

# 6 Implementation of the Proposed Action (Draft CCP)



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*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  $348.1 \pm 13.4$  (mean  $\pm$  SE); with peak numbers over 800 individuals. The ponds now provide winter habitat for  $40.5 \pm 7.8$  swans,  $117.0 \pm 10.6$  ducks, and  $2.1 \pm 1.0$  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).



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*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



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*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> <sup>a,b</sup>	<i>Nesting Substrate</i> <sup>c</sup>	<i>Foraging Substrate</i> <sup>c</sup>
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

<sup>a</sup> Finch 1989

<sup>b</sup> Douglas et al. 1992

<sup>c</sup> 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



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*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**

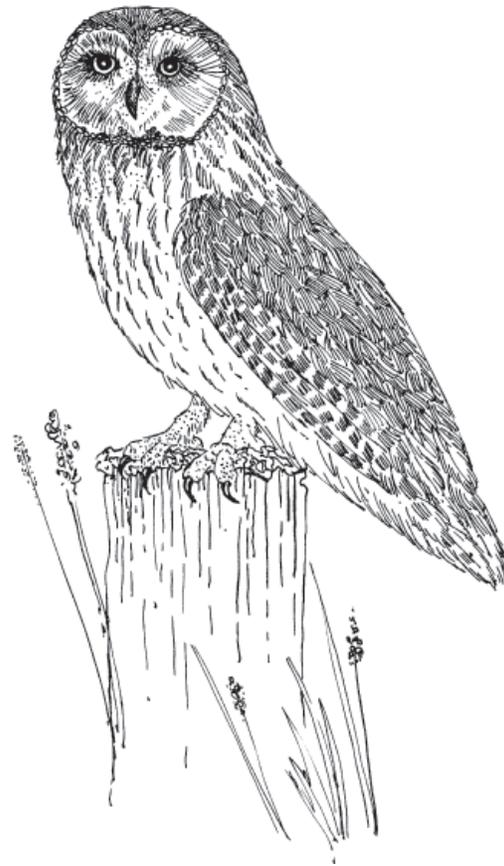
Provide structurally-complex native meadow, grassland, and shrub-steppe habitats, within a watershed context, for sagebrush-dependent species, upland-nesting migratory birds, rare plant species, and other resident wildlife. Appendix E contains the draft compatibility determinations for research and cattle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



*Short-eared owl*

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- 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.



USFWS

*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



*Western tanager.*

Mike Parker/USFWS

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



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*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.

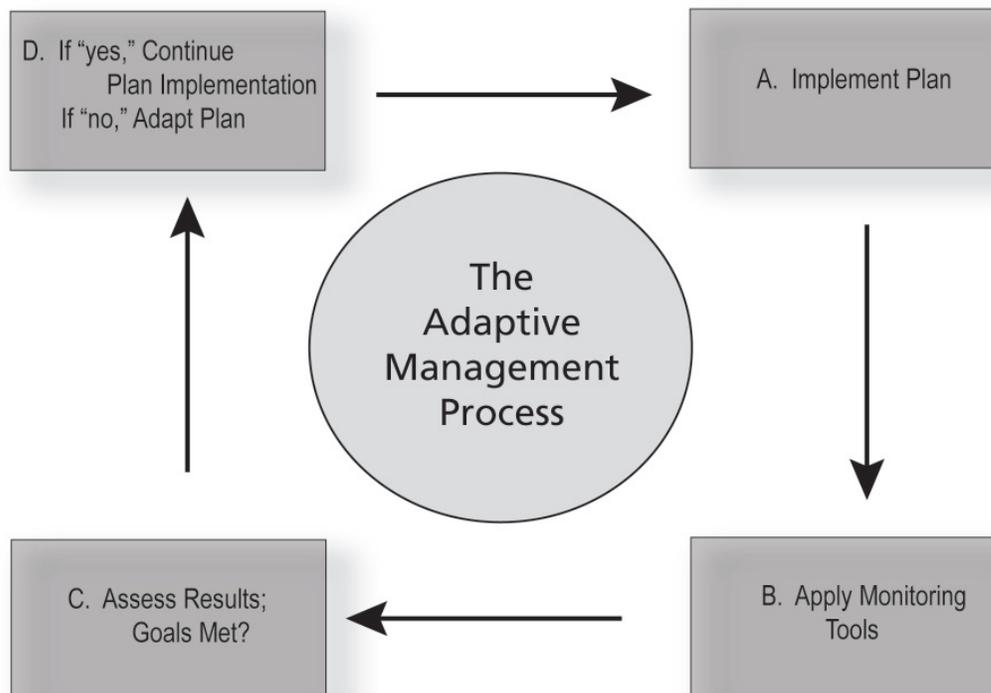
The first three components (goals, actions, and models) are largely defined before initiation of an ARM plan, while the latter two (monitoring and directed decision-making) comprise an iterative process, whereby each year the predictive ability of models are tested against what was observed during monitoring. 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.**

