miss opportunities to inform visitors about refuge issues and resources without dedicated staff developing environmental education, interpretation, and outreach programs.

Campgrounds

Two campgrounds would continue to provide visitors with an opportunity to experience quality wildlife-dependent recreational activities for more than half a day without having to drive excessive distances across rough roads. Minor improvements would occur as funding allows. Some short-term impacts, such as littering, vegetation trampling, and wildlife disturbance, can be expected, but these would be minimal and manageable impacts to current refuge programs or wildlife use of the area. The campgrounds would continue to be important to provide visitors a place to reconnect with wildlife and the natural environment.

Cultural Resources

Under this alternative, the refuge would continue to maintain historic properties that are in use and update the interpretive panel at the Shambow Way Station. These actions would preserve the buildings built by the Works Progress Administration for the public to enjoy and to educate visitors about the history of the Way Station.

Alternative B: Proposed Action

Alternative B would increase opportunities for visitors to participate in wildlife-dependent recreation. Visitor numbers are expected to increase. Hiring a temporary seasonal visitor services specialist would allow the refuge to expand the on-refuge interpretive program, enhancing the visitors' experience. In addition, having one staff member acquire and maintain law enforcement credentials would provide added protection for these additional visitors while protecting the refuge and its resources.

Hunting

Hunting area boundary changes would simplify hunting area boundaries and reduce road hunting, while providing additional huntable acres. This change should result in a reduction of violations and a reduction in illegal road hunting while providing continued and expanded opportunities for quality, fair-chase hunts. There would be a reduction in browsing impacts on habitat because ungulates would become more dispersed throughout the refuge. A refuge hunting brochure would assist hunters in identifying areas open to hunting and understanding refuge regulations. To maintain other wildlife-dependent recreational opportunities, use by the public in areas closed to hunting would be allowed, thereby providing year-round nonconsumptive compatible uses to occur.



R. Madsen/USFWS

Waterfowl hunter.

Fishing

The focus of management would be on fish species of management concern, primarily Arctic grayling and Westslope cutthroat trout. While Arctic grayling populations are being restored, MacDonald, Widgeon, and Culver ponds would be open under state regulations to bank fishing, but closed if necessary to protect nesting swans and Arctic grayling. All refuge streams would be open to fishing in compliance with state and refuge regulations. Educating anglers about restoration projects could lead to involvement in the process to protect native species.

The refuge would promote the taking of nonnative fish species, according to state regulations, to reduce competition with Arctic grayling. Opening new streams to fishing may lead to some vegetation trampling, invasive species spread, and wildlife disturbance. A fishing brochure would be developed. There is a potential for increased disturbance to nesting swans on Shambow Pond that may lead to nest abandonment, but the closed area surrounding this nesting area should provide adequate protection.

Wildlife Observation and Photography

Additional opportunities for wildlife observation and photography would provide visitors with a

higher quality visitor experience while maintaining wilderness qualities. The refuge would accomplish this through improving signing, updating brochures, new information kiosks, clarifying regulations, constructing pullouts for wildlife viewing, and developing an auto tour route. With improved facilities to view wildlife, visitor numbers may increase, and visitors may stay longer or go to more sites on the refuge. This may lead to increased disturbance to wildlife. A positive effect of public involvement in these priority visitor services would be a better appreciation and more complete understanding of refuge wildlife and habitats. That can translate into more widespread, stronger support for the refuge, Refuge System, and the protection of the Centennial Valley.

Environmental Education, Interpretation, and Outreach

The actions in this alternative would result in an improved understanding by the refuge visitors of this area's natural history, wildlife resources, cultural resources, and qualities of the refuge, and the mission of the Refuge System. A temporary seasonal visitor services specialist would allow the refuge to develop a limited interpretive program by replacing outdated interpretive panels, directional and boundary signs, and update brochures to better orient and inform visitors. An interpreted auto tour route would allow visitors of all abilities to view and learn about the refuge resources. With no environmental education programs and little outreach, there could be a loss of opportunities to reach surrounding communities, local governments and youth and young adults that could garner support for refuge programs and conservation efforts in the Centennial Valley.

Campgrounds

Campgrounds would continue to be open for visitors participating in wildlife-dependent recreation. They would be improved through the installation of universally accessible toilets at both campgrounds, along with making one campsite at the River Marsh campground accessible. Other improvements, such as food storage containers, picnic tables, fire rings and road repair, would increase visitor safety and the opportunities to use the refuge over multiple days. A recreational fee would be charged to help offset the maintenance of the campgrounds.

Wildlife disturbance would occur in the immediate vicinity of the campgrounds, but impacts would be minimal. Camping supports other priority uses (fishing, hunting, wildlife observation, and photography). Camping on the refuge would have limited negative impacts on natural resources when conducted under refuge regulations.

By providing environmental educational and interpretive programs at the campgrounds to a "captive" audience, the refuge staff can influence citizens of all ages to protect wildlife and habitat,

while developing their own environmental ethics, developing support for the refuge, and decreasing wildlife violations.

Cultural Resources

The actions in this alternative would improve refuge staff's knowledge of the locations and types of cultural resources on refuge lands. This improved knowledge would give the Service the ability to preserve and restore various cultural resources. Better interpretation of cultural resources would provide visitors opportunities to better understand the history of this area.

Alternative C: Wetland Restoration

Alternative C would greatly increase opportunities for visitors to participate in wildlife-dependent recreation. By hiring a full-time visitor services specialist, on- and off-site programs could be developed to reach a much larger number of people, building a constituency who would have a greater understanding of refuge resources and programs and the Refuge System.

Hunting

Same as B, but additional quality hunting opportunities would be provided by creating a unique primitive hunt (such as archery or black powder) area in the central portion of the refuge (see figure 9, page 35). New hunting opportunities would increase harvest and disperse unnaturally concentrated ungulates (as a result of this large closed area) thereby reducing browsing impacts on habitats.

Fishing

This alternative is similar to alternative B, with the exception that fishing opportunities would decrease on creeks currently open to fishing according to state regulations, by opening them later in the summer (June 15) to protect spawning Arctic grayling. Educating anglers about restoration projects and new regulations can lead to their involvement in the process to protect these native species.

Wildlife Observation and Photography

Same as alternative B, but the eastern ponds area would be opened later (June 15), decreasing visitor access to the auto tour route. The refuge would miss opportunities to inform visitors about refuge issues and resources because of the later opening date; however this should be offset by increased opportunities elsewhere on the refuge.

Environmental Education, Interpretation, and Outreach

This alternative would greatly increase opportunities for on- and off-site programs by hiring a full-time visitor services specialist. These actions could

reach a much larger number of people, potentially building a constituency who would have a greater understanding of refuge resources and programs, the Refuge System, and the importance of protecting these lands and the surrounding resources in the Centennial Valley. This could result in expanded interest in the refuge's Conservation Easement Program; thereby protecting the valley from impacts from residential development.

Campgrounds

River Marsh campground would be closed, decreasing opportunities for visitors to enjoy extended stays on the refuge during periods of high use (such as holidays, weekends, and hunt openings). These visitors may be displaced from the refuge due to the limited capacity and popularity of Upper Lake campground. They may not be able to participate in other priority uses (fishing, hunting, wildlife observation, and photography), forcing them to leave the valley and limiting their opportunity to learn about the refuge.

Upper Lake campground would continue to be open for visitors participating in wildlife-dependent recreation. Restrooms would be replaced and made universally accessible. Other improvements, such as food storage containers, picnic tables, fire rings, and road repair, would increase safety for visitors and opportunities to use the refuge over multiple days. The new recreational fee would help offset the maintenance costs of the campgrounds.

Cultural Resources

This alternative is similar to B, except that it has the potential to improve certain aspects of the refuge's habitat management and visitor services because areas of cultural concern would be identified. Additionally, this alternative would increase the likelihood of protecting cultural resources while accomplishing habitat management. This alternative would require an increase in funding to complete the inventory and cultural resources management plan.

Alternative D: Ecological Restoration

Under this alternative wildlife-dependent recreational opportunities would decrease because campgrounds would be closed; interpretation and information would be focused at the visitor contact station in the office; and moose hunting would be eliminated. No new facilities would be built to improve opportunities for wildlife observation and photography. These actions would reduce facility maintenance costs and promote a wilderness/backcountry experience. Lack of facilities and programs may lead to missed opportunities to educate visitors and garner support and understanding for refuge programs.

Hunting

Same as alternative C, except that moose hunting would be eliminated. Moose would be less dispersed during the hunting season and willow habitat would be negatively impacted due to increased moose population size. There would be impacts to a variety of species that use willow habitats, including migratory birds and wintering moose. This impact may increase as moose become concentrated on the newly-created closed area during the hunting season.

Fishing

Same as alternative C.

Wildlife Observation and Photography

This alternative would decrease costs of maintaining infrastructure but would also lead to missed opportunities to educate refuge visitors. No new facilities would be built to improve wildlife observation and photography experiences by visitors. The refuge would promote walking off the trails and roads to observe and photograph wildlife. Dispersed use may increase disturbance to wildlife across a wider area instead of focusing use at developed sites.

Environmental Education, Interpretation, and Outreach

This alternative would be similar to alternative A, but it would focus outreach and interpretation at the visitor contact station only. This would lead to missed opportunities to educate refuge visitors about issues. Minimal signage would preserve a more wilderness setting but only a minimum number of visitors would independently understand and be oriented to the refuge and its resources.

Campgrounds

This alternative would eliminate campgrounds, thus eliminating extended visits at the refuge and promoting one-time day use. Visitors would now have to drive long distances, over rough roads, to other camp sites (≥15 miles) and communities (≥45 miles). These visitors would be displaced due to the limited capacity and popularity of the nearest campsites at Elk Lake. They may not be able to participate in other priority uses (fishing, hunting, wildlife observation, and photography), forcing them to leave the valley and limiting their learning about the refuge. This could lead to increased road traffic from visitors driving from town or other distant campsites to view wildlife, fish, or hunt on the refuge. An increase in road traffic may increase wildlife disturbance and impact the wilderness setting. The combination of more vehicles and poor road conditions could affect the safety of visitors.

Cultural Resources

Same as alternative B.

REFUGE OPERATIONS

Alternative A: No Action

Under this alternative the refuge would not add any infrastructure or staff to support the biological or visitor services programs. This would severely limit the ability of the refuge to develop a greater understanding of the refuge's habitats and dependent wildlife and conduct effective and necessary management actions. The visitor services program would continue to receive minimal attention due to current staff, time, and facility limitations. This lack of interaction with visitors would result in a continued loss of opportunities to educate the many visitors about the refuge and resources and provide almost no opportunities to conduct off-refuge programs.

Alternative B: Proposed Action

Increased biological staffing, including an increase in annual discretionary funding for biological technicians, would greatly increase the ability of the refuge to gain a greater understanding of the refuge's wildlife and habitats. This would allow the refuge to make scientifically-based management decisions and monitor results. Facilities would be built to support basic refuge programs and to provide universal accessibility for visitors of all abilities to enhance their appreciation for and understanding of the resources of the refuge while maintaining wilderness values. There would be added maintenance costs for these facilities. Visitors would also be better oriented on the refuge through better signage. These improvements and the recruiting of a temporary seasonal visitor services specialist would lead to opportunities to educate visitors and garner support and understanding of refuge programs, issues, and the conservation of the resources of the refuge and the Centennial Valley. Closing refuge roads that receive minimal use will save maintenance costs.

Alternative C: Wetland Restoration

This alternative is the same as alternative B except that up to five residences would be constructed. This additional residence would allow the refuge to recruit additional staff, but there will be added costs for constructing and maintaining this additional residence. The addition of a full-time permanent visitor services specialist would allow the refuge to reach a much larger number of people, building a constituency who have a greater understanding of refuge resources and programs, the Refuge System, and the values of conserving the resources of the Centennial Valley.

Alternative D: Ecological Restoration

Same as alternative B, except interpretation and outreach would be concentrated at the visitor contact

station only, minimizing facilities in the field. No new facilities would be built to improve opportunities for wildlife observation and photography. Campgrounds would be eliminated. No new trails or roads would be developed or improved. These actions would reduce facility maintenance costs and promote a wilderness/backcountry experience. The lack of facilities in the field would lead to missed opportunities to educate visitors and garner support and understanding of refuge programs. Eliminating the campgrounds would result in a loss of multi-day visits due to the refuge's remoteness and minimal lodging facilities nearby. The greatest impact would be on hunters who typically spend multiple days at the refuge in pursuit of this wildlife-dependent activity. Wildlife observers and photographers would also not be accommodated should they wish to explore the refuge and the surrounding valley for extended periods. Overall, visitor numbers would decline. Closing refuge roads that receive minimal use will save maintenance costs.

SOCIOECONOMICS

Alternative A: No Action

Alternative A, the no-action alternative, would not see any significant change in the net economic contribution of the refuge to the local economy through visitor spending and employee earnings. Current visitation levels are expected to remain the same, contributing \$260,000 to the local economy. Employment would remain at five full-time employees.

Alternative B: Proposed Action

Under alternative B, increases in employment and visitation to the refuge and Centennial Valley would result in an increase in the economic activity the refuge generates in the local area. Visitation would increase due to enhanced outreach efforts and offerings at the refuge. Visitation under this alternative is expected to increase to 15,000 visitor days, 12,750 of which are from nonlocal visitors. Assuming nonlocal visitors spend an average of \$25 per day, visitation to the refuge would generate roughly \$320,000 in annual local spending. Additional employees under this alternative would increase employment at the refuge from five to seven full-time employees and add at least five seasonal staff. There would be added costs associated with constructing and maintaining housing for staff. Designating refuge trails and an auto tour route may add to maintenance costs and would require the replacement of one refuge bridge.

Alternative C: Wetland Restoration

Under alternative C, increases in employment and visitation would cause a more significant increase in economic activity generated by the refuge. Visitation

would increase due to enhanced outreach efforts, programming, and other offerings at the refuge. Visitation is expected to increase to 16,000 visitor days per year under this alternative, of which 13,600 are from nonlocal visitors. Assuming nonlocal visitors spend an average of \$25 per day, visitation to the refuge would generate about \$340,000 in annual local spending. The addition of an additional full-time employee under this alternative would increase employment at the refuge from five to six full-time equivalents.

Alternative D: Ecological Restoration

Alternative D is expected to result in a decrease in the economic activity generated by the refuge due to a large decrease in visitation. Visitation is expected to fall due to the closing of campgrounds and the banning of moose hunting. However, if free-ranging bison were reintroduced to the refuge, expected visitation loss under this alternative may be offset by attracting new wildlife viewers. Combining these effects, it is estimated that visitation would decline to 7,500 visitor days per year under alternative D, of which 6,375 of those visitors would be nonlocal. Assuming nonlocal visitors spend an average of \$25 per day, visitation to the refuge would generate about \$160,000 in annual local spending. The elimination of grazing would have an uncertain effect on the local economy. The effect may be negative if the ranchers currently using the refuge for grazing do not have adequate private land for cattle grazing and have to move their cattle out of the study area, thereby incurring transportation costs. If there is an adequate local substitute for refuge grazing land, then impacts would be minor. There would be substantial financial costs associated with the removal of all water impoundment or management structures. Additional employees under this alternative would increase employment at the refuge from five to seven full-time employees and add several temporary seasonal staff. There would be added cost for constructing and maintaining additional refuge housing while maintenance costs would be reduced for signage, roads, and trails.

CUMULATIVE IMPACTS

Cumulative impacts include the incremental effects of the actions for an alternative, when these are added to past, present, and reasonably foreseeable future actions. Cumulative impacts can be the result of individually minor impacts, which can become significant when added over time.

The Council on Environmental Quality regulations that carries out NEPA requires mitigation measures when the environmental analysis process detects possible significant impacts on habitat, wildlife, or the human environment.

None of the activities proposed are expected nor intended to produce significant levels of cumulative environmental impacts that would require mitigation measures. Nevertheless, the final CCP would contain the following measures to preclude significant environmental impacts from occurring:

- Federally listed species would be protected from intentional or unintended impacts by having activities banned where these species occur.
- All proposed activities would be regulated to lessen potential impacts to wildlife, fish, and plant species, especially during sensitive reproductive cycles.
- Monitoring protocols would be established to determine goal achievement levels and possible unforeseen impacts to resources. This would allow for application of adaptive resource management to ensure wildlife and habitat resources, as well as the human environment, are preserved.
- The CCP could be revised and amended after 5 years of implementation, for application of adaptive resources management to correct unforeseen impacts that occur during the first five years of the plan.



Mike Parker/USFWS

Garter snakes are the only reptile known to inhabit the refuge.

6 Implementation of the Proposed Action (Draft CCP)



USFWS

Refuge wetland complex.

The draft CCP described in this chapter presents the details of how the U.S. Fish and Wildlife Service would carry out its proposed action—alternative B—for management of Red Rock Lakes National Wildlife Refuge. The planning team recommends this proposed action as the alternative that could best achieve the refuge’s purposes, vision, and goals while helping to fulfill the Refuge System mission.

Management under alternative B acknowledges the importance of naturally functioning ecological communities on the refuge. However, changes to the landscape have affected the ability of the Service to manage the refuge solely as a naturally functioning ecological community. Those changes resulted from human alterations to the landscape, past refuge management to create wetlands, and special management actions to protect species in peril. Because some of these changes are significant, some refuge habitats will require “hands on” management actions during the life of this plan.

Alternative B contains the following key elements:

- There would be improved management of riparian habitats to benefit Arctic grayling and migratory bird species dependent on these habitats. There would be restoration of some modified wetlands (including Culver and McDonald ponds) back to riparian corridors.
- Management actions (such as grazing and prescribed fire) would be directed toward

specific habitat and wildlife objectives, with increased and improved oversight, monitoring, and research (when appropriate) conducted to assess if management objectives are being met.

- Visitor service programs would be improved in order to increase awareness and understanding of refuge resources and management programs, which will result in garnering support for the Refuge System and the conversion of Red Rock Lakes National Wildlife Refuge and the Centennial Valley.
- The following staff and facilities would be needed to carry out this plan:
 - one full-time GS-9 wildlife biologist and at least three temporary seasonal biological science technicians
 - one full-time GS-7 range technician
 - one permanent WG-6 seasonal maintenance worker
 - one temporary seasonal visitor services specialist
 - one temporary seasonal office assistant
 - Due to expanded refuge programs all grade levels for current staff will be evaluated.
 - up to four new residences for current and added staff
 - three additional concrete pads to accommodate recreational vehicles needed to recruit seasonal volunteers

The implementation of the final CCP begins once it has been approved by the regional director (region 6) and the U.S. Fish and Wildlife Service has notified the public of its decision. If alternative B were selected by the director as the preferred alternative, the objectives and strategies presented in this chapter would become the final plan to be carried out over the next 15 years. The CCP would serve as the primary management document for the refuge until it is formally revised. The Service would carry out the final CCP with help from partner agencies, organizations, and the public. The management direction presented in this chapter would meet the purposes, vision, and goals of the refuge.

6.1 PROPOSED GOALS, OBJECTIVES, AND STRATEGIES

This section discusses goals, objectives, and strategies that serve as the steps needed to achieve the CCP goals.

A *goal* is a descriptive, broad statement of desired future conditions that conveys a purpose but does not define measurable units.

An *objective* is a concise statement that indicates what is to be achieved, the extent of the achievement, who is responsible, and when and where the objective should be achieved.

The *rationale* for each objective provides context, such as background information, assumptions, and technical details.

The *strategies* describe the actions needed to achieve the objectives.

LAKE, POND, AND MARSH HABITAT GOAL

Provide habitat for breeding and migrating birds, native fishes, and resident wildlife that maintains the biological diversity and integrity of montane wetland systems. Appendix E contains the draft compatibility determination for research conducted by partners outside the Service.

Natural Lakes Objective

Natural Lakes Objective 1: Maintain Upper Red Rock and Swan lakes in a SAV-dominated stable state (>35% and 60% SAV canopy cover, respectively) throughout the life of the CCP, for the benefit of migratory birds and native fishes.

Strategies

- Review existing water quality data to provide an understanding of the natural variation to be expected in Upper Red Rock and Swan lakes.
- Develop a monitoring protocol with an emphasis on factors that could alter phosphorous and

nitrogen levels, as well as turbidity (for example, upland management in surrounding watershed).

Rationale

Shallow lakes often exist in one of two stable states. The first, and current state of Upper Red Rock and Swan lakes, is a relatively clear water, SAV-dominated condition. The second state is characterized by turbid water and algal domination. These two states seem to fall along a continuum of abiotic and biotic factors such as total phosphorous concentrations (Bayley and Prather 2003) and presence of zooplankton grazers (Jeppesen et al. 1998), respectively. Several of these factors can be altered by anthropogenic actions higher in the watershed.

The refuge's natural lakes provide foraging and brood-rearing habitat for a diverse group of waterfowl and waterbirds. Maintaining these lakes in a SAV-dominated condition increases the value of the lakes to foraging birds. Greater plant biomass directly benefits predominantly herbivorous species such as trumpeter swans (Mitchell 1994, Squires and Anderson 1995), as well as increases the abundance and diversity of invertebrates (Krull 1970, Voigts 1976, Zimmer et al. 2000) for breeding ducks (Baldassarre and Bolen 2006) and largely carnivorous species such as eared grebe (Cullen et al. 1999) and Franklin's gull (Burger and Gochfeld 1994).

Upper Red Rock Lake also supports the last native population of lacustrine/adfluvial Arctic grayling in the contiguous United States (Kaya 1992, Unthank 1989). This population migrates into Red Rock Creek during the spring to spawn and lives the remainder of the year in Upper Red Rock Lake (Gangloff 1996, Nelson 1954). There is limited evidence that a small component of the population migrates into Odell Creek during the spring to spawn (Gangloff 1996, Nelson 1954), although recent work indicates most Arctic grayling that spawn in Odell Creek spend the entire year in the creek (USFWS 2007). Aquatic invertebrates are a significant food source for lake-dwelling Arctic grayling (Kruse 1959, Leonard 1939); therefore, this unique population of Arctic grayling would also benefit from maintaining Upper Red Rock Lake in its current SAV-dominated condition.

Water-quality monitoring will be conducted to ensure the management of adjacent habitats would not adversely affect the lakes. Grazing and fire are known to increase the nutrient cycling of nitrogen and phosphorous (Burke et al. 2005, Hauer and Spencer 1998, McEachern et al. 2000). Management of upland habitats adjacent to Upper Red Rock or Swan lakes could result in elevated levels of these nutrients. Elevated levels of phosphorous and nitrogen can lead to increases in algae and turbidity in shallow lakes, which may ultimately lead to significant losses of SAV communities. See for example, Egertson et al. (2004).

Managed Wetlands Objectives

Managed Wetlands Objective 1: Remove impoundments on Elk Springs Creek and the upper reach of Picnic Creek that create MacDonald and Culver ponds, respectively, within 15 years of CCP approval, to restore approximately 1.7 miles of riparian habitat for spawning Arctic grayling, migratory birds, and native ungulates.

Managed Wetlands Objective 2: Throughout the life of the CCP, maintain Widgeon Pond at full pool to provide lacustrine habitat for Arctic grayling during nonbreeding periods of their life-cycle.

Strategies

- Use stream sections below each of the proposed restorations as representative sites (such as width to depth ratio, sinuosity, and riparian vegetation species composition and canopy cover) to determine when restoration has been successfully completed.
- Define Arctic grayling spawning habitat based on cobble size, stream stretch classification (riffle, pool, run), and water temperature and velocity to ensure suitable spawning habitat is provided in each restored stretch.
- Until restoration is complete, maintain the current infrastructure on Culver and MacDonald ponds to allow water-level manipulations to (1) establish stream channels, (2) restore native riparian vegetation, and (3) provide the option of flooding out nonnative invasive plants such as Canada thistle.
- Update the water control structure at Widgeon Pond to a design that will prevent emigration or immigration of fish.
- Replace the culvert on Culver Road to make fish movement to the headwaters of Elk Springs Creek easier.
- Remove nonnative fish from Picnic Creek and Widgeon ponds, throughout the life of the CCP.
- Use remote-site incubators (Kaeding and Boltz 2004) in Elk Springs and Picnic creeks to reestablish Arctic grayling populations, throughout the life of the CCP.
- Conduct annual Arctic grayling spawning population counts on Elk Springs and Picnic creeks, throughout the life of the CCP.
- Restore Mallard Canal and Pintail Ditch. This will also preclude diversion of water to the West Pintail Ditch wetlands. Use the recently installed fish screen in the headgates to improve the water diversion structure at Red Rock Creek.

Rationale

Arctic grayling in Montana represent a glacial relict population from the Wisconsin Ice Age

(Redenbach and Taylor 1999). Two endemic Arctic grayling populations persist in Montana: a fluvial (river-dwelling) form in the Big Hole River and a lacustrine/adfluvial (lake-dwelling and stream spawning) form in Upper Red Rock Lake. The population in Upper Red Rock Lake represents the last endemic population of lacustrine/adfluvial Arctic grayling in the contiguous United States, although populations have been established in approximately 60 lakes throughout western Montana (MFWP [no date]). Lacustrine/adfluvial Arctic grayling spend the nonbreeding season in lake habitats, while using lake tributaries for spring spawning activities.

Early accounts by homesteaders show that Arctic grayling were common throughout the lakes and streams of the upper Centennial Valley (Unthank 1989). The population began to decline in the 1930s (Vincent 1962), likely due to a combination of factors such as introduction of nonnative fish (such as brook trout), water diversion, and heavy grazing of riparian corridors (Unthank 1989). Upper Red Rock Lake Arctic grayling currently only spawn in Red Rock and Odell creeks, although historically they spawned in other Upper Lake tributaries.

Restoring Elk Springs Creek and the upper reach of Picnic Creek would provide approximately 1.7 miles of stream habitat that was traditional spawning habitat for Arctic grayling. To create a lake and creek complex to meet the life-history needs of lacustrine/adfluvial Arctic grayling, Widgeon Pond, an impoundment downstream of Culver Pond on Picnic Creek, would be maintained. The Picnic Creek and Widgeon Pond complex would be managed specifically for Arctic grayling, which would include the removal of nonnative fish. This complex would provide a local refuge Arctic grayling population for other reestablishment projects in the valley. Additionally, Widgeon Pond is large enough and deep enough that it could possibly support a Westslope cutthroat population as part of the pond's fishery.

Additionally, refuge willow habitats support one of the highest density winter moose populations in Montana (Warren and O'Reilly 2005). The population has been steadily increasing by about 2% annually for the period 1966–2008 (USFWS 2008a). However, there is evidence that the population is demonstrating density-dependent habitat limitation, for example, Ferguson et al. 2000). The increase in winter moose population has been concurrent with a significant decline in productivity, as measured by the ratio of calves to adults in annual surveys (Warren and O'Reilly 2005) Intense browsing of willow (Keigley and Frisina 2001, O'Reilly 2006) and aspen (Richard Keigley, research ecologist, USGS, personal interview) by ungulates has been observed within the refuge. This evidence suggests that the moose population may be limited by winter habitat. Restoring Elk Springs Creek and the upper reach of Picnic Creek would increase the available winter

habitat for moose on the refuge by approximately 40 acres.

The proposed removal of MacDonald and Culver ponds would eliminate 10–20 acres (varies depending upon ice cover) of winter waterfowl habitat. These ponds were historically used to feed wintering trumpeter swans. Winter feeding at the refuge occurred from 1935 to 1992, and was an important component of early trumpeter swan conservation efforts. The feeding program was terminated as part of a program to expand the winter range of the increasing Rocky Mountain population (RMP) of trumpeter swans (USFWS 1992). According to the “Midwinter Waterfowl Survey” the average number of wintering trumpeter swans on the two ponds during the 5 years before termination of winter feeding (1988–1992) was 348.1 ± 13.4 (mean \pm SE); with peak numbers over 800 individuals. The ponds now provide winter habitat for 40.5 ± 7.8 swans, 117.0 ± 10.6 ducks, and 2.1 ± 1.0 geese, based on 10-year averages (USFWS 2008b). Restoring Elk Springs Creek and the upper reach of Picnic Creek would eliminate waterfowl winter habitat but would further efforts to expand the winter range of RMP trumpeter swans.

Managed Wetlands Objective 3: Manage Shambow, Shorebird, Shoveler, Sparrow, and Teepee Creek ponds and Sparrow Slough with alternate, infrequent drawdowns to provide about 132 acres of semipermanent palustrine emergent habitat with 30%-50% flooded emergent canopy cover for the benefit of breeding migratory birds over the life of the CCP.

Managed Wetlands Objective 4: To protect riparian corridors, over the life of the CCP, divert water to

North Tuck Slough in years when snow-water equivalent is above the 30-year average by the last day of snow-pack accumulation, as measured by the Lakeview Ridge (SNOpack TELEmetry) site (USDA Natural Resources Conservation Service). This will provide 103 acres of semipermanent palustrine emergent habitat with 30%-50% flooded emergent canopy for breeding migratory bird habitat.

Strategies

- Conduct a drawdown every 7 years (on average), in an alternating cycle, on managed wetlands, throughout the life of the CCP.
- Begin monitoring emergent wetland vegetation to ensure the objective is being met, within the first year of implementation of the CCP.
- Fill North Tuck’s Slough, via the Hansen diversion, as prescribed.
- Throughout the life of the CCP, monitor Red Rock Creek for Arctic grayling fry upstream of the Hansen diversion weekly when diverting water to North Tuck’s Slough. The diversion will be closed when Arctic grayling fry are observed.

Rationale

Periodic drawdowns will be undertaken to increase productivity of these managed wetlands. Maintaining relatively static and high water levels, as has been done with the wetlands in recent history, lowers wetland productivity. Static water levels create anaerobic conditions within wetlands, thereby limiting decomposition and nutrient cycling (Brinson et al. 1981). The natural drought cycle of prairie glacial wetlands allows for infrequent aeration of the bottom substrate and decomposition of accumulated detritus (Mitsch and Gosselink 1986). Less is known about the effects of drought on montane wetlands, but key physical processes (such as decomposition of detritus and release of soluble nutrients) should function in much the same fashion. Therefore, drawdowns in managed wetlands are frequently recommended in order to mimic the natural drought cycle and stimulate the decomposition of accumulated detritus and nutrient cycling (Payne 1992).



USFWS

Created wetland, North Tuck Slough.

Persistent deep water in wetlands also alters plant communities. Many species of wetland plants do not germinate in deep water and cannot survive if continuously flooded (Bishop et al. 1979, Harris and Marshall 1963, Kadlec 1962, Weller 1999). As a result, there are greater open-water areas, which reduces populations of aquatic invertebrates and lowers bird diversity (Weller and Spatcher 1965, Weller 1981). Although this open-water marsh stage is selected by various bird species such as American coot, lesser scaup, ruddy duck (Murkin et al. 1997), and grebes (Cullen et al. 1999, Muller and Storer 1999, Storer and Nuechterlein 1992), it represents a phase of the natural cycle marshes undergo, not a climax community. Drought conditions “reset the clock” for an open-water-stage marsh by lowering water levels, which results in exposed mud flats that stimulate plant germination. When reflooding occurs, dense stands of inundated emergent vegetation persist for a brief period before being flooded out. The period of open water, interspersed with emergent vegetation in roughly equal amounts, is known as the hemi-marsh. Maximum bird numbers and the greatest diversity of dabbling duck species are associated with the hemi-marsh stage (Kaminski and Prince 1981, Murkin et al. 1997, Weller and Spatcher 1965). The continued flooding of the hemi-marsh stage results in the return of the marsh to the open-water stage.

Lower Red Rock Lake and River Marsh Objective

Lower Red Rock Lake and River Marsh

Objective 1: Increase the percent coverage of pondweeds and Canadian waterweed, collectively, to >40% in Lower Red Rock Lake and River Marsh within 10 years of CCP approval.

Strategies

- Follow the “Adaptive Resource Management Plan for Lower Red Rock Lake, Red Rock Lakes National Wildlife Refuge, Montana”, as long as the WCS is still functional.
- Maintain the WCS for the life of this CCP, unless it is determined that removal is warranted due to negative effects on the hydrological system.
- Conduct ecological experiments to improve the understanding and management of the WCS and surrounding hydrological system, throughout the life of the CCP.
- Continue to monitor submerged aquatic vegetation, climate, and water levels annually, throughout the life of the CCP.

Rationale

Historical survey data and the relative forage quality of SAV were the criteria used to determine the desired species composition of Lower Red Rock Lake and River Marsh. The SAV community is currently dominated by shortspike watermilfoil (USFWS 2008c). Historical records show this species was always present but that other species were also well represented. A 1922 field report (Sperry 1922) stated shortspike watermilfoil was abundant in Lower Red Rock Lake, as well as several pondweed species, star duckweed, and quillwort. Also recorded in the report were one large bed of Canadian waterweed and several large beds of arumleaf arrowhead. Importantly, these observations were made before any form of WCS was placed on Lower Red Rock Lake.

A wooden WCS was built on the western outflow of Lower Red Rock Lake in 1930 by the state of Montana. This structure was in place for over 20 years before the first refuge survey of the SAV community in 1955–56 (Beed 1957). The greatest percent species composition measured during that initial survey was Canadian waterweed at 39%, followed by pondweeds (18%), and algae (12%). Shortspike watermilfoil was scarce in Lower Red Rock Lake (<2%). The wooden structure was replaced in 1957 with a concrete WCS with a sill height elevation of 6,607 feet above mean sea level. This new structure was built without headgates, preventing the refuge from being able to manipulate water levels.

The SAV community of Lower Red Rock Lake changed little during the 15 years after the construction of the 1957 WCS. Paullin (1973) found that shortspike watermilfoil comprised 2%–17% of the aquatic vegetation during 1956 to 1971, while pondweeds comprised 18%–42% over that same period. However, the proportion of Canadian waterweed and arumleaf arrowhead decreased during this period, the former from 60% to <1% and the later from 8% to 1.3%. Paullin (1973) attributed the decline of Canadian waterweed to overgrazing by trumpeter swans and macro-nutrient depletion. The decline of arumleaf arrowhead is likely related to the termination of seeding by the refuge. Arumleaf arrowhead was introduced to the Red Rock lakes shortly after the refuge was established, with seeding continuing for several years.

The sampling plan established by Paullin (1973) was continued on an annual basis until 1985. By this time, the species composition of the vegetation comprised of shortspike watermilfoil had increased to 34%, while that of pondweeds remained within its historical range, also at 34%. The 1957 WCS was replaced in 1987 with a WCS

that facilitated water level manipulations via six adjustable headgates with a sill height of 6,604 feet above mean sea level. Unfortunately, SAV surveys of Lower Red Rock Lake were not conducted between 1986 and 2001. When SAV surveys were conducted in 2002, shortspike watermilfoil had increased to 57% species composition, while pondweeds declined to 12%. The Service believes that this result can be partially explained by recent Lower Red Rock Lake water levels. The 7 years preceding this most recent survey were marked by high water levels (>6,607 feet above mean sea level) maintained in Lower Red Rock Lake throughout the summer. Relatively high static water levels during the growing season would likely favor shortspike watermilfoil, a species more common in lacustrine habitats. Additionally, consistently high water levels may negatively affect pondweeds, which are known to produce especially heavy seed crops under drought conditions (Muenscher 1936, Sharp 1951). Sago pondweed, an especially favored waterfowl food (Kadlec and Smith 1989, Kantrud 1990), ostensibly lacks competitive ability in increased water levels (Harris and Marshall 1963).

Recent trends in local climate (increasing temperatures and decreasing precipitation) have raised concern for the future of refuge water resources. If these trends continue, the current WCS may provide important management capabilities to protect wetland habitats. For this reason, the Service will maintain the current structure; however, if studies determine that the current WCS negatively affects the hydrology of the system, the structure may be removed.

RIPARIAN HABITAT GOAL

Maintain the processes necessary to sustain the biological diversity and integrity of native riparian vegetation for breeding birds, native fishes, and wintering ungulates. Appendix E contains the draft



Mike Parker/USFWS

Moose depend on refuge riparian areas for winter survival.

compatibility determinations for research (conducted by partners outside the Service) and cattle grazing.

Riparian Habitat Objectives

Riparian Habitat Objective 1: Maintain at least 500 acres of moderate to dense (>40% canopy cover) willow riparian habitat to benefit breeding migratory songbirds, spawning Arctic grayling, and native ungulates, throughout the life of the CCP.

Strategies

- Continue collecting data on willow canopy cover and shrub volume along Red Rock and Odell creeks as needed to determine and monitor management actions, throughout the life of the CCP.
- Maintain existing riparian fences and use temporary fencing, as needed, to protect riparian habitats from cattle, throughout the life of the CCP.
- Continue to cooperate with The Nature Conservancy to conduct annual monitoring and treatment of nonnative invasive plant species, throughout the life of the CCP.

Rationale

Riparian habitat refers to “plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water bodies (rivers, streams, lakes, or drainage ways). Riparian corridors have one or both of the following characteristics: (1) distinctively different vegetative species than adjacent areas; or (2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian corridors are usually transitional between wetlands and uplands” (USFWS 1997).

Riparian habitats on the refuge are comprised of both woody and herbaceous vegetation. Woody vegetation includes Bebb, Booth’s, sageleaf, Drummond’s, narrowleaf, Geyer, Pacific, false mountain, and Wolf’s willows with scattered bog birch and shrubby cinquefoil, whereas the herbaceous community consists of various grasses, sedges, and forbs. Most of the woody species have the ability to resprout following disturbance. A large willow fen covers nearly 1,400 acres on the southeastern edge of Upper Red Rock Lake. Large stands of shrubby cinquefoil, totaling over 2,000 acres, occur throughout the refuge, with the largest stands occurring on the eastern portion. Red Rock and Odell creeks are the two largest streams on the refuge, with each supporting approximately 210, and 130 acres of willow-dominated riparian habitat, respectively. Additionally, each creek has several small tributaries with associated riparian habitat.

Hydrology is the primary determinant of riparian vegetation composition and structure (Beschta 2003,

Cary 2005, Cooper et al. 2006). The most important hydrological parameters include the time, duration, magnitude, and frequency of both surface and groundwater flows. Flow magnitude is important to consider in relation to creating suitable conditions (scouring and overbank flooding) for germination whereas duration and frequency of near-surface flows are critical to ensuring survival of newly established vegetation.

Hydrology also indirectly affects the periodicity, severity, and intensity of fire, which can exert tremendous influence on both the germination conditions and the structure of existing vegetation (Dwire and Kauffman 2003, Pettit and Naiman 2007). Fires in riparian habitats are typically less intense and occur at a lower frequency than the surrounding uplands due to higher moisture content and higher relative humidity (Dwire and Kauffman 2003, Pettit and Naiman 2007). Typically, fires enter riparian habitats from the surrounding uplands, creating patches of burned and unburned habitat, and the degree to which the riparian habitat burns is related to the intensity of the fire and the width of the riparian corridor (Pettit and Naiman 2007). The effect of fire on riparian habitats depends upon several characteristics, including local topography, stream size, vegetation structure and composition, and topographic aspect. Fire can also influence stream sedimentation and nutrient levels (Pettit and Naiman 2007).

The current condition of riparian habitats on the refuge is variable, depending upon which stream is considered. Woody and herbaceous vegetation exists within most stream corridors, but visual observations suggest that new germination may be lacking in some areas. A potential cause for this disruption includes water diversions that have altered the hydrologic system. In addition, nonnative invasive plant species, especially Canada thistle and common tansy, have been introduced to many stream corridors. Many

riparian habitats on the refuge have been fenced out to exclude cattle, although cattle are still able to access some streams.

Plant communities associated with riparian habitats on the refuge have multiple natural resource values important in the Intermountain West and the Centennial Valley. These communities provide breeding and stopover habitat for migratory land birds, browse and forage for native ungulates, and travel corridors for various large mammals. In addition, riparian vegetation also provides many indirect values, including regulation of stream temperatures, and nutrient inputs to streams (particularly headwater areas) that form the basis of the food chain for invertebrates, fish, and herpetiles. Also, treefalls provide materials for beaver that influence bed load transport, streamflows, and various other processes important to sustaining stream systems.

Dozens of migratory land birds that occur on the refuge depend on riparian habitats for breeding or migration. Breeding bird surveys were conducted over two breeding seasons (2006–2007) in refuge willow riparian habitats. Over 70% of all bird species detections were comprised of five species: yellow warbler, common yellowthroat, song sparrow, Lincoln's sparrow, and white-crowned sparrow. These species represent a range of nesting and foraging requirements (table 6), demonstrating the habitat diversity currently provided by refuge riparian habitats.

Data from vegetation measurements conducted along both Odell and Red Rock creeks, as well as the willow fen, show that along the creeks, tall-statured willow species predominate (primarily Booth's, Geyer, and Drummond's willow). The willow fen is comprised of a mosaic of low-statured (Wolf's willow) and tall-statured willow species (primarily Booth's, Bebb, and Geyer's willow). Canopy cover of willow

Table 6. Nesting and foraging requirements for the five most commonly detected bird species in willow riparian habitat at Red Rock Lakes National Wildlife Refuge, Montana.

<i>Species</i>	<i>Nesting Habitat</i> ^{a,b}	<i>Nesting Substrate</i> ^c	<i>Foraging Substrate</i> ^c
Yellow warbler	intermediate	shrub	shrub
Common yellowthroat	mesic, short willow, dense cover	ground	ground/low vegetation
Song sparrow	mesic, short willow, dense cover	ground	ground/water
White-crowned sparrow	xeric, tall willow	ground	ground/shrub
Lincoln's sparrow	mesic, short willow, dense cover	ground	ground

^a Finch 1989

^b Douglas et al. 1992

^c Lowther et al. 1999, Guzy et al. 1999, Arcese et al. 2002, Chilton et al. 1995, Ammon 1995

averaged between 30% and 50%. The willow habitat along the creeks tended to have higher volume and structural heterogeneity than the willow fen.

Riparian Habitat Objective 2: Maintain low to moderate browse levels, as indicated by a positive live/dead browse index, within willow habitats for the maintenance of willow volume, canopy cover, and structural heterogeneity, throughout the life of the CCP.

Strategies

- Cooperate with the MFWP to assess the level of browse within willow riparian habitats on the refuge at least every 3 years, throughout the life of the CCP.
- If browse surveys show that browse levels are increasing (that is, if stems killed by browsing are taller than live stems), cooperate with the MFWP to develop an adaptive harvest plan for native ungulates, throughout the life of the CCP.

Rationale

Herbivory can also significantly influence the vegetative structure and composition of riparian habitats. Riparian habitat on the refuge is critical in maintaining native ungulate populations, particularly moose. The refuge supports one of the highest densities of wintering moose in the northern Rocky Mountains. In southwest Montana, willow provides over three-fourths of summer and winter forage for moose (Dorn 1970). Dorn (1970) found Booth's willow to be the preferred browse species for moose in all seasons, as well as the most common species on the refuge. Other work has shown that Geyer willow is most preferred, followed by Booth's willow, with Bebb willow being the least preferred (Cary 2005, Hansen et al. 1995). Booth's willow was the most common species observed in the fen during Dorn's study; however, the majority of tall willow in the fen habitat is currently Bebb willow. This may show that at some point over the last three decades, a shift in willow species composition occurred in response to browse intensity.

The current level of willow browsing by moose was estimated during two growing seasons (2006-2007) by comparing the height of live stems to the height of stems killed by browsing (LD index; Keigley et al. 2002). The LD index is an efficient method of assessing the level of browse pressure in the willow community and predicting related willow community trends. If live stems are taller than stems killed by browsing, this indicates light to moderate browse pressure. The estimated LD index across habitats and years was positive, indicating light to moderate browsing was occurring in refuge riparian habitats.

Riparian Habitat Objective 3: Provide relatively shallow (<16 inches) gravel and pebble (0.1–2.4



McLaury/USFWS

Native lake dwelling Arctic grayling.

inches) dominated, moderate flow (0.9–3.0 feet per second-1) habitat for spawning Arctic grayling (Sempeki and Gaudin 1995) on Odell and Red Rock creeks within the refuge, over the life of the CCP.

Strategies

- Determine current spawning grounds within Odell and Red Rock creeks within the refuge, and identify any immediate threats to these areas within 2 years of CCP approval.
- Restore irrigation ditches that influence the hydrology of streams currently used for spawning by Arctic grayling, while retaining ditches needed for restoration efforts.
- Throughout the life of the CCP, work with adjacent landowners to reduce effects of cattle grazing on upstream sections of Red Rock Creek to protect and improve Arctic grayling spawning habitat. Encourage establishment of seasonal grazing and fencing systems. Encourage landowners to avoid trailing cattle through streams during peak spawning, and fry movement and dispersal.
- Use visual assessments to examine the hydrologic function and riparian habitat quality of refuge streams in terms of the level of bank erosion, vegetation cover, and sedimentation, throughout the life of the CCP.
- Work with adjacent landowners to reevaluate the current condition of spawning habitat contained in streams (particularly Red Rock and Odell) upstream of the refuge boundary.

Rationale

The refuge provides habitat for the last known native population of lacustrine/adfluvial Arctic grayling in the conterminous United States. Historically, this species spawned in numerous tributaries of Lower and Upper Red Rock lakes. Currently, spawning occurs in only Odell and Red Rock creeks. Threats to Arctic grayling include water quality (sedimentation and nutrients), as well as water quantity. High overbank flows can strand spawning Arctic grayling on streambanks, whereas low flows can result in increased sedimentation and water temperatures

(Nelson 1954). Competition with and predation by introduced fish species, especially brook and rainbow trout, has also impacted Arctic grayling populations. Water diversions used for irrigation purposes through the 1970s resulted in direct mortality of adult spawning Arctic grayling and fry as they returned to the lakes. Finally, livestock grazing, both historic and current, has had a detrimental effect on Arctic grayling spawning habitat by removing vegetation and increasing sediment and nutrient loads, as well as trampling of Arctic grayling eggs and fry still in the stream gravels.

WET MEADOW, GRASSLAND, AND SHRUB-STEPPE HABITAT GOAL

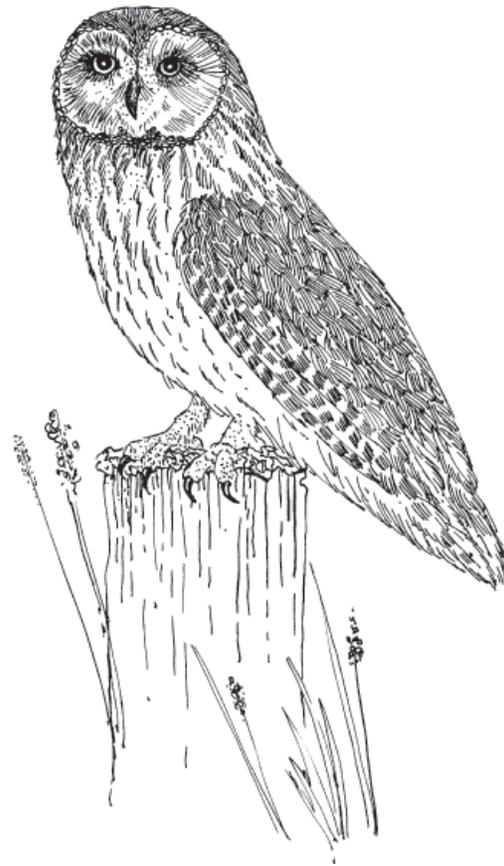
Provide structurally-complex native meadow, grassland, and shrub-steppe habitats, within a watershed context, for sagebrush-dependent species, upland-nesting migratory birds, rare plant species, and other resident wildlife. Appendix E contains the draft compatibility determinations for research and cattle grazing.

Wet Meadow Objective

Wet Meadow Objective 1: Continue to provide nesting, foraging, and brood-rearing habitat for northern pintail, long-billed curlew, short-eared owl, sandhill crane, and greater sage-grouse by ensuring large, contiguous areas (5,000 acres or more) of wet meadow habitat dominated (70% or more of total canopy cover) by native graminoids (sedges, rushes, grasses) with a mosaic of relatively short (<1 foot in height) to moderately tall (1–2 feet in height) vegetation; moderate to high (30% to 70%) litter cover, and moderate (30% to 60%) canopy cover of forbs annually from mid-April to early August, throughout the life of the CCP

Strategies

- Implement a vegetation monitoring program to assess if focal species habitat requirements are being met within 5 years of CCP approval.
- Determine long-billed curlew distribution, nesting densities, and nesting success on the refuge within 5 years of CCP approval.
- Determine sandhill crane distribution, nesting densities, and nesting success on the refuge within 5 years of CCP approval.
- Carry out a study of short-eared owls, examining their distribution, nesting densities, and nesting success and relate these to annual variation in small mammal abundance during the life of the CCP.
- Implement a study to determine the influence of cattle grazing on the abundance and distribution of small mammals, the primary



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Short-eared owl

- prey of short-eared owls, within 2 years of CCP approval.
- Use prescribed cattle grazing or prescribed fire, or both, in an adaptive management context to maintain vegetation characteristics, particularly in areas invaded by smooth brome and Kentucky bluegrass, throughout the life of the CCP.
- Use fuels treatment (including prescribed fire or other mechanical means) to also reduce hazardous fuels, thereby minimizing the threat to life and property, throughout the life of the CCP.
- Study the impact of participating in state repatriation initiatives, if bison become reclassified as wildlife in Montana, determining the effects of free-ranging bison on the resources of the refuge and the Centennial Valley.
- Lethal control of carnivores (such as wolf, grizzly bear, mountain lion) would not be permitted on the refuge to protect cattle used in the prescribed grazing program without permission from the refuge manager and a special use permit, throughout the life of the CCP.

Rationale

Wet meadow habitats provide nesting, foraging, and brood-rearing habitat for several species of shorebirds, raptors, game birds, and passerines. Several federal, state, and nongovernmental lists were reviewed to determine birds of conservation concern that breed on the refuge. Five species were selected as target species that reflect the suitable nesting and foraging wet meadow habitat on the refuge. These species were selected for a number of reasons:

- All five species use the refuge for some portion of their breeding cycle.
- Northern pintail, long-billed curlew, sandhill crane, and short-eared owl are service focal species (Warren and O'Reilly 2005).
- Long-billed curlew and short-eared owl are bird species of conservation concern (USFWS 2002b).
- Long-billed curlew is of concern under the U.S. Shorebird Conservation Plan (USFWS 2001).
- Long-billed curlew is a state-listed sensitive species in Montana (MTNHP and MFWP 2006).
- Long-billed curlew, short-eared owl, and greater sage-grouse are listed as priority level III or higher by Montana Partners in Flight (Casey 2000).

Although over 7,000 acres of the refuge are wet meadow, the most contiguous area occurs north of Upper Red Rock Lake (5,000 acres or more). Several of the target bird species have large territories (Dugger and Dugger 2002, Rowland et al. 2004, Tacha et al. 1992, Wiggins et al. 2006), thus large contiguous areas of suitable habitat are critical. Vegetative and structural characteristics (such as a mosaic of vegetation heights and residual cover) inherent to wet meadow habitats on the refuge likely provide suitable nesting, foraging, and brood-rearing habitat for these species. Data on distribution and breeding success for these species on the refuge are necessary to determine what, if any, management changes are needed.

A comprehensive literature review was conducted for these species to determine their specific habitat requirements, and management objectives for this habitat were developed based on these requirements. Requirements such as vegetation height, canopy cover, and litter or residual cover were used to create objectives for this habitat (see table 7).

Northern pintails are one of the earliest breeding North American ducks, preferentially selecting shallow ephemeral wetlands over more permanent wetlands for breeding territories (Stewart and Kantrud 1973). Ephemeral wetlands support abundant chironomids (midges) immediately after ice melt, providing a particularly important food resource for breeding female pintails (Fredrickson

and Heitmeyer 1991). Females typically select nest sites further from wetlands and with sparser vegetation than other upland-nesting ducks (Austin and Miller 1995). Refuge wet meadow habitats provide both seasonally flooded shallow wetlands and extensive areas of short, dense vegetation for nesting pintails.

Long-billed curlews typically select nests in vegetation with high vertical density in the 10- to 20-inch range (Pampush and Anthony 1993) and over 12 inches in height (Dugger and Dugger 2002). Foraging territories may be within or outside of nesting territories, as long-billed curlews are opportunistic foragers, feeding primarily on terrestrial insects such as grasshoppers (Dugger and Dugger 2002).

Sandhill cranes nesting in wet meadow habitats typically select vegetation that is between 4 and 12 inches in height early in the nesting season (late April-early May) (Austin et al. 2007). Late in the nesting season (early June), vegetation around nests can be highly variable (between 4 and 24 inches in height), depending on moisture and vegetative composition (Austin et al. 2007). Early season water depths around nests in wet meadows average about 1.5 inches (Austin et al. 2007). Sandhill cranes are opportunistic foragers (Mullins and Bizeau 1978, Tacha et al. 1992).

Short-eared owls select nesting habitat with moderately tall vegetation, dense residual cover, and high visual obstruction readings (Dechant et al. 2003, Fondell and Ball 2004, Herkert et al. 1999, Kantrud and Higgins 1992, Wiggins et al. 2006). Major food items are small mammals, voles in particular (Wiggins et al. 2006), and voles require residual cover for the creation of extensive runways (Foresman 2001). Several studies have noted that short-eared owl annual breeding numbers are closely tied to vole numbers (Wiggins et al. 2006).

Greater sage-grouse use wet meadows in a mosaic of upland sagebrush that provide abundant insects and succulent forbs as brood-rearing habitat (Schroeder et al. 1999). Wet meadows may be particularly important for broods in dry years (Rowland et al. 2004).

If bison become designated as a free-ranging wildlife in Montana, the Service will work with the state to determine the feasibility of repatriating bison onto the refuge and the Centennial Valley. Studies would need to be conducted to determine the effects these reintroduced ungulates would have on the refuge resources and the valley in combination with other native ungulates and cattle. Any proposals that would require the construction of additional fencing, which would limit native wildlife movements, would not be considered.

Table 7. Habitat requirements for target wet meadow bird species.

<i>Species</i>	<i>Vegetation Height (inches)</i>	<i>Vegetation Cover</i>	<i>Litter and/or Residual Cover</i>	<i>Area Requirements</i>	<i>Nesting</i>	<i>Foraging</i>
Northern pintail	< 12	Nest sites have low visual obstruction readings.	Dependent upon residual cover for nest concealment.	Nesting success positively related to larger, more contiguous, grassland area	X	
Short-eared owl	12–24	Nest sites have high visual obstruction readings. Has higher nest survival in ungrazed habitats. Avoids areas with bare ground.	2–8 years of residual cover buildup	> 250 acres	X	X
Long-billed curlew	< 12	Nest sites have low vertical profile and vegetation density.	Requires moderate residual cover for nesting	35 acres per territory with buffer of 984–1,640 feet	X	X
Sandhill crane	< 4–24	Needs adequate cover for concealment of large nest platforms.	Requires moderate residual cover for nesting	42 acres per territory		X
Greater sage-grouse	Variable	> 15% canopy cover	Dense residual cover may hinder movements by young birds	Highly variable; summer range 130–12,000 acres for female with brood		X

Note: < = less than; > = greater than

Shrub-steppe and Grasslands Objectives

Shrub-steppe and Grasslands Objective 1: Throughout the life of the CCP, in shrub-steppe habitats, maintain at least 10% canopy cover of sagebrush with moderate (30%–70%) to high (>70%) canopy cover of native bunchgrasses for sagebrush-dependent species, including Brewer’s sparrow and greater sage-grouse. Managing for these habitat attributes will also provide nesting, roosting, and foraging habitat for short-eared owl, sharp-tailed grouse, ferruginous hawk, and Swainson’s hawk.

Shrub-steppe and Grasslands Objective 2: Throughout the life of the CCP, in grassland habitats, maintain moderate (30%–70%) to high (>70%) canopy cover of native bunchgrasses and moderate forb cover (30%–70%) for nesting habitat for short-eared owl and brood-rearing habitat for greater sage-grouse.

Strategies

- Begin vegetation monitoring of shrub-steppe and grassland habitats to ensure adequate coverage of sagebrush, native bunchgrasses, and forbs.
- Conduct a comprehensive survey for nesting greater sage-grouse and sharp-tailed grouse on the refuge within 7 years of CCP approval.
- Implement a study to determine the influence of cattle grazing on the abundance and distribution of small mammals (the primary prey of short-eared owl, ferruginous hawk, and Swainson’s hawk), within 2 years of CCP approval.
- Do not permit lethal control of carnivores (such as wolf, grizzly bear, and mountain lion) on the refuge to protect cattle used in the prescribed grazing program without permission from the refuge manager and a special use permit, throughout the life of the CCP.

- Avoid prescribed fire in large areas of shrub-steppe habitats to prevent loss of sagebrush cover.

Rationale

Idaho fescue, the dominant bunchgrass species on the refuge, can withstand light to moderate grazing, particularly if grazing occurs after flowering (Mueggler and Stewart 1980). Flowering occurs on the refuge around mid-July and coincides with the arrival of cattle. Idaho fescue is relatively intolerant to heavy grazing, and repeated overgrazing can lead to eventual replacement by invasive grasses such as cheatgrass (Mueggler and Stewart 1980, Zouhar 2000). Perennial needlegrass species, particularly needle-and-thread grass and western and Richardson's needlegrass, make up an important component of these habitats as well. The effect of cattle grazing on needlegrasses is variable, depending upon timing of grazing. For example, needle-and-thread grass greens up early in the spring and is most sensitive to grazing during flowering; however, the sharp awns developed by mid- to late summer typically result in reduced use of this grass by livestock (Zlatnik 1999).

Detailed fire histories for most shrub communities are lacking (Baker 2006). Threetip sagebrush has the ability to resprout after fire, but this resprouting capacity varies regionally and can also depend upon fire severity (Bunting et al. 1987, Lesica et al. 2005). Cover of threetip sagebrush can decrease in the early years postfire (Lesica et al. 2005). Native bunchgrasses associated with these habitats have variable responses to fire, and fire-related mortality depends upon fire severity. Fire kills the culms, but individual plants can survive if fire does not damage the root crown (Zouhar 2000). Canopy cover of Idaho fescue can return to pre-fire levels; however, livestock grazing immediately following fire can result in high (over 50%) plant mortality (Bunting et al. 1998). Perennial needlegrass species are extremely susceptible to damage by fire (Esser 1992, Wright and Klemmedson 1965), although they can recover if the fire is not severe enough to damage the crown (Esser 1992).

Several federal, state, and nongovernmental lists were reviewed to determine birds of conservation concern that breed in these habitats on the refuge. Six bird species were selected as target species that reflect the suitable nesting and foraging shrub-steppe and grassland habitats on the refuge. These species were selected for a number of reasons:

- All six species use the refuge for some portion of their breeding cycle.
- Brewer's sparrow, Swainson's hawk, and ferruginous hawk are bird species of conservation concern (USFWS 2002b).
- Brewer's sparrow, sharp-tailed grouse, greater sage-grouse, ferruginous hawk, and Swainson's hawk are state-listed sensitive species in Montana (MTNHP and MFWP 2006).
- All six species are listed as priority level III or higher by Montana Partners in Flight (Casey 2000).

Two other state sensitive species have breeding records on the refuge, but populations are irruptive (lark bunting), or the refuge is on the edge of their range (grasshopper sparrow) (see table 7 for habitat requirements). The short-eared owl nests in shrub-steppe habitats immediately adjacent to wet meadow habitats on the refuge (see "Wet Meadows").

Ground squirrels are the primary prey of both ferruginous hawk and Swainson's hawk during the breeding season (Restani 1991). Thus, their foraging habitat is dictated by the habitat requirements of their prey.

Historically, sharp-tailed grouse used the refuge for lekking and nesting grounds, although no comprehensive surveys were conducted. Refuge populations appeared to decline in the 1940s and 1950s, and the species is not mentioned in the refuge narratives after 1960. A potential brood was observed in midsummer of 2005, and individuals were observed in the summers of 2006 and 2007, and the winter of 2007–08.

Shrub-steppe and Grasslands Objective 3: Within 10 years of CCP approval, smooth brome will be reduced by 25% and restored with native grass species needed to provide nesting and foraging habitat for migratory birds.

Strategies

- Determine the amount (percent cover) of native forbs and grasses within areas of the refuge dominated by smooth brome.
- Conduct experiments using a combination of spring prescribed fire and cattle grazing to determine the best method for smooth brome control.
- Use fuels treatment (including prescribed fire or mechanical methods) to reduce hazardous fuels, minimizing the threat to life and property, throughout the life of the CCP.
- Examine potential revegetation options based on the surrounding native plant communities.

Rationale

Historically, smooth brome was planted for livestock forage, and haying occurred annually on over 200 acres of refuge lands until the mid-1970s. Pure stands of smooth brome now cover approximately 1,100 acres on the refuge. Smooth brome also occurs along refuge roads, as isolated patches in wet meadows, and now dominates the understory in over 300 acres of various willow- and sagebrush-dominated habitats within the eastern and southern portions of the refuge. Smooth brome is an aggressive invader because of its sod-forming root system and prolific seed production. Current management includes occasional prescribed fire and cattle grazing. Smooth brome is highly tolerant to grazing (Howard 1996). Periodic spring or early fall fires can increase smooth brome productivity by removing litter; however, repeated annual spring burns can reduce tiller elongation and biomass (Willson and Stubbendieck 1997). Repeated heavy grazing during tiller elongation in spring was an effective method to reduce aboveground biomass and cover in cool-season grasslands (Stacy et al. 2005). Mowing may be ineffective if it fails to remove all of the emerging buds (Willson and Stubbendieck 1996). Treatment options also depend upon the amount of remnant native grasses and forbs available to compete with smooth brome (Willson and Stubbendieck 2000).

Centennial Sandhills Objectives

Centennial Sandhills Objective 1: Maintain at least 2,500 acres of basin big sagebrush habitat with at least 10% canopy cover of sagebrush with moderate cover (30%–70%) of native bunchgrasses and forbs and moderate amounts of bare ground (30%–70%) for sagebrush-dependent species, including sage thrasher, Brewer’s sparrow, greater sage-grouse, pygmy rabbit, and Preble’s shrew.

Strategies

- Continue vegetation monitoring in the Centennial Sandhills to ensure adequate coverage of basin big sagebrush and native bunchgrasses.
- Continue land bird monitoring in the Centennial Sandhills to determine Brewer’s sparrow and sage thrasher densities.
- Start a nesting study of Brewer’s sparrow and sage thrasher to determine the demography of the population in the sandhills within 7 years of CCP approval.
- Conduct a comprehensive survey for nesting greater sage-grouse in basin big sagebrush habitats on the refuge within 7 years of CCP approval.
- Avoid prescribed fire in large areas of basin big sagebrush habitats to prevent loss of sagebrush cover.



Centennial Sandhills, dominated by native sagebrush and bunchgrasses.

Rationale

The Centennial Sandhills are a unique habitat located in the northeastern portion of the Centennial Valley. Vegetation in the sandhills is dominated by sagebrush and native bunchgrass species. On the refuge portion of the sandhills, the dominant sagebrush species is basin big sagebrush. This tall sagebrush has an extremely limited distribution in Montana, occurring in localized stands in southwestern Montana (Morris et al. 1976). Basin big sagebrush is typically confined to areas with relatively deep, well-drained soils (Tirmenstein 1999). The average sagebrush height in the refuge portion of the sandhills is between 16 and 20 inches, although several areas have shrubs that reach heights of well over 5 feet. The sandhills are characterized by moderate to high levels of bare ground (40%–70%), and moderate to high canopy cover of native bunchgrasses (50%–90%), predominantly needle-and-thread and Idaho fescue. Canopy cover of basin big sagebrush in the sandhills is low, averaging 10%. Currently, cheatgrass and pale madwort are the major invasive plant species occurring in the sandhills, although coverage is <1%.

Basin big sagebrush is killed by fire and may take at least 20 to 30 years to recover to pre-fire conditions (Lesica et al. 2005). Frequent fires will eliminate basin big sagebrush habitat (Tirmenstein 1999). Recovery of sagebrush communities is slow, in part because of the lack of availability of mature seeds, as seeds do not travel far from mature plants (Baker 2006, Welch and Criddle 2003). A fire burned nearly 2,500 acres of refuge sandhills in October 1974. It is possible that low sagebrush canopy cover values on the refuge are a result of this fire, as previous cover was described as a “dense stand of old-age sagebrush” (USFWS 1974–1975). Canopy cover in basin big sagebrush stands that have not burned in the past 35 years averaged 20% with a height averaging about 4 feet (Lesica et al. 2005).

Several federal, state, and nongovernmental lists were reviewed to determine birds of conservation concern that breed on the refuge. Three bird species

Table 8. Bird species dependent on sagebrush habitat for breeding and nesting.

<i>Species</i>	<i>Habitat</i>	<i>Shrub Height (inches)</i>	<i>Shrub Cover</i>	<i>Herbaceous Height (inches)</i>	<i>Herbaceous Cover</i>	<i>Area Requirements (acres)</i>	<i>Response to Grazing</i>	<i>Nesting/ Brood-rearing</i>
Brewer's sparrow	basin big sagebrush shrub-steppe	> 20	> 10%	n/a	> 25%		+/-	+
Sage thrasher	basin big sagebrush shrub-steppe	> 27	> 10%	n/a	> 10% bare ground	> 40		+
Greater sage-grouse	basin big sagebrush shrub-steppe	> 16	≥ 15%	> 7	15%–25%	Highly variable; summer range 130–12,000 acres for female with brood	-	+
Sharp-tailed grouse	shrub-steppe grasslands	< 40	> 10%	≥ 8	> 30%; associated with high forb cover and diversity	≥ 500	-	+
Short-eared owl	wet meadows shrub-steppe grasslands	-	-	8–24	nest sites have high visual obstruction readings	> 250	-	+
Swainson's hawk	shrub-steppe grasslands	n/a	n/a	primary prey (ground squirrels and voles) depend upon abundant herbaceous vegetation	home range 1,500–6,800 acres	+/-		+
Ferruginous hawk	shrub-steppe grasslands	n/a	n/a	primary prey (ground squirrels) dependent upon abundant herbaceous vegetation	home range 840–2,200 acres	+/-		+

Note: > = greater than; ≥ = greater than or equal to; +/- = plus or minus; n/a = not applicable

were selected as target species that reflect the suitable nesting and foraging tall sagebrush habitat on the refuge (see table 8). These species were selected for a number of reasons.

- All three species use the refuge for some portion of their nesting cycle.
- Brewer's sparrow and greater sage-grouse are bird species of conservation concern (USFWS 2002b).
- All three species are state-listed sensitive species in Montana (MTNHP and MFWP 2006).
- All three species are listed as priority level II or higher by Montana Partners in Flight (Casey 2000).

Sage thrasher, Brewer's sparrow, and greater sage-grouse are all positively associated with sagebrush cover. None of these species will nest in sagebrush habitats with <10% sagebrush canopy cover (Connelly et al. 2000, Reynolds et al. 1999, Walker 2004).

Sage thrasher typically nests in or below sagebrush shrubs that are over 27 inches in height. This species is positively associated with bare ground because it typically forages on the ground for insects. However, cover of perennial bunchgrasses is also important in areas with adequate sagebrush cover (Reynolds et al. 1999).

Brewer's sparrow typically nests in sagebrush shrubs over 20 inches in height (Rotenberry et al. 1999). In general, this species is not area sensitive because it will breed in small isolated sagebrush patches (Knick and Rotenberry 1995, Vander Haegen et al. 2000); however, nests can have lower productivity in these smaller fragments (Vander Haegen et al. 2000, 2002).

Active sage grouse leks on lands adjacent to the refuge are <0.5 mile from basin big sagebrush habitats on the refuge, and broods were observed on the refuge during the summer of 2006. Sage grouse females typically nest within 3 miles of lekking grounds (Wallestad and Pyrah 1974), thus it seems probable that greater sage-grouse are nesting in this habitat on the refuge.

Two small mammal species of conservation concern, pygmy rabbit and Preble's shrew, also occur in this habitat. Pygmy rabbits are primarily Great Basin species, but their range extends into southwestern Montana. The summer diet of pygmy rabbits is primarily grasses (over 50%) and forbs (over 30%), whereas sagebrush foliage (over 90%) is the dominant forage in winter (Thines et al. 2004). Pygmy rabbits avoid grazed habitats in eastern Washington (Thines et al. 2004) and cattle can trample burrows (Rauscher 1997). Preble's shrew occupies arid shrub-steppe habitats with sandy soils. Nothing is known about the diet of Preble's shrew,

although other shrews eat primarily insects and worms (Foresman 2001).

Centennial Sandhills Objective 2: Work with cooperators over the next 15 years to develop a management plan for the Centennial Sandhills that will guide the management of this habitat, in a landscape context, as a mosaic of early and late-seral stages to maintain four rare early seral-associated plant species (Fendler cat's-eye, sand wildrye, painted milkvetch, and pale evening primrose), as well as late-seral habitats.

Strategies

- Cooperate with BLM, The Nature Conservancy, and other partners to continue rare plant surveys in the Centennial Sandhills.
- Cooperate with BLM and The Nature Conservancy to determine the effectiveness of prescribed fire and cattle grazing to create or maintain early seral habitats in suitable portions of the Centennial Sandhills within 5 years of CCP approval.

Rationale

The Centennial Sandhills are well-vegetated sand dunes characterized by a mosaic of seral stages. The most topographically variable and active (migrating) sand dunes are in the western portion of the sandhills on lands owned by the BLM and The Nature Conservancy. As dunes lose sand via depositional loss, the density of vegetation increases such that the dunes become stabilized and movement stops (Chadwick and Dalke 1965). Dunes in the eastern portion of the sandhills are stabilized and blowouts (windblown areas of bare sand) are rare. Two rare plant species, painted milkvetch and sand wildrye, are restricted to these blowouts and have not been documented on the refuge, whereas pale evening primrose and Fendler cat's-eye occur in blowouts and areas of relatively recently deposited sands on the upper slopes of the dunes (Lesica and Cooper 1999). Pale evening primrose is rare in both the western and eastern sandhills, but Fendler cat's-eye is very common, particularly in the eastern sandhills. Late seral habitats are dominated by basin big sagebrush on the refuge and threetip sagebrush on the western sandhills. Both of these communities are unique in Montana (Cooper et al. 1999).

ASPEN FOREST, MIXED CONIFEROUS FOREST, AND WOODLANDS GOAL

Create and maintain aspen stands of various age classes within a mosaic of coniferous forest and shrubland for cavity-nesting birds, and other migratory and resident wildlife. Appendix E contains the draft compatibility determination for research conducted by partners outside the Service.

Aspen Forest and Woodland Objective

Aspen Forest and Woodland Objective 1: Determine the historical and current extent of aspen and current levels of aspen regeneration and browsing by elk and moose within aspen stands on the refuge and surrounding lands in the Centennial Valley within 5 years of CCP approval.

Strategies

- Develop a monitoring plan in conjunction with cooperators to monitor levels of aspen browse in the Centennial Valley.
- If aspen monitoring indicates continued intense browsing, work with partners to develop an adaptive management plan that incorporates native ungulate harvest and large-scale disturbances to benefit aspen.
- Supplement aspen stand delineation via aerial photo interpretation with intensive ground-sampling based on existing data regarding aspen distribution in the Centennial Valley.

Rationale

Large-scale declines of aspen across the American West have been widely distributed, likely caused by a combination of factors, including global climate change, high-levels of ungulate herbivory, and conifer encroachment due to fire suppression (Bartos and Campbell 1998). The Centennial Mountains have seen declines of aspen as great as 80% (Gallant et al. 2003, Korb 2005, Korb et al. 2008). Browsing by native ungulates, especially elk and moose, can significantly reduce aspen regeneration and the ability of stems to grow above browse height (Berger et al. 2001, Romme et al. 1995). The collection of data on the current level of aspen regeneration (number of stems/acre) and browsing (LD index; Keigley et al. 2002) in the Centennial Valley was initiated by The Nature Conservancy in the summer of 2006. Preliminary results show that regeneration at current browse levels will be very limited.

Additionally, some historic aspen stands have been lost, as evidenced by areas of downed aspen or aspen snags and lack of young aspen stems. The degree to which this loss has occurred throughout the Centennial Valley is unknown.

The Centennial Valley is part of the MFWP Gravelly Elk Management Unit, Hunting District 327. Elk populations in this management unit have more than doubled since 1985 (MFWP 2004). Wintering moose populations on the refuge have also increased 4-fold from 1966–2007, with approximately 100 moose currently wintering on or near the refuge (USFWS 2008a). The inability of aspen stems to grow above browse height, coupled with the increase in elk and moose numbers, suggests that intense browsing may be limiting the reduced regeneration of aspen in the Centennial Valley.

Aspen provides the only deciduous tree habitat in montane regions of the Rocky Mountains. This habitat has higher biodiversity and productivity than the surrounding upland habitats (Hansen et al. 2000) and is extremely valuable to breeding birds (Dobkin et al. 1995, Finch and Reynolds 1987, Martin et al. 2004). Aspen within a mosaic of coniferous forest is used for nesting disproportionately to its availability on the landscape (Martin et al. 2004). In particular, primary cavity excavators (such as woodpeckers) create nesting and roosting cavities for a complex community of species. As aspen age, they invariably become infected with fungal heartrot (Hinds 1985). This susceptibility to heartrot creates ideal conditions for cavity excavation (Aitken et al. 2002, Hart and Hart 2001). Several primary cavity-nesting species and secondary cavity-nesting species (non-excavators) breed in aspen habitats on the refuge, including northern flicker, red-naped sapsucker, house wren, American kestrel, and tree swallow. Other bird species that nest in aspen habitat are ruffed grouse, dusky flycatcher, cordilleran flycatcher, western wood-pewee, warbling vireo, and broad-tailed hummingbird.

Several birds that breed in aspen habitats are listed as species of conservation concern by the Service (red-naped sapsucker; 2002), by the state of Montana (broad-tailed hummingbird; 2006), or by Montana Partners in Flight (red-naped sapsucker, warbling vireo, ruffed grouse, cordilleran flycatcher, and dusky flycatcher; 2000). All of these species require large trees with a dense canopy (Dobkin et al. 1995, Gardali and Ballard 2000, Lowther 2000, Rusch et al. 2000, Sedgwick 1993).

Mixed Coniferous Forest and Woodlands Objective

Mixed Coniferous Forest and Woodland Objective 1: Provide wildland–urban interface protection and prevention measures around Lakeview based on strategies developed in an interagency fire management plan.

Strategy

- Work with BLM and Forest Service to develop a fire management plan that will use prescribed fire and mechanical treatments to thin conifer stands and reduce hazardous fuels, minimizing the threat to life and property.

Rationale

Wildland fire management must be coordinated across administrative boundaries to reach management goals. It must balance fire suppression methods to protect property and other resources with the use of fire to maintain and promote healthy ecosystems. The development of a fire management plan for the wildland–urban interface surrounding the town of Lakeview will serve to protect homes and other structures and also allow land management agencies to adopt wildland fire use principles that

will support minimal suppression of wildland fire in these habitats.

A 13,600-acre lightning-ignited fire occurred in mixed coniferous forests in the western Centennial Mountains in 2003, burning nearly 1,000 acres of the refuge. Aside from this fire, wildland fires have been essentially absent from coniferous forests in the Centennial Valley for nearly 150 years (Korb 2005). This absence of fire, in combination with mountain pine beetle and spruce budworm outbreaks, and a complex interaction between climatic patterns and fuels, has created suitable conditions for wildland fire to occur in this habitat. Continued maintenance of coniferous forests through natural disturbance will provide habitat for a diverse assemblage of breeding birds.

Several bird species of conservation concern breed in coniferous forests on the refuge. These include Williamson's sapsucker (Casey 2000, MTNHP and MFWP 2006, USFWS 2002b); olive-sided flycatcher, three-toed woodpecker, great gray owl, northern goshawk, brown creeper (Casey 2000, MTNHP and MFWP 2006); and Calliope's hummingbird, Townsend's solitaire, red crossbill, Cassin's finch, and Clark's nutcracker (Montana Partners in Flight 2000). Several bird species are also closely associated with burned coniferous forests, including black-backed woodpecker (Casey 2000, MTNHP and MFWP 2006), three-toed woodpecker, and olive-sided flycatcher, which is often more abundant in burned forests than unburned forests (Altman and Sallabanks 2000). The overall guidance for use of prescribed fire and management of wildland fire is in the description of the fire management program in appendix F.

VISITOR SERVICES AND CULTURAL RESOURCES GOAL

Provide quality wildlife-dependent recreation, interpretation, and outreach opportunities that nurture an appreciation and understanding of the unique natural and cultural resources of the Centennial Valley for visitors and local community members of all abilities while maintaining the primitive and remote experience unique to the refuge. Appendix E contain draft compatibility determinations for the visitor services programs described below.

Hunting Objective

Hunting Objective 1: Continue to provide hunting opportunities for elk, white-tailed and mule deer, moose, pronghorn, ducks, geese, and coots within modified refuge hunting area boundaries. Seventy-five percent of hunters will report a safe, quality hunting experience that enriches their personal lives while garnering support for preserving the unique

qualities and natural resources of the refuge and Centennial Valley for future generations.

Strategies

- To address illegal road hunting, no big game hunting will be permitted within 50 yards of the centerline of any county or refuge road.
- Develop the hunting chapter within the Visitor Services Plan.
- Hunting for duck, goose, and coot will continue to be permitted near Lower Red Rock Lake under state and federal regulations and seasons (see figure 8, page 34).
- Hunting boundaries would be modified and expanded to eliminate boundary confusion, address law enforcement issues, and provide additional opportunities.
- Big game hunting for elk, pronghorn, and mule and white-tailed deer will continue to be permitted on current and expanded portions of the refuge (see figure 8, page 34.).
- Open the area west of South Valley Road near "Saier Corrals" to create a contiguous moose hunting area, eliminating hunting boundary confusion. Close the area south of South Valley Road to eliminate a road hunting issue. Open moose season to follow state regulations.
- Open areas closed to hunting for other visitors according to refuge regulations, in order to promote other wildlife-dependent activities during hunting seasons.
- Create a hunting regulations brochure that meets Service standards.
- Conduct random hunting surveys to determine the quality of visitors' hunting experiences.

Rationale

The refuge is part of a larger ecosystem known as the Greater Yellowstone Area. Most wildlife species migrate on and off the refuge. Working with MFWP is vital in balancing wildlife populations needed to provide a quality experience for visitors while ensuring habitats are protected from concentrated wildlife.

The open landscape of the Centennial Valley allows for excellent scouting for big game animals from the road. This sometimes leads hunters to harvest animals illegally by shooting from the road. By adopting a state regulation (currently used for the bison hunt program), the refuge hopes to promote ethical and legal hunting. Currently, the refuge hunt area boundaries and regulations are confusing. By implementing the strategies, confusing hunting boundaries would be eliminated, additional quality hunting opportunities would be provided, and hunters would be better informed of the location of boundaries and regulations.

Fishing Objective

Fishing Objective 1: Continue to provide quality fishing opportunities to visitors in a remote, wild setting, with minimal disturbance to migratory birds. These encounters will enrich visitors' personal lives while garnering support for preserving the unique qualities and natural resources of the refuge and Centennial Valley for future generations.

Strategies

- Open all refuge streams to fishing in compliance with state and refuge regulations.
- Until they are restored, MacDonald, Widgeon, and Culver ponds would be open under state regulations to fishing from the bank unless closing is necessary to protect nesting swans or Arctic grayling restoration efforts.
- Work with the state and neighboring landowners to address impacts to off-refuge Arctic grayling habitat upstream of the refuge.
- Update the fishing regulations in the general brochure.
- Encourage all visitors to keep nonnative fish in accordance with state regulations.
- Open Red Rock Creek west of Lower Lake structure to fishing.
- Work with refuge partners to determine population numbers of native and nonnative fish species and potential impacts from fishing pressure.
- Conduct random fishing surveys to determine the quality of visitors' fishing experiences.

Rationale

Fishing is one of the priority visitor services for the Refuge System and a popular activity on Red Rock Lakes National Wildlife Refuge—this use should be considered, where compatible. More fishing opportunities can be provided by allowing existing and new fishing to occur on created ponds and several creeks. Fishing can also play an important role in control of nonnative fish populations for the benefit of Arctic grayling and Westslope cutthroat trout.

Wildlife Observation and Photography Objective

Wildlife Observation and Photography Objective 1: Provide visitors of all abilities with more opportunities to view and photograph wildlife in a wilderness setting. These encounters will enrich visitors' personal lives while garnering support for conserving the unique qualities and natural resources of the refuge and Centennial Valley for future generations.

Strategies

- Maintain wildlife observation and photography opportunities during hunting seasons by using geographic separation. The east ponds section (north of Red Rock Creek, east of Elk Lake Road) will be open to foot traffic by the public year-round.
- Work with Beaverhead County to provide accessible pulloff(s) for the safe viewing of wildlife and photography. The site would be interpreted through an auto-tour brochure.
- Establish an auto tour route on Culver Springs Road for wildlife observation. This will require replacing Red Rock Creek Bridge. The auto-tour route will be interpreted through a brochure and minimal signage.
- Produce a vertebrate checklist brochure that meets Service standards.
- To eliminate confusing regulations, open all refuge roads to vehicles from May 15 to December 2. All roads may be closed at anytime due to weather conditions. An exception is Widgeon Pond Road, it will be closed until July 15 to minimize disturbance to nesting swans.
- Add a wildlife observation and photography question to the interpretation questionnaire to measure results and quality of enhanced programs.

Rationale

The refuge is located in one of the most undeveloped and beautiful valleys in Montana, the Centennial Valley. This picturesque setting, combined with rich habitats, make wildlife observation and photography the most popular wildlife-dependent recreational activity at the refuge. There are a few developed trails and some roads from which visitors can view and photograph habitats and wildlife; however, most have not been adequately marked or identified on a map, so they are not obvious to the less adventurous



Mike Parker/USFWS

Western tanager.

visitor. There are definitely areas where these opportunities could be expanded, but it is also critical that the wilderness characteristics that bring visitors to the refuge be maintained and complemented by any accommodations (such as developed trails).

Interpretation Objective

Interpretation Objective 1: Ensure that 75% of refuge visitors will understand they are on a national wildlife refuge where wildlife comes first. These visitors will also understand the purposes and significance of Red Rocks Lakes National Wildlife Refuge and the value of conserving the natural resources of the Centennial Valley.

Strategies

- Recruit a GS-6 seasonal visitor services specialist (same as the outreach objective).
- Develop a common theme for all refuge interpretation that supports and promotes the refuge's purposes, protection of the Centennial Valley, and the unique qualities of being part of the Refuge System.
- Ensure that all current and future brochures and other refuge literature meet Service standards.
- Design and install a comprehensive interpretive package (such as signage, displays, hands-on exercises, and literature) for the visitor contact area.
- Design and install updated interpretive panels for existing kiosks.
- Install new (and move existing) interpretive kiosks at entry points (west entrance at Lower Red Rock Lake, east entrance at Red Rock Creek, and northwest entrance).
- Staff the visitor contact area on weekends during months of high visitor use.
- Retain the primitive visitor experience while ensuring that the auto tour route is adequately interpreted with a brochure and limited signage.
- Improve signs to ensure all visitors are oriented and understand refuge-specific regulations.
- Partner with the BLM and Forest Service to develop interpretive panels at Monida Hill and Red Rock Pass that highlight the value of the refuge and Centennial Valley as a critical wildlife corridor between the Bitterroot and Greater Yellowstone ecosystems.
- Create an interpretive brochure for the newly developed auto tour route.
- Measure results using a visitor questionnaire.

Rationale

The refuge offers excellent opportunities to interpret wildlife resources, the Refuge System, and the large

intact landscapes found in the Centennial Valley and southwest Montana. By providing the opportunities listed above, visitors to the refuge should be well informed of refuge resources and its role within this large, undeveloped landscape. Any additional interpretive facilities will compliment the wilderness, rustic qualities of the refuge while better orienting and educating visitors.

Outreach Objective

Outreach Objective 1: Reach out to local, state, and federal representatives; local communities; landowners; nongovernmental organizations; and current and potential partners to promote an understanding of refuge purposes and management objectives and to garner support for management actions and the conservation easement program.

Strategies

- Promote participation by local landowners in conservation easement programs by providing information on the programs' benefits to the conservation of the valley and in promoting and preserving their way of life.
- Conduct annual visits and provide a briefing paper to local, county, state, and federal governments that highlights current refuge programs and challenges.
- Measure results of the outreach program by determining the level of support and understanding for refuge resources; current and proposed management programs; and the goals of the Refuge System.

Rationale

The refuge has many challenges and opportunities related to its remote location and wilderness characteristics. Because of the wild, undeveloped landscape of the Centennial Valley, the refuge has the opportunity to work with many partners to protect a large landscape and to provide travel corridors and near-pristine habitat for far-ranging wildlife such as wolves, grizzly bears, wolverine, elk, pronghorn, and waterfowl and other migratory birds. Outreach opportunities would encourage visitors, local communities, landowners, and governments to gain a better understanding the values of the Centennial Valley, the refuge, its resources, management issues, and the Refuge System.

Campgrounds Objective

Campgrounds Objective 1: Continue to provide two primitive campgrounds with 17 campsites at Upper and Lower lakes to accommodate wildlife-dependent recreation in this remote wilderness setting.

Strategies

- Rehabilitate campground facilities, such as fire rings and access roads.
- Create an accessible campsite at River Marsh campground and improve the current accessible site at Upper Lake.
- Replace the restrooms at the campgrounds to make them accessible.
- Implement a recreational fee program to provide added resources for maintaining the campgrounds.

Rationale

It is a policy of the U.S. Fish and Wildlife Service that, “We may allow other activities on refuges, such as camping, to facilitate compatible wildlife-dependent recreation.” (605 FW 1, 1.2B). Due to the remote location of this refuge, the great majority of the visitors using these campgrounds participate in wildlife-dependent activities on and adjacent to the refuge. Only one other location in the Centennial Valley provides a pit toilet. This is located just north of the refuge at Elk Lake—about 17 miles from headquarters. Elk Lake’s primitive campsites are also well used by visitors who are fishing and hunting on other public lands. The refuge’s campgrounds also provide a critical watering and stopping point for visitors hiking or bicycling the Continental and Great Divide trails, which both traverse the refuge. The campgrounds allow visitors to stay multiple days to thoroughly experience the refuge, whether they are bird watching, hunting, fishing, hiking, or just experiencing wilderness solitude.

Cultural Resources Objective

Cultural Resources Objective 1: Identify, value, and preserve the cultural resources and history of the refuge to connect the refuge staff, visitors, and the community to the area’s past, while ensuring that 100% of known cultural resources are protected from federal and visitor activities.

Strategies

- Continue to conduct site-specific surveys for lands and facilities that may be disturbed by refuge management activities.
- Continue to maintain historic properties currently in use.
- Through partnerships, begin preparing a comprehensive, refuge-wide survey to determine the presence of cultural resources on the refuge.
- Design and print a brochure to interpret select cultural resources and historic structures.
- Address cultural resources in the auto tour interpretive brochure.

Rationale

The refuge has many known historical structures, many of which are still in use, including the refuge office, two residences, and a storage building. The Centennial Valley also has a rich history of Native and Euro-American presence. Federal laws and policies mandate the identification and protection of cultural resources on federal lands. Specifically, section 106 of the National Historic Preservation Act requires all federal agencies to consider impacts on cultural resources before any federal action. Ideally, a comprehensive refuge-wide inventory would help ensure the protection of these resources. However, these inventories take time and are very costly, which is why most refuges have not completed surveys. Nevertheless, the law requires all federal activities that have the potential to impact cultural resources be evaluated. Throughout the life of this 15-year plan, the refuge will work with other partners, including the regional archaeologist and staff, to begin documenting cultural sites on the refuge. Until this survey is completed, the refuge staff will continue to work with the regional archaeologist to evaluate projects with the potential to have impacts, on a case-by-case basis.

REFUGE OPERATIONS GOAL

Prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, and volunteer programs.

Staff Objective

Staff Objective 1: Add the needed staff within 5 years of CCP approval; this includes seasonals and volunteers necessary to fully carry out the CCP.

Strategies

- Recruit a permanent WG-6 permanent seasonal maintenance worker to help with the large maintenance backlog in support of all refuge programs.
- Recruit one full-time permanent GS-5/7/9 wildlife biologist and at least three seasonal biological science technicians.
- Recruit one full-time permanent GS-7 range technician.
- Use additional management capability monies to recruit seasonals, develop and implement the visitor services program, and enhance habitat management and monitoring.
- Annually recruit a seasonal visitor services specialist.
- Annually recruit a seasonal office assistant.
- Given the added staff and complexity of the expanded refuge programs, evaluate grade levels of current refuge staff.

- Require one staff member to maintain collateral duty law enforcement credentials to provide for the safety of visitors, staff, facilities, and wildlife

Rationale

Additional staff, including permanent, seasonal, and volunteer employees, will be necessary in order to implement the objectives and strategies identified in the CCP. There have been many needs identified in the CCP such as suggested improvements to the existing maintenance, habitat management and monitoring, law enforcement, and visitor services programs. Many of these changes are dependent on the availability of additional staff to design and execute these new programs. These additional positions will be critical to achieving the vision and goals presented in the CCP. The refuge's programs have become more complex over time. This draft CCP proposes additional complexities be added. These added challenges and increased staff size, combined with the large area of responsibility, should warrant evaluating the grade levels of current staff positions.

Facilities Objective

Facilities Objective 1: Maintain, create, or rehabilitate facilities to provide staff and visitors of all abilities with a safe and quality experience while preserving and complementing the remote wilderness character of the refuge.

Strategies

- Construct up to four residences.
- Build 3 trailer pads for housing volunteers to support refuge programs.
- Improve parking at headquarters, Odell Creek and Sparrow Pond trailheads and the entrance to Lower Lake Road.
- Replace all vault toilets with “clean-smelling” technology vault toilets, making them universally accessible to meet requirements of the Americans with Disabilities Act. Develop accessible parking and access routes to all restrooms.
- Provide a universally accessible boat launch (hardened surfaces) at Lower Lake for persons with disabilities.
- Replace Red Rock Creek Bridge to allow for development of an auto tour route and replace Sparrow Pond Trail Bridge for foot traffic and use by heavy equipment to maintain dams.
- Replace and update all interpretive panels and signage to ensure visitors are oriented, informed, and feel welcome.
- Provide opportunities for wildlife observation and photography through accessible interpretive trails, auto tour route, kiosks, and viewing areas.

- Improve road, campsites, and parking at Upper Lake campground.
- Rehabilitate existing refuge residences (Q94 foundation repair, Q94 and 110 garage replacement, Q1 foundation and interior rehabilitation, Q90 health safety/attic, and windows in most residences) and restore or stabilize other historic structures (headquarters log barn, Shambow Creek barn, and fire tower).
- Repair and rehabilitate the shop building to be more in keeping with the historic site.
- Replace existing boundary fencing and construct new boundary fencing for newly acquired lands.
- Permanently close Idlewild Road (and the associated boat ramp) and spur roads off of the North Valley Road to public vehicle access in order to reduce maintenance costs.

Rationale

One of the greatest limitations to expanding the refuge's biological and visitor services programs is the lack of staff and facilities. The Service is required to provide housing for all staff because of the remote location of the refuge. Currently, all refuge houses are occupied by existing staff. Adding any new positions will require additional housing.

Existing staff and visitor facilities (such as buildings, signs, kiosks, roads, fences, trails, parking, and campgrounds) are also in need of major repair or replacement in order to provide for a safe, productive working environment and to promote the refuge and its resources in an effective, safe, and professional manner.

6.2 PERSONNEL

Current staffing at the refuge consists of five permanent full-time employees. Table 9 shows the current staff and proposed additional staff required to fully implement the CCP. Due to the area of responsibility and added complexities of this plan all



Mike Parker/USFWS

This remote refuge has four houses for refuge staff.

grade levels for current staff will be evaluated. If all positions are funded, the refuge staff will be able to carry out all aspects of this CCP, which will provide maximum benefit to wildlife, improve facilities, and provide visitor services. Projects that have adequate funding and staffing will receive priority for accomplishment. Staffing and funding are requested for the 15-year life of this CCP.

Table 9. Current and proposed staff, Red Rock Lakes National Wildlife Refuge, Montana.

<i>Program</i>	<i>Current Positions</i>	<i>Proposed changes/added positions</i>
Management	Refuge manager, GS-12	
	Assistant Manager, GS-11	Require law enforcement credentials for the assistant manager.
Biological	Wildlife biologist, GS-11	GS-5/7/9 full-time wildlife biologist and at least three temporary seasonal biological science technicians GS-7 range technician
Administrative	Administrative support assistant, GS-7	Temporary seasonal administrative assistant (generalist)
Maintenance	Maintenance worker, WG-8	Additional WG-6 permanent seasonal maintenance worker
Visitor Services	None	GS-6 temporary seasonal visitor services specialist

6.3 STEP-DOWN MANAGEMENT PLANS

The CCP is intended as a broad umbrella plan that provides general concepts and specific wildlife, habitat, visitor services, and partnership objectives over the next 15 years. The purpose of the step-down management plans is to provide greater detail to managers and employees for implementing specific actions and strategies authorized by the CCP. Table 10. presents the plans needed for the refuge, their status, and the next revision date.

Table 10. Step-down management plans for Red Rock Lakes National Wildlife Refuge, Montana

<i>Plan</i>	<i>Completed Plan, Year Approved</i>	<i>New or Revised Plan, Completion Year</i>
Habitat Management	—	2010
Fire Management	2002	2009
Disease Contingency	2006	2016
Wilderness Management	1986	2012
Refuge Safety	2002	2010
Visitor Services	1986	2012
Wildlife Inventory and Monitoring	—	2012
Spill Prevention Control and Countermeasures	2006	2012

6.4 PARTNERSHIP OPPORTUNITIES

A major objective of this CCP is to establish partnerships with landowners, volunteers, private organizations, and county, state, and federal natural resource agencies. In particular, landowners will be informed of opportunities to participate in compensated habitat protection programs (such as conservation easements). Opportunities exist to enhance or establish new partnerships with nonprofit organizations, sporting clubs, community organizations, and educational institutes. Strong partnerships already exist with The Nature Conservancy, MFWP, Montana State University, Beaverhead County Weed District, Centennial Valley Association, and Centennial Valley Historical Society.

6.5 MONITORING AND EVALUATION

The Service proposes that the uncertainty surrounding habitat management can be dealt with most efficiently within the paradigm of adaptive resource management (ARM) (see figure 19.) (Holling 1978, Kendall 2001, Lancia et al. 1996, Walters and Holling 1990). This approach provides a framework within which objective decisions can be made and the uncertainty surrounding those decisions reduced. Briefly, the key components of an ARM plan follow:

1. Clearly defined management goals and objectives.
2. A set of management actions with associated uncertainty as to their outcome.
3. A suite of a priori models representing various alternative working hypotheses describing the response of species or communities of interest.

4. Monitoring and assessment of the response of target organism(s).
5. Use of monitoring and assessment information to direct future decision-making through the selection of a best model.

The first three components (goals, actions, and models) are largely defined before initiation of an ARM plan, while the latter two (monitoring and directed decision-making) comprise an iterative process, whereby each year the predictive ability of models are tested against what was observed during monitoring. This may result in a new best model, greater support for the existing best model, or new models constructed from emerging hypotheses. In this way, management can “evolve” as more information about the refuge is gained and uncertainty is reduced.

Development of ARM plans for habitat management will allow the refuge to “learn by doing,” while maintaining a focus on management objectives. Knowledge gained from assessing management actions is considered as integral to the process as the management actions themselves. This emphasis on gaining knowledge about the refuge creates a situation whereby the refuge can refine its habitat management in a feedback between management and assessment. Reducing the uncertainty of habitat management via ARM plans will greatly

help the refuge in development of long-term habitat management plans.

6.6 PLAN AMENDMENT AND REVISION

This CCP will be reviewed annually to determine the need for revision. A revision will occur if and when significant information becomes available, such as a change in ecological conditions. The final CCP will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the CCP goals and objectives. Revisions to the CCP and the step-down management plans will be subject to public review and NEPA compliance. At a minimum, this plan will be evaluated every 5 years and revised after 15 years.

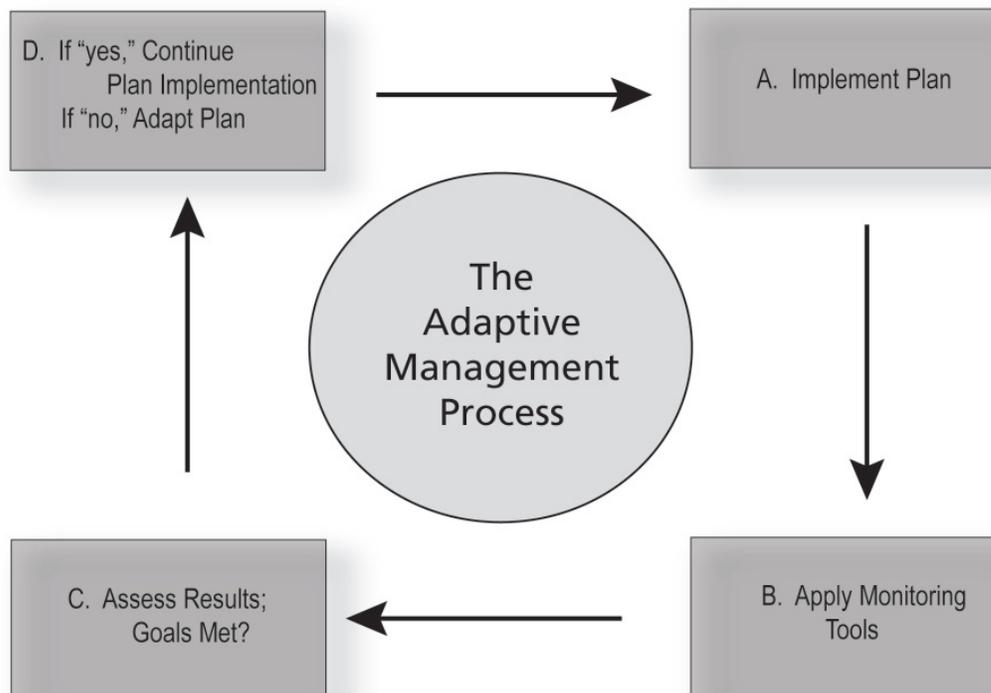


Figure 19. Adaptive management process.

Glossary

accessible—Pertaining to physical access to areas and activities for people of different abilities, especially those with physical impairments.

adaptive resource 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 research, monitoring, and evaluation of management actions to support or modify objectives and strategies at all planning levels; a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plans. Analysis of results helps managers determine whether current management should continue “as is” or whether it should be modified to achieve desired conditions.

adfluvial—Lake dwelling.

Administration Act—National Wildlife Refuge System Administration Act of 1966.

alternative—A reasonable way to solve an identified problem or satisfy the stated need (40 CFR 1500.2); one of several different means of accomplishing refuge purposes and goals and contributing to the Refuge System mission (Draft Service Manual 602 FW 1.5).

amphibian—A class of cold-blooded vertebrates including frogs, toads or salamanders.

annual—A plant that flowers and dies within 1 year of germination.

baseline—A set of critical observations, data, or information used for comparison or as a control.

biological control—The use of organisms or viruses to control invasive plants or other pests.

biological diversity, also biodiversity—The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1.12B). The National Wildlife Refuge System’s focus is on indigenous species, biotic communities, and ecological processes.

biotic—Pertaining to life or living organisms; caused, produced by, or comprised of living organisms.

blowout—An area denuded of vegetation due to rapid wind erosion.

calcareous—Consisting of or containing calcium carbonate.

canopy—A layer of foliage, generally the uppermost layer, in a vegetative stand; midlevel or understory vegetation in multilayered stands. Canopy closure (also canopy cover) is an estimate of the amount of overhead vegetative cover.

CCP—*See* comprehensive conservation plan.

CFR—*See* Code of Federal Regulations.

cfs—Cubic feet per second.

clonal—A group of genetically identical individuals (e. g., plants, fungi, or bacteria) that have grown in a given location, all originating vegetatively (not sexually) from a single ancestor.

Code of Federal Regulations (CFR)—The codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government. Each volume of the CFR is updated once each calendar year.

compatibility determination—*See* compatible use.

compatible use—A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the director of the U.S. Fish and Wildlife Service, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge (Draft Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identified stipulations or limits necessary to ensure compatibility.

comprehensive conservation plan (CCP)—A document that describes the desired future conditions of the refuge and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the Refuge System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

concern—*See* issue.

cool-season grasses—Grasses that begin growth earlier in the season and often become dormant in the summer. These grasses will germinate at lower temperatures. Examples of cool-season grasses at the refuge are western wheatgrass, needle and thread, and green needlegrass.

cover, *also cover type, canopy cover*—Present vegetation of an area.

cultural resources—The remains of sites, structures, or objects used by people in the past.

deme—A local, usually stable population of interbreeding organisms of the same kind or species.

depredation—Destruction or consumption of eggs, broods, or individual wildlife due to a predatory animal; damage inflicted on agricultural crops or ornamental plants by wildlife.

drawdown—The act of manipulating water levels in an impoundment to allow for the natural drying-out cycle of a wetland.

EA—*See* environmental assessment.

ecosystem—A dynamic and interrelating complex of plant and animal communities and their associated nonliving environment; a biological community, together with its environment, functioning as a unit. For administrative purposes, the Service has designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries and their sizes and ecological complexity vary.

ecotone—The transition zone between two different plant communities, as that between forest and prairie.

ecotype—A subspecies or race that is especially adapted to a particular set of environmental conditions.

EIS—Environmental impact statement.

emergent—A plant rooted in shallow water and having most of the vegetative growth above water such as cattail and hardstem bulrush.

endangered species, federal—A plant or animal species listed under the Endangered Species Act of 1973, as amended, that is in danger of extinction throughout all or throughout a significant portion of its range.

endangered species, state—A plant or animal species in danger of becoming extinct or extirpated in a particular state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

endemic species—Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

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 and alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare

an environmental impact statement or a finding of no significant impact (40 CFR 1508.9).

eutrophication—Characterized by an abundant accumulation of nutrients that support a dense growth of algae and other organisms, the decay of which depletes the shallow waters of oxygen in summer.

extinction—The complete disappearance of a species from the earth; no longer existing.

extirpation—The extinction of a population; complete eradication of a species within a specified area.

fauna—All the vertebrate and invertebrate animals of an area.

federal trust resource—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 international treaties, and native plant or wildlife species found on a national wildlife refuge.

federal trust species—All species where the federal government has primary jurisdiction including federally endangered or threatened species, migratory birds, anadromous fish, and certain marine mammals.

fen—An area of low, flat, marshy land.

flora—All the plant species of an area.

forb—A broad-leaved, herbaceous plant; a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue but dies down at the end of the growing season.

fragmentation—The alteration of a large block of habitat that creates isolated patches of the original habitat that are interspersed with a variety of other habitat types; the process of reducing the size and connectivity of habitat patches, making movement of individuals or genetic information between parcels difficult or impossible.

geographic information system (GIS)—A computer system capable of storing and manipulating spatial data; a set of computer hardware and software for analyzing and displaying spatially referenced features (such as points, lines and polygons) with nongeographic attributes such as species and age.

gleyed soil—Greenish-gray in color and oxygen-deprived due to high water content.

GIS—*See* geographic information system.

goal—A descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

graminoid—Grasses or grasslike plants such as sedges and rushes.

grassland tract—A contiguous area of grassland without fragmentation.

GS—General schedule (pay rate schedule for certain federal positions).

habitat—Suite of existing environmental conditions required by an organism for survival and reproduction; the place where an organism typically lives and grows.

habitat type, also vegetation type, cover type—A land classification system based on the concept of distinct plant associations.

hypereutrophic—Very nutrient-rich lakes characterized by frequent and severe nuisance algal blooms and low transparency. Hypereutrophic lakes are the most biologically productive lakes, and support large amounts of plants, fish and other animals. Hypereutrophic lakes have a visibility depth of <3 feet, they have >40 micrograms/liter total chlorophyll and >100 micrograms/liter phosphorus.

Improvement Act—*National Wildlife Refuge System Improvement Act of 1997.*

indigenous—Originating or occurring naturally in a particular place.

integrated pest management—Methods of managing undesirable species such as invasive plants; education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods.

introduced species—A species present in an area due to intentional or unintentional escape, release, dissemination, or placement into an ecosystem as a result of human activity.

invasive plant—A species that is nonnative to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

issue—Any unsettled matter that requires a management decision; for example, a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (Draft Service Manual 602 FW 1.5).

lacustrine—Of or pertaining to a lake.

lek—A dancing ground for male sage grouse used to attract breeding females.

management alternative—*See alternative.*

mesic—Of, pertaining to, or adapted to an environment having a balanced supply of moisture.

mesotrophic—Commonly clear water lakes and ponds with beds of submerged aquatic plants and medium levels of nutrients.

migration—Regular extensive, seasonal movements of birds between their breeding regions and their wintering regions; to pass usually periodically from one region or climate to another for feeding or breeding.

migratory birds—Birds that follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

mission—Succinct statement of purpose and/or reason for being.

mitigation—Measure designed to counteract an environmental impact or to make an impact less severe.

monitoring—The process of collecting information to track changes of selected parameters over time.

national wildlife refuge—A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include coordination areas; a complete listing of all units of the Refuge System is in the current “Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service.”

National Wildlife Refuge System (Refuge System)—Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management areas; and waterfowl production areas.

National Wildlife Refuge System Improvement Act of 1997 (Improvement Act)—Sets the mission and the administrative policy for all refuges in the National Wildlife Refuge System; defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation); establishes a formal process for determining appropriateness and compatibility; establish the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; requires a comprehensive conservation plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

native species—A species that historically occurred or currently occurs in that ecosystem; does not include species that are present in an ecosystem as a result of an introduction.

Neotropical migrant—A bird species that breeds north of the United States and Mexican border and winters primarily south of this border.

nest success—The percentage of nests that successfully hatch one or more eggs of the total number of nests initiated in an area.

nongovernmental organization (NGO)—Any group that is not composed of federal, state, tribal, county, city, town, local, or other governmental entities.

noxious weed—Any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, natural resources of the United States, public health, or the environment.

objective—Concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work; derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific and should be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively (Draft Service Manual 602 FW 1.5).

obligates—Species which must occupy a certain niche or behave in a certain way in order to survive.

palustrine—Relating to a system of inland, nontidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation (vegetation that is rooted below water but grows above the surface). Palustrine wetlands range from permanently saturated or flooded land (as in marshes, swamps, and lake shores) to land that is wet only seasonally.

patch—An area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

pelagic—Open water.

perennial—Lasting or active through the year or through many years; a plant species that has a life span of more than two years.

permanent seasonal employee—*See* temporary seasonal employee. A permanent position with benefits, 40 hours per week during the season of employment, usually summer.

plant community—An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soil, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community, such as ponderosa pine or bunchgrass.

pluvial lake—A lake that experiences significant increase in depth and extent as a result of increased precipitation and reduced evaporation.

prescribed fire—The skillful application of fire to natural fuels under conditions such as weather, fuel moisture, and soil moisture that allow 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 use—One of six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority if found to be compatible with a refuge's purposes. This includes hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

proposed action—The alternative proposed to best achieve the purpose, vision, and goals of a refuge (contributes to the Refuge System mission, addresses the significant issues, and is consistent with principles of sound fish and wildlife management).

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 or scoping—A process that offers affected 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.

purpose of the refuge—The purpose of a refuge is specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing authorization or expanding a refuge, refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

raptor—A carnivorous bird such as a hawk, a falcon, or a vulture that feeds wholly or chiefly on meat taken by hunting or on carrion (carcasses).

refuge operations needs system (RONS)—A national database that contains the unfunded operational needs of each refuge. Projects included are those required to implement approved plans and meet goals, objectives, and legal mandates.

refuge purpose—*See* purpose of the refuge.

Refuge System—*See* National Wildlife Refuge System.

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.

resident species—A species inhabiting a given locality throughout the year; nonmigratory species.

rest—Free from biological, mechanical, or chemical manipulation, in reference to refuge lands.

restoration—Management emphasis designed to move ecosystems to desired conditions and processes, such as healthy upland habitats and aquatic systems.

riparian corridor—An area or habitat that is transitional from terrestrial to aquatic ecosystems including streams, lakes, wet areas, and adjacent plant communities and their associated soils that have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, “riparian” describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes all plant life growing on the land adjoining a stream and directly influenced by the stream.

scoping—The process of obtaining information from the public for input into the planning process.

sediment—Material deposited by water, wind, and glaciers.

senior water users—water users with a water right that was filed “earlier” than the Services

Service—See U.S. Fish and Wildlife Service.

shorebird—Any of a suborder (*Charadrii*) of birds, such as a plover or a snipe, that frequent the seashore or mud flat areas.

sodic—Soil containing sodium.

spatial—Relating to, occupying, or having the character of space.

special use permit—A permit for special authorization from the refuge manager required for any refuge service, facility, privilege, or product of the soil provided at refuge expense and not usually available to the general public through authorizations in Title 50 CFR or other public regulations (Refuge Manual 5 RM 17.6).

step-down management plan—A plan that provides the details necessary to implement management strategies identified in the comprehensive conservation plan (Draft Service Manual 602 FW 1.5).

strategy—A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

temporal—Of or relating to time.

temporary seasonal employee—See permanent seasonal employee. A temporary position without benefits, 40 hours per week during the season of employment, usually summer. The position will be re-opened for candidates each year.

threatened species, federal—Species listed under the Endangered Species Act of 1973, as amended, that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

threatened species, state—A plant or animal species likely to become endangered in a particular state within the near future if factors contributing to population decline or habitat degradation or loss continue.

trust resource—See federal trust resource.

trust species—See federal trust species.

U.S. Fish and Wildlife Service (Service, USFWS, FWS)—The principal federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. The Service manages the 93-million-acre National Wildlife Refuge System comprised of more than 530 national wildlife refuges and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological service field stations, the agency enforces federal wildlife laws, manages migratory bird populations, restores national significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the *Endangered Species Act*, and helps foreign governments with their conservation efforts. It also oversees the federal aid program that distributes millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

USFWS—See U.S. Fish and Wildlife Service.

U.S. Geological Survey (USGS)—A federal agency whose mission is to provide reliable scientific information to describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

USGS—See U.S. Geological Survey.

ungulate—A hooved animal such as a white-tailed deer or bison.

vegetation alliance—A physiognomically (pertaining to physical features, character, or appearance) uniform group of vegetation associations sharing one or more diagnostic (dominant, differential, indicator, or character) species that, as a rule, are found in the uppermost stratum of the vegetation. This is

the second finest level in the National Vegetation Classification Standard hierarchy.

vision statement—A concise statement of the desired future condition of the planning unit, based primarily on the Refuge System mission, specific refuge purposes, and other relevant mandates (Draft Service Manual 602 FW 1.5).

visual obstruction—Pertaining to the density of a plant community; the height of vegetation that blocks the view of predators and conspecifics to a nest.

visual obstruction reading (VOR)—A method of visually quantifying vegetative structure and composition.

VOR—*See* visual obstruction reading.

wading birds—These birds have long legs that enable them to wade in shallow water; wading birds include egrets, great blue herons, black-crowned night-herons, and bitterns.

waterbird—Birds dependent upon aquatic habitats to complete portions of their life cycles (for example, breeding).

waterfowl—A category of birds that includes ducks, geese, and swans.

watershed—The region draining into a river, a river system, or a body of water.

wetland management district (WMD)—Land that the Refuge System acquires with Federal Duck Stamp funds for restoration and management primarily as prairie wetland habitat critical to waterfowl and other wetland birds.

WG—wage grade schedule (pay rate schedule for certain federal positions).

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

wildlife-dependent recreational use—Use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, environmental education, or interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the Refuge System.

WMD—*See* wetland management district.

woodland—Open stands of trees with crowns which do not usually touch, generally forming 25–60% cover.

WPA—Works Progress Administration or Waterfowl Production Area

WUI—wildland–urban interface.

Appendix A

Key Legislation and Policies

This appendix briefly describes the guidance for the National Wildlife Refuge System and other policies and key legislation that guide the management of Red Rock Lakes National Wildlife Refuge.

NATIONAL WILDLIFE REFUGE SYSTEM

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. (National Wildlife Refuge System Improvement Act of 1997)

GOALS

- To fulfill our statutory duty to achieve refuge purpose(s) and further the Refuge System mission.
- Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.
- Perpetuate migratory bird, inter-jurisdictional fish, and marine mammal populations.
- Conserve a diversity of fish, wildlife, and plants.
- Conserve and restore, where appropriate, representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.
- To foster understanding and instill appreciation of fish, wildlife, and plants and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

GUIDING PRINCIPLES

There are four guiding principles for management and general public use of the Refuge System established by Executive Order 12996 (1996):

- **Public Use**—The Refuge System provides important opportunities for compatible wildlife-dependent recreational activities involving

hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

- **Habitat**—Fish and wildlife will not prosper without high-quality habitat and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges.
- **Partnerships**—America’s sportsmen and women were the first partners who insisted on protecting valuable wildlife habitat within wildlife refuges. Conservation partnerships with other federal agencies, state agencies, tribes, organizations, industry, and the general public can make significant contributions to the growth and management of the Refuge System.
- **Public Involvement**—The public should be given a full and open opportunity to participate in decisions regarding acquisition and management of our national wildlife refuges.

LEGAL AND POLICY GUIDANCE

Management actions on national wildlife refuges are circumscribed by many mandates including laws and executive orders, the latest of which is the Volunteer and Community Partnership Enhancement Act of 1998. Regulations that affect refuge management the most are listed below.

American Indian Religious Freedom Act

(1978)—Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act (1992)

—Prohibits discrimination in public accommodations and services.

Antiquities Act (1906)

—Authorizes the scientific investigation of antiquities on federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Archaeological and Historic Preservation Act

(1974)—Directs the preservation of historic and archaeological data in federal construction projects.

Archaeological Resources Protection Act (1979), as amended—Protects materials of archaeological interest from unauthorized removal or destruction and requires federal managers to develop plans and schedules to locate archaeological resources.

Architectural Barriers Act (1968)—Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977)—Requires consultation with the U.S. Army Corps of Engineers (404 permits) for major wetland modifications.

Emergency Wetlands Resources Act (1986)—Promotes wetland conservation for the public benefit to help fulfill international obligations in various migratory bird treaties and conventions. The act authorizes the purchase of wetlands from Land and Water Conservation Fund monies.

Endangered Species Act (1973)—Requires all federal agencies to carry out programs for the conservation of endangered and threatened species.

Executive Order No. 7023 (1935)—Establishes Red Rock Lakes National Wildlife Refuge “as a refuge and breeding ground for birds.”

Executive Order 11988 (1977)—Requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)—Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the Refuge System.

Executive Order 13007, Indian Sacred Sites (1996)—Directs federal land management agencies to accommodate access to and ceremonial uses of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Federal Noxious Weed Act (1990)—Requires the use of integrated management systems to control or contain undesirable plant species and an interdisciplinary approach with the cooperation of other federal and state agencies.

Federal Records Act (1950)—Requires the preservation of evidence of the government’s organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Act (1956)—Directs the Secretary of the Interior to develop the policies and procedures necessary for carrying out fish and wildlife laws and to research and report on fish and wildlife matters.

The act establishes the U.S. Fish and Wildlife Service within the Department of the Interior, as well as the positions of Assistant Secretary for Fish and Wildlife and Director of the Service.

Fish and Wildlife Coordination Act (1958)—Allows the U.S. Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Migratory Bird Conservation Act (1929)—Establishes procedures for acquisition by purchase, rental, or gifts of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934)—Authorizes the opening of part of a refuge to waterfowl hunting.

Migratory Bird Treaty Act (1918)—Designates the protection of migratory birds as a federal responsibility; and enables the setting of seasons and other regulations, including the closing of areas, federal or nonfederal, to the hunting of migratory birds.

National Environmental Policy Act (1969)—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 this Act with other planning requirements, and prepare appropriate documents to facilitate better environmental decision making. [From the Code of Federal Regulations (CFR), 40 CFR 1500]

National Historic Preservation Act (1966), as amended—Establishes as policy that the federal government is to provide leadership in the preservation of the nation’s prehistoric and historical resources.

National Wildlife Refuge System Administration Act (1966)—Defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge, provided such use is compatible with the major purposes for which the refuge was established.

National Wildlife Refuge System Improvement Act of 1997—Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System; mandates comprehensive conservation planning for all units of the Refuge System.

Native American Graves Protection and Repatriation Act (1990)—Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Refuge Recreation Act (1962)—Allows the use of refuges for recreation when such uses are compatible with the refuge’s primary purposes and when sufficient funds are available to manage the uses.

Rehabilitation Act (1973)—Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the federal government to ensure that any person can participate in any program.

Volunteer and Community Partnership Enhancement Act (1998)—Encourages the use of volunteers to help in the management of refuges within the Refuge System; facilitates partnerships between the Refuge System and nonfederal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

Appendix B

List of Preparers, Consultation, and Coordination

This document is the result of the extensive, collaborative, and enthusiastic efforts by members of the planning team shown below.

<i>Team Member</i>	<i>Position</i>	<i>Work Unit</i>
Suzanne Beachaine	Wildlife refuge specialist (assistant manager)	Red Rock Lakes National Wildlife Refuge, Lima, MT
Bob Brannon	Area biologist	Montana Fish, Wildlife, and Parks; region 3; Sheridan, Montana
Mark Ely	Geographic information system (GIS) specialist	Division of Planning, Region 6, Lakewood, CO
Susan Hale	Editor	TBC Solutions, Clinton, TN
Laura King	Planning team leader	Division of Planning, Region 6, Cayuga, ND
Karen Newlon	Former biological science technician (wildlife)	Red Rock Lakes National Wildlife Refuge, Lima, MT
Mike Parker	Former Refuge manager	Red Rock Lakes National Wildlife Refuge, Lima, MT
Jeff Warren	Wildlife biologist	Red Rock Lakes National Wildlife Refuge, Lima, MT

Many organizations, agencies, and individuals provided invaluable assistance with the preparation of this CCP. The Service acknowledges the efforts of the following individuals and groups towards the completion of this plan. The diversity, talent, and knowledge contributed dramatically improved the vision and completeness of this document.

<i>Contributor</i>	<i>Position</i>	<i>Work Unit</i>
Steve Berenzen	<i>Former</i> refuge supervisor	USFWS
Glenn Boltz	Fisheries biologist	USFWS
Rick Coleman	Assistant regional director, Refuge System	USFWS
Tim Covino	Graduate student, hydrology	Montana State University
Steve Custer	Professor, earth sciences	Montana State University
John Esperance	Chief, Comprehensive and Land Protection Planning	USFWS
Sheri Fetherman	Chief, Division of Education and Visitor Services	USFWS
Sean Fields	Wildlife biologist/GIS	USFWS

<i>Contributor</i>	<i>Position</i>	<i>Work Unit</i>
Brian Hackett	Range specialist	BLM
Dave Hamilton	Ecologist	USGS
Shannon Heath	Outdoor recreation planner	USFWS
Lynn Kaeding	Fisheries biologist	USFWS
Richard Keigley	Research ecologist	USGS
Wayne King	Wildlife biologist	USFWS
Nathan Korb	Biologist	The Nature Conservancy
Murray Laubhan	<i>Former</i> ecologist	USGS, <i>formerly</i>
Rachel Laubhan	Wildlife biologist	USFWS
Peter Lesica	Range management consultant	Independent consultant
Brian McGlynn	Professor, watershed hydrology	Montana State University
Jim Mogen	Fisheries biologist	USFWS
Jana Mohrman	Hydrologist	USFWS
Deb Parker	Writer and Editor	USFWS
Ken Pierce	Geologist emeritus	USGS
David Redhorse	<i>Former</i> Native American liaison	USFWS
Jay Rotella	Professor of ecology	Montana State University
Dean Rundle	Refuge supervisor	USFWS
Rick Schroeder	Wildlife biologist	USGS
Richard Sodja	Wildlife biologist	USGS
Michael Spratt	Chief, Division of Refuge Planning	USFWS
Meg Van Ness	Regional archeologist	USFWS

Appendix C

Public Involvement

A notice of intent (NOI) to prepare the draft comprehensive conservation plan (CCP) and environmental assessment (EA) was published in the Federal Register on June 12, 2006. A mailing list of more than 250 names was compiled during preplanning; the list includes private citizens; local, regional, and state government representatives and legislators; other federal agencies; and interested organizations. Public scoping began immediately after publication of the NOI and was announced through news releases and issuance of the first planning update in July 2006. Information was provided on the history of the refuge and the CCP process, along with an invitation to public scoping meetings. Each planning update included a comment form and postage-paid envelope to give the public an opportunity to provide written comments. Emails were also accepted at the refuge's email address Redrocks@fws.gov.

Three public scoping meetings were held within a 2-hour drive of the refuge office. There were over 35 attendees, primarily local citizens and surrounding ranchers. Following a presentation about the refuge and an overview of the CCP and National Environmental Policy Act (NEPA) processes, attendees were encouraged to ask questions and offer comments. Verbal comments were recorded, and each attendee was given a comment form to submit additional thoughts or questions in writing.

All written comments were due September 15, 2006. A total of 55 additional written comments were received throughout the scoping process. All comments were shared with the planning team and considered throughout the planning process.

FEDERAL OFFICIALS

U.S. Representative Dennis Rehberg, Washington DC
Representative Rehberg State Office, Missoula, MT
U.S. Senator Max Baucus, Washington DC
Sen. Baucus's Area Director, Bozeman, MT
U.S. Senator John Tester, Washington DC
Sen. Tester's Area Director, Bozeman, MT

FEDERAL AGENCIES

National Forest Service, Dillon, MT
National Forest Service, Ennis, MT
Bureau of Land Management, Dillon, MT

National Park Service, Yellowstone National Park, MT
Bureau of Reclamation, Dillon, MT
Agricultural Research Service, Dubois, ID
U.S. Geological Service, Fort Collins Science Center, Fort Collins, CO
U.S. Geological Service, Bozeman, MT

TRIBAL OFFICIALS

Eastern Shoshone Business Council, Ft. Washakie, WY
Crow Tribe of Indians, Crow Agency, MT
Northern Cheyenne Tribal Council, Lame Deer, MT
Arapaho Business Council, Fort Washakie, WY

STATE OFFICIALS

Governor Brian Schweitzer, Helena, MT
Mary Sexton, Office of the Governor, Helena, MT
Representative Diane Rice, Harrison, MT
Representative Bill Tash, Dillon, MT
Representative Debbie Barrett, Dillon, MT
Representative Roger Koopman, Bozeman, MT
Representative John Sinrud, Bozeman, MT
Representative Jack Wells, Bozeman, MT
Senator Gary Perry, Manhattan, MT
Senator Steve Gallus, Butte, MT
Senator Joe Balyeat, Bozeman, MT

STATE AGENCIES

Montana Department of State Lands, Dillon, MT
Montana Fish, Wildlife and Parks, Bozeman, MT
Montana Fish, Wildlife and Parks, West Yellowstone, MT
Montana Fish, Wildlife and Parks, Dillon, MT
Montana Fish, Wildlife and Parks, Sheridan, MT
Montana Fish, Wildlife and Parks, Helena, MT
Montana Department of Environmental Quality, Helena, MT
Harriman State Park, Island Park, ID
Idaho Fish and Game, Boise, ID
Montana Department of Natural Resources and Conservation, Dillon, MT
Montana Historical Society and Preservation Office, Helena, MT

LOCAL GOVERNMENT

Madison County Commissioners, Madison, MT
Gallatin County Commissioners, Belgrad, MT
Beaverhead County Commissioners, Dillon, MT
Beaverhead County Road Department, Dillon, MT
Beaverhead County Weed Coordinator, Dillon, MT
Beaverhead County Planner, Dillon, MT

ORGANIZATIONS

Conservation Endowment Fund, Lima, MT
Greater Yellowstone Coalition, Bozeman, MT
Gallatin Wildlife Association, Bozeman, MT
Centennial Valley Association, Idaho Falls, ID
Henry's Lake Foundation, Island Park, ID
Montana Wildlife Federation, Helena, MT
Montana Audubon, Helena, MT
Greater Yellowstone Coordinating Committee, Bozeman, MT
Wilderness Watch, Missoula, MT
American Wildlands, Missoula, MT and Bozeman, MT
Ducks Unlimited, Memphis, TN and Lincoln, MT
Pintler Audubon Society, Dillon, MT
Wildlife Conservation Society, Bozeman, MT
Defenders of Wildlife, Bozeman, MT and Washington DC
Trumpeter Swan Society, Wayan, ID
Sierra Club, San Francisco, CA and Bozeman, MT
The Nature Conservancy, Bozeman, MT
Rocky Mountain Elk Foundation, Missoula, MT
Trout Unlimited, Missoula, MT
Montana Wilderness Association, Dillon, MT
National Wildlife Refuge Association, Washington DC
The Wilderness Society, Washington D.C. and Bozeman, MT
Audubon Society, Washington DC and New York, NY
North American Nature Photography Association, Wheat Ridge, CO
Animal Protection Institute
Beyond Pesticides
Wildlife Management Institute
National Wildlife Federation, Reston, VA
National Trappers Association, New Martinsville, WV
Fund for Animals
Isaac Walton League, Gaithersburg, MD
American Bird Conservancy, The Plains, VA
U.S. Humane Society, Washington DC

UNIVERSITIES, COLLEGES, AND SCHOOLS

Montana Tech, Butte, MT
University of Montana–Western, Dillon, MT
Montana State University, Bozeman, MT

MEDIA

Dillon Tribune, Dillon, MT
Montana Standard, Butte, MT
Bozeman Daily Chronicle, Bozeman, MT
West Yellowstone News, West Yellowstone, MT
KDBM Radio, Dillon, MT
KBOW and KOPR Radio, Butte, MT
KWYS and KEZQ Radio, Idaho Falls, ID
The Missoulian, Missoula, MT
KID Radio, Idaho Falls, ID
KUPI Radio and Sandhills Media, Idaho Falls, ID
The Post Register, Idaho Falls, ID
Rexburg Standard Journal, Rexburg, ID
Idaho State Journal, Pocatello, ID
Dillonite Daily, Dillon, MT

INDIVIDUALS

78 private individuals

Appendix D

Species List

Below is a list of resident and migrant wildlife and plant species found at or adjacent to Red Rock Lakes National Wildlife Refuge.

This list includes all mammals, fish, and herpetofauna expected to occur on Red Rock Lakes National Wildlife Refuge based on refuge files, unpublished systematic survey data, and other relevant literature and data that pertains to southwest Montana. Bird species listed in this appendix are based on the Red Rock Lakes National Wildlife Refuge Bird List,

as well as additional information from refuge files. Plant species listed in this appendix are based upon plant collections made on or near the refuge (Dorn 1969, Culver 1994, Paullin 1971), refuge files, and the recent vegetation mapping of the refuge (Newlon 2007).

Taxonomic order follows the Integrated Taxonomic Information System (<http://www.itis.gov>) and the "Check-list of North American Birds" ([anon.] 2007).

CLASS AMPHIBIA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Caudata	Blotched tiger salamander	<i>Ambystoma mavortium melanostictum</i>
Anura	Western toad	<i>Bufo boreas</i>
Anura	Columbia spotted frog	<i>Rana luteiventris</i>
Anura	Boreal chorus frog	<i>Pseudacris maculate</i>

CLASS REPTILIA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Squamata	Western terrestrial garter snake	<i>Thamnophis elegans</i>

CLASS AVES

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Anseriformes	Snow goose	<i>Chen caerulescens</i>
Anseriformes	Ross's goose	<i>Chen rossii</i>
Anseriformes	Greater white-fronted goose	<i>Anser albifrons</i>
Anseriformes	Canada goose	<i>Branta canadensis</i>
Anseriformes	Trumpeter swan	<i>Cygnus buccinator</i>
Anseriformes	Tundra swan	<i>Cygnus columbianus</i>
Anseriformes	Mute swan	<i>Cygnus olor</i>
Anseriformes	Black swan	<i>Cygnus atratus</i>
Anseriformes	Wood duck	<i>Aix sponsa</i>
Anseriformes	Gadwall	<i>Anas strepera</i>
Anseriformes	American Pigeon	<i>Anas americana</i>
Anseriformes	Mallard	<i>Anas platyrhynchos</i>
Anseriformes	Blue-winged teal	<i>Anas discors</i>
Anseriformes	Cinnamon teal	<i>Anas cyanoptera</i>
Anseriformes	Northern shoveler	<i>Anas clypeata</i>
Anseriformes	Northern pintail	<i>Anas acuta</i>
Anseriformes	Green-winged teal	<i>Anas crecca</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Anseriformes	Canvasback	<i>Aythya valisineria</i>
Anseriformes	Redhead	<i>Aythya Americana</i>
Anseriformes	Ring-necked duck	<i>Aythya collaris</i>
Anseriformes	Lesser scaup	<i>Aythya affinis</i>
Anseriformes	Greater scaup	<i>Aythya marila</i>
Anseriformes	Bufflehead	<i>Bucephala albeola</i>
Anseriformes	Common goldeneye	<i>Bucephala clangula</i>
Anseriformes	Barrow's goldeneye	<i>Bucephala islandica</i>
Anseriformes	Hooded merganser	<i>Lophodytes cucullatus</i>
Anseriformes	Common merganser	<i>Mergus merganser</i>
Anseriformes	Red-breasted merganser	<i>Mergus serrator</i>
Anseriformes	Ruddy duck	<i>Oxyura jamaicensis</i>
Anseriformes	Surf scoter	<i>Melanitta perspicillata</i>
Anseriformes	White-winged scoter	<i>Melanitta fusca</i>
Anseriformes	Long-tailed duck	<i>Clangula hyemalis</i>
Anseriformes	Harlequin duck	<i>Histrionicus histrionicus</i>
Galliformes	Ruffed grouse	<i>Bonasa umbellus</i>
Galliformes	Blue grouse	<i>Dendragapus obscurus</i>
Galliformes	Greater sage grouse	<i>Centrocercus urophasianus</i>
Galliformes	Columbia sharp-tailed grouse	<i>Tympanuchus phasianellus columbianus</i>
Galliformes	Gray partridge	<i>Perdix perdix</i>
Galliformes	Ring-necked pheasant	<i>Phasianus colchicus</i>
Gaviiformes	Common loon	<i>Gavia immer</i>
Gaviiformes	Arctic loon	<i>Gavia arctica</i>
Podicipediformes	Pied-billed grebe	<i>Podilymbus podiceps</i>
Podicipediformes	Horned grebe	<i>Podiceps auritus</i>
Podicipediformes	Red-necked grebe	<i>Podiceps grisegena</i>
Podicipediformes	Eared grebe	<i>Podiceps nigricollis</i>
Podicipediformes	Western grebe	<i>Aechmophorus occidentalis</i>
Podicipediformes	Clark's grebe	<i>Aechmophorus clarkii</i>
Pelicaniformes	American white pelican	<i>Pelecanus erythrocephalus</i>
Pelicaniformes	Double-crested cormorant	<i>Phalacrocorax auritus</i>
Ciconiiformes	American bittern	<i>Botaurus lentiginosus</i>
Ciconiiformes	Great blue heron	<i>Ardea Herodias</i>
Ciconiiformes	Great egret	<i>Ardea alba</i>
Ciconiiformes	Snowy egret	<i>Egretta caerulea</i>
Ciconiiformes	Black-crowned night-heron	<i>Nycticorax nycticorax</i>
Ciconiiformes	White-faced ibis	<i>Plegadis chihi</i>
Ciconiiformes	Turkey vulture	<i>Cathartes aura</i>
Falconiformes	Osprey	<i>Pandion haliaetus</i>
Falconiformes	Bald eagle	<i>Haliaeetus leucocephalus</i>
Falconiformes	Northern harrier	<i>Circus cyaneus</i>
Falconiformes	Sharp-shinned hawk	<i>Accipiter striatus</i>
Falconiformes	Cooper's hawk	<i>Accipiter cooperii</i>
Falconiformes	Northern goshawk	<i>Accipiter gentilis</i>
Falconiformes	Swainson's hawk	<i>Buteo swainsoni</i>
Falconiformes	Red-tailed hawk	<i>Buteo jamaicensis</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Falconiformes	Ferruginous hawk	<i>Buteo regalis</i>
Falconiformes	Rough-legged hawk	<i>Buteo lagopus</i>
Falconiformes	Golden eagle	<i>Aquila chrysaetos</i>
Falconiformes	American kestrel	<i>Falco sparverius</i>
Falconiformes	Merlin	<i>Falco columbarius</i>
Falconiformes	Peregrine falcon	<i>Falco peregrinus</i>
Falconiformes	Prairie falcon	<i>Falco mexicanus</i>
Falconiformes	Gyr falcon	<i>Falco rusticolus</i>
Gruiformes	Virginia rail	<i>Rallus limicola</i>
Gruiformes	Yellow rail	<i>Coturnicops noveboracensis</i>
Gruiformes	Sora	<i>Porzana carolina</i>
Gruiformes	American coot	<i>Fulica Americana</i>
Gruiformes	Sandhill crane	<i>Grus canadensis</i>
Gruiformes	Whooping crane	<i>Grus americana</i>
Charadriiformes	Killdeer	<i>Charadrius vociferous</i>
Charadriiformes	Semipalmated plover	<i>Charadrius semipalmatus</i>
Charadriiformes	Mountain plover	<i>Charadrius montanus</i>
Charadriiformes	Snowy plover	<i>Charadrius alexandrius</i>
Charadriiformes	Black-bellied plover	<i>Pluvialis squatarola</i>
Charadriiformes	Black-necked stilt	<i>Himantopus mexicanus</i>
Charadriiformes	American avocet	<i>Recurvirostra americana</i>
Charadriiformes	Greater yellowlegs	<i>Tringa melanoleuca</i>
Charadriiformes	Lesser yellowlegs	<i>Tringa flavipes</i>
Charadriiformes	Solitary sandpiper	<i>Tringa solitaria</i>
Charadriiformes	Willet	<i>Catoptrophorus semipalmatus</i>
Charadriiformes	Spotted sandpiper	<i>Actitis macularia</i>
Charadriiformes	Upland sandpiper	<i>Bartamia longicauda</i>
Charadriiformes	Long-billed curlew	<i>Numenius americanus</i>
Charadriiformes	Marbled godwit	<i>Limosa fedoa</i>
Charadriiformes	Long-billed dowitcher	<i>Limnodromus scolopaceus</i>
Charadriiformes	Wilson's snipe	<i>Gallinago delicata</i>
Charadriiformes	American woodcock	<i>Scolopax minor</i>
Charadriiformes	Wilson's phalarope	<i>Phalaropus tricolor</i>
Charadriiformes	Red-necked phalarope	<i>Phalaropus lobatus</i>
Charadriiformes	Parasitic jaeger	<i>Stercorarius parasiticus</i>
Charadriiformes	Sanderling	<i>Calidris alba</i>
Charadriiformes	Semipalmated sandpiper	<i>Calidris pusilla</i>
Charadriiformes	Western sandpiper	<i>Calidris mauri</i>
Charadriiformes	Least sandpiper	<i>Calidris minutilla</i>
Charadriiformes	White-rumped sandpiper	<i>Calidris fuscicollis</i>
Charadriiformes	Pectoral sandpiper	<i>Calidris melanotos</i>
Charadriiformes	Dunlin	<i>Calidris alpina</i>
Charadriiformes	Baird's sandpiper	<i>Calidris bairdii</i>
Charadriiformes	Franklin's gull	<i>Larus pipixcan</i>
Charadriiformes	Ring-billed gull	<i>Larus delawarensis</i>
Charadriiformes	California gull	<i>Larus californicus</i>
Charadriiformes	Herring gull	<i>Larus argentatus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Charadriiformes	Bonaparte's gull	<i>Larus philadelphia</i>
Charadriiformes	Forster's tern	<i>Sterna forsteri</i>
Charadriiformes	Black tern	<i>Sterna niger</i>
Charadriiformes	Caspian tern	<i>Sterna caspia</i>
Charadriiformes	Common tern	<i>Sterna hirundo</i>
Columbiformes	Mourning dove	<i>Zenaida macroura</i>
Columbiformes	Band-tailed pigeon	<i>Patagioenas fasciata</i>
Columbiformes	Rock pigeon	<i>Columba livia</i>
Cuculiformes	Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Cuculiformes	Yellow-billed cuckoo	<i>Coccyzus americanus</i>
Strigiformes	Great horned owl	<i>Bubo virginianus</i>
Strigiformes	Burrowing owl	<i>Athene cunicularia</i>
Strigiformes	Long-eared owl	<i>Asio otus</i>
Strigiformes	Short-eared owl	<i>Asio flammeus</i>
Strigiformes	Northern saw-whet owl	<i>Aegolius acadicus</i>
Strigiformes	Northern pygmy-owl	<i>Glaucidium gnoma</i>
Strigiformes	Western screech-owl	<i>Megascops kennicottii</i>
Strigiformes	Great gray owl	<i>Strix nebulosa</i>
Caprimulgiformes	Common nighthawk	<i>Chordeiles minor</i>
Apodiformes	White-throated swift	<i>Aeronautes saxatalis</i>
Apodiformes	Broad-tailed hummingbird	<i>Selasphorus platycercus</i>
Apodiformes	Rufous hummingbird	<i>Selasphorus rufus</i>
Apodiformes	Calliope hummingbird	<i>Stellula calliope</i>
Apodiformes	Black-chinned hummingbird	<i>Archilochus alexandri</i>
Coraciiformes	Belted kingfisher	<i>Ceryle alcyon</i>
Piciformes	Lewis' woodpecker	<i>Melanerpes lewis</i>
Piciformes	Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Piciformes	Downy woodpecker	<i>Picoides pubescens</i>
Piciformes	Hairy woodpecker	<i>Picoides villosus</i>
Piciformes	Black-backed woodpecker	<i>Picoides arcticus</i>
Piciformes	American three-toed woodpecker	<i>Picoides dorsalis</i>
Piciformes	Pileated woodpecker	<i>Dryocopus pileatus</i>
Piciformes	Northern flicker	<i>Colaptes auratus</i>
Piciformes	Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>
Piciformes	Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Passeriformes	Western kingbird	<i>Tyrannus verticalis</i>
Passeriformes	Eastern kingbird	<i>Tyrannus forficatus</i>
Passeriformes	Say's phoebe	<i>Saynoris saya</i>
Passeriformes	Willow flycatcher	<i>Empidonax traillii</i>
Passeriformes	Dusky flycatcher	<i>Empidonax oberholseri</i>
Passeriformes	Hammond's flycatcher	<i>Empidonax hammondi</i>
Passeriformes	Cordilleran flycatcher	<i>Empidonax occidentalis</i>
Passeriformes	Least flycatcher	<i>Empidonax minimus</i>
Passeriformes	Western wood-peewee	<i>Contopus sordidulus</i>
Passeriformes	Olive-sided flycatcher	<i>Contopus cooperi</i>
Passeriformes	Horned lark	<i>Eremophila alpestris</i>
Passeriformes	Tree swallow	<i>Tachycineta bicolor</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Passeriformes	Violet-green swallow	<i>Tachycineta thalassina</i>
Passeriformes	Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
Passeriformes	Bank swallow	<i>Riparia riparia</i>
Passeriformes	Cliff swallow	<i>Petrochelidon pyrrhonota</i>
Passeriformes	Barn swallow	<i>Hirundo rustica</i>
Passeriformes	Steller's jay	<i>Cyanocitta stelleri</i>
Passeriformes	Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Passeriformes	Gray jay	<i>Perisoreus Canadensis</i>
Passeriformes	Blue jay	<i>Cyanocitta cristata</i>
Passeriformes	Black-billed magpie	<i>Pica hudsonia</i>
Passeriformes	American crow	<i>Corvus brachyrhynchos</i>
Passeriformes	Common raven	<i>Corvus corax</i>
Passeriformes	Clark's nutcracker	<i>Nucifraga columbiana</i>
Passeriformes	Black-capped chickadee	<i>Poecile atricappila</i>
Passeriformes	Mountain chickadee	<i>Poecile gambeli</i>
Passeriformes	American dipper	<i>Cinclus mexicanus</i>
Passeriformes	Red-breasted nuthatch	<i>Sitta canadensis</i>
Passeriformes	White-breasted nuthatch	<i>Sitta carolinensis</i>
Passeriformes	Pygmy nuthatch	<i>Sitta pygmaea</i>
Passeriformes	Brown creeper	<i>Certhia americana</i>
Passeriformes	House wren	<i>Troglodytes aedon</i>
Passeriformes	Winter wren	<i>Troglodytes troglodytes</i>
Passeriformes	Rock wren	<i>Salpinctes obsoletus</i>
Passeriformes	Canyon wren	<i>Catherpes mexicanus</i>
Passeriformes	Marsh wren	<i>Cistothorus palustris</i>
Passeriformes	Gray catbird	<i>Dumetella carolinensis</i>
Passeriformes	Northern mockingbird	<i>Mimus polyglottos</i>
Passeriformes	Sage thrasher	<i>Oreoscoptes montanus</i>
Passeriformes	American robin	<i>Turdus migratorius</i>
Passeriformes	Townsend's solitaire	<i>Myadestes townsendi</i>
Passeriformes	Swainson's thrush	<i>Catharus ustulatus</i>
Passeriformes	Hermit thrush	<i>Catharus guttatus</i>
Passeriformes	Veery	<i>Catharus fuscescens</i>
Passeriformes	Mountain bluebird	<i>Sialia currucoides</i>
Passeriformes	Western bluebird	<i>Sialia mexicana</i>
Passeriformes	Golden-crowned kinglet	<i>Regulus satrapa</i>
Passeriformes	Ruby-crowned kinglet	<i>Regulus calendula</i>
Passeriformes	American pipit	<i>Anthus rubescens</i>
Passeriformes	Sprague's pipit	<i>Anthus spragueii</i>
Passeriformes	Bohemian waxwing	<i>Bombycilla garrulous</i>
Passeriformes	Cedar waxwing	<i>Bombycilla cedrorum</i>
Passeriformes	Loggerhead shrike	<i>Lanius ludovicianus</i>
Passeriformes	Northern shrike	<i>Lanius excubitor</i>
Passeriformes	European starling	<i>Sturnus vulgaris</i>
Passeriformes	Warbling vireo	<i>Vireo gilvus</i>
Passeriformes	Cassin's vireo	<i>Vireo cassinii</i>
Passeriformes	Red-eyed vireo	<i>Vireo olivaceus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Passeriformes	Tennessee warbler	<i>Vermivora peregrina</i>
Passeriformes	Orange-crowned warbler	<i>Vermivora celata</i>
Passeriformes	Yellow warbler	<i>Dendroica petechia</i>
Passeriformes	Yellow-rumped warbler	<i>Dendroica coronata</i>
Passeriformes	Townsend's warbler	<i>Dendroica townsendi</i>
Passeriformes	Northern waterthrush	<i>Seiurus noveboracensis</i>
Passeriformes	Common yellowthroat	<i>Geothlypis trichas</i>
Passeriformes	MacGillivray's warbler	<i>Oporornis tolmiei</i>
Passeriformes	Wilson's warbler	<i>Wilsonia pusilla</i>
Passeriformes	Yellow-brested chat	<i>Icteria virens</i>
Passeriformes	American redstart	<i>Setophaga ruticilla</i>
Passeriformes	House sparrow	<i>Passer domesticus</i>
Passeriformes	Bobolink	<i>Dolichonyx oryzivorus</i>
Passeriformes	Western meadowlark	<i>Sturnella neglecta</i>
Passeriformes	Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
Passeriformes	Red-winged blackbird	<i>Agelaius phoeniceus</i>
Passeriformes	Brewer's blackbird	<i>Euphagus cyanocephalus</i>
Passeriformes	Common grackle	<i>Quiscalus quiscula</i>
Passeriformes	Brown-headed cowbird	<i>Molothrus ater</i>
Passeriformes	Bullock's oriole	<i>Icterus bullockii</i>
Passeriformes	Western tanager	<i>Piranga ludoviciana</i>
Passeriformes	Black-headed grosbeak	<i>Pheucticus melanocephalus</i>
Passeriformes	Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>
Passeriformes	Evening grosbeak	<i>Coccothraustes vespertinus</i>
Passeriformes	Lazuli bunting	<i>Passerina amoena</i>
Passeriformes	Cassin's finch	<i>Carpodacus cassinii</i>
Passeriformes	House finch	<i>Carpodacus mexicanus</i>
Passeriformes	Pine grosbeak	<i>Pinicola enucleator</i>
Passeriformes	Gray-crowned rosy finch	<i>Leucosticte tephrocotis</i>
Passeriformes	Black rosy finch	<i>Leucosticte atrata</i>
Passeriformes	White-winged crossbill	<i>Loxia leucoptera</i>
Passeriformes	Common redpoll	<i>Carduelis flammea</i>
Passeriformes	Pine siskin	<i>Carduelis pinus</i>
Passeriformes	American goldfinch	<i>Carduelis tristis</i>
Passeriformes	Red crossbill	<i>Loxia curvirostra</i>
Passeriformes	Green-tailed towhee	<i>Pipilo chlorurus</i>
Passeriformes	Spotted towhee	<i>Pipilo maculatus</i>
Passeriformes	Savannah sparrow	<i>Passerculus sandwichensis</i>
Passeriformes	Lark bunting	<i>Calamospiza melanocorys</i>
Passeriformes	Vesper sparrow	<i>Poocetes gramineus</i>
Passeriformes	Lark sparrow	<i>Chondestes grammacus</i>
Passeriformes	Dark-eyed junco	<i>Junco hyemalis</i>
Passeriformes	American tree sparrow	<i>Spizella arborea</i>
Passeriformes	Chipping sparrow	<i>Spizella passerina</i>
Passeriformes	Brewer's sparrow	<i>Spizella breweri</i>
Passeriformes	Clay-colored sparrow	<i>Spizella pallida</i>
Passeriformes	White-crowned sparrow	<i>Zonotrichia leucophrys</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Passeriformes	White-throated sparrow	<i>Zonotrichia albicollis</i>
Passeriformes	Harris' sparrow	<i>Zonotrichia querula</i>
Passeriformes	Fox sparrow	<i>Passerelia iliaca</i>
Passeriformes	Song sparrow	<i>Melospiza melodia</i>
Passeriformes	Lincoln sparrow	<i>Melospiza lincolni</i>
Passeriformes	Grasshopper sparrow	<i>Ammodramus savannarum</i>
Passeriformes	Sage sparrow	<i>Amphispiza belli</i>
Passeriformes	McCown's longspur	<i>Calcarius mccownii</i>
Passeriformes	Lapland longspur	<i>Calcarius lapponicus</i>
Passeriformes	Chestnut-collared longspur	<i>Calcarius ornatus</i>
Passeriformes	Snow bunting	<i>Plectrophenax nivalis</i>

CLASS MAMMALIA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Insectivora	Masked shrew	<i>Sorex cinereus</i>
Insectivora	Water shrew	<i>Sorex palustris</i>
Chiroptera	Little brown bat	<i>Myotis lucifugus</i>
Chiroptera	Small-footed bat	<i>Myotis leibii</i>
Chiroptera	Hoary bat	<i>Lasiurus cinereus</i>
Chiroptera	Silver-haired bat	<i>Lasionycteris noctivagans</i>
Carnivora	Black bear	<i>Ursus americanus</i>
Carnivora	Grizzly bear	<i>Ursus arctos</i>
Carnivora	Ermine	<i>Mustela erminea</i>
Carnivora	Long-tailed weasel	<i>Mustela frenata</i>
Carnivora	Mink	<i>Mustela vison</i>
Carnivora	Marten	<i>Martes americana</i>
Carnivora	Fisher	<i>Martes pennanti</i> *
Carnivora	Wolverine	<i>Gulo gulo</i>
Carnivora	River otter	<i>Lontra canadensis</i>
Carnivora	Badger	<i>Taxidea taxus</i>
Carnivora	Striped skunk	<i>Mephitis mephitis</i>
Carnivora	Raccoon	<i>Procyon lotor</i>
Carnivora	Red fox	<i>Vulpes vulpes</i>
Carnivora	Coyote	<i>Canis latrans</i>
Carnivora	Gray wolf	<i>Canis lupus</i>
Carnivora	Bobcat	<i>Lynx rufus</i>
Carnivora	Canada lynx	<i>Lynx canadensis</i>
Carnivora	Mountain lion	<i>Puma concolor</i>
Artiodactyla	Moose	<i>Alces alces</i>
Artiodactyla	Pronghorn	<i>Antilocapra americana</i>
Artiodactyla	Bison	<i>Bison bison</i> *
Artiodactyla	Elk	<i>Cervus elaphus</i>
Artiodactyla	Mule deer	<i>Odocoileus hemionus</i>
Artiodactyla	White-tailed deer	<i>Odocoileus virginianus</i>
Artiodactyla	Bighorn sheep	<i>Ovis Canadensis</i> *
Lagomorpha	White-tailed jackrabbit	<i>Lepus townsendii</i>
Lagomorpha	Black-tailed jackrabbit	<i>Lepus californicus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Lagomorpha	Snowshoe hare	<i>Lepus americanus</i>
Lagomorpha	Pygmy rabbit	<i>Brachylagus idahoensis</i>
Lagomorpha	Pika	<i>Ochotona princeps</i>
Rodentia	Wyoming ground squirrel	<i>Spermophilus elegans</i>
Rodentia	Golden-mantled ground squirrel	<i>Spermophilus lateralis</i>
Rodentia	Northern flying squirrel	<i>Spermophilus lateralis</i>
Rodentia	Red squirrel	<i>Tamiasciurus hudsonicus</i>
Rodentia	Least chipmunk	<i>Tamias minimus</i>
Rodentia	Yellow-pine chipmunk	<i>Tamias amoenus</i>
Rodentia	Yellow-bellied marmot	<i>Marmota flaviventris</i>
Rodentia	Bushy-tailed woodrat	<i>Neotoma cinerea</i>
Rodentia	Porcupine	<i>Erethizon dorsatum</i>
Rodentia	Northern pocket gopher	<i>Thomomys talpoides</i>
Rodentia	Muskrat	<i>Ondatra zibethicus</i>
Rodentia	Beaver	<i>Castor canadensis</i>
Rodentia	Deer mouse	<i>Peromyscus maniculatus</i>
Rodentia	Western jumping mouse	<i>Zapus princeps</i>
Rodentia	Southern red-backed vole	<i>Clethrionomys gapperi</i>
Rodentia	Meadow vole	<i>Microtus pennsylvanicus</i>
Rodentia	Montane vole	<i>Microtus montanus</i>
Rodentia	Long-tailed vole	<i>Microtus longicaudus</i>

CLASS OSTEICHTHYES

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Cypriniformes	White sucker	<i>Catostomus commersonii</i>
Cypriniformes	Longnose sucker	<i>Catostomus catostomus</i>
Cypriniformes	Mountain sucker	<i>Catostomus platyrhynchus</i>
Cypriniformes	Longnose dace	<i>Rhinichthys cataractae</i>
Gadiformes	Burbot	<i>Lota lota</i>
Salmoniformes	Arctic grayling	<i>Thymallus arcticus</i>
Salmoniformes	Mountain whitefish	<i>Prosopium williamsoni</i>
Salmoniformes	Yellowstone cutthroat trout	<i>Oncorhynchus clarkii bowvieri</i>
Salmoniformes	Rainbow trout	<i>Oncorhynchus mykiss</i>
Salmoniformes	Brook trout	<i>Salvelinus fontinalis</i>
Scorpaeniformes	Mottled sculpin	<i>Cottus bairdii</i>

PLANTS

CLASS PINOPIPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Pinales	Subalpine fir	<i>Abies lasiocarpa</i>
Pinales	Engelmann spruce	<i>Picea engelmannii</i>
Pinales	Whitebark pine	<i>Pinus albicaulis</i>
Pinales	Lodgepole pine	<i>Pinus contorta</i>
Pinales	Limber pine	<i>Pinus flexilis</i>
Pinales	Douglas-fir	<i>Pseudotsuga menziesii</i>
Pinales	Rocky Mountain juniper	<i>Juniperus scopulorum</i>
Pinales	Common juniper	<i>Juniperus communis</i>
Pinales	Creeping juniper	<i>Juniperus horizontalis</i>

CLASS MAGNOLIOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Salicales	Balsam poplar	<i>Populus balsamifera ssp. trichocarpa</i>
Salicales	Quaking aspen	<i>Populus tremuloides</i>
Salicales	Bebb willow	<i>Salix bebbiana</i>
Salicales	Booth's willow	<i>Salix boothii</i>
Salicales	Sageleaf willow	<i>Salix candida</i>
Salicales	Drummond's willow	<i>Salix drummondiana</i>
Salicales	Geyer willow	<i>Salix geyeriana</i>
Salicales	Grayleaf willow	<i>Salix glauca</i>
Salicales	Pacific willow	<i>Salix lucida ssp. lasiandra</i>
Salicales	Yellow willow	<i>Salix lutea</i>
Salicales	Blueberry willow	<i>Salix myrtilifolia</i>
Salicales	Diamondleaf willow	<i>Salix planifolia</i>
Salicales	False mountain willow	<i>Salix pseudomonticola</i>
Salicales	Scouler's willow	<i>Salix scouleriana</i>
Salicales	Wolf's willow	<i>Salix wolfii</i>
Sapindales	Rocky Mountain maple	<i>Acer glabrum</i>
Asterales	Little sagebrush	<i>Artemisia arbuscula ssp. arbuscula</i>
Asterales	Alkali sagebrush	<i>Artemisia arbuscula ssp. longiloba</i>
Asterales	Silver sagebrush	<i>Artemisia cana ssp. viscidula</i>
Asterales	Prairie sagewort	<i>Artemisia frigida</i>
Asterales	Basin big sagebrush	<i>Artemisia tridentata ssp. tridentata</i>
Asterales	Mountain big sagebrush	<i>Artemisia tridentata ssp. vaseyana</i>
Asterales	Threetip sagebrush	<i>Artemisia tripartita ssp. tripartita</i>
Asterales	Green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>
Asterales	Whitestem goldenbush	<i>Ericameria discoidea</i>
Asterales	Rubber rabbitbrush	<i>Ericameria nauseosa</i>
Asterales	Dwarf goldenbush	<i>Ericameria nana</i>
Asterales	Singlehead goldenbush	<i>Ericameria suffruticosa</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Asterales	Spineless horsebrush	<i>Tetradymia canescens</i>
Asterales	Common yarrow	<i>Achillea millefolium</i>
Asterales	Orange agoseris	<i>Agoseris aurantiaca</i>
Asterales	Pale agoseris	<i>Agoseris glauca</i>
Asterales	Western pearly everlasting	<i>Anaphalis margaritacea</i>
Asterales	Alpine pussytoes	<i>Antennaria alpina</i>
Asterales	Pearly pussytoes	<i>Antennaria anaphaloides</i>
Asterales	Flat-top pussytoes	<i>Antennaria corymbosa</i>
Asterales	Rush pussytoes	<i>Antennaria luzuloides</i>
Asterales	Littleleaf pussytoes	<i>Antennaria microphylla</i>
Asterales	Raceme pussytoes	<i>Antennaria racemosa</i>
Asterales	Rosy pussytoes	<i>Antennaria rosea</i>
Asterales	Chamisso arnica	<i>Arnica chamissonis</i>
Asterales	Heartleaf arnica	<i>Arnica cordifolia</i>
Asterales	Broadleaf arnica	<i>Arnica latifolia</i>
Asterales	Hairy arnica	<i>Arnica mollis</i>
Asterales	Twin arnica	<i>Arnica sororia</i>
Asterales	Biennial wormwood	<i>Artemisia biennis</i>
Asterales	Tarragon	<i>Artemisia dracuncululus</i>
Asterales	White sagebrush	<i>Artemisia ludoviciana</i>
Asterales	Arrowleaf balsamroot	<i>Balsamorhiza sagittata</i>
Asterales	Nodding beggartick	<i>Bidens cernua</i>
Asterales	Musk thistle	<i>Carduus nutans*</i>
Asterales	Spotted knapweed	<i>Centaurea stoebe*</i>
Asterales	Douglas' dustymaiden	<i>Chaenactis douglasii</i>
Asterales	Canada thistle	<i>Cirsium arvense*</i>
Asterales	Graygreen thistle	<i>Cirsium canovirens</i>
Asterales	Meadow thistle	<i>Cirsium scariosum</i>
Asterales	Wavyleaf thistle	<i>Cirsium undulatum</i>
Asterales	Bull thistle	<i>Cirsium vulgare*</i>
Asterales	Tapertip hawksbeard	<i>Crepis acuminata</i>
Asterales	Fiddleleaf hawksbeard	<i>Crepis runcinata</i>
Asterales	Giant sumpweed	<i>Cyclachaena xanthifolia</i>
Asterales	Tufted fleabane	<i>Erigeron caespitosus</i>
Asterales	Cutleaf daisy	<i>Erigeron compositus</i>
Asterales	Longleaf fleabane	<i>Erigeron corymbosus</i>
Asterales	Streamside fleabane	<i>Erigeron glabellus</i>
Asterales	Quill fleabane	<i>Erigeron gracilis</i>
Asterales	Shortray fleabane	<i>Erigeron lonchophyllus</i>
Asterales	Buff fleabane	<i>Erigeron ochroleucus</i>
Asterales	Philadelphia fleabane	<i>Erigeron philadelphicus</i>
Asterales	Subalpine fleabane	<i>Erigeron peregrinus</i>
Asterales	Rydberg's fleabane	<i>Erigeron rydbergii</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Asterales	Aspen fleabane	<i>Erigeron speciosus</i>
Asterales	Tweedy's fleabane	<i>Erigeron tweedyi</i>
Asterales	Common woolly sunflower	<i>Eriophyllum lanatum</i>
Asterales	Elegant aster	<i>Eucephalus elegans</i>
Asterales	Engelmann's aster	<i>Eucephalus engelmannii</i>
Asterales	Western showy aster	<i>Eurybia conspicua</i>
Asterales	Thickstem aster	<i>Eurybia integrifolia</i>
Asterales	Common gaillardia	<i>Gaillardia aristata</i>
Asterales	Western marsh cudweed	<i>Gnaphalium palustre</i>
Asterales	Curlycup gumweed	<i>Grindelia squarrosa</i>
Asterales	Oneflower helianthella	<i>Helianthella uniflora</i>
Asterales	Common sunflower	<i>Helianthus annuus</i>
Asterales	Nuttall's sunflower	<i>Helianthus nuttallii</i>
Asterales	Showy goldeneye	<i>Heliomeris multiflora</i>
Asterales	White hawkweed	<i>Hieracium albiflorum</i>
Asterales	Houndstongue hawkweed	<i>Hieracium cynoglossoides</i>
Asterales	Slender hawkweed	<i>Hieracium gracile</i>
Asterales	Fineleaf hymenopappus	<i>Hymenopappus filifolius</i>
Asterales	Owl's-claws	<i>Hymenoxys hoopesii</i>
Asterales	Lava aster	<i>Ionactis alpina</i>
Asterales	Tall blue lettuce	<i>Lactuca biennis</i>
Asterales	Blue lettuce	<i>Lactuca tatarica</i>
Asterales	Hoary tansyaster	<i>Machaeranthera canescens</i>
Asterales	Mountain tarweed	<i>Madia glomerata</i>
Asterales	Disc mayweed	<i>Matricaria discoidea</i>
Asterales	Nodding microseris	<i>Microseris nutans</i>
Asterales	Meadow prairie-dandelion	<i>Nothocalais nigrescens</i>
Asterales	Woolly groundsel	<i>Packera cana</i>
Asterales	Weak groundsel	<i>Packera debilis</i>
Asterales	Elegant groundsel	<i>Packera indecora</i>
Asterales	Balsam groundsel	<i>Packera paupercula</i>
Asterales	Falsegold groundsel	<i>Packera pseud aurea</i>
Asterales	Rocky Mountain groundsel	<i>Packera streptanthifolia</i>
Asterales	Hoary groundsel	<i>Packera wernerifolia</i>
Asterales	Arctic sweet coltsfoot	<i>Petasites frigidus</i>
Asterales	Many-stemmed goldenweed	<i>Pyrocoma integrifolia</i>
Asterales	Lanceleaf goldenweed	<i>Pyrocoma lanceolata</i>
Asterales	Plantain goldenweed	<i>Pyrocoma uniflora</i>
Asterales	Western coneflower	<i>Rudbeckia occidentalis</i>
Asterales	Thickleaf ragwort	<i>Senecio crassulus</i>
Asterales	Dwarf mountain ragwort	<i>Senecio fremontii</i>
Asterales	Tall ragwort	<i>Senecio hydrophiloides</i>
Asterales	Water ragwort	<i>Senecio hydrophilus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Asterales	Lambstongue ragwort	<i>Senecio integerrimus</i>
Asterales	Small blacktip ragwort	<i>Senecio lugens</i>
Asterales	Tall ragwort	<i>Senecio serra</i>
Asterales	Ballhead ragwort	<i>Senecio sphaerocephalus</i>
Asterales	Arrowleaf ragwort	<i>Senecio triangularis</i>
Asterales	Canada goldenrod	<i>Solidago canadensis</i>
Asterales	Missouri goldenrod	<i>Solidago missouriensis</i>
Asterales	Manyray goldenrod	<i>Solidago multiradiata</i>
Asterales	Gray goldenrod	<i>Solidago nemoralis</i>
Asterales	Dwarf goldenrod	<i>Solidago simplex</i>
Asterales	Moist sowthistle	<i>Sonchus arvensis</i> *
Asterales	Stemless mock goldenweed	<i>Stenotus acaulis</i>
Asterales	Woolly mock goldenweed	<i>Stenotus lanuginosus</i>
Asterales	Narrowleaf wirelettuce	<i>Stephanomeria minor</i>
Asterales	Western meadow aster	<i>Symphyotrichum campestre</i>
Asterales	Eaton's aster	<i>Symphyotrichum eatonii</i>
Asterales	White prairie aster	<i>Symphyotrichum falcatum</i>
Asterales	Alpine leafybract aster	<i>Symphyotrichum foliaceum</i>
Asterales	White panicle aster	<i>Symphyotrichum lanceolatum</i>
Asterales	Western mountain aster	<i>Symphyotrichum spathulatum</i>
Asterales	Common tansy	<i>Tanacetum vulgare</i> *
Asterales	Rock dandelion	<i>Taraxacum laevigatum</i> *
Asterales	Common dandelion	<i>Taraxacum officinale</i> *
Asterales	Graylocks four-nerve daisy	<i>Tetraneuris grandiflora</i>
Asterales	Wyoming Townsend daisy	<i>Townsendia alpigena</i>
Asterales	Cushion Townsend daisy	<i>Townsendia condensata</i>
Asterales	Parry's Townsend daisy	<i>Townsendia parryi</i>
Asterales	Yellow salsify	<i>Tragopogon dubius</i> *
Asterales	Jack-to-bed-at-noon	<i>Tragopogon lamottei</i> *
Asterales	Mule-ears	<i>Wyethia amplexicaulis</i>
Asterales	Sunflower mule-ears	<i>Wyethia helianthoides</i>
Fagales	Bog birch	<i>Betula pumila</i>
Caryophyllales	Brittle pricklypear	<i>Opuntia fragilis</i>
Caryophyllales	Greasewood	<i>Sarcobatus vermiculatus</i>
Dipsacales	Twinberry honeysuckle	<i>Lonicera involucrata</i>
Dipsacales	Utah honeysuckle	<i>Lonicera utahensis</i>
Dipsacales	Red elderberry	<i>Sambucus racemosa</i>
Dipsacales	Mountain snowberry	<i>Symphoricarpos oreophilus</i>
Dipsacales	Squashberry	<i>Viburnum edule</i>
Dipsacales	Twinline	<i>Linnaea borealis</i>
Dipsacales	Tobacco root	<i>Valeriana edulis</i>
Dipsacales	Western valerian	<i>Valeriana occidentalis</i>
Cornales	Redosier dogwood	<i>Cornus sericea</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Cornales	Bunchberry dogwood	<i>Cornus canadensis</i>
Rhamnales	Russet buffaloberry	<i>Shepherdia canadensis</i>
Rhamnales	Alderleaf buckthorn	<i>Rhamnus alnifolia</i>
Ericales	Kinnikinnick	<i>Arctostaphylos uva-ursi</i>
Ericales	Thinleaf huckleberry	<i>Vaccinium membranaceum</i>
Ericales	Grouse whortleberry	<i>Vaccinium scoparium</i>
Ericales	Pipsissewa	<i>Chimaphila umbellata</i>
Ericales	Sidebells wintergreen	<i>Orthilia secunda</i>
Ericales	Liverleaf wintergreen	<i>Pyrola asarifolia</i>
Ericales	Single delight	<i>Moneses uniflora</i>
Ericales	Greenflowered wintergreen	<i>Pyrola chlorantha</i>
Fabales	Siberian peashrub	<i>Caragana arborescens*</i>
Fabales	Purple milkvetch	<i>Astragalus agrestis</i>
Fabales	Alpine milkvetch	<i>Astragalus alpinus</i>
Fabales	American milkvetch	<i>Astragalus americanus</i>
Fabales	Silverleaf milkvetch	<i>Astragalus argophyllus</i>
Fabales	Canadian milkvetch	<i>Astragalus canadensis</i>
Fabales	Browse milkvetch	<i>Astragalus cibarius</i>
Fabales	Drummond's milkvetch	<i>Astragalus drummondii</i>
Fabales	Elegant milkvetch	<i>Astragalus eucosmus</i>
Fabales	Flexile milkvetch	<i>Astragalus flexuosus</i>
Fabales	Bent milkvetch	<i>Astragalus inflexus</i>
Fabales	Spiny milkvetch	<i>Astragalus kentrophyta</i>
Fabales	Prairie milkvetch	<i>Astragalus laxmannii</i>
Fabales	Freckled milkvetch	<i>Astragalus lentiginosus</i>
Fabales	Park milkvetch	<i>Astragalus leptaleus</i>
Fabales	Timber milkvetch	<i>Astragalus miser</i>
Fabales	Woollypod milkvetch	<i>Astragalus purshii</i>
Fabales	Railhead milkvetch	<i>Astragalus terminalis</i>
Fabales	Bentflower milkvetch	<i>Astragalus vexilliflexus</i>
Fabales	Utah sweetvetch	<i>Hedysarum boreale</i>
Fabales	White sweetvetch	<i>Hedysarum sulphurescens</i>
Fabales	Silvery lupine	<i>Lupinus argenteus</i>
Fabales	Velvet lupine	<i>Lupinus leucophyllus</i>
Fabales	Bigleaf lupine	<i>Lupinus polyphyllus</i>
Fabales	Silky lupine	<i>Lupinus sericeus</i>
Fabales	Yellow sweetclover	<i>Melilotus officinalis*</i>
Fabales	Nodding locoweed	<i>Oxytropis deflexa</i>
Fabales	Haresfoot locoweed	<i>Oxytropis lagopus</i>
Fabales	White locoweed	<i>Oxytropis sericea</i>
Fabales	Slimflower scurfpea	<i>Psoralidium tenuiflorum</i>
Fabales	Alsike clover	<i>Trifolium hybridum*</i>
Fabales	Longstalk clover	<i>Trifolium longipes</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Fabales	Red clover	<i>Trifolium pratense</i> *
Fabales	White clover	<i>Trifolium repens</i> *
Fabales	American vetch	<i>Vicia americana</i>
Rosales	Wax currant	<i>Ribes cereum</i>
Rosales	Northern black currant	<i>Ribes hudsonianum</i>
Rosales	Whitestem gooseberry	<i>Ribes inerme</i>
Rosales	Gooseberry currant	<i>Ribes montigenum</i>
Rosales	Inland gooseberry	<i>Ribes oxycanthoides</i>
Rosales	Sticky currant	<i>Ribes viscosissimum</i>
Rosales	Shrubby cinquefoil	<i>Dasiphora fruticosa</i>
Rosales	Mat rockspirea	<i>Petrophyton caespitosum</i>
Rosales	Chokecherry	<i>Prunus virginiana</i>
Rosales	Woods' rose	<i>Rosa woodsii</i>
Rosales	American red raspberry	<i>Rubus idaeus</i>
Rosales	Thimbleberry	<i>Rubus parviflorus</i>
Rosales	Greene's mountain ash	<i>Sorbus scopulina</i>
Rosales	White spirea	<i>Spiraea betulifolia</i>
Rosales	Ledge stonecrop	<i>Rhodiola integrifolia</i>
Rosales	Redpod stonecrop	<i>Rhodiola rhodantha</i>
Rosales	Leiberg stonecrop	<i>Sedum leibergii</i>
Rosales	Spearleaf stonecrop	<i>Sedum lanceolatum</i>
Rosales	Silverweed cinquefoil	<i>Argentina anserina</i>
Rosales	Virginia strawberry	<i>Fragaria virginiana</i>
Rosales	Largeleaf avens	<i>Geum macrophyllum</i>
Rosales	Old man's whiskers	<i>Geum triflorum</i>
Rosales	Gordon's ivesia	<i>Ivesia gordonii</i>
Rosales	Varileaf cinquefoil	<i>Potentilla diversifolia</i>
Rosales	Sticky cinquefoil	<i>Potentilla glandulosa</i>
Rosales	Slender cinquefoil	<i>Potentilla gracilis</i>
Rosales	Sheep cinquefoil	<i>Potentilla ovina</i>
Rosales	Platte River cinquefoil	<i>Potentilla plattensis</i>
Rosales	Roundleaf alumroot	<i>Heuchera cylindrica</i>
Rosales	Smallflower woodland-star	<i>Lithophragma parviflorum</i>
Rosales	Smallflower miterwort	<i>Mitella stauropetala</i>
Rosales	Fringed grass of Parnassus	<i>Parnassia fimbriata</i>
Rosales	Smallflower grass of Parnassus	<i>Parnassia palustris</i>
Rosales	Yellowdot saxifrage	<i>Saxifraga bronchialis</i>
Rosales	Brook saxifrage	<i>Saxifraga odontoloma</i>
Rosales	Diamondleaf saxifrage	<i>Saxifraga rhomboidea</i>
Solanales	Granite prickly phlox	<i>Linanthus pungens</i>
Solanales	Dwarf hesperochiron	<i>Hesperochiron pumilus</i>
Solanales	Ballhead waterleaf	<i>Hydrophyllum capitatum</i>
Solanales	Basin nemophila	<i>Nemophila breviflora</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Solanales	Franklin's phacelia	<i>Phacelia franklinii</i>
Solanales	Silverleaf phacelia	<i>Phacelia hastata</i>
Solanales	Silky phacelia	<i>Phacelia sericea</i>
Solanales	Tiny trumpet	<i>Collomia linearis</i>
Solanales	Spiny phlox	<i>Phlox hoodii</i>
Solanales	Kelsey's phlox	<i>Phlox kelseyi</i>
Solanales	Longleaf phlox	<i>Phlox longifolia</i>
Solanales	Western polemonium	<i>Polemonium occidentale</i>
Solanales	Jacob's-ladder	<i>Polemonium pulcherrimum</i>
Solanales	Sticky polemonium	<i>Polemonium viscosum</i>
Solanales	Black henbane	<i>Hyoscyamus niger*</i>
Scrophulariales	Bush penstemon	<i>Penstemon fruticosus</i>
Scrophulariales	Flat-top broomrape	<i>Orobanche corymbosa</i>
Scrophulariales	Clustered broomrape	<i>Orobanche fasciculata</i>
Scrophulariales	Louisiana broomrape	<i>Orobanche ludoviciana</i>
Scrophulariales	Wyoming besseya	<i>Besseya wyomingensis</i>
Scrophulariales	Yellow Indian paintbrush	<i>Castilleja flava</i>
Scrophulariales	Giant red Indian paintbrush	<i>Castilleja miniata</i>
Scrophulariales	Sulphur Indian paintbrush	<i>Castilleja sulphurea</i>
Scrophulariales	Maiden blue eyed Mary	<i>Collinsia parviflora</i>
Scrophulariales	Water mudwort	<i>Limosella aquatica</i>
Scrophulariales	Seep monkeyflower	<i>Mimulus guttatus</i>
Scrophulariales	Yellow owl's-clover	<i>Orthocarpus luteus</i>
Scrophulariales	Field locoweed	<i>Oxytropis campestris</i>
Scrophulariales	Elephanthead lousewort	<i>Pedicularis groenlandica</i>
Scrophulariales	Parry's lousewort	<i>Pedicularis parryi</i>
Scrophulariales	Sickle-top lousewort	<i>Pedicularis racemosa</i>
Scrophulariales	Sulphur penstemon	<i>Penstemon attenuatus</i>
Scrophulariales	Cordroot beardtongue	<i>Penstemon montanus</i>
Scrophulariales	Matroot penstemon	<i>Penstemon radicosus</i>
Scrophulariales	Rydberg's penstemon	<i>Penstemon rydbergii</i>
Scrophulariales	American speedwell	<i>Veronica americana</i>
Scrophulariales	American alpine speedwell	<i>Veronica wormskjoldii</i>
Scrophulariales	Common bladderwort	<i>Utricularia macrorhiza</i>
Alismatales	Arumleaf arrowhead	<i>Sagittaria cuneata</i>
Apiales	Lyall's angelica	<i>Angelica arguta</i>
Apiales	Small-leaf angelica	<i>Angelica pinnata</i>
Apiales	American thorum wax	<i>Bupleurum americanum</i>
Apiales	Western water hemlock	<i>Cicuta douglasii</i>
Apiales	Plains springparsley	<i>Cymopterus acaulis</i>
Apiales	Snowline springparsley	<i>Cymopterus nivalis</i>
Apiales	Common cowparsnip	<i>Heracleum maximum</i>
Apiales	Fernleaf licorice-root	<i>Ligusticum filicinum</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Apiales	Wyeth biscuitroot	<i>Lomatium ambiguum</i>
Apiales	Cous biscuitroot	<i>Lomatium cous</i>
Apiales	Desert biscuitroot	<i>Lomatium foeniculaceum</i>
Apiales	Bigseed biscuitroot	<i>Lomatium macrocarpum</i>
Apiales	Nineleaf biscuitroot	<i>Lomatium triternatum</i>
Apiales	Leafy wildparsley	<i>Musineon divaricatum</i>
Apiales	Sweetcicely	<i>Osmorhiza berteroi</i>
Apiales	Bluntseed sweetroot	<i>Osmorhiza depauperata</i>
Apiales	Western sweetroot	<i>Osmorhiza occidentalis</i>
Apiales	Gardner's yampah	<i>Perideridia gairdneri</i>
Apiales	Henderson's wavewing	<i>Pteryxia hendersonii</i>
Apiales	Hemlock waterparsnip	<i>Sium suave</i>
Apiales	Meadow zizia	<i>Zizia aptera</i>
Lamiales	Sanddune cryptantha	<i>Cryptantha fendleri</i>
Lamiales	Roundspike cryptantha	<i>Cryptantha humilis</i>
Lamiales	Torrey's cryptantha	<i>Cryptantha torreyana</i>
Lamiales	Watson's cryptantha	<i>Cryptantha watsonii</i>
Lamiales	Gypsyflower	<i>Cynoglossum officinale</i>
Lamiales	Manyflower stickseed	<i>Hackelia floribunda</i>
Lamiales	Jessica sticktight	<i>Hackelia micrantha</i>
Lamiales	Spotted stickseed	<i>Hackelia patens</i>
Lamiales	Flatspine stickseed	<i>Lappula occidentalis</i>
Lamiales	Narrowleaf stoneseed	<i>Lithospermum incisum</i>
Lamiales	Western stoneseed	<i>Lithospermum ruderale</i>
Lamiales	Tall fringed bluebells	<i>Mertensia ciliata</i>
Lamiales	Oblongleaf bluebells	<i>Mertensia oblongifolia</i>
Lamiales	Tall bluebells	<i>Mertensia paniculata</i>
Lamiales	Asian forget-me-not	<i>Myosotis asiatica</i>
Lamiales	True forget-me-not	<i>Myosotis scorpioides</i>
Lamiales	Sleeping popcornflower	<i>Plagiobothrys scouleri</i>
Lamiales	Nettleleaf giant hyssop	<i>Agastache urticifolia</i>
Lamiales	Wild mint	<i>Mentha arvensis</i>
Lamiales	Common selfheal	<i>Prunella vulgaris</i>
Lamiales	Marsh skullcap	<i>Scutellaria galericulata</i>
Lamiales	Marsh hedgenettle	<i>Stachys palustris</i>
Capparales	Pale madwort	<i>Alyssum alyssoides*</i>
Capparales	Desert madwort	<i>Alyssum desertorum</i>
Capparales	Spreadingpod rockcress	<i>Arabis ×divaricarpa</i>
Capparales	Hairy rockcress	<i>Arabis hirsuta</i>
Capparales	Collins' rockcress	<i>Arabis holboellii</i>
Capparales	Lemmon's rockcress	<i>Arabis lemmonii</i>
Capparales	Littleleaf rockcress	<i>Arabis microphylla</i>
Capparales	Nuttall's rockcress	<i>Arabis nuttallii</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Capparales	Sicklepod rockcress	<i>Arabis sparsiflora</i>
Capparales	American yellowrocket	<i>Barbarea orthoceras</i>
Capparales	Littlepod false flax	<i>Camelina microcarpa</i>
Capparales	Shepherd's purse	<i>Capsella bursa-pastoris</i> *
Capparales	Brewer's bittercress	<i>Cardamine breweri</i>
Capparales	Crossflower	<i>Chorispora tenella</i>
Capparales	Mountain tansymustard	<i>Descurainia incana</i>
Capparales	Western tansymustard	<i>Descurainia pinnata</i>
Capparales	Herb sophia	<i>Descurainia sophia</i> *
Capparales	Golden draba	<i>Draba aurea</i>
Capparales	Cushion draba	<i>Draba breweri</i>
Capparales	Snowbed draba	<i>Draba crassifolia</i>
Capparales	Lancepod draba	<i>Draba lonchocarpa</i>
Capparales	Woodland draba	<i>Draba nemorosa</i>
Capparales	Fewseed draba	<i>Draba oligosperma</i>
Capparales	Payson's draba	<i>Draba paysonii</i>
Capparales	Western wallflower	<i>Erysimum asperum</i>
Capparales	Wormseed wallflower	<i>Erysimum cheiranthoides</i> *
Capparales	Shy wallflower	<i>Erysimum inconspicuum</i>
Capparales	Common pepperweed	<i>Lepidium densiflorum</i>
Capparales	Mountain pepperweed	<i>Lepidium montanum</i>
Capparales	Clasping pepperweed	<i>Lepidium perfoliatum</i> *
Capparales	Virginia pepperweed	<i>Lepidium virginicum</i>
Capparales	Idaho bladderpod	<i>Lesquerella carinata</i>
Capparales	Onerow yellowcress	<i>Nasturtium microphyllum</i> *
Capparales	Watercress	<i>Nasturtium officinale</i> *
Capparales	Meadow pennycress	<i>Noccaea parviflora</i>
Capparales	Common twinpod	<i>Physaria didymocarpa</i>
Capparales	Curvepod yellowcress	<i>Rorippa curvisiliqua</i>
Capparales	Bog yellowcress	<i>Rorippa palustris</i>
Capparales	Small tumbleweed mustard	<i>Sisymbrium loeselii</i> *
Capparales	Alpine smelowskia	<i>Smelowskia calycina</i>
Capparales	Northwestern thelypody	<i>Thelypodium paniculatum</i>
Capparales	Arrow thelypody	<i>Thelypodium sagittatum</i>
Capparales	Field pennycress	<i>Thlaspi arvense</i>
Campanulales	Bluebell bellflower	<i>Campanula rotundifolia</i>
Campanulales	Great Basin calicoflower	<i>Downingia laeta</i>
Caryophyllales	Slender mountain sandwort	<i>Arenaria capillaris</i>
Caryophyllales	Ballhead sandwort	<i>Arenaria congesta</i>
Caryophyllales	Field chickweed	<i>Cerastium arvense</i>
Caryophyllales	Bering chickweed	<i>Cerastium beeringianum</i>
Caryophyllales	Big chickweed	<i>Cerastium fontanum</i>
Caryophyllales	Nuttall's sandwort	<i>Minuartia nuttallii</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Caryophyllales	Twinflower sandwort	<i>Minuartia obtusiloba</i>
Caryophyllales	Beautiful sandwort	<i>Minuartia rubella</i>
Caryophyllales	Bluntleaf sandwort	<i>Moehringia lateriflora</i>
Caryophyllales	Tuber starwort	<i>Pseudostellaria jamesiana</i>
Caryophyllales	Western pearlwort	<i>Sagina decumbens</i>
Caryophyllales	Moss campion	<i>Silene acaulis</i>
Caryophyllales	Bladder campion	<i>Silene latifolia*</i>
Caryophyllales	Menzies' campion	<i>Silene menziesii</i>
Caryophyllales	Nightflowering silene	<i>Silene noctiflora*</i>
Caryophyllales	Parry's silene	<i>Silene parryi</i>
Caryophyllales	Northern starwort	<i>Stellaria calycantha</i>
Caryophyllales	Fleshy starwort	<i>Stellaria crassifolia</i>
Caryophyllales	Curled starwort	<i>Stellaria crispa</i>
Caryophyllales	Longleaf starwort	<i>Stellaria longifolia</i>
Caryophyllales	Longstalk starwort	<i>Stellaria longipes</i>
Caryophyllales	Rocky Mountain chickweed	<i>Stellaria obtusa</i>
Caryophyllales	Spear saltbrush	<i>Atriplex patula</i>
Caryophyllales	Wedgescale saltbush	<i>Atriplex truncata</i>
Caryophyllales	Lambsquarters	<i>Chenopodium album*</i>
Caryophyllales	Blite goosefoot	<i>Chenopodium capitatum</i>
Caryophyllales	Oakleaf goosefoot	<i>Chenopodium glaucum*</i>
Caryophyllales	Red goosefoot	<i>Chenopodium rubrum</i>
Caryophyllales	Nuttall's povertyweed	<i>Monolepis nuttalliana</i>
Caryophyllales	Red swampfire	<i>Salicornia rubra</i>
Caryophyllales	Lanceleaf springbeauty	<i>Claytonia lanceolata</i>
Caryophyllales	Bitter root	<i>Lewisia rediviva</i>
Caryophyllales	Water minerslettuce	<i>Montia chamissoi</i>
Papaverales	Scrambled eggs	<i>Corydalis aurea</i>
Gentianales	Elkweed	<i>Frasera speciosa</i>
Gentianales	Pleated gentian	<i>Gentiana affinis</i>
Gentianales	Moss gentian	<i>Gentiana fremontii</i>
Gentianales	Autumn dwarf gentian	<i>Gentianella amarella</i>
Gentianales	Oneflower fringed gentian	<i>Gentianopsis simplex</i>
Gentianales	Felwort	<i>Swertia perennis</i>
Geraniales	Richardson's geranium	<i>Geranium richardsonii</i>
Geraniales	Sticky geranium	<i>Geranium viscosissimum</i>
Malvales	Streambank wild hollyhock	<i>Iliamna rivularis</i>
Myrtales	Fireweed	<i>Chamerion angustifolium</i>
Myrtales	Tall annual willowherb	<i>Epilobium brachycarpum</i>
Myrtales	Fringed willowherb	<i>Epilobium ciliatum</i>
Myrtales	Glaucus willowherb	<i>Epilobium glaberrimum</i>
Myrtales	Hornemann's willowherb	<i>Epilobium hornemannii</i>
Myrtales	Marsh willowherb	<i>Epilobium palustre</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Myrtales	Spreading groundsmoke	<i>Gayophytum diffusum</i>
Myrtales	Dwarf groundsmoke	<i>Gayophytum humile</i>
Myrtales	Tufted evening-primrose	<i>Oenothera caespitosa</i>
Myrtales	Yellow evening-primrose	<i>Oenothera flava</i>
Myrtales	Pale evening-primrose	<i>Oenothera pallida</i>
Myrtales	Idaho pale evening-primrose	<i>Oenothera pallida</i> ssp. <i>pallida</i>
Plantaginales	Common plantain	<i>Plantago major</i>
Plantaginales	Tweedy's plantain	<i>Plantago tweedyi</i>
Polygonales	Matted buckwheat	<i>Eriogonum caespitosum</i>
Polygonales	Cushion buckwheat	<i>Eriogonum ovalifolium</i>
Polygonales	Sulphur-flower buckwheat	<i>Eriogonum umbellatum</i>
Polygonales	Alpine mountainsorrel	<i>Oxyria digyna</i>
Polygonales	American bistort	<i>Polygonum bistortoides</i>
Polygonales	Douglas' knotweed	<i>Polygonum douglasii</i>
Polygonales	Curlytop knotweed	<i>Polygonum lapathifolium</i>
Polygonales	Western dock	<i>Rumex aquaticus</i>
Polygonales	Alpine sheep sorrel	<i>Rumex paucifolius</i>
Polygonales	Water knotweed	<i>Polygonum amphibium</i>
Primulales	Pygmyflower rockjasmine	<i>Androsace septentrionalis</i>
Primulales	Darkthroat shootingstar	<i>Dodecatheon pulchellum</i>
Primulales	Silvery primrose	<i>Primula incana</i>
Ranunculales	Red baneberry	<i>Actaea rubra</i>
Ranunculales	Little Belt Mountain thimbleweed	<i>Anemone lithophila</i>
Ranunculales	Pacific anemone	<i>Anemone multifida</i>
Ranunculales	Yellow columbine	<i>Aquilegia flavescens</i>
Ranunculales	Western columbine	<i>Aquilegia formosa</i>
Ranunculales	Hairy clematis	<i>Clematis hirsutissima</i>
Ranunculales	Duncecap larkspur	<i>Delphinium occidentale</i>
Ranunculales	Little larkspur	<i>Delphinium bicolor</i>
Ranunculales	Twolobe larkspur	<i>Delphinium nuttallianum</i>
Ranunculales	Eastern pasqueflower	<i>Pulsatilla patens</i>
Ranunculales	Sharpleaf buttercup	<i>Ranunculus acriformis</i>
Ranunculales	Alkali buttercup	<i>Ranunculus cymbalaria</i>
Ranunculales	Sagebrush buttercup	<i>Ranunculus glaberrimus</i>
Ranunculales	Gmelin's buttercup	<i>Ranunculus gmelinii</i>
Ranunculales	High northern buttercup	<i>Ranunculus hyperboreus</i>
Ranunculales	Graceful buttercup	<i>Ranunculus inamoenus</i>
Ranunculales	Cursed buttercup	<i>Ranunculus sceleratus</i>
Ranunculales	Longbeak buttercup	<i>Ranunculus longirostris</i>
Ranunculales	Fendler's meadow-rue	<i>Thalictrum fendleri</i>
Ranunculales	Western meadow-rue	<i>Thalictrum occidentale</i>
Ranunculales	Veiny meadow-rue	<i>Thalictrum venulosum</i>
Ranunculales	Creeping barberry	<i>Mahonia repens</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Rubiales	Northern bedstraw	<i>Galium boreale</i>
Rubiales	Fragrant bedstraw	<i>Galium triflorum</i>
Santalales	Bastard toadflax	<i>Comandra umbellata</i>
Urticales	Stinging nettle	<i>Urtica dioica</i>
Violales	Hookedspur violet	<i>Viola adunca</i>
Violales	Northern bog violet	<i>Viola nephrophylla</i>
Violales	Goosefoot violet	<i>Viola purpurea</i>
Callitrichales	Northern water-starwort	<i>Callitriche hermaphroditica</i>
Callitrichales	Vernal water-starwort	<i>Callitriche palustris</i>
Callitrichales	Common mare's-tail	<i>Hippuris vulgaris</i>
Nymphaeales	Coon's tail	<i>Ceratophyllum demersum</i>
Haloragales	Shortspike watermilfoil	<i>Myriophyllum sibiricum</i>
Linales	Lewis flax	<i>Linum lewisii</i>
Linales		<i>Class Liliopsida</i>

CLASS LILIOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Najadales	Seaside arrowgrass	<i>Triglochin maritima</i>
Najadales	Nodding waternymph	<i>Najas flexilis</i>
Najadales	Leafy pondweed	<i>Potamogeton foliosus</i>
Najadales	Fries' pondweed	<i>Potamogeton friesii</i>
Najadales	Whitestem pondweed	<i>Potamogeton praelongus</i>
Najadales	Small pondweed	<i>Potamogeton pusillus</i>
Najadales	Richardson's pondweed	<i>Potamogeton richardsonii</i>
Najadales	Flatstem pondweed	<i>Potamogeton zosteriformis</i>
Najadales	Sago pondweed	<i>Stuckenia pectinata</i>
Najadales	Sheathed pondweed	<i>Stuckenia vaginata</i>
Najadales	Fineleaf pondweed	<i>Stuckenia filiformis</i>
Najadales	Horned pondweed	<i>Zannichellia palustris</i>
Liliales	Rocky Mountain iris	<i>Iris missouriensis</i>
Liliales	Narrowleaf blue-eyed grass	<i>Sisyrinchium angustifolium</i>
Liliales	Tapertip onion	<i>Allium acuminatum</i>
Liliales	Shortstyle onion	<i>Allium brevistylum</i>
Liliales	Nodding onion	<i>Allium cernuum</i>
Liliales	Geyer's onion	<i>Allium geyeri</i>
Liliales	Wild chives	<i>Allium schoenoprasum</i>
Liliales	Textile onion	<i>Allium textile</i>
Liliales	White mariposa lily	<i>Calochortus eurycarpus</i>
Liliales	Sego lily	<i>Calochortus nuttallii</i>
Liliales	Small camas	<i>Camassia quamash</i>
Liliales	Bride's bonnet	<i>Clintonia uniflora</i>
Liliales	Yellow avalanche-lily	<i>Erythronium grandiflorum</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Liliales	Spotted fritillary	<i>Fritillaria atropurpurea</i>
Liliales	Yellow fritillary	<i>Fritillaria pudica</i>
Liliales	Common alplily	<i>Lloydia serotina</i>
Liliales	Feathery false lily of the valley	<i>Maianthemum racemosum</i>
Liliales	Starry false lily of the valley	<i>Maianthemum stellatum</i>
Liliales	Roughfruit fairybells	<i>Prosartes trachycarpa</i>
Liliales	Claspleaf twistedstalk	<i>Streptopus amplexifolius</i>
Liliales	Meadow deathcamas	<i>Zigadenus venenosus</i>
Orchidales	Fairy slipper	<i>Calypso bulbosa</i>
Orchidales	Summer coralroot	<i>Corallorhiza maculata</i>
Orchidales	Pacific coralroot	<i>Corallorhiza mertensiana</i>
Orchidales	Western rattlesnake plantain	<i>Goodyera oblongifolia</i>
Orchidales	Northern twayblade	<i>Listera borealis</i>
Orchidales	Slender-spire orchid	<i>Piperia unalascensis</i>
Orchidales	Northern green orchid	<i>Platanthera aquilonis</i>
Orchidales	Slender bog orchid	<i>Platanthera stricta</i>
Orchidales	Hooded lady's tresses	<i>Spiranthes romanzoffiana</i>
Typhales	Broadleaf cattail	<i>Typha latifolia</i>
Typhales	Narrowleaf bur-reed	<i>Sparganium angustifolium</i>
Typhales	Broadfruit bur-reed	<i>Sparganium eurycarpum</i>
Typhales	Floating bur-reed	<i>Sparganium fluctuans</i>
Cyperales	Water sedge	<i>Carex aquatilis</i>
Cyperales	Slenderbeak sedge	<i>Carex athrostachya</i>
Cyperales	Golden sedge	<i>Carex aurea</i>
Cyperales	Lesser paniced sedge	<i>Carex diandra</i>
Cyperales	Softleaf sedge	<i>Carex disperma</i>
Cyperales	Douglas' sedge	<i>Carex douglasii</i>
Cyperales	Needleleaf sedge	<i>Carex duriuscula</i>
Cyperales	Threadleaf sedge	<i>Carex filifolia</i>
Cyperales	Geyer's sedge	<i>Carex geyeri</i>
Cyperales	Cloud sedge	<i>Carex haydeniana</i>
Cyperales	Hood's sedge	<i>Carex hoodii</i>
Cyperales	Idaho sedge	<i>Carex idahoa</i>
Cyperales	Inland sedge	<i>Carex interior</i>
Cyperales	Woollyfruit sedge	<i>Carex lasiocarpa</i>
Cyperales	Kellogg's sedge	<i>Carex lenticularis</i>
Cyperales	Smallwing sedge	<i>Carex microptera</i>
Cyperales	Manyrib sedge	<i>Carex multicostata</i>
Cyperales	Nebraska sedge	<i>Carex nebrascensis</i>
Cyperales	Chamisso sedge	<i>Carex pachystachya</i>
Cyperales	Dunhead sedge	<i>Carex phaeocephala</i>
Cyperales	Clustered field sedge	<i>Carex praegracilis</i>
Cyperales	Raynolds' sedge	<i>Carex raynoldsii</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Cyperales	Ross' sedge	<i>Carex rossii</i>
Cyperales	Northern singlespike sedge	<i>Carex scirpoidea</i>
Cyperales	Mountain sedge	<i>Carex scopulorum</i>
Cyperales	Analogue sedge	<i>Carex simulata</i>
Cyperales	Northwest Territory sedge	<i>Carex utriculata</i>
Cyperales	Valley sedge	<i>Carex vallicola</i>
Cyperales	Whitescale sedge	<i>Carex xerantica</i>
Cyperales	Needle spikerush	<i>Eleocharis acicularis</i>
Cyperales	Pale spikerush	<i>Eleocharis macrostachya</i>
Cyperales	Common spikerush	<i>Eleocharis palustris</i>
Cyperales	Fewflower spikerush	<i>Eleocharis quinqueflora</i>
Cyperales	Tall cottongrass	<i>Eriophorum angustifolium</i>
Cyperales	Simple bog sedge	<i>Kobresia simpliciuscula</i>
Cyperales	Hardstem bulrush	<i>Schoenoplectus acutus</i>
Cyperales	Indian ricegrass	<i>Achnatherum hymenoides</i>
Cyperales	Columbia needlegrass	<i>Achnatherum nelsonii</i>
Cyperales	Western needlegrass	<i>Achnatherum occidentale</i>
Cyperales	Crested wheatgrass	<i>Agropyron cristatum*</i>
Cyperales	Spike bentgrass	<i>Agrostis exarata</i>
Cyperales	Redtop	<i>Agrostis gigantea</i>
Cyperales	Seashore bentgrass	<i>Agrostis pallens</i>
Cyperales	Rough bentgrass	<i>Agrostis scabra</i>
Cyperales	Shortawn foxtail	<i>Alopecurus aequalis</i>
Cyperales	Boreal alopecurus	<i>Alopecurus alpinus</i>
Cyperales	Water foxtail	<i>Alopecurus geniculatus</i>
Cyperales	American sloughgrass	<i>Beckmannia syzigachne</i>
Cyperales	Fringed brome	<i>Bromus ciliatus</i>
Cyperales	Smooth brome	<i>Bromus inermis*</i>
Cyperales	Mountain brome	<i>Bromus marginatus</i>
Cyperales	Cheatgrass	<i>Bromus tectorum*</i>
Cyperales	Bluejoint	<i>Calamagrostis canadensis</i>
Cyperales	Plains reedgrass	<i>Calamagrostis montanensis</i>
Cyperales	Pinegrass	<i>Calamagrostis rubescens</i>
Cyperales	Northern reedgrass	<i>Calamagrostis stricta</i>
Cyperales	Water whorlgrass	<i>Catabrosa aquatica</i>
Cyperales	Drooping woodreed	<i>Cinna latifolia</i>
Cyperales	Orchardgrass	<i>Dactylis glomerata</i>
Cyperales	Timber oatgrass	<i>Danthonia intermedia</i>
Cyperales	Tufted hairgrass	<i>Deschampsia caespitosa</i>
Cyperales	Slender hairgrass	<i>Deschampsia elongata</i>
Cyperales	Saltgrass	<i>Distichlis spicata</i>
Cyperales	Baker's wheatgrass	<i>Elymus bakeri</i>
Cyperales	Blue wildrye	<i>Elymus glaucus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Cyperales	Thickspike wheatgrass	<i>Elymus lanceolatus</i>
Cyperales	Quackgrass	<i>Elymus repens</i>
Cyperales	Slender wheatgrass	<i>Elymus trachycaulus</i>
Cyperales	Alpine fescue	<i>Festuca brachyphylla</i>
Cyperales	Idaho fescue	<i>Festuca idahoensis</i>
Cyperales	Western fescue	<i>Festuca occidentalis</i>
Cyperales	Small floating mannagrass	<i>Glyceria borealis</i>
Cyperales	American mannagrass	<i>Glyceria grandis</i>
Cyperales	Fowl mannagrass	<i>Glyceria striata</i>
Cyperales	Needle-and-thread	<i>Hesperostipa comata</i>
Cyperales	Meadow barley	<i>Hordeum brachyantherum</i>
Cyperales	Foxtail barley	<i>Hordeum jubatum</i>
Cyperales	Prairie junegrass	<i>Koeleria macrantha</i>
Cyperales	Basin wildrye	<i>Leymus cinereus</i>
Cyperales	Yellow wildrye	<i>Leymus flavescens</i>
Cyperales	Purple oniongrass	<i>Melica spectabilis</i>
Cyperales	Marsh muhly	<i>Muhlenbergia racemosa</i>
Cyperales	Mat muhly	<i>Muhlenbergia richardsonis</i>
Cyperales	Western wheatgrass	<i>Pascopyrum smithii</i>
Cyperales	Alpine timothy	<i>Phleum alpinum</i>
Cyperales	Common timothy	<i>Phleum pratense</i>
Cyperales	Canada bluegrass	<i>Poa compressa</i>
Cyperales	Cusick's bluegrass	<i>Poa cusickii</i>
Cyperales	Fowl bluegrass	<i>Poa palustris</i>
Cyperales	Kentucky bluegrass	<i>Poa pratensis</i>
Cyperales	Sandberg's bluegrass	<i>Poa secunda</i>
Cyperales	Rough bluegrass	<i>Poa trivialis</i>
Cyperales	Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>
Cyperales	Nuttall's alkaligrass	<i>Puccinellia nuttalliana</i>
Cyperales	Alkali cordgrass	<i>Spartina gracilis</i>
Cyperales	Spike trisetum	<i>Trisetum spicatum</i>
Juncuales	Baltic rush	<i>Juncus arcticus</i> ssp. <i>littoralis</i>
Juncuales	Toad rush	<i>Juncus bufonius</i>
Juncuales	Colorado rush	<i>Juncus confusus</i>
Juncuales	Drummond's rush	<i>Juncus drummondii</i>
Juncuales	Common rush	<i>Juncus effusus</i>
Juncuales	Swordleaf rush	<i>Juncus ensifolius</i>
Juncuales	Hall's rush	<i>Juncus hallii</i>
Juncuales	Longstyle rush	<i>Juncus longistylis</i>
Juncuales	Parry's rush	<i>Juncus parryi</i>
Juncuales	Rocky Mountain rush	<i>Juncus saximontanus</i>
Juncuales	Smallflowered woodrush	<i>Luzula parviflora</i>
Hydrocharitales	Canadian waterweed	<i>Elodea canadensis</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Arales	Star duckweed	<i>Lemna trisulca</i>
Arales	Common duckweed	<i>Lemna minor</i>
Polypodiales	Brittle bladderfern	<i>Cystopteris fragilis</i>
Polypodiales	Oregon cliff fern	<i>Woodsia oregana</i>
Polypodiales	Brewer's cliffbrake	<i>Pellaea breweri</i>

CLASS EQUISETOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Equisetales	Field horsetail	<i>Equisetum arvense</i>
Equisetales	Smooth horsetail	<i>Equisetum laevigatum</i>
Equisetales	Water horsetail	<i>Equisetum fluviatile</i>
Equisetales	Marsh horsetail	<i>Equisetum palustre</i>

CLASS LYCOPODIOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Isoetales	Quillwort	<i>Isoetes</i> spp.

CLASS CHAROPHYCEAE

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Charales	Common stonewort	<i>Chara vulgaris</i>

Appendix E

Draft Compatibility Determinations

Refuge Name: Red Rock Lakes National Wildlife Refuge

Date Established: April 22, 1935

ESTABLISHING AND ACQUISITION AUTHORITIES

- Executive Order 7023, April 22, 1935
- Executive Order 7172, September 4, 1935
- 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- 16 U.S.C. § 460k-2 (Refuge Recreation Act) (16 U.S.C. § 460k-460k-4), as amended
- 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)
- 16 U.S.C. § 742f(a)(4) and 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)
- 16 U.S.C. § 668dd(a)(2) (National Wildlife Refuge System Administration Act)

REFUGE PURPOSES

- “As a refuge and breeding ground for wild birds and animals.” [Executive Order 7023]
- “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” [16 U.S.C. § 715d (Migratory Bird Conservation Act)]
- “Suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species . . . 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-1, k-2 (Refuge Recreation Act) (16 U.S.C. § 460k-460k-4), as amended)]
- “The conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions.” [16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)]
- “For the development, advancement,

management, conservation, and protection of fish and wildlife resources . . . 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(a)(4), (b)(1) (Fish and Wildlife Act of 1956)]

- “Conservation, management, and . . . restoration of the fish, wildlife, and plant resources and their habitats . . . for the benefit of present and future generations of Americans.” [16 U.S.C. § 668dd(a)(2) (National Wildlife Refuge System Administration Act)]
- “Wilderness areas . . . shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness.” [16 U.S.C. § 1131 (Wilderness Act)]

NATIONAL WILDLIFE REFUGE SYSTEM 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.

DESCRIPTION OF USE: BIG GAME HUNTING

Hunting in the Centennial Valley is a traditional form of wildlife-dependent recreation. Red Rock Lakes National Wildlife Refuge has a long history of allowing hunting. Waterfowl hunting has been allowed on the refuge since its establishment. However, big game hunting on the refuge was not

allowed until 1952 when a limited moose hunt was initiated. This limited hunt occurred until 1958. From 1959 to 1962, the only hunting allowed on the refuge was for waterfowl. A very limited pronghorn hunt was allowed in 1963 in the northeast corner of the refuge. This hunt area was expanded in 1964 to include all refuge lands on the north side of the refuge (north of Lower lake, the River Marsh area and Upper lake). In 1965 hunting of waterfowl, elk, deer, pronghorn and moose was allowed on the refuge. The hunt was separated in space with waterfowl hunting occurring on Lower lake, deer and elk hunting occurring south of the Southside Centennial Road, pronghorn hunting occurring on “the north side” of the refuge (north of the River Marsh area, Upper and Lower Red Rock lakes), and moose hunting occurring in the southwest corner of the refuge (also known as willow fen area). Big game and waterfowl hunting have continued on the refuge, using various scenarios of time and space separation to manage potential and observed conflicts.

The Red Rock Lakes National Wildlife Refuge proposes to continue to provide limited opportunities for big game hunting that are compatible with the refuge purpose. Hunting is identified as a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1997. Hunting of deer (white-tailed and mule deer), pronghorn, elk, and moose will be permitted in designated hunting areas on the refuge. Hunting will be conducted in accordance with state of Montana regulations and refuge-specific regulations. When appropriate, zoning (utilizing time and space separation) will be used to resolve conflicts with other user groups.

The refuge big game hunting program objectives are to (1) control and maintain ungulate populations at a level that is compatible with plant and wildlife animal communities on the refuge (for example, to prevent over-browsing of willow communities), and (2) provide the public with high-quality wildlife-oriented recreation.

The refuge proposes to allow deer, elk, and pronghorn hunting on approximately 20,592 acres, or of the entire refuge. In addition, the refuge is proposing to have the option of opening an additional 2,982 acres (the area between Upper and Lower Red Rock lakes) to limited primitive weapons only hunt. This hunt would only be opened if degraded habitat conditions (such as over-browsing of vegetation by native ungulates) were documented. The hunting area will be delineated by signs and physical features (such as roads and creeks). To create a contiguous hunting area and eliminate hunting boundary confusion, moose hunting would be open in the area west and north of South Valley Road (Red Rock Pass Road). The area south of South Valley Road would be closed to eliminate a road hunting issue. Closed areas in the northern section of the refuge would be opened to deer, elk, and pronghorn hunting. Moose hunting

will be permitted on approximately 2,675 acres, or less than 6% of the entire refuge. This hunting area will be delineated by signs, roads, creeks, and lake shores.

Seasons and regulations vary for each big game species. The typical seasons for each species are shown in table 1. There will be no limit on the number of hunters and hunt days and no designated blind sites. Refuge staff estimate 800 hunter visits during the big game season. Hunting pressure varies but is usually heaviest during the openers of each season.

Table 1. Typical hunting seasons for pronghorn, deer, elk and moose in the state of Montana.

<i>Species</i>	<i>Typical Start Date</i>	<i>Typical End Date</i>
Pronghorn—archery	1st Saturday in September	2nd Saturday in October
Pronghorn—archery	1st Sunday in October	2nd Sunday in November
Deer and elk—archery	1st Saturday in September	2nd Sunday in October
Deer and elk—archery	3rd Sunday in October	5 weeks after opening
Moose—general*	September 15	December 15

Access will be on foot for a majority of the area because most of the hunting area exists in a designated wilderness area. However, stock animals would be allowed south of the Southside Centennial Road, mainly to allow access into the Centennial Mountains. Stock may be used in order to retrieve big game on the refuge within designated hunt areas. Stock may not be used in areas north of the Southside Centennial Road for hunting purposes—only retrieval purposes.

AVAILABILITY OF RESOURCES

The following annual costs would be required to administer and manage waterfowl hunting activities:

<i>Item</i>	<i>Cost</i>
Buy and post signs	\$10,000
Maintenance of campgrounds and parking areas	\$7,000
Law enforcement	\$5,000
Administration (brochures, monitoring, etc.)	\$15,000
Total	\$37,000

Adequate funding exists to administer the big game hunt program. There is currently no law enforcement staff on-site although it is typically available during periods of heavy use. Partnerships have been developed with the Bureau of Land Management and

Montana Fish, Wildlife and Parks to assist with law enforcement needs and provide for a safe, quality visitor services program as described above.

ANTICIPATED IMPACTS OF USE

The direct effects of hunting on big game include mortality, wounding, and changes in distribution. However, regulated big game hunting has been used as a management tool to control ungulate populations, which helps ensure high-quality habitats and thus producing healthy individuals and populations of big game species. In addition, it is well recognized that hunting has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. Despite the potential negative impacts of hunting, a goal of the refuge is to provide opportunities for quality wildlife-dependent recreation. By law (see above), hunting is one of the six priority visitor services of the National Wildlife Refuge System. The key focus is to offer a safe quality program and maintain adverse impacts within acceptable limits.

Hunting on the refuge does affect big game movements, distribution, and behavior. Big game species will likely spend more time in wooded habitats during the day as well as in closed areas (regardless of habitat type) on the refuge. Hunting also increases agitation, nervousness, and energetic expenditures associated with running from hunters and the sounds of weapons being fired. Changing the areas where hunting is allowed from 1 year to the next may increase these impacts because big game would have to learn where the “safe zones” are every year. This would also negatively impact wildlife viewing opportunities because there may not be a particular area each year where big game animals would congregate. Areas on the refuge that have traditionally been closed to hunting provide some of the best big game viewing opportunities to see white-tailed deer, elk, and moose. Big game animals typically congregate in these closed areas.

Direct negative impacts of big game hunting on other wildlife will be minimal because hunting occurs in the fall when breeding and nesting seasons are over. Most land birds and many of the waterfowl have migrated out of the valley when the peak big game hunting occurs. Other birds (such as owls, ravens, and magpies) do remain in the area during hunting season; however, impacts on these species are expected to be minimal. Any disturbance impacts on most predators and scavengers will probably be outweighed by an increase in food in the form of gut piles and carcass remains.

Recreational hunting activities may, in some cases, result in competition for limited resources (such as preferred campsites or use areas) between hunters and other refuge users. However, campsites are

typically available even during the peak hunting seasons. In addition, a portion of the areas closed to hunting are still open to other wildlife-dependent recreation activities such as wildlife viewing, wildlife photography. Some big game animals tend to congregate in the closed areas. This behavior may ultimately provide refuge visitors with increased opportunities to view animals such as moose, elk, and deer. However, the aesthetic value of the viewing may be diminished by the occasional sound of gunshots.

DETERMINATION

Recreational big game hunting is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

The refuge big game hunt program will be designed to provide quality experiences. A quality hunt experience means that (1) hunters are safe; (2) hunters exhibit high standards of ethical behavior; (3) hunters are provided with uncrowded conditions; (4) hunters have reasonable harvest opportunities; (5) hunters are clear on which areas are open and closed to hunting; and (6) minimal conflicts occur between hunters and other visitors, especially those engaging in wildlife-dependent priority visitor services.

The 7-day per week hunt program proposed on the refuge would include the following restrictions to reduce impacts:

1. a limited hunt area (areas will be posted and enforced)
2. use of stock animals to retrieve game
3. use of stock animals south of the Southside Centennial Road to access other areas of the Centennial Mountains
4. periodic biological and social monitoring and evaluation of the hunting program, including feedback from users to determine if objectives of a quality experience are being met

Hunter compliance with current State of Montana big game and refuge specific regulations would be achieved through a combination of printed information, signing, outreach efforts, and enforcement of regulations by law enforcement officers.

JUSTIFICATION

Hunting is one of the six priority visitor services of the National Wildlife Refuge System. Providing for a quality hunting program contributes to achieving one of the refuge goals. This program as described was determined to be compatible in view of the potential impacts that hunting, camping, and use

of stock animals can have on the Service’s ability to achieve refuge purposes and goals. The refuge would be opened to big game hunting, with sufficient restrictions in place on hunting, use of stock animals, and other visitor services to ensure a quality hunting program.

Refuge hunt programs are designed to provide quality experiences. In general, hunting on refuges should be superior to that available on other public lands, which may require special restrictions (Refuge Manual 8RM5). Measures are often used to ensure quality. The limited hunt program is proposed on the refuge to (1) provide a quality hunting experience that meets refuge guidelines and policies; (2) prevent conflicts with other priority wildlife-dependent visitor services; and (3) control and maintain ungulate populations at a level that is compatible with plant and wildlife animal communities on the refuge and meets habitat objectives (for example, preventing over-browsing of willow communities) outlined in the refuge’s Comprehensive Conservation Plan.

The hunting areas provide distinct, manageable units that can be easily delineated, posted, and enforced. It is anticipated that big game will find sufficient food resources and resting places, both inside and outside of the hunt area, hunting pressure will not cause premature departure from the area, the physiological condition of big game and other wildlife species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall state and national population status will not be impaired (that is, the species will not be in jeopardy of becoming federally threatened or endangered).

Mandatory 15-year reevaluation date: 2023

**DESCRIPTION OF USE:
WATERFOWL HUNTING**

The Red Rock Lakes National Wildlife Refuge proposes to continue to provide limited opportunities for waterfowl hunting (a wildlife-dependent recreation) that are compatible with the refuge’s purpose. Hunting is identified as a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1997. Hunting of waterfowl (limited to coots, ducks, and geese) will be permitted in a designated hunting area on and surrounding the Lower Red Rock lake (also known as Lower lake) and Red Rock Creek/River Marsh area.

The refuge proposes to allow waterfowl hunting on approximately 7,750 acres—less than 17% of the entire refuge. However, 3,550 acres of this is upland habitat where little or no hunting occurs because few geese or ducks are present in this habitat. As such, due to habitat constraints, hunting typically only occurs on

4,200 acres of the refuge, less than 10% of the entire refuge. The hunting area will be delineated by signs along the eastern and northern boundaries, the refuge boundary fence and signs along the western boundary, and the Southside Centennial Road along the southern boundary.

Hunting will be allowed consistent with annual Montana State hunting regulations and seasons, as well as applicable specific refuge and federal regulations. The waterfowl hunting season generally falls within the period from October through early January. However, waterfowl hunting on the refuge typically does not occur after October because all water is frozen, and very few waterfowl remain in the area. There will be no limit on the number of hunters and hunt days and no designated blind sites. Refuge staff estimate 300 hunter visits during the waterfowl season. A majority of hunter visits occur on the first two weekends of the year. Hunting pressure is almost nonexistent during weekdays and after the second weekend of the hunting season.

Access will be on foot and nonmotorized boats for a majority of the area because most of the hunting area exists in a designated wilderness area. However, motorized boats would be allowed from the Lower Red Rock lake water control structure downstream on Red Rock Creek. During the hunting season, hunting dogs will be allowed off leash and under voice control for the purpose of retrieving waterfowl.

AVAILABILITY OF RESOURCES

The following annual costs would be required to administer and manage waterfowl hunting activities:

<i>Item</i>	<i>Cost</i>
Buy and post signs	\$7,000
Maintenance of access roads, parking lots, boat ramps	\$12,000
Law enforcement	\$3,000
Administration (brochures, monitoring, etc.)	\$10,000
Total	\$32,000

Adequate funding exists to administer the waterfowl hunt program. Law enforcement staffing does not currently occur on-site but typically is available during periods of heavy use. Partnerships have been developed with the Bureau of Land Management and Montana Fish, Wildlife and Parks to assist with law enforcement needs and provide for a safe, quality visitor services program.

ANTICIPATED IMPACTS OF USE

Adequate funding exists to administer the waterfowl hunt program. There is currently no law enforcement staff on-site. There is some law enforcement presence during periods of heavy use. Partnerships have been

developed with the Bureau of Land Management and Montana Fish, Wildlife and Parks to assist with law enforcement needs.

By its very nature, waterfowl hunting has very few, if any, positive effects on waterfowl and other birds while the activity is occurring. However, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. Furthermore, despite the potential impacts of hunting, a goal of the refuge is to provide opportunities for quality wildlife-dependent recreation. By law (see above), hunting is one of the six priority visitor services of the National Wildlife Refuge System. A key concern is to offer a safe and quality program and to keep adverse impacts to within acceptable limits.

Although hunting directly impacts individual birds, the amount of waterfowl harvest is not expected to have a measurable effect on refuge, national or international populations, especially since waterfowl hunting activity is extremely limited (in time and space) on the refuge. For example, the refuge staff estimates that approximately 300 hunter visits are made annually to the refuge. Over the entire season, the average hunter visit per day would be approximately 3.0 during an average season. However, since the refuge hunting season is typically nonexistent after October, the average on the refuge is probably closer to 9.1 hunter visits per day. Hunting may be either compensatory or additive to natural mortality (Anderson 1995). Compensatory mortality occurs when hunting substitutes for other forms of mortality (such as disease, competition, predation, and severe weather). Additive mortality occurs when hunting compounds the total mortality. In some cases, hunting can be used as a management tool to control populations. In concert with Canada, Mexico, and multistate flyway councils, the Service and Montana Fish, Wildlife and Parks regulate hunting so that harvest does not reduce populations to unsustainable levels.

Direct effects of hunting on waterfowl are mortality, wounding, and disturbance (DeLong 2002). Hunting can alter behavior (such as foraging time), population structure, and distribution patterns of wildlife (Bartelt 1987, Cole and Knight 1990, Madsen 1985, Owens 1977, Raveling 1979, Thomas 1983, White-Robinson 1982). In Denmark, hunting was documented to affect the diversity and number of birds using a site (Madsen 1995). Bird diversity changed from predominantly mute swan and mallard to a more even distribution of a greater number of species when a sanctuary was established. Hence, species diversity increased with the elimination of hunting. There also appears to be an inverse relationship between the number of birds using an area and hunting intensity (DeLong 2002). In Connecticut, lesser scaup were observed to forage

less in areas that were heavily hunted (Cronan 1957). In California, the numbers of northern pintails on Sacramento National Wildlife Refuge nonhunt areas increased after the first week of hunting and remained high until the season was over in early January (Heitmeyer and Raveling 1988). Following the close of hunting season, ducks generally increased their use of the hunt area; however, use was lower than before the hunting season began.

Human disturbance to wintering birds and other wildlife using the open waters and marshes on the refuge would occur as a result of hunting activity. Migratory and wintering waterfowl generally attempt to minimize time spent in flight and maximize foraging time because flight requires considerably more energy than any other activity, other than egg laying. Human disturbance associated with hunting includes loud noises and rapid movements, such as those produced by shotguns and boats powered by motors. This disturbance, especially when repeated over a period of time, compels waterfowl to change food habits, feed only at night, lose weight, or desert feeding areas (Belanger and Bedard 1990; Madsen 1995; Wolder 1993). Disturbance levels from hunting activity outside Chincoteague National Wildlife Refuge were found to be high enough to force wintering black ducks into a pattern of nocturnal feeding within surrounding salt marsh and diurnal resting with refuge impoundments (Morton et al. 1989a, 1989b). Unhunted populations have been documented to behave differently from hunted ones (Wood 1993).

These impacts can be reduced by the presence of sanctuary areas where hunting does not occur, and birds can feed relatively undisturbed. Sanctuaries or nonhunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et al. 1992). Prolonged and extensive disturbances may cause large numbers of waterfowl to leave disturbed areas and migrate elsewhere (Madsen 1995; Paulins 1984). In Denmark, hunting disturbance effects were experimentally tested by establishing two sanctuaries (Madsen 1995). Over a 5-year period, these sanctuaries became two of the most important staging areas for coastal waterfowl. Numbers of dabbling ducks and geese increase 4- to 20-fold within the sanctuary (Madsen 1995). Thus, sanctuary areas are very important to minimize disturbance to waterfowl populations to ensure their continued use of the refuge.

Intermittent hunting can be a means of minimizing disturbance, especially if rest periods in between hunting events are weeks rather than days (Fox and Madsen 1997). It is common for refuges with heavily used hunt programs to manage their programs with nonhunt days. At Sacramento National Wildlife Refuge, 3%–16% of northern pintails were located in hunt units during nonhunt days, but they were almost entirely absent in those same units on hunt days (Wolder 1993). In addition, northern pintails,

American wigeon, and northern shovelers decreased time spent feeding on days when hunting occurred on public shooting areas, as compared to nonhunt days (Heitmeyer and Raveling 1988). However, intermittent hunting may not always greatly reduce hunting impacts. At Sacramento National Wildlife Refuge, the intermittent hunting of three hunt days per week results in lower northern pintail densities on hunt areas during nonhunt days than establishing nonhunt areas (Wolder 1993). In Germany, several studies reported a range from a few days to approximately 3 weeks for waterbird numbers to recover to pre-disturbance levels (Fox and Madsen 1997). The proposed hunt program at Red Rock Lakes National Wildlife Refuge will not be intermittent due to the limited nature of the hunting season, limited use that occurs during the week days, and the limited amount of area that is open to hunting.

Boating activity associated with hunting during the fall can alter distribution, reduce use of particular habitats or entire areas by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). In the upper Midwest, motor boating and hunting have been found to be the two main activities that disturb waterfowl (Korschgen et al. 1985). In Connecticut, selection of feeding sites by lesser scaup was influenced by disturbances from hunters, anglers, and pleasure boats (Cronan 1957). In Germany, boat pressure on wintering waterfowl had reached such a high level that it was necessary to establish larger sanctuaries, implement a seasonal closure on water sports and angling, and impose a permanent ban on hunting (Bauer et al. 1992). Impacts of boating can occur even at low densities, given their noise, speed, and ability to cover extensive areas in a short amount of time. However, impacts from boating at Red Rock Lakes National Wildlife Refuge will be greatly reduced because a majority of the proposed hunting area will be open to only nonmotorized boating. Thus, much of the disturbance impacts (identified above due to motor boats quick movements, noise, and ability to cover large areas in a short amount of time) will not apply to this refuge. As such, the use of nonmotorized boats is one way of minimizing disturbance to waterbirds at this refuge. In addition, allowing only nonmotorized boating on a majority of the hunting area provides for a very unique experience not easily found in southwest Montana. Each year, the refuge staff receives comments from hunters who specifically come to this refuge because of the nonmotorized regulations.

Additional impacts from hunting activity include conflicts with individuals participating in wildlife-dependent priority visitor services, such as canoeing, kayaking, and other wildlife observations. However, the refuge currently provides a minimum of 3,200 acres that are closed to hunting but open to nonmotorized boating and wildlife observation.

In addition, approximately 4,500 acres of upland habitat is closed to hunting but open for visitors to participate in wildlife observation activities on foot.

DETERMINATION

Waterfowl hunting is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

The refuge's waterfowl hunt program will be designed to provide quality experiences. A quality hunt experience means that (1) hunters are safe; (2) hunters exhibit high standards of ethical behavior; (3) hunters are provided with uncrowded conditions; (4) hunters have reasonable harvest opportunities; (5) hunters are clear on which areas are open and closed to hunting; and (6) minimal conflicts occur between hunters and other visitors, especially those engaging in wildlife-dependent priority visitor services.

The 7-days-per-week hunt program proposed on the refuge would include the following restrictions to reduce impacts: (1) a limited hunt area (areas will be posted and enforced); (2) use of nonmotorized boats, except downstream (west) of the Lower Red Rock lake water control structure; (3) use of closed areas, as needed, to provide sufficient feeding and resting habitat for waterfowl; and (4) periodic biological and social monitoring and evaluation of the hunting program, including feedback from users to determine if the objectives for a high-quality experience (as defined above) are being met.

Hunter compliance with current migratory bird and refuge regulations would be achieved through a combination of printed information, signing, outreach efforts, and enforcement of regulations by law enforcement officers.

JUSTIFICATION

Hunting is one of the six priority visitor services of the National Wildlife Refuge System. Providing for a quality hunting program contributes to achieving one of the refuge goals. This program as described was determined to be compatible, in view of potential impacts that hunting and supporting activities (boating) can have on the Service's ability to achieve refuge purposes and goals. The refuge would be opened to waterfowl hunting, with sufficient restrictions in place on hunting, boating, and other visitor services to ensure that an adequate amount of quality feeding and resting habitat would be available in relatively undisturbed areas (sanctuaries) for a majority of waterfowl and other wetland birds using the refuge.

Refuge hunt programs are designed to provide high-quality experiences. In general, hunting on

refuges should be superior to that available on other public lands, which may require special restrictions (Refuge Manual 8RM5). Measures are often used to ensure quality. The limited hunt program is proposed on the refuge to accomplish the following (1) provide a quality hunting experience that meets refuge guidelines and policies, (2) provide sufficient waterfowl sanctuary, and (3) prevent conflicts with other priority wildlife-dependent visitor services.

Consolidation of the hunting area into a single block of land provides a distinct, manageable unit that can be easily delineated, posted, and enforced. It is anticipated that birds will find sufficient food resources and resting places, both inside and outside the hunt area, such that their abundance and use of the refuge will not be measurably lessened, hunting pressure will not cause premature departure from the area, the physiological condition of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall population status will not be impaired.

Mandatory 15-year reevaluation date: 2023

DESCRIPTION OF USE: RECREATIONAL FISHING

Recreational fishing (a wildlife-dependent activity) has been identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority public use, provided it is compatible with the purpose for which the refuge was established. An establishment authority for Red Rock Lakes National Wildlife Refuge, the Refuge Recreation Act, provides for “incidental fish and wildlife-oriented recreational development.”

Currently, fishing is allowed on Odell, Red Rock, and Elk Springs (west of Elk Lake Road) under state seasons. Culver, Widgeon, and MacDonald ponds and Elk Springs Creek (east of Elk Lake Road) are open seasonally (July 15–October 1). All other refuge waters are closed to fishing to protect breeding waterfowl and trumpeter swans. Game fish include native Westslope cutthroat trout (although mostly hybridized with nonnatives), Arctic grayling, and limited mountain whitefish. Nonnative game species include brook, Yellowstone cutthroat, and rainbow trout. There are unimproved parking areas at the ponds. Vehicle access points with minimal parking exist at two locations on Red Rock Creek and one each at Elk Springs and Odell creeks. Commercial guiding is not allowed.

Anglers must use nontoxic artificial lures or flies. Lead sinkers are prohibited. Fishing with bait is not permitted in order to reduce introduction of nonnative invasive species and increase the survival of released native fish. The refuge has not collected data on fishing use. From observations, Red Rock

Creek receives the greatest fishing pressure. There is the potential for some Arctic grayling mortality due to such things as trampling of eggs and catch and release fishing. To minimize future impacts on Arctic grayling from fishing, no additional parking areas will be created.

The refuge does not stock nonnative fish species to protect Arctic grayling populations. A primary objective of the proposed alternative (B) is to restore Arctic grayling and Westslope cutthroat trout populations. While refuge streams will be open in compliance with state regulations, fishing closures in target creeks and ponds may be implemented while restoration work is being completed.

The CCP proposes the following fishing opportunities:

- Until they are restored, MacDonald, Widgeon, and Culver ponds would be open under state regulations to fishing from the bank, unless necessary to protect nesting swans or lacustrine/adfluvial Arctic grayling restoration efforts.
- All refuge streams would be open to fishing in compliance with state and refuge regulations.
- To protect native Arctic grayling and Westslope cutthroat populations, visitors would be encouraged to keep all nonnative fish they catch in accordance with state regulations.
- Red Rock Creek west of Lower lake structure would be opened to fishing.

AVAILABILITY OF RESOURCES

Sufficient resources are available at the current levels of fishing pressure. The refuge will continue to work with Montana Fish, Wildlife and Parks to conduct fish and creel surveys.

ANTICIPATED IMPACTS OF USE

Fishing and other human activities cause disturbance to wildlife. This disturbance may have cumulative impacts on wildlife, habitat, and the fisheries resource. This includes more disturbances to wildlife, vegetation trampling, potential introduction and spread of exotic aquatic and terrestrial plants, potential transmission of diseases including whirling disease, problems associated with disposal of human waste, and deposition of lead sinkers and fishing line. Birds or mammals feeding or resting may be disturbed by anglers fishing from the bank. The current visitor use is often low enough that disturbance by anglers cause minimal impacts on most wildlife species. Opening the remaining creeks on the refuge to fishing should not impact Arctic grayling because they have not been found during surveys outside of Odell and Red Rock creeks.

DETERMINATION

Recreational fishing is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- Fishing is not allowed on Swan Lake and Lower and Upper Red Rock lakes.
- Fishing on the creeks is open according to Montana state seasons.
- Until restored, bank fishing on MacDonald, Widgeon, and Culver ponds would be open under state regulations unless necessary to protect nesting swans or Arctic grayling restoration efforts.
- Anglers must use nontoxic artificial lures or flies.
- Lead sinkers are prohibited.
- Fishing with bait is not permitted.
- The harvest of nonnative game fish species is promoted.
- Commercial guiding is not permitted.
- Existing use is monitored to ensure that disturbance to wildlife continues to be minimal.
- Existing signage is improved or replaced.

JUSTIFICATION

Based upon biological impacts described above and in the EA, it is determined that recreational fishing within Red Rock Lakes National Wildlife Refuge will not materially interfere with or detract from the purposes for which the refuge was established. One of the secondary goals of the National Wildlife Refuge System is to provide opportunities for public fishing when compatible, and it is identified as a priority public use in the National Wildlife Refuge System Improvement Act of 1997. Current recreational fishing at the refuge will support this goal with only minimal conflicts with the wildlife conservation mission of the Refuge System.

Mandatory 15-year reevaluation date: 2023

DESCRIPTION OF USE: WILDLIFE OBSERVATION AND PHOTOGRAPHY

Wildlife observation and photography are major visitor services at the refuge. The beauty and uniqueness of the area combined with the abundance of various bird and mammal species draw over 12,000 visitors each year. The refuge will continue to support and enhance opportunities related to wildlife observation and photography. Supporting uses to assist visitors in wildlife observation and photography are vehicle access, foot access (including

hiking trails), campgrounds, nonmotorized boat and bicycle access. These supporting uses (access) will be controlled and regulated through the publication of refuge brochures and through information posted at the kiosks.

Wildlife observation and photography are two of the six wildlife-dependent recreational uses specified in the Improvement Act.

Wildlife observation and photography will be allowed across most of the refuge, with the exception of closed areas at Shambow Pond and the area surrounding the residences, shop, and equipment yard.

Foot travel, including hiking, snowshoeing, and cross-country skiing, is permitted throughout the refuge except for the above mentioned closed areas.

Passenger vehicles, motorcycles and bicycles will be restricted to county and public refuge roads. Seasonal road closures, due to weather, limit access during the winter and spring months. Snowmobiles are not permitted on refuge roads and are restricted to county roads. ATV's are not allowed on refuge roads or campgrounds and must be licensed for highway use to be able to operate on county roads.

Nonmotorized boat access is seasonally allowed on Red Rock Creek, Upper and Lower Red Rock lakes and the river marsh connecting the two lakes. Boating access is difficult if a drought persists due to the shallowness of the lakes. Sailing is not permitted.

Horses, mules, llamas, and other animals used for riding or packing are permitted only for access into mountainous areas south of South Valley Road (Red Rock Pass Road).

The CCP proposes to continue the above uses and add the following to improve wildlife observation and wildlife photography:

- Update and improve refuge signs and brochures.
- Develop an auto-tour route.
- Replace existing kiosks, update interpretive panels, and add an interpretive kiosk.
- Investigate the development of accessible habitat specific wildlife-viewing/photography areas, infrastructure or trails.

AVAILABILITY OF RESOURCES

Developing new facilities outlined in the CCP is closely tied to funding requests in the form of refuge operation needs system (RONS) and maintenance management system (MMS) projects. Existing programs such as current refuge directional signs and brochures can be updated with available resources.

ANTICIPATED IMPACTS OF USE

Wildlife observation and photography can affect the wildlife resource positively or negatively. A positive effect of public involvement in these priority visitor services will be a better appreciation and more complete understanding of the refuge's wildlife and habitats. That can translate into more widespread, stronger support for the refuge, Refuge System, and the Service.

Walking and hiking is expected to minimally disturb wildlife and wildlife habitat at the current and proposed levels. Increased disturbance to wildlife would occur in areas regularly frequented by visitors, such as the campgrounds and trails. During snow-free months, the majority of visitors restrict their pedestrian use to the trails and parking areas, which concentrates these uses along the road system, minimizing disturbance to wildlife and habitats. The majority of the bird species migrate out of the area in the winter months. Elk, pronghorn, and mule deer also tend to leave the valley. Winter pedestrian travel will have little to no impact on other species because of the inaccessibility of the refuge. White-tailed deer and moose around the headquarters are disturbed more frequently in the winter from pedestrian travel but can easily move away from those visitors snowshoeing or skiing.

Vehicular access, while restricted to the roads, allows visitors to cover more ground, potentially increasing the number of times an animal is disturbed, but it may be of shorter duration compared to pedestrian disturbance. Some areas are closed during the winter to all public activity, thereby protecting wintering waterfowl and trumpeter swans. Wildlife disturbance, especially impacts to moose, from snowmobiles traveling through the refuge has not been studied. Snowmobiles are restricted to the county roads. Snowmobile use on the South Valley Road to Elk Creek Road is low at this time. The use may dramatically increase if a resort business opens up in Lakeview in the near future. Snowmobile use through the refuge on Elk Lake Road is relatively high (average 30 snowmobiles/day). These visitors come from West Yellowstone and go up to Elk Lake Resort for lunch. This use needs to be monitored for impacts on wildlife.

Nonmotorized boating is restricted to Red Rock Creek and Upper Red Rock lake from July 15 to freeze up. Lower Red Rock lake and the River Marsh connecting the two lakes is open September 1 to freeze up. Kayaks and canoes are the typical nonmotorized boats used. Wildlife disturbance from human-powered boating displaces birds from the immediate area of the visitors. The slow speeds of the boats and large size of the lakes allow the birds to easily move to another area without further disturbance. This use needs to be monitored for impacts on wildlife.

No cultural resources would be impacted. No impact on endangered species should occur.

Short-term impacts: There may be temporary disturbance to wildlife near the activity. Direct short-term impacts may include minor damage from traffic to refuge roads and trails when wet and muddy. Temporary disturbance may occur due to facility improvements. However, suitable habitats exist nearby and effects on wildlife would be minor and nonpermanent.

Long-term Impacts: None.

Cumulative Impacts: The Service does not expect substantial cumulative impacts from these two priority uses in the near term, but it will be important for refuge staff to monitor those uses and, if necessary, respond to conserve high-quality wildlife resources.

Refuge staff, in collaboration with volunteers, will monitor and evaluate the effects of these priority visitor services to discern and respond to any unacceptable impacts on wildlife or habitats. To mitigate those impacts, the refuge will close areas where birds such as bald eagles, colonial waterbirds, or swans are nesting. The Service expects no additional effects from providing these two priority uses.

DETERMINATION

Wildlife observation and photography are compatible uses at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- Wildlife observation and photography will be allowed across most of the refuge, with the exception of closed areas at Shambow Pond and the area surrounding the residences, shop, and equipment yard.
- Foot travel, including hiking, snowshoeing, and cross-country skiing, is permitted throughout the refuge, except for the above-mentioned closed areas.
- Passenger vehicles, motorcycles, and bicycles will be restricted to county and public refuge roads. Seasonal road closures due to weather limit access during the winter and spring months. Snowmobiles are not permitted on refuge roads and are restricted to county roads. All terrain vehicles are not allowed on refuge roads or campgrounds and must be licensed for highway use to be able to operate on county roads.
- Nonmotorized boat access is seasonally allowed on Red Rock Creek, Upper and Lower Red Rock lakes, and the River Marsh connecting the two lakes. Boating access is difficult if a drought

persists due to the shallowness of the lakes. Sailing is not permitted.

- Horses, mules, llamas, and other animals used for riding or packing are permitted only for access into mountainous areas south of South Valley Road (Red Rock Pass Road).
- An increase in education and law enforcement patrols would minimize illegal or undesirable activity.
- Newly constructed viewing areas would be designed to minimize disturbance impacts on wildlife and all refuge resources while providing a good opportunity to view wildlife in their natural environments.

JUSTIFICATION

According to the National Wildlife Refuge System Improvement Act of 1997, wildlife observation and photography are priority public use activities that should be encouraged and expanded where possible. It is through compatible visitor services such as this that the public becomes aware of and provides support for refuges.

Mandatory 15-year reevaluation date: 2023

DESCRIPTION OF USE: ENVIRONMENTAL EDUCATION AND INTERPRETATION

Environmental education and interpretation are both defined as wildlife-dependent recreational uses under the Improvement Act. Currently these programs have been opportunistic as time and staff allows. School group participation in environmental education is severely limited due to road conditions and distance from communities. A few organized groups request tours and talks during the summer months. Interpretation is limited to brochures, information panels at the headquarters visitor contact station, two standalone panels, and three kiosks. In addition, the refuge does not have an auto-tour route or interpretation along designated trails.

The CCP proposes to continue with the above uses, and add the following to improve environmental education and interpretation:

- Hire a seasonal visitor services technician to develop and carry out interpretive programs.
- Update and improve refuge signs and brochures, identifying refuge trails.
- Develop and interpret an auto tour route.
- Replace existing kiosks, update interpretive panels, and add an interpretive kiosk.

AVAILABILITY OF RESOURCES

Funding for these activities is supported solely by annual operation and maintenance money. Resources are stretched in order to continue providing

environmental education and interpretation at the refuge. Implementing new facilities outlined in the CCP is closely tied to funding requests in the form of refuge operation needs system (RONS) and maintenance management system (MMS) projects. Existing programs such as current refuge directional signs and brochures can be updated with available resources.

ANTICIPATED IMPACTS OF USE

The use of the refuge to provide interpretation and environmental education on the refuge may impose a low-level impact on those sites used for these activities. Impacts may include trampling vegetation and temporary disturbance to wildlife species in the immediate vicinity.

DETERMINATION

Environmental education and interpretation use are compatible uses at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

Visitors participating in environmental education and Interpretation programs will follow all refuge regulations. On-site activities should be held where minimal impact would occur.

JUSTIFICATION

One of the secondary goals of the National Wildlife Refuge System is to provide opportunities for the public to develop an understanding and appreciation for wildlife when it is found compatible with other goals. The above uses are identified as priority visitor services in the National Wildlife Refuge System Improvement Act of 1997 and will help meet the above secondary goal with only minimal conflicts.

Environmental education and interpretation are used to encourage an understanding in citizens of all ages to act responsibly in protecting wildlife and its habitat. These are tools used in building land ethics, developing support for the refuge, and decreasing wildlife violations.

Environmental education at the refuge is incidental to other programs since there is no full-time staff to conduct these activities. However, the program is important and provides visitors with an awareness of refuge-specific issues such as wetland ecology, migratory bird management, and issues relating to the entire Refuge System.

Based on anticipated biological impacts and in the environmental assessment, it is determined that environmental education and interpretation on the refuge will not interfere with refuge habitat goals and objectives or the purposes for which it was

established. Limits to access and monitoring can help mitigate any adverse impacts.

Mandatory 15-year reevaluation date: 2023

DESCRIPTION OF USE: CAMPING

Red Rock Lakes National Wildlife Refuge manages two primitive campgrounds for visitors participating in wildlife-dependant recreation. Camping is not permitted elsewhere on the refuge. The campgrounds provide opportunities to participate in wildlife-dependant recreation without traveling great distances. Because of the distance to town and limited public land access, the campgrounds are used regularly by visitors who are bird watching, photographing wildlife, fishing, hunting, and hiking or bicycling the Continental Divide trails. Groups touring the valley and refuge also use the campgrounds for day use.

Camping is permitted year-round, but it primarily occurs from May through October with some use in November. Access to the campgrounds in the winter is limited to travel across snow-covered roads, and the vault toilets are not maintained. Visitors observing and photographing wildlife are the primary users during the summer, with hunters dominating in the fall. Camping is allowed for up to 14 consecutive days. Fires are only allowed in fire rings, and visitors can collect dead and downed material. Garbage must be packed out. Visitors to the campgrounds rarely litter. Food and carcass storage is required to protect grizzly and black bears and visitors. The refuge will provide bear-proof storage containers for hikers, bicyclists, and motorcyclists and for hunters to store carcasses.

Upper Lake campground receives the most use by visitors due to its beautiful scenery and location adjacent to the county road. It provides two vault toilets (not accessible), piped spring water, picnic tables (one accessible), and fire rings. The entrance road and all campsites need repairs. There are no hookups, parking, or turnarounds specifically for recreational vehicles (RVs). This limits RVs from using this campground, which provides more campsites for hikers, bicyclists, and vehicle campers. This minimizes conflicts between vehicles using generators and low-impact campers. There are 11 designated sites. There is a boat ramp (not accessible) for nonmotorized boats. An informational kiosk is provided to inform the visitor about the refuge and its wildlife. Upper Red Rock lake is open to nonmotorized boats from July 15 to freeze up to protect breeding birds.

River Marsh campground provides two vault toilets (not accessible) and fire rings. There are no designated campsites here and it can accommodate RVs. This campground is primarily used during hunting seasons, especially waterfowl hunting

because it provides immediate access to open hunt areas. Summer use does occur by wildlife observers who want to get away from the county road. There is a boat ramp (accessible) for nonmotorized boats. Lower Red Rock lake is open to nonmotorized boats from September 1 to freeze up to protect breeding birds.

Universally accessible toilets would replace old toilets at both campgrounds, along with an accessible campsite at the River Marsh campground. Other improvements, such as food storage containers, picnic tables, fire rings, and road repair, will increase the safety for visitors and the opportunities to use the refuge over multiple days. A recreational fee may be charged to help offset the maintenance of the campgrounds.

AVAILABILITY OF RESOURCES

Existing funding and staffing are adequate to maintain the refuge campgrounds to provide access to wildlife-dependent activities on and off of the refuge. During the peak summer months, volunteers maintain the vault toilets, pick up litter, and clean campsites. They also make many contacts with visitors, educating them about the refuge and its wildlife. The campgrounds are both about 4 miles away from headquarters, which allows for easy access to patrol and monitor the visitors. Visitor Facility Enhancement funding will help correct drainage issues on the entrance and campsite access roads. Operating the campgrounds as a fee unit would require, at a minimum, one full day a week of staff time for collecting and counting of money and increased law enforcement presence. The refuge contracts the pumping of the vault toilets. The Upper Lake toilets need to be pumped twice a year due to the high use and inadequate size of the vaults. The refuge could reduce pumping needs to once a year or less by replacing the old vault toilets with adequately sized, clean-smelling vault toilets. The new toilets would meet Americans with Disabilities Act requirements. This improvement is dependent upon funding from the Visitor Facility Enhancement Program.

ANTICIPATED IMPACTS OF THE USE

Some short-term impacts, such as littering, vegetation trampling, and wildlife disturbance, can be expected, but these are not anticipated to be significant at current or increased levels of camping. This is because the vast majority of visitors travel the long distances over rough roads to enjoy the scenery, outdoors, solitude, and wildlife of the refuge. Isolation buffers the refuge from visitors looking for a party location. Very few problems have occurred with visitors using the campgrounds.

The Upper Lake campground is surrounded by thick vegetation, and visitors tend to watch wildlife within

the open areas of the campground and along the county road. Refuge staff regularly receive reports by visitors who see moose, badger, fox, and deer walking through the campground. The River Marsh campground is located in open grassland habitat next to Lower Red Rock lake. Wildlife disturbance primarily impacts waterfowl that move away from the shoreline when there are people present in the campground. The potential for accidental wildfires exists, but with education, the hazard would be reduced or eliminated if burn bans are implemented.

The use of these primitive campsites by through hikers, bicyclists, and motorcyclists on the Continental and Great Divide trails will not adversely impact refuge purposes and objectives. This use is at a low level and is not expected to substantially increase over the next 15 years.

By providing environmental education or interpretive programs, or both, at the campgrounds to a “captive” audience, the refuge staff can encourage an understanding in citizens of all ages to act responsibly in protecting wildlife and habitat. These are tools used in building land ethic, developing support of the refuge, and decreasing wildlife violations.

DETERMINATION

Camping is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- The refuge will continue to enforce general visitor services regulations which protect habitat and wildlife, and limit disturbance to other refuge visitors.
- The refuge manager may prohibit fires during periods of high fire danger.
- The refuge will continue to provide information to campers.
- Expansion of the campgrounds will not occur.
- A detailed step-down visitor services plan will be completed and will include planned improvements to the existing impacted area within the campgrounds such as placement of new accessible vault toilets out of the view of Upper Red Rock lake, an accessible observation deck, and planned campsite placement.
- Commercial operations will not be allowed to use the campgrounds.

JUSTIFICATION

Camping is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Improvement Act of 1997. It is, however, an activity in support of other priority

uses, such as fishing, hunting, wildlife observation, and photography. It is a policy of the U.S. Fish and Wildlife Service that, “We may allow other activities on refuges, such as camping, to facilitate compatible wildlife-dependent recreation.” (605 FW 1, 1.2B). Camping on the refuge will have limited negative impacts on natural resources when conducted under the above stipulations. Management of this use will require minimal administrative time and potentially manageable amounts of time in the form of toilet maintenance and public contacts. Camping, therefore, at its current level of use will not negatively interfere with the purposes of the refuge or the mission of the Refuge system.

Mandatory 15-year reevaluation date: 2023

DESCRIPTION OF USE: COMMERCIAL FILMING, AUDIO RECORDING, AND STILL PHOTOGRAPHY

Commercial filming is defined as the digital or film recording of a visual image or sound recording by a person, business, or other entity for a market audience, such as for a documentary, television or feature film, advertisement, or similar project. It does not include news coverage or visitor use. Still photography is defined as the capturing of a still image on film or in a digital format.

The Red Rock Lakes National Wildlife Refuge and designated Wilderness is an incredibly scenic and beautiful landscape with tremendous opportunities for commercial filming and commercial still photography. The refuge provides an ideal setting for filmmakers and photographers. Each year the refuge staff receives approximately one to five requests to conduct commercial filming or commercial still photography on the refuge. Each request is evaluated on an individual basis, using a number of Department of the Interior, U.S. Fish and Wildlife Service, and National Wildlife Refuge System policies (for example, 43 CFR Part 5, 50 CFR Part 7, 8 RM 16). Commercial filming will be managed on the refuge through the special user permit process (except as described below for certain activities conducted by commercial still photographers—see Stipulations Necessary to Ensure Compatibility) to minimize the possibility of damage to cultural or natural resources or interference with other visitors to the area. In addition, much of the refuge is designated wilderness area. A minimum-requirements decision guide will be completed for all commercial filming activities proposed in the wilderness area. This process involves determining if an essential task should be conducted in the Wilderness Area, and then determining the combination of methods, equipment, or administrative practices necessary to successfully and safely administer the refuge and accomplish wilderness management objectives.

The use includes access by groups or individuals in vehicles on roads open to the general public, by nonmotorized boats on refuge waters open to the general public, and on refuge lands open to the general public. In rare cases, access to areas closed to the general public may be permitted through the special use permit process.

AVAILABILITY OF RESOURCES

In general, the refuge would normally incur no expense except administrative costs for review of applications, issuance of a special use permit, and staff time to conduct compliance checks. These costs may be able to be recovered as outlined in a Proposed Rule modifying commercial filming and still photography policy for the several agencies within the Department of the Interior. This Proposed Rule is currently in the public review process (Federal Register, Volume 72, Number 160, dated August 20, 2007).

ANTICIPATED IMPACTS OF THE USE

Wildlife photographers and filmmakers tend to create the largest disturbance impacts of all wildlife observers (Dobb 1998, Klein 1993, Morton 1995). While wildlife observers frequently stop to view species, wildlife photographers are more likely to approach wildlife (Klein 1993). Even a slow approach by wildlife photographers tends to have behavioral consequences to wildlife species (Klein 1993). Other impacts include the potential for photographers to remain close to wildlife for extended periods of time, in an attempt to habituate the wildlife subject to their presence (Dobb 1998) and the tendency for photographers with low-power lenses to get much closer to their subjects (Morton 1995). This usually results in increased disturbance to wildlife and habitat, including the trampling of plants. Handling of animals and disturbing vegetation (such as cutting plants, removing flowers) is prohibited on the refuge.

These impacts are expected to be minimized or avoided through the denial of issuance of special use permits for commercial filming and still photography (see exceptions to still photography permitting outlined below) on a case-by-case basis.

PUBLIC REVIEW AND COMMENT

This compatibility determination was prepared concurrently with the CCP for the refuge. Public review and comment was achieved concurrently with the public review and comment period for the draft CCP and EA.

DETERMINATION

Commercial filming, audio recording, and still photography are compatible uses at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

All commercial filming requires a special use permit.

- Special use permits will identify conditions that protect the refuge's values, purposes, resources; public health and safety, and prevent unreasonable disruption of the public's use and enjoyment of the refuge. Such conditions may be, but are not limited to, specifying road conditions when access will not be allowed, establishing time limitations, and identifying routes of access into the refuge. These conditions will be identified to prevent excessive disturbance to wildlife, damage to habitat or refuge infrastructure, or conflicts with other visitor services or management activities.
- The special use permit will stipulate that imagery produced on refuge lands will be made available to the refuge to use in outreach, interpretation, internal documents, or other suitable uses. In addition, any commercial products must include appropriate credits to the refuge, the National Wildlife Refuge System, and the U.S. Fish and Wildlife Service.
- The commercial filming or still photography use must demonstrate a means to extend public appreciation and understanding of wildlife or natural habitats, or enhance education, appreciation and understanding of the National Wildlife Refuge System, or facilitate outreach and education goals of the refuge. Failure to demonstrate any of these criteria will result in a special use permit being denied.
- Still photography requires a special use permit (with specific conditions as outlined above) if one or more of the following would occur:
 - it takes place at locations where or when member of the public are not allowed.
 - it uses model(s), set(s), prop(s) that are not part of the location's natural or cultural resources or administrative facilities.
 - the refuge would incur additional administrative costs to monitor the activity.
 - the refuge would need to provide management and oversight to: avoid impairment of the resources and values of the site; limit resource damage; or minimize health and safety risks to the visiting public.
 - the photographer(s) intentionally manipulate(s) vegetation to create a "shot" (for example cutting vegetation to create a blind).
- To minimize impact on refuge lands and resources, the refuge staff will ensure that all commercial filmmakers and commercial still photographers (regardless of whether a special use permit is issued) comply with policies, rules,

and regulations, and refuge staff will monitor and assess the activities of all filmmakers, photographers and audio recorders.

JUSTIFICATION

Allowing commercial filming, still photography or audio recording is an economic use that must contribute to the achievement of the refuge purposes, mission of the National Wildlife Refuge System, or the mission of the U.S. Fish and Wildlife Service. Providing opportunities for commercial filming, still photography, or audio recording that meets the above requirements should result in an increased public awareness of the refuge's ecological importance as well as advancing the public's knowledge and support for the National Wildlife Refuge System and the U.S. Fish and Wildlife Service. The stipulations outlined above and conditions imposed in the special use permits issued to commercial filmmakers, still photographers and audio recorders would ensure that these wildlife-dependent activities occur without adverse effects on refuge resources or refuge visitors.

Mandatory 15-year reevaluation date: 2023

DESCRIPTION OF USE: COMMERCIALY GUIDED OR OUTFITTED STOCK ANIMAL SERVICES FOR GAME RETRIEVAL AND ACCESS ACROSS THE REFUGE INTO THE CENTENNIAL MOUNTAINS

Use of stock animals by the public to retrieve game and access the Centennial Mountains is currently authorized on the refuge (see Recreational Hunting – Compatibility Determination which was evaluated separately). There is no authorized use of hunting guides on the refuge.

Commercially guided and/or outfitted stock animal services can be divided into two categories. The first is the use of stock animals (with or without the services of the stock owner) to retrieve big game taken on the refuge or adjacent lands. This service is typically provided to moose hunters on the refuge as it is usually logistically difficult to remove moose carcasses on foot due to the terrain and size of the animal. In addition, this service has been typically provided to hunters that take an elk off-refuge in the upper elevations of the Centennial Mountains. Many times, the only feasible access to this animal is to cross refuge property with the outfitted stock animals. Approximately, 10 to 20 pack trips are made annual to retrieve animals.

The second category of use is to provide access to hunters, campers and environmental education students that are being guided and/or taught by the sole outfitting/guiding service (known as Centennial Outfitters) authorized to operate in the Centennial

Mountains (under State of Montana and Bureau of Land Management permits). Access to the Centennial Mountains across public land is extremely limited – especially on the east end of the mountain range where the refuge exists. Access into the Centennial Mountains by this outfitter is restricted to two access points across the refuge (Odell Creek trail and Shambow Trail). Approximately 65 to 75 trips are made each year over a period of 55 to 65 days. The majority of the trips occur in September, October and November. Trips vary in the number of stock animals that are used from 1 (just a rider on a horse) up to 23 animals (various number of riders and pack animals). The largest number of animals occurs during the summer months (typically July) when Centennial Outfitters are offering day trips for wildlife observation and environmental education/interpretation programs.

Centennial Outfitters is the sole commercial operation licensed to operate in the Centennial Mountains. Access onto and across the refuge has been conducted utilizing a Special Use Permit in past years. As of 2005, Centennial Outfitters reports all trips made across the refuge as well as the number of riders and animals used as a condition of their special use permit.

The use of commercially provided stock animals contributes to fulfillment of refuge purposes and to the National Wildlife Refuge System mission by facilitating priority visitor services (hunting, wildlife observation, interpretation and environmental education) and management of healthy wildlife populations through controlled hunting.

AVAILABILITY OF RESOURCES

Adequate refuge personnel and base operational funds are available to manage this commercial activity at existing levels. Administrative staff time primarily involves issuing one special use permit a year. This burden could be reduced by extending the period of use of this one permit. Fieldwork associated with administering this program primarily involves monitoring the permittee's compliance with permit terms and assessing trail conditions. Total staff time for administering this permit is approximately 5 days per year.

ANTICIPATED IMPACTS OF THE USE

Wildlife disturbance from horseback riding and stock animals is not well-documented. However, some studies suggest that many wildlife species are habituated to livestock and that horseback wildlife observers can approach wildlife at closer distances than by other forms of travel (Bennett and Zuelke 1999, Williams and Conway-Durver 1998).

Horseback riding and the use of stock animals has both a direct and indirect effect on habitat. Trampling causes mortality of plant and animal species. Indirect

effects result when soil is compacted and plants cannot reestablish (Summer 1980). Grazing can reduce vegetation. Nonnative plant species can be spread by stock animals through feces and seeds dropped that were caught in a stock animal's hair. In addition, stock animal manure, although not harmful to human health, can cause conflicts with other trail users since it can be odorous, unaesthetic, and a nuisance.

While there can be user group conflicts and some limited safety issues resulting from hikers and commercial use of stock animals using the same trail, these are expected to be minimal given the current level of use.

In general the impacts to wildlife, plant species, and other visitors to the refuge are expected to be minimal given the current level of use by one outfitter using stock animals to access the Centennial Mountains or retrieve game animals from the refuge.

DETERMINATION

Commercially guided or outfitted stock animal services for game retrieval and access across the refuge into the Centennial Mountains is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- All commercial use of stock animals requires a special use permit. Special use permits will identify conditions that protect the refuge's values, purposes, resources, and public health and safety, as well as prevent unreasonable disruption of the public's use and enjoyment of the refuge. Such conditions may be, but are not limited to specifying trail conditions when access will not be allowed, establishing limitations on the group size and number of trips allowed annually, recommendations for preventing the spread of nonnative vegetation, and identifying routes of access into the refuge. These conditions will be identified to prevent excessive disturbance to wildlife, damage to habitat or refuge infrastructure, or conflicts with other visitor services or management activities.
- The commercial use of stock animals must demonstrate a means to extend public appreciation and understanding of wildlife or natural habitats, or both; OR enhance education, appreciation and understanding of the National Wildlife Refuge System; OR facilitate outreach, education, and visitor services goals of the refuge. Failure to demonstrate any of these criteria will result in denial of a special use permit.

- Commercial stock animals may not be corralled, tethered, or hitched along trails on the refuge.

JUSTIFICATION

Recreational hunting, environmental interpretation, and environmental education have been found to be compatible with the purposes of the refuge and the National Wildlife Refuge System mission. Commercially guided and outfitted stock animal services is a form of traditional activity that Congress intended to preserve with the enactment of the Wilderness Act, which is an important act guiding the management of the refuge. These services on the refuge support priority visitor services, including hunting, environmental education, environmental interpretation, and wildlife observation and photography. Access into the Centennial Mountains would be much more restricted if these services were not allowed. The requirements placed on recreation guides ensure that these commercial operations are safe and high-quality operations. These requirements are by the Bureau of Land Management through its selection process, by the refuge through the terms of a special use permit, and by the state of Montana through regulations placed on guides and outfitters. These services are a valuable benefit to a segment of the American public that is not physically able to, not comfortable with, or for other reasons chooses not to participate in unguided trips into the Centennial Mountains. Access across the refuge by commercially guided or outfitted stock animals is essential to getting these types of Americans into this wilderness area. In addition, due to the difficulty of pedestrian travel in the area where moose hunting is allowed on the refuge, many moose hunters would not be able to retrieve their animals if this service were not provided.

Mandatory 15-year reevaluation date: 2023

DESCRIPTION OF USE: RESEARCH

The Red Rock Lakes National Wildlife Refuge receives approximately 1–3 requests per year to conduct scientific research on the refuge. Priority would be given to studies that contribute to the enhancement, protection, preservation, and management of the refuge's native plant, fish, and wildlife populations and their habitats. Research applicants must submit a proposal that outlines (1) objectives of the study; (2) justification for the study; (3) detailed study methodology and schedule; and (4) potential impacts on refuge wildlife and habitat, including disturbance (short and long-term), injury, or mortality. This includes a description of measures the researcher will take to reduce disturbances or impacts; (5) personnel required and their qualifications/experience; (6) status of necessary permits (scientific collecting permits, endangered species permits); (7) costs to refuge and refuge staff time requested, if any; and (8) anticipated progress

reports and end products (such as reports or publications). Refuge staff or others, as appropriate, would review research proposals and issues special use permits if approved.

Evaluation criteria will include, but not be limited to, the following:

- Research that will contribute to specific refuge management issues will be given higher priority over other requests.
- Research that will conflict with other ongoing research, monitoring, or management programs will not be approved.
- Research projects that can be conducted off-refuge are less likely to be approved.
- Research that causes undue disturbance or is intrusive will likely not be approved. The degree and type of disturbance would be carefully weighed when evaluating a research request.
- Research evaluation will determine if any effort has been made to minimize disturbance through study design, including adjusting location, timing scope, number of permittees, study methods, and number of study sites.
- If staffing or logistics make it impossible for the refuge to monitor researcher activity in a sensitive area, this may be reason to deny the request, depending on the specific circumstances.
- The length of the project will be considered and agreed upon before approval. Projects will be reviewed annually.

The refuge currently has an active land acquisition program. If newly acquired property includes areas of research interest, the same special use permit process and evaluation criteria described above will be followed.

AVAILABILITY OF RESOURCES

Adequate funding and staffing currently exist to manage for a limited amount of research at the Red Rock Lakes National Wildlife Refuge. As always, discretionary use of staff time would be weighed through a cost-benefit analysis. It is anticipated that approximately \$6,000 per year would be required to administer and manage research activities described above. Administration would include, but not be limited to, evaluation of applications, management of permits, and oversight of research projects.

ANTICIPATED IMPACTS OF USE

Some degree of disturbance is expected with all research activities since most researchers will be entering areas that are seasonally-closed or conducting research in remote areas of the refuge that have limited visitation by the general public,

and some research requires collection of samples or handling of wildlife. However, minimal impact on refuge wildlife and habitats is expected with research studies because special use permits will include conditions to ensure that impact to wildlife and habitats are kept to a minimum.

DETERMINATION

Research use is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Extremely sensitive wildlife habitat areas and wildlife species will be provided sufficient protection from disturbance by limiting proposed research activities in these areas. All refuge rules and regulations must be followed unless otherwise exempted by refuge management.
- Refuge staff will use the criteria for evaluating a research proposal, as outlined above under "Description of Use," when determining whether to approve a proposed study on the refuge. If proposed research methods are evaluated and determined to have potential impacts on refuge resources (habitat or wildlife), it must be demonstrated that the research is necessary for refuge resource conservation management. Measures to minimize potential impacts would need to be developed and included as part of the study design. In addition, these measures will be listed as conditions on the special use permit.
- Refuge staff will monitor research activities for compliance with conditions of the special use permit. At any time, refuge staff may accompany the researchers to determine potential impacts. Staff may determine that previously approved research and special use permits be terminated due to observed impacts. The refuge manager will also have the ability to cancel a special use permit if the researcher is out of compliance or to ensure wildlife and habitat protection.

JUSTIFICATION

The program as described is determined to be compatible. Potential impacts of research activities on refuge resources will be minimized because sufficient restrictions would be included as part of the study design and research activities will be monitored by the refuge staff. Research projects will contribute to the enhancement, protection, preservation, and management of the refuge's wildlife populations and their habitats.

Mandatory 15-year reevaluation date: 2023**DESCRIPTION OF USE: GRAZING**

The refuge currently uses livestock grazing as a tool to manage a variety of upland, riparian, and seasonal wetland habitats. Livestock grazing has been a preferred management tool because the effect on habitat is controllable and measurable. Livestock grazing has been used in a variety of ways, including high intensity – short duration, rest rotation, and complete rest. Grazing is not permitted on the refuge until after July 10 to minimize disturbance to nesting birds. Between 1994 and 2006 grazing rates ranged from 0.31–0.85 animal unit months (AUM) per acre, with an average of 3,790 AUM used annually. Actual rates per field varied substantially depending on the site, with some grazing unit rates being as low as 0.02 AUM per acre and others as high as 2.17 AUM per acre. The refuge currently has 23 subunits where grazing is being used as a management tool. Maintenance of the fences is a constant effort due to weather, water, animal, and human impacts.

The CCP proposes to continue using prescribed grazing in order to manage habitats. The CCP will establish goals and objectives for specific habitat types (such as riparian, wet meadow, and shrub-steppe) where prescribed grazing may be used. In addition, target wildlife species (such as northern pintail and Brewer's sparrow) and their habitat requirements have been identified. This has resulted in development of objectives that will guide management to meet target wildlife species habitat needs. The refuge will improve upon the vegetation and wildlife monitoring and research program in order to assess habitat and wildlife population responses to the prescribed grazing management program. Different grazing rates and management strategies will be investigated in order to determine the best methods for the refuge to meet the identified habitat goals and objectives of the CCP.

AVAILABILITY OF RESOURCES

Current refuge staff and funding resources are limited for the purposes of monitoring habitats and implementing research needs to understand the impacts of grazing on the refuge habitats. A minimum of one full-time seasonal biological technician would greatly enhance the refuge's ability to assess the outcomes of grazing. However, over the past 4 years, refuge staff have been able to use students from universities and colleges to lay the ground work for an improved monitoring program. In addition, the refuge recently completed a detailed vegetation inventory using the U.S. National Vegetation Classification Standards. Data were collected during the summers of 2005–2007. Field surveys were digitized, and a database for geographic information systems was generated. This data will greatly benefit the refuge in designing

research and monitoring protocol for assessing the prescribed grazing management program.

ANTICIPATED IMPACTS OF USE

The prescribed grazing management program is intended to be used to meet habitat and species-specific goals and objectives identified in the CCP. This management is intended to maintain and enhance habitat conditions for the benefit of a wide variety of fish and wildlife that used the refuge. Minimal negative impacts are expected through the use of this tool. Some trampling of areas may occur around watering areas or mineral licks. If fences are not maintained, it may be difficult to meet habitat objectives. It is anticipated that grazing will be in a mosaic pattern with some areas more intensely grazed than others in certain years. Grazing, as well as fire, is known to increase the nutrient cycling of nitrogen and phosphorous (Burke et al. 2005, Hauer and Spencer 1998, McEachern et al. 2000). Therefore, management of upland habitats adjacent to natural lakes (such as Upper and Swan lakes) and marshes could result in elevated levels of these nutrients in the lakes. Elevated levels of phosphorous and nitrogen can lead to increases in algae and turbidity in shallow lakes, which may ultimately lead to significant losses of submerged aquatic vegetation communities (see for example, Egertson et al. 2004). In addition, the presence of livestock would be disturbing to some wildlife species and some public users. The benefits of this habitat management tool are felt to outweigh these negative impacts.

DETERMINATION

Grazing use is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

- Maintain existing riparian fences and use temporary fencing, as needed, to protect riparian habitats from cattle.
- Implement a vegetation monitoring program to assess if focal species habitat requirements are being met.
- Carry out a study to determine the influence of cattle grazing on the abundance and distribution of small mammals, as identified in the CCP.
- Begin vegetation monitoring of shrub-steppe and grassland habitats to assure adequate coverage of sagebrush, native bunchgrasses, and forbs—as identified in the CCP.
- Begin nutrient (such as phosphorus, nitrogen) monitoring in Lower Red Rock, Upper Red Rock, and Swan lakes to ensure that nutrient levels are not increased to a point that would

result in algae and turbidity increases and decreases in submerged aquatic vegetation communities.

JUSTIFICATION

To maintain and enhance habitat for migratory birds and other wildlife, some habitat management needs to occur. Prescribed livestock grazing is one option that can be used to achieve desired habitat conditions. Prescribed grazing is a useful tool because it can be controlled, and results of the grazing can be monitored (for example, vegetation monitoring) so that adjustments to the program can be made in order to meet habitat goals and objectives.

Mandatory 15-year reevaluation date: 2023

Appendix F

Fire Management Program

The U.S. Fish and Wildlife Service has administrative responsibility which includes fire management for Red Rock Lakes National Wildlife Refuge, which covers approximately 47,756 acres in southwestern Montana.

THE ROLE OF FIRE

Vegetation in the Rocky Mountains evolved under periodic disturbance and defoliation from fire, drought, floods, large herbivores, insect outbreaks, and disease. These periodic disturbances are what kept the ecosystem diverse and healthy, while maintaining significant biodiversity for thousands of years.

Historically, naturally occurring wildland fire played an important disturbance role in many ecosystems by stimulating regeneration, cycling nutrients, providing a diversity of habitats for plants and wildlife, and decreasing the impacts of insects and diseases.

When fire is excluded on a broad scale, the accumulation of living and dead fuels can contribute to degraded plant communities and wildlife habitats. These fuel accumulations often change fire system characteristics, and have created potential for uncharacteristically severe wildland fires.

Return of fire in most ecosystems is essential for healthy vegetation for wildlife habitat in grasslands, wetlands, and forests. When integrated back into an ecosystem, fire can help restore and maintain healthy systems and reduce the risk of wildland fires. To make fire's natural role in the environment easier, fire first must be integrated into land and resource management plans and activities on a broad scale.

Fire, when properly utilized, can:

- reduce hazardous fuels buildup in both wildland–urban interface (WUI) and non-WUI areas;
- improve wildlife habitats by reducing the density of vegetation or changing plant species composition;
- sustain or increase biological diversity;
- improve woodlands and shrub lands by reducing plant density;

- reduce susceptibility of plants to insect and disease outbreaks;
- improve the effectiveness of an integrated pest management program (such as for controlling smooth brome).

WILDLAND FIRE MANAGEMENT POLICY AND GUIDANCE

An update of the 1995 “Federal Fire Policy” was completed and approved in 2001 by the Secretaries of the Interior and Agriculture. The 2001 “Federal Wildland Fire Management Policy” directs federal agencies to achieve a balance between fire suppression to protect life, property, and resources, and fire use to regulate fuels and maintain healthy ecosystems. In addition, it directs agencies to use the appropriate management response for all wildland fire regardless of the ignition source. This policy provides eight guiding principles that are fundamental to the success of the fire management program:

- Firefighter and public safety is the first priority in every fire management activity.
- The role of wildland fires as an ecological process and natural change agent will be incorporated into the planning process.
- Fire management plans, programs, and activities support land and resource management plans and their implementation.
- Sound risk management is a foundation for all fire management activities.
- Fire management programs and activities are economically viable, based on values to be protected, costs, and land and resource management objectives.
- FMPs and activities are based on the best available science.
- FMP's and activities incorporate public health and environmental quality consideration.
- Federal, state, tribal, local, interagency, and international coordination and cooperation are essential.
- Standardization of policies and procedures among federal agencies is an ongoing objective.

The fire management considerations, guidance, and direction should be addressed in the land

use resource plans such as the Comprehensive Conservation Plan (CCP). FMPs are step-down processes from the land use plans and habitat plans, with more detail on fire suppression, fire use, and fire management activities.

MANAGEMENT DIRECTION

Red Rock Lakes National Wildlife Refuge will suppress human-caused fires and wildfires that threaten life and property. The use of appropriate management response will be incorporated into the refuge's FMP to allow agency administrators the ability to choose from a full spectrum of fire suppression actions. Appropriate suppression actions, whether aggressive, high intensity, or low intensity actions, will be based on preplanned analysis and executed to minimize suppression costs, and resource losses consistent with land management objectives.

Wildland fire and prescribed fire, as well as manual and mechanical fuel treatments will be used in an ecosystem context to protect both federal and private property, and for habitat management purposes. Fuel reduction activities will be applied in collaboration with federal, state, private, and nongovernmental organization partners. In addition, fuel treatments will be prioritized based on the guidance for prioritization established in the goals and strategies outlined in the "U.S. Fish and Wildlife Services National Wildlife Refuge System Wildland Fire Management Program Strategic Plan 2003–2010" and "Region 6 Refuges Regional Priorities FY07 to FY11." For WUI treatments, areas with community wildfire protection plans (CWPPs) and "Communities at Risk" will be the primary focus. The settlement of Lakeview, Montana, located adjacent to the refuge, was identified as a "Community at Risk" in the Federal Register: August 17, 2001 (Volume 66, Number 160). Lakeview is being incorporated into a CWPP.

All aspects of the fire management program will be conducted in a manner consistent with applicable laws, policies, and regulations. Red Rock Lakes National Wildlife Refuge will maintain an FMP to accomplish the fire management goals described below. Wildland fire, prescribed fire, and manual and mechanical fuel treatments will be applied in a scientific manner under selected weather and environmental conditions.

FIRE MANAGEMENT GOALS

The goals and strategies of the U.S. Fish and Wildlife Service National Wildlife Refuge System Wildland Fire Management Program Strategic Plan are consistent with the U.S. Department of the Interior, and Service policies, National Fire Plan direction, the President's Healthy Forest Initiative, the 10-Year Comprehensive Strategy and Implementation Plan,

National Wildfire Coordinating Group Guidelines, initiatives of the Wildland Fire Leadership Council, and Interagency Standards for Fire and Aviation Operations.

The "Region 6 Refuges Regional Priorities FY07 through FY11" are consistent with the refuge's vision statement for region 6: "to maintain and improve the biological integrity of the region, ensure the ecological condition of the region's public and private lands are better understood, and endorse sustainable use of habitats that support native wildlife and people's livelihoods."

REFUGE FIRE MANAGEMENT GOALS

The goal of the refuge's fire management program is to work with our interagency partners to:

1. Suppress human-caused fires and wildfires that threaten life and property.
2. Reduce wildland fire risk to the community of Lakeview and other structures on public and private land through hazardous fuels reduction treatments.
3. Use wildland and prescribed fire, manual, and mechanical treatment methods to achieve habitat goals and objectives identified in this CCP using scientific techniques and adaptive resource management to monitor results.
4. Update the current (2002) "Fire Management Plan," incorporating fire management within an interagency fire management plan.

STRATEGIES

Strategies and tactics that consider public and firefighter safety as well as resource values at risk will be used. Wildland fire use and suppression, prescribed fire methods, manual and mechanical methods, timing, and monitoring are described in more detail within step-down FMPs.

All management actions would use wildland fire, prescribed fire, and manual or mechanical treatment methods to reduce hazardous fuels, restore and maintain desired habitat conditions, and control nonnative vegetation within the diverse ecosystem habitats. The fuels treatment program will be outlined in the FMP for the refuges. Site-specific prescribed fire plans will be developed following the "Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide" (2006) template.

Prescribed fire temporarily reduces air quality by reducing visibility and releasing components through combustion. The refuge will meet the Clean Air Act emission standards by adhering to the "Montana State Implementation Plan" requirements during all prescribed fire activities.

FIRE MANAGEMENT ORGANIZATION, CONTACTS, AND COOPERATION

Qualified fire management technical oversight for the refuge will be established by region 6, using the fire management district approach. Under this approach, fire management staff will be determined by established modeling systems based on the fire management workload of a group of refuges, and possibly that of interagency partners. The fire management workload consists of historical wildland fire activity, as well as historical and planned fuels treatments.

Depending on budgets, fire management staffing and support equipment may be located at the administrative station or at other refuges within the district and shared between all units. Fire management activities will be conducted in a coordinated and collaborative manner with federal and nonfederal partners.

Upon approval of this CCP, a new FMP for Red Rock Lakes National Wildlife Refuge will be developed in collaboration with interagency partners.

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