

# Chapter 4—Management Direction



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*Greater sandhill cranes and other waterfowl forage on a cold spring morning at Monte Vista Refuge. Many birds begin migrating north in late February.*

This chapter describes the management direction for Monte Vista, Alamosa, and Baca Refuges. Chapter 1 contains a discussion of the issues addressed in this CCP.

## 4.1 Management Focus

We will approach management with an emphasis on maintaining or restoring the composition, structure, and function of the natural and modified habitats within the refuge complex. We will consider the ecological site characteristics and wildlife species needs on our refuge lands by developing sound and sustainable management strategies that preserve and restore ecological (biological) integrity, productivity, and diversity. We will apply strategic habitat conservation principles (a structured, science-driven, and adaptive approach; see chapter 1, section 1.3) in determining how to best manage our lands for native fish, wildlife, and plant species, with a particular emphasis on migratory birds, waterfowl, and declining or listed species. Compatible wildlife-dependent public uses will be enhanced and expanded to include all three refuges (figures 40, 41, and 42). Figures 43,

44, and 45 show the potential future habitat conditions for the three refuges. Refer to chapter 3, section 3.2 for maps of the current vegetation conditions for the three refuges. We will facilitate the protection, restoration, and conservation of important water resources through partnerships, public education, and stewardship.

## Habitat and Wildlife Resources

We will manage our natural and constructed wetland areas within the refuge complex to achieve a variety of wetland types and conditions. These wetlands will be managed to support a diversity of migratory birds and other wildlife, with a specific focus on surrogate and focal species that represent the Service's and other partners' larger conservation goals (refer to chapter 1, section 1.3). We will work to restore historical flow patterns through more effective water management practices and the continued use of prescriptive grazing, haying, and fire. We will prioritize the restoration of our riparian areas to improve habitat conditions for many species. We will place our highest priority on restoring riparian habitat along streams in the Baca Refuge as well as on

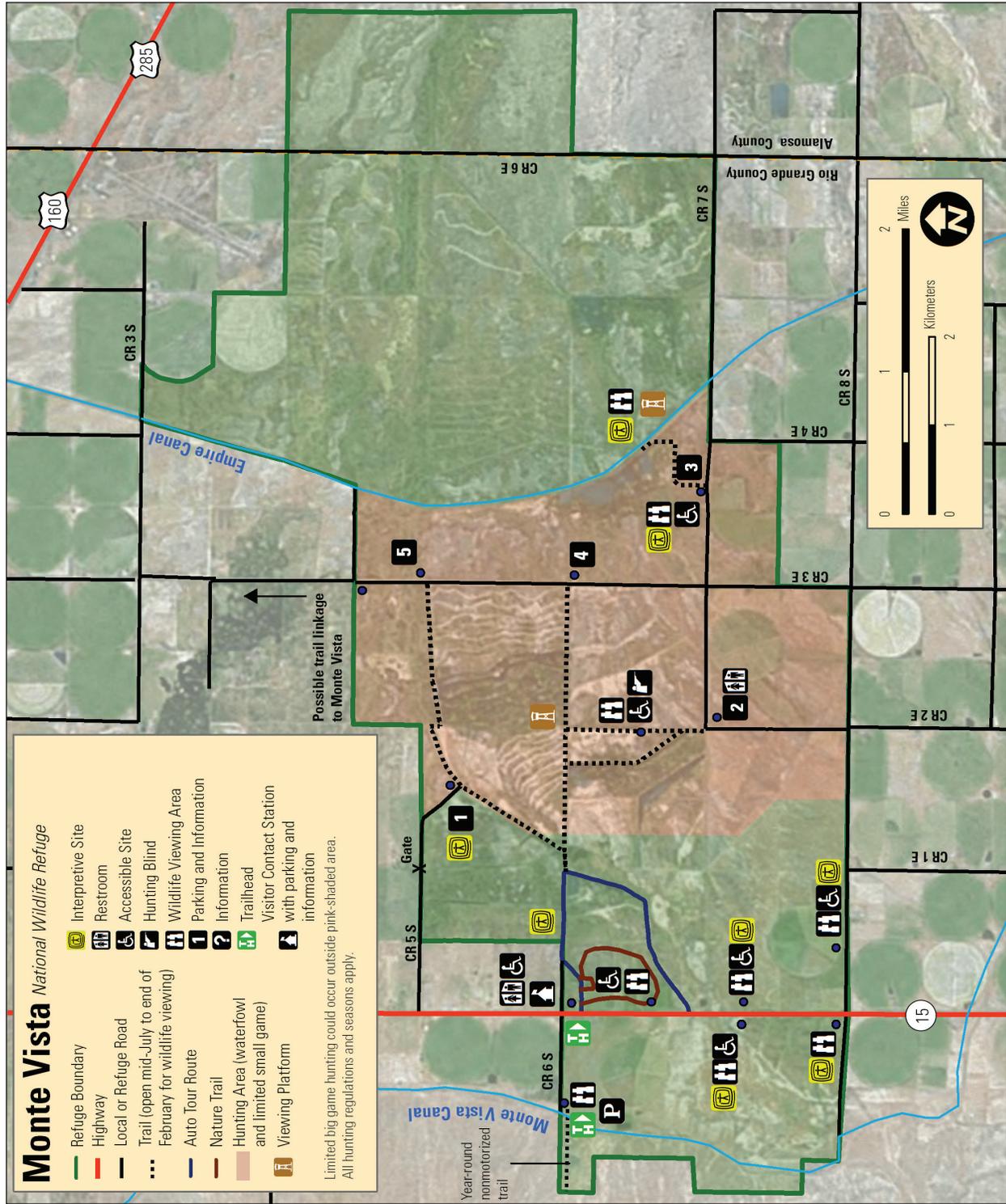


Figure 40. Management direction for Monte Vista National Wildlife Refuge, Colorado.

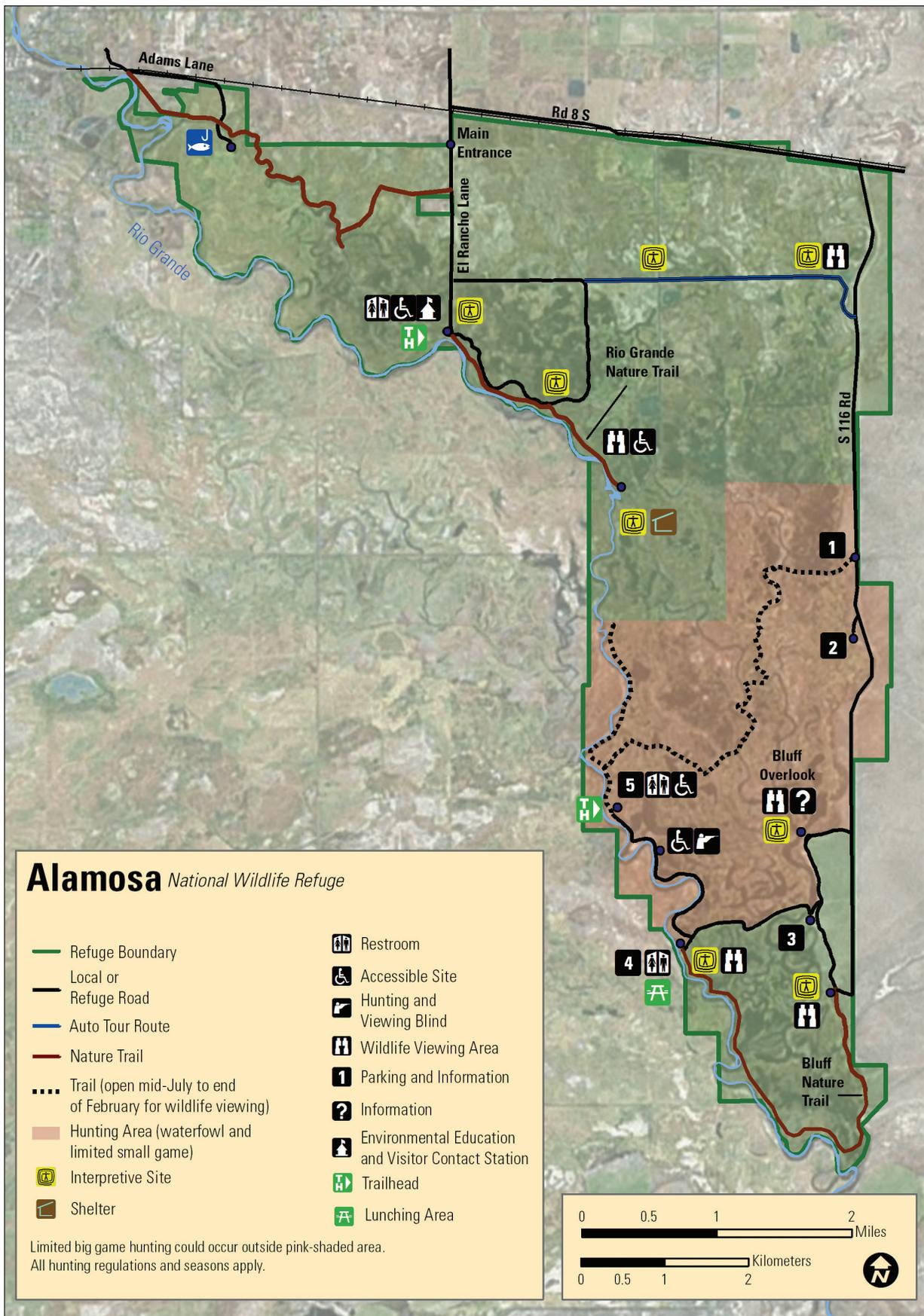


Figure 41. Management direction for Alamosa National Wildlife Refuge, Colorado.



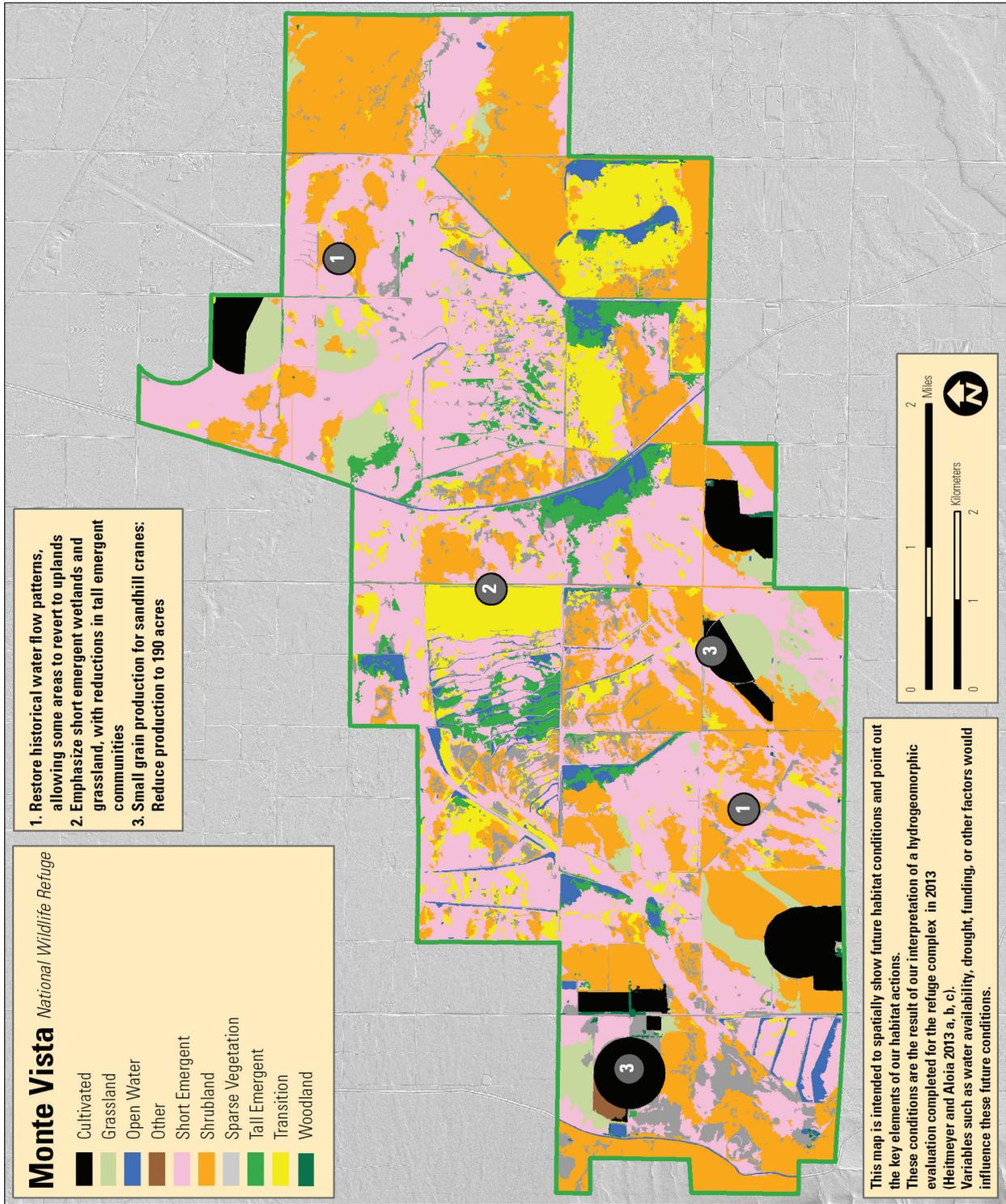


Figure 43. Map of the potential future habitat conditions for Monte Vista National Wildlife Refuge, Colorado.

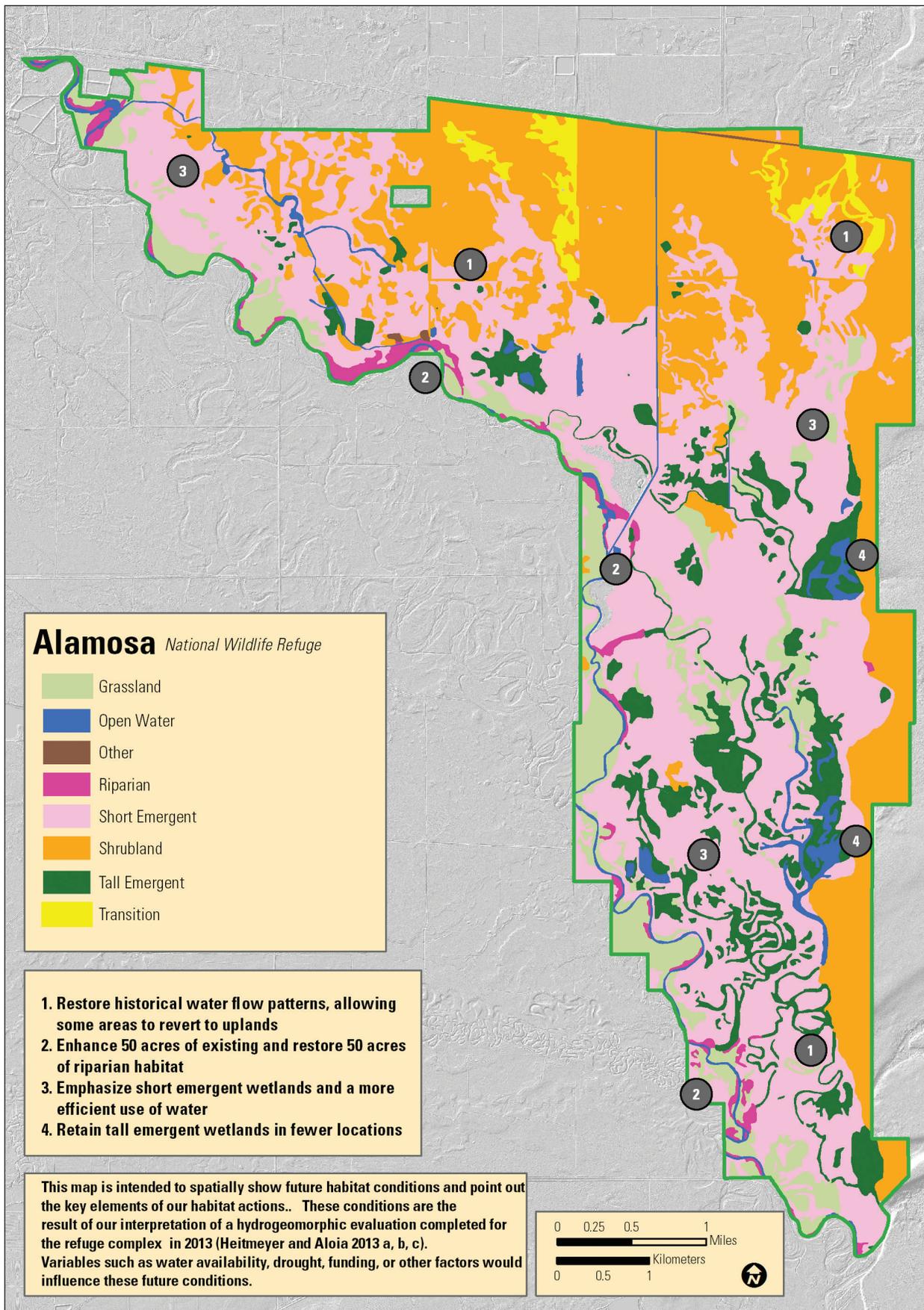


Figure 44. Map of potential future habitat conditions for Alamosa National Wildlife Refuge, Colorado.

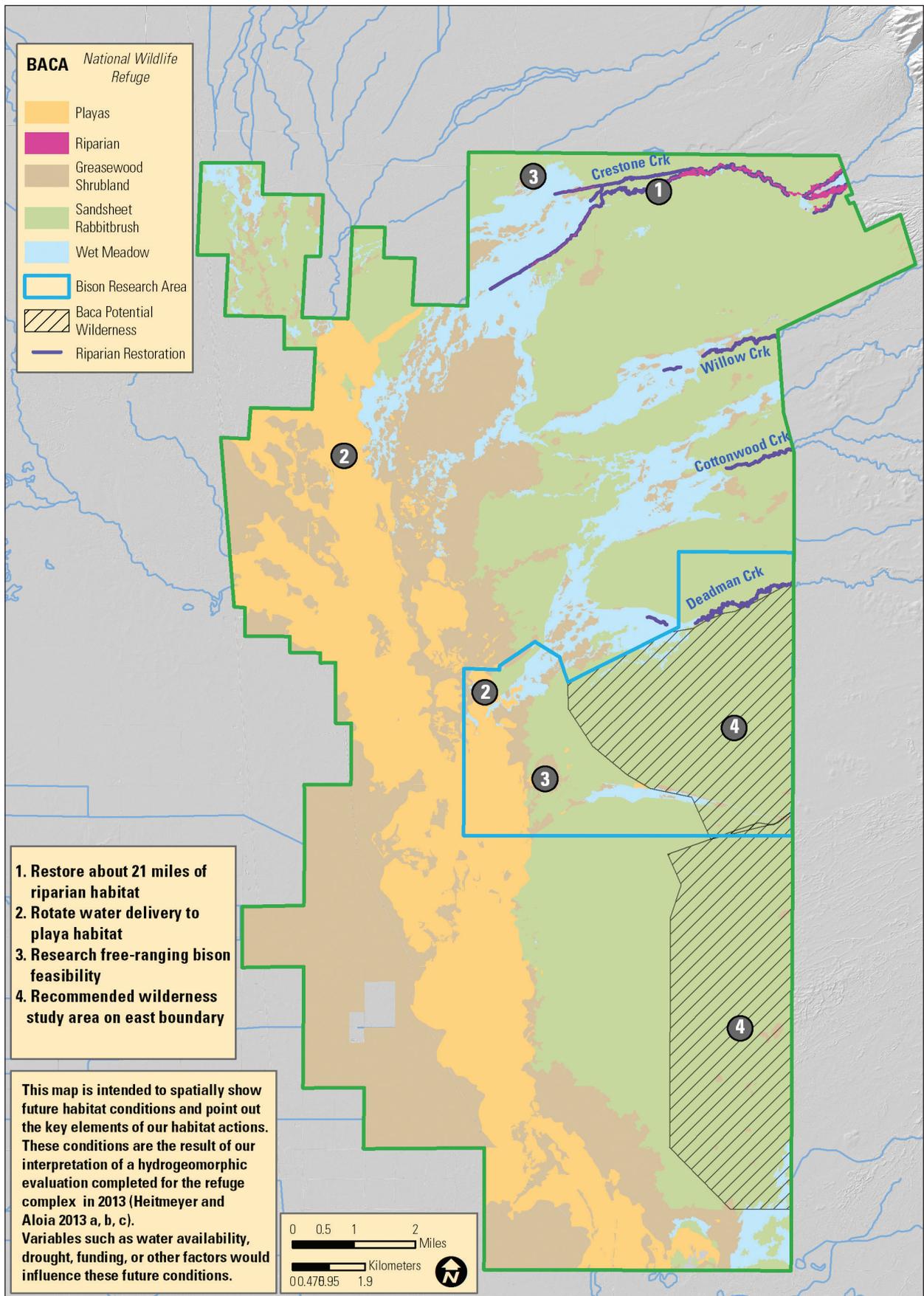


Figure 45. Map of potential future habitat conditions for Baca National Wildlife Refuge, Colorado.

off-channel sites along the Rio Grande on the Alamosa Refuge where soil and available water are conducive to restoring willow and cottonwood habitat. We will manage upland habitats to create a variety of seral stage conditions that provide habitat for a diverse array of wildlife species, particularly nesting and migrating focal birds.

We will use public hunting to complement the State's management, working together to keep elk populations at levels that will allow us to sustain healthy plant communities both in the refuge complex and on neighboring lands. This will include opening portions of the Baca Refuge to public hunting and opening parts of the Alamosa and Monte Vista Refuges to a limited public dispersal hunt. We will work with our partners (CPW, NPS, BLM, USFS, and other conservation organizations) to manage elk populations.

We will work with other Federal and State agencies as well as other conservation partners to improve habitats for threatened and endangered species and other species of concern. Particular focus will be on riparian areas, which are habitat for southwestern willow flycatcher, and creek systems, which are habitat for Rio Grande sucker and Rio Grande chub. In addition, habitats for other native species of concern such as Gunnison's prairie dog and northern leopard frog will be protected, restored, and enhanced where practical and necessary.

The existing arrangement with TNC for bison management on former State lands within the Baca Refuge will be phased out. Since bison are important to other stakeholders and partners, we will research the feasibility, potential, and suitability of using semi-free-ranging bison year-round to effectively maintain and enhance certain refuge habitats.

We will also use traditional prescriptive livestock grazing and haying to manage habitats within the refuge complex. We will continue to grow limited amounts of small grain on the Monte Vista Refuge (about 190 acres) to provide necessary food for the Rocky Mountain population of greater sandhill cranes, as specified in the management plan for the Pacific and central flyways for the Rocky Mountain greater sandhill cranes. Constant and consistent evaluation and monitoring of habitats will occur to make sure that objectives are being met.

Following the development of a comprehensive and integrated pest management plan, we will control and reduce the incidence of invasive weeds such as tall whitetop, Russian knapweed, Canada thistle, saltcedar, and reed canarygrass through more effective management and by using prescribed fire as well as chemical, mechanical, and biological control methods. We will make every effort to increase weed control in sensitive habitats or where there is a risk of weeds spreading to neighboring private land.

We will strengthen the fire program within the refuge complex by improving fire management planning and by increasing coordination with partners. Whenever possible, we will use prescribed fire and wildfire to help achieve our habitat management objectives, and we will conduct prescribed fires on a more consistent basis. We will pursue more funding to protect property and human safety under the wildland-urban interface guidelines, and, where possible, we will reduce the number of individual facilities that will require fire protection.

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## **Water Resources Goal**

We will continue to work with other landowners and agencies throughout the watershed to remain flexible as well as to protect and, if necessary, augment our water rights as State regulations evolve. Water quality standards will be established and studies will be initiated to help protect water rights; prioritize habitat management and planning; and develop concise water use reporting methods. Our ground water use will comply with new State ground water rules and regulations through augmentation plans or by working with others and contracting with ground water management subdistricts.

We will achieve our habitat management objectives while providing for quality visitor experiences and we will improve our water infrastructure, delivery, and efficiency to make sure that habitat objectives are met.

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## **Visitor Services Goal**

We will continue to offer hunting for waterfowl and small game on the Monte Vista and Alamosa Refuges. We will open the Baca Refuge for big and limited small game hunting, and we will offer public dispersal elk hunts and conduct limited big game hunting on the Monte Vista and Alamosa Refuges. This will provide recreational opportunities while enabling us to manage the numbers and distribution of elk. Access points and parking areas will be developed on the Baca Refuge (figures 40, 41, and 42).

General public access will be improved on the Monte Vista and Alamosa Refuges and established on the Baca Refuge.

On Monte Vista and Alamosa refuges, we will allow for more access for wildlife viewing and interpretation from about mid-July to the end of February on roads that are currently open only to hunters during hunting season. Modes of access such as cross-

country skiing and bicycling that facilitate wildlife-dependent uses could be considered.

Portions of the Baca Refuge will be opened for limited public use on several trails and tour routes, and nonmotorized access, including walking, biking, and limited horseback riding, will be allowed on several trails and tour routes. An auto tour route will be built on the Baca Refuge. During hunting season, the hunting areas (except archery) will be open to all members of the public.

The construction of more trails or viewing platforms on the Monte Vista and Alamosa Refuges will be considered. Limited commercial opportunities such as photography will be considered. We will seek funding to build a visitor center and refuge complex staff offices at either Monte Vista or Alamosa Refuge to better serve the public, provide for safer access to our offices, and provide a modern work environment for our employees. In coordination with our Friends group, we will continue to host the Kid's Fishing Day on the Monte Vista Refuge and work with the local Chamber of Commerce and others who host the Monte Vista Crane Festival. On Alamosa Refuge, we will provide for limited fishing access along the banks of the Rio Grande just above and below the Chicago dam. Additional fishing opportunities could be considered in the future.

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## Cultural Resources and Tribal Coordination Goal

We will increase our efforts toward identifying and protecting significant resources. We will explore opportunities to reach out to Native American tribes regarding their oral traditions and regional knowledge concerning the history of the San Luis Valley. This traditional knowledge could be used in planning, interpretation, and increased tribal interaction with the refuge lands and the refuge staff. Dialogue with the tribes about the continued reinterment of individuals on refuge lands through the NAGPRA process is anticipated and valued.

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## Partnerships and Refuge Complex Operations Goal

When the Baca Refuge was established under the Great Sand Dunes National Park and Preserve Act of 2000, operations funding did not come with the added management responsibilities and the added costs were borne by the refuge complex. In order to meet

our management objectives, we will seek more funding for habitat conservation, visitor services, and maintenance. Overall, refuge complex offices are inadequate and provide for little visitor contact. We will seek to increase our staff levels of both full-time and seasonal employees, as well as seek funding for safe access and accessible offices for our staff and visitors.

We will continue to collaborate with CPW and other agencies to effectively manage elk, which will result in an improved distribution across the refuges and the local game management units (GMUs).

We will continue to work closely with the San Luis Valley Interagency Fire Unit to achieve habitat management objectives while minimizing risk to sensitive habitats and human structures. We will seek funding for a more dependable prescribed fire program. We will develop working relationships with neighboring landowners, habitat partnership programs (HPPs), and others to address interface issues such as invasive species control, shared fence management, elk management, and other concerns.

The use of haying, livestock grazing, and other habitat management tools with an economic benefit will be managed through special use permits and will conform to all Service policies.

On the Baca Refuge we will work extensively with owners and developers of third party-owned mineral rights to find ways to reduce the effects of future exploration activities on visitors and wildlife and to locate exploration and production facilities away from visitors.

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## Research, Science, and Wilderness Review Goal

We will increase monitoring efforts to gain a better understanding of the effects of management actions on habitat conditions, wildlife populations, and water resources. We will also research the effects of climate change. We will recommend that about 13,800 acres along the southeastern boundary of the Baca Refuge be managed as a wilderness study area and be considered for eventual wilderness designation (refer to figure 47 in appendix F).

## 4.2 Objectives and Strategies

Objectives are concise statements of what needs to be achieved; how much, when, and where they will be achieved; and who will be responsible. To the extent possible, each objective has been developed to be SMART, or specific, measurable, achievable, results-oriented, and time-fixed (Adamacik et al. 2004). Objectives provide the basis for identifying strategies and evaluating success in meeting the goals. The rationale for each objective describes how and why the objective's actions are important for achieving the associated goal. Strategies are specific tools or techniques used to carry out the objectives.

Each goal title is listed below, followed by the associated objectives, rationale, and strategies.

### Organization of Objectives and Strategies

Objectives have been developed for each goal topic. Under each topic, there may be a number of subtopics or categories. For example, the habitat objectives are divided into the following areas: riparian, wetlands, playa wetlands, uplands, and transition areas. There are several specific categories related to wildlife management, such as for threatened and endangered species, focal bird species, greater sandhill cranes, and other species. Other subtopics are also included.

Objectives for visitor services; partnerships; refuge operations; cultural resources and tribal coordi-

nation; and research, science, and wilderness review are discussed under their respective goal headings. While the objectives are separated by the vision and goals that we set for the project based on our scoping process, these topics are closely interrelated and should not be thought of as distinct, separate goals.

The objectives are organized by the following goal headings:

- Habitat and Wildlife Resources
- Water Resources
- Visitor Services
- Cultural Resources
- Partnerships and Refuge Complex Operations
- Research, Science, and Wilderness Review

## 4.3 Habitat and Wildlife Resources

Habitat and wildlife resources on the refuge complex are diverse and varied. Important habitat types that are analyzed in this section are riparian habitats, various wetland habitats, playa wetlands (which are found predominantly on the Baca Refuge), and upland habitats. Although we generally discuss our management actions, such as grazing, invasive species control, haying, and mowing under each habitat type, we have separated out fire management and have included specific objectives for this topic. For wildlife resources, we have identified specific objectives for threatened and endangered species, sandhill cranes, focal bird species, and bison. While all wildlife species are important, we believe that the objec-



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*When wet, playa wetlands on Baca Refuge provide important foraging habitat for shorebirds and waterbirds.*

tives identified for each of these habitat types should help most of the species found on the refuge.

## RIPARIAN HABITAT

Riparian habitat is a plant community consisting of water-loving trees or shrubs, such as cottonwoods and willows and their associated understory, that is contiguous to a river, stream, or drainage. This type of habitat is found on the Alamosa and Baca Refuges. In fact, the name “Alamosa” is a Spanish word that refers to the once-extensive cottonwood groves in the region.

Riparian habitat provides nesting and foraging habitat for a large array of birds, including the endangered southwestern willow flycatcher. It is also one of the most degraded and limited habitat types in the western United States.

### Objectives for Riparian Habitat

We will restore the riparian community with native plants to provide quality habitat for birds, mammals, reptiles, and amphibians.

#### *Alamosa National Wildlife Refuge*

**Riparian Objective 1.** On the Alamosa Refuge, maintain and enhance a minimum of 50 acres of existing willow and cottonwood riparian habitat along the Rio Grande to help riparian species, with an emphasis on breeding songbirds.

**Riparian Objective 2.** By year 15, on off-channel sites, restore or establish a minimum of 50 acres of moderate to dense (>35 percent canopy cover) willow and cottonwood riparian habitat in locations where site conditions, including soil and available water (see figure 38 in chapter 3), will ensure long-term health, sustainability, and ecological function.

#### *Baca National Wildlife Refuge*

**Riparian Objective 3.** On the Baca Refuge, prioritize addressing ongoing degradation and encroachment of invasive species in riparian areas.

**Riparian Objective 4.** On the Baca Refuge, by year 15, maintain existing reaches of healthy riparian habitats, which are defined as those with dense and multilayered woody vegetation. Restore the reaches of riparian habitat along about 21 miles of the Crestone, Willow, Cottonwood, and Deadman Creek drainages that are considered to be in poor condition with scattered mature plants and small patches of very small (< 2 ft. tall) young willows and narrowleaf cottonwoods. Restoration potential will be based on hydrology, seedling regeneration, and other factors

(refer to figure 24 in chapter 3, which shows flow paths and potential riparian restoration areas). On average, achieve >35 percent canopy cover of about 15–30 feet wide to help riparian species, with an emphasis on breeding songbirds (see table 16, below, for the focal birds that use riparian habitats).

**Riparian Objective 5.** On the Baca Refuge, by year 15, achieve or maintain low browse levels (height of new growth each year exceeds browse height) by elk on >25 percent or 5 miles out of 21 miles of riparian corridors.

**Riparian Objective 6.** On the Baca Refuge, maintain hydrologic conditions (not dewatering streams; maintaining meanders; allowing sediment transport and position and allowing sufficient water to remain in creeks to support riparian vegetation growth and stream function) in creek channels and off-channel locations along 21 miles within the 4 creek drainages (refer to figure 24 in chapter 3).

**Rationale for Riparian 1–6.** Although riparian habitat occupies a small part of the land in western North America, it is disproportionately important for wildlife in general and birds in particular (Pase and Laysen 1977, Thomas et al. 1979, Szaro 1980).

The restoration, enhancement, and maintenance of riparian habitat is one of our highest priorities for the refuge complex because of its importance to neotropical migratory songbirds and other wildlife species. Riparian habitat provides nesting habitat for the southwestern willow flycatcher, a federally endangered species, and enhancing riparian habitat on the refuges will contribute toward the recovery efforts for this species. Maintenance, enhancement, and restoration efforts will focus on providing a riparian community that has a diversity of plant species, age classes, and structure, and that is resilient and sustainable over the long term. This is essential for the survival of wildlife species that use these habitats for nesting, foraging, migration, and movement corridors (Shafroth et al. 2000, Scott et al. 2003, and Skagen et al. 2005).

There appears to be an overall lack of recruitment and survival of young willows and cottonwoods along the Rio Grande on the Alamosa Refuge. Although elk are present on the Alamosa Refuge, they do not appear to be a dominant influence on willow and cottonwood growth and survival. Instead, we and Keigley et al. (2009) surmise that hydrology, rather than browsing, is the driving factor in willow and cottonwood establishment, growth, and survival. On the Alamosa Refuge, our efforts will be aimed at restoring a minimum of 50 acres of riparian habitat along the river and another 50 acres in off-channel areas.



FWS

Along many sections of the creek corridors on Baca Refuge, the riparian habitat is in poor condition, having few mature plants with only small patches of willow or cottonwoods.

Riparian restoration and enhancement opportunities have been identified on about 21 miles of riparian habitat on four of the five creeks on the refuge. Selection of these areas is based on several criteria, including hydrology, channel morphology, and existing and potential willow and cottonwood reproduction. We will also consider other in-stream modifications where appropriate, including inducing proper meandering, elevating the stream bed, and introducing cobble to provide substrate for phytoplankton growth for Rio Grande sucker and chub populations along Crestone Creek. We believe restoration of the riparian vegetation component will improve sinuosity, riffles, runs, pools and point bars; sediment transport and deposition; and the overall health of the active floodplain for these species.

One of the largest habitat constraints is the narrow width of the active floodplain where willow and cottonwood establishment and survival is possible. The dimensions, including width, length, and overall area, of woody riparian habitat are an important factor for many bird species (Darveau et al. 1993, Spackman and Hughes 1995). In general, the abundance of migratory birds is higher in the interior of riparian habitats, and species richness increases with the area or width of those habitats (Szaro and Jakle 1985, Stauffer and Best 1980, Dobkin and Wilcox 1986, Keller et al. 1993, Freemark et al. 1995). Because of

the morphological constraints such as the narrow floodplain, we will restore riparian habitat along all the creeks, achieving the greatest width possible (minimum 15–30 feet wide on average), and thereby providing habitat for many edge and interior bird species, while realizing that some area-sensitive and interior species may not find this configuration suitable.

#### **Strategies for Riparian 1–6.**

- Evaluate levels of ungulate, beaver, and porcupine browsing within willow and cottonwood habitats at least once every 3 years.
- Develop thresholds that will trigger increased management levels to prevent or reduce browsing.
- Use fencing to exclude browsing animals.
- In cooperation with the CPW, develop additional strategies, including elk dispersal and harvest.
- If needed, temporarily control beaver and porcupine.

- By year 3 of the CCP, establish a hydrologic monitoring plan and install ground water measurement devices.
- Within 3 years, begin a vegetation monitoring plan to assess the influence of hydrologic conditions on willow and cottonwood growth and survival.
- Plant willows and cottonwoods in suitable locations.
- Manage hydrologic conditions in creek channels and off-channel locations to the greatest extent possible to promote the regeneration, growth, and survival of willows and cottonwoods.
- Ensure that the timing, duration, frequency, and location of haying, mowing, and grazing activities do not negatively affect riparian areas.
- Employ wildland fire management actions (wildfire suppression and prescribed fire) to protect, enhance, or promote the regeneration and growth of riparian vegetation.
- Improve creek morphology to manage erosion and sediment transport and stop further channel incising.
- Monitor wildlife to document changes in wildlife use and possible correlations to changes in habitat quantity and quality.
- On the Baca Refuge, evaluate and monitor the native fish community in Crestone Creek and Willow Creek to determine how habitat conditions affect reproduction and survival (refer to objectives for Rio Grande suckers below).

## WETLANDS

Wetlands are broken out into several subcategories, including short-emergent and tall-emergent. Short-emergent species include spike rush, sedges, and Baltic rush; tall emergent species include phragmites, cattail, and bulrush. Existing vegetation classes for the three refuges are shown in figures 29, 30, and 31 in section 3.2 in chapter 3. Playa wetlands are discussed separately following tall and short emergent wetlands.

## Objectives for Wetlands

Our overall goal for wetlands is to provide and manage natural and constructed wetland habitat; mimic to the greatest extent possible natural hydrologic and disturbance regimes; promote sustainable native ecological communities; and provide habitat for waterfowl, shorebirds, rails, wading birds, and other wetland-associated wildlife. These objectives consider various habitat types found on the refuges; their current and future potential availability and condition; surrounding land-use practices; the amount of habitat loss and degradation that has occurred for various habitat types across the landscape (both locally and regionally); drought and availability of irrigation water; and a review of the needs of wildlife species. For declining species, we examined the limiting factors that are causing their declines.

Figures 43 and 44 show the potential future habitat conditions on the Alamosa and Monte Vista Refuges, and figure 45 shows potential future habitat conditions on the Baca Refuge. Variables such as water availability, drought, funding, and other factors could alter the acreage of each habitat type. The acreage identified in the objectives below reflects the future habitat conditions.

### *Alamosa and Monte Vista National Wildlife Refuges*

**Monte Vista Wetland Objective 1.** From mid-February through March (spring migration), depending on the availability of irrigation water, provide water to accomplish the following:

- Flood 25 percent (+/- 10 percent) of the 2,221 estimated maximum potential acres of short-emergent habitat to depths of <15 inches to provide foraging and pairing habitat for waterfowl as well as roosting habitat for sandhill cranes. Tolerance level of invasive plant species is ≤10 percent.
- Flood 25 percent (+/- 10 percent) of the 544 estimated maximum potential acres of tall-emergent habitat to provide foraging habitat for waterfowl.

**Monte Vista Wetland Objective 2.** From April through mid-June (nesting) and depending on the availability of irrigation water, provide water to accomplish the following:

- Flood 50 percent (+/- 10 percent) of the 2,221 estimated maximum potential acres of short-emergent habitat to depths of <15 inches to provide foraging and nesting habi-

tat for waterfowl, shorebirds, wading birds, and rails. Tolerance level of invasive plant species is  $\leq 15$  percent.

- Flood 60 percent (+/- 10 percent) of the 544 estimated maximum potential acres of tall-emergent habitat to provide habitat for nesting waterbirds such as colonial-nesting white-faced ibis, black-crowned night-herons, and snowy egrets as well as grebes and black terns.
- Flood 25 percent (+/- 10 percent) of the 1,095 estimated maximum potential acres of habitat dominated by inland saltgrass to depths of  $< 3$  inches for short durations ( $< 60$  days) to provide foraging and nesting areas for shorebirds.

**Monte Vista Wetland Objective 3.** From mid-June through August (brood rearing) and depending on the availability of irrigation water, provide water to accomplish the following:

- Flood about 250 (+/- 10 percent) acres annually of open water and tall-emergent habitat to provide brood rearing areas for waterfowl and waterbirds throughout the refuge.

**Monte Vista Wetland Objective 4.** In September and October (fall migration) and depending on the availability of irrigation water, provide water to accomplish the following:

- Flood 25 percent (+/- 10 percent) of the 2,221 estimated maximum potential acres of short-emergent habitat to depths  $< 15$  inches to provide foraging habitat for waterfowl as well as roosting habitat for sandhill cranes. Tolerance level of invasive plant species is  $\leq 10$  percent.
- Flood 25 percent (+/- 10 percent) of the 544 estimated maximum potential acres of tall-emergent habitat to provide foraging and pairing habitat for waterfowl.

**Alamosa Wetland Objective 5.** From mid-February through March (spring migration), provide water to accomplish the following:

- Flood 25 percent (+/- 10 percent) of the 5,528 estimated maximum potential acres of short-emergent habitat to depths of  $< 15$  inches to provide foraging and pairing habitat for waterfowl. Tolerance level of invasive plant species is  $\leq 10$  percent.

- Flood 25 percent (+/- 10 percent) of the 1,109 estimated maximum potential acres of tall-emergent habitat to provide foraging and pairing habitat for waterfowl.

**Alamosa Wetland Objective 6.** From April through mid-June (nesting) and depending on the availability of irrigation water, provide water to accomplish the following:

- Flood 50 percent (+/- 10 percent) of the 5,528 estimated maximum potential acres of short-emergent habitat to depths of  $< 15$  inches to provide foraging and nesting habitat for waterfowl, shorebirds, wading birds, and rails. Tolerance level for invasive plant species is  $\leq 10$  percent.
- Flood 60 percent (+/- 10 percent) of the 1,109 estimated maximum potential acres of tall-emergent habitat to provide habitat for nesting waterbirds.
- Flood 25 percent (+/- 10 percent) of the 216 estimated maximum potential acres of transition habitat (dominated by inland saltgrass) to depths of  $< 3$  inches for short durations ( $< 60$  days) to provide foraging and nesting areas for shorebirds.

**Alamosa Wetland Objective 7.** From mid-June through August (brood rearing) and depending on the availability of irrigation water, provide water to accomplish the following:

- Flood about 300 acres (+/- 10 percent) annually of open water and tall-emergent habitat to provide brood-rearing areas for waterfowl and waterbirds.

**Alamosa Wetland Objective 8.** In September and October (fall migration) and depending on the availability of irrigation water, provide water to accomplish the following:

- Flood 25 percent (+/- 10 percent) of the 5,528 estimated maximum potential acres of short-emergent habitat to depths of  $< 15$  inches to provide foraging habitat for waterfowl. Tolerance level for invasive plant species is  $\leq 10$  percent.
- Flood 25 percent (+/- 10 percent) of the 1,109 estimated maximum potential acres of tall-emergent habitat to provide foraging habitat for waterfowl.

**Rationale for Wetlands 1–8.** The refuge complex supports a diversity of wetland types, including ephemeral wetlands interspersed with native shrublands, seasonal wetlands, semipermanent wetlands such as oxbows and abandoned channels along the Rio Grande, and created wetlands that can be managed to mimic different wetland types. Collectively, these wetland areas support a range of habitat types, including open water, tall emergent, short emergent, saltgrass, and bare mudflat. Each of these habitats provides resources such as invertebrates, plant foods, and cover in unique combinations that are important for meeting the needs of focal species. Maintaining and restoring the integrity, productivity, function, and long-term sustainability of these wetland types on the refuges is of principal importance.

Hydrology is the single greatest driver of wetland function, including nutrient cycling and plant community dynamics (Mitsch and Gosselink 2003, Euliss et al. 2004, Laubhan et al. 2012). Wetland communities on the refuges are influenced greatly by the timing and availability of surface water. Under natural conditions, hydrology was highly dynamic, varying seasonally and annually, with most water available during spring and early summer from snowmelt and runoff from the surrounding mountains. Most wetlands have typically dried up by fall in most years, although deeper wetland depressions may have had semipermanent water regimes during wet years or when ground water levels were high. As a result, native wildlife species are adapted to and depend on the resources provided by wetland habitats influenced by a dynamic hydrologic regime. Habitat-based objectives and strategies therefore focus on maintaining or mimicking natural hydrologic regimes, both spatially and temporally, with the assumption that if the integrity of the system is maintained or restored, the key resources required by wildlife species will be provided.

Significant changes to the land surface and hydrology have occurred on all three refuges, both before and after refuge establishment. The most extensive changes have been on the Monte Vista and Alamosa Refuges, where water and habitat management activities have emphasized waterfowl production and associated hunting opportunities. After long-term monitoring of nesting waterfowl on the Monte Vista Refuge revealed that certain areas, primarily those characterized by dense stands of Baltic rush, exhibited extremely high densities of nesting waterfowl (Gilbert et al. 1996), significant attempts were made to create these conditions elsewhere across the Monte Vista and Alamosa Refuges. Numerous levees and ditches were constructed and water control and diversion structures were installed with the goal of maximizing the amount of flooded acres to create dense stands of Baltic rush. However,

much of this occurred irrespective of soil types and other abiotic considerations (FWS 1962) and, as a consequence, plant communities on the refuges were greatly degraded.

We believe that the water management regime that has occurred over the last 30 years on the Monte Vista and Alamosa Refuges cannot continue to maintain the integrity, productivity, and function of many of the wetland habitats. This is especially true given the continued and dynamic climatic variations; anticipated changes in Colorado State water law (ground water rules and regulations) that may affect the future volume and timing of water availability on the refuges; and declining flows in the Rio Grande (Rich Roberts, personal communication with Pete Striffler, February 13, 2013) resulting from drought, depletions, and a changing climate. As a result, many wetland habitats are not likely to continue to provide the resources necessary to support migrating and nesting populations of waterfowl.

In order to ensure that the wetland habitats on the refuges are ecologically resilient to climatic and hydrologic changes, the proposed objectives and strategies are intended to maintain the integrity and persistence of all wetland types and to provide food and cover for a diversity of waterfowl, waterbirds, and other wildlife species (refer to figures 43 and 44, which show the potential future habitat conditions). While this approach involves the restoration of natural hydrologic patterns and corresponding native vegetation types in some areas, not all artificially created wetland habitats will be returned to historical conditions. Many of these areas will be artificially maintained because these created habitats provide resources such as food and cover that are required by a wide array of wildlife species. These areas will be continually evaluated to determine their long-term sustainability and productivity. However, other areas may require modifications to current infrastructure to facilitate water management that best mimics natural hydrologic regimes.

Invasive weed control in wetland habitats continues to be a top priority for the refuge complex. Little information exists about the effects of low densities of invasive weeds across large wetland complexes. While more research is needed, we believe that once infestations cover more than 15 percent of a wetland basin or densities exceed 20 stems/meter<sup>2</sup>, detrimental effects are most likely occurring to wetland habitat quality. At these densities, we will aggressively control weed infestations using a combination of tools such as prescriptive grazing; prescribed fire; haying and mowing; and herbicide application.

**Strategies for Wetlands 1–8:**

- Maintain existing surface and ground water rights.
- Continue to evaluate water management infrastructure needs to facilitate water management that mimics, to the greatest extent possible, natural hydrologic conditions.
- Following evaluation, alter or install water management infrastructure as needed to facilitate the delivery and maintenance of waterflow in natural flow paths and created wetlands.
- Following evaluation, change obstructions such as roads, ditches, and levees that significantly alter surface and subsurface waterflows.
- Manage hydrology to restore native shrublands and saltgrass habitats in suitable locations.
- Manage the timing, duration, and volume of water in natural flow paths and created wetlands that mimic, to the greatest extent possible, natural hydrologic regimes to restore and maintain wetland function, productivity, and sustainability. Use information available on life cycle requirements of focal species to guide management decisions.
- In addition to managing hydrology, use a combination of treatments such as prescribed fire, grazing, and haying to provide a diversity of vegetative structure for foraging, roosting, and nesting birds.
- Use management treatments such as seasonal flooding, prescribed fire, prescribed grazing and haying, and herbicides to promote native plant communities and reduce and control invasive plant species.
- Continue to provide wetland mitigation for the Closed Basin Project following the Fish and Wildlife Coordination Act Report and subsequent agreements (Coordination Act). Evaluate the use of mitigation water in other wetland areas to meet wildlife management objectives while complying with the Coordination Act.

**Baca National Wildlife Refuge**

**Short Emergent Objective 1.** Over 15 years, use flood and sub-irrigation on 70–80 percent of irrigable acreage, of which about 8,329 acres fluctuates annually based on snowpack levels in the Sangre de Cristo Mountains, to maintain and improve graminoid (grasses) health. Where degradation is occurring or is anticipated to occur such as from invasive species, low live-to-dead ratios, or low-stem density levels, take proactive or corrective actions.

**Rationale for Short Emergent 1.** Many changes have occurred to land and water management in the San Luis Valley and at the Baca Refuge during the last century. The original Baca Land Grant Number 4 that now encompasses much of the refuge had its first water right decreed by the State in 1869, followed by dozens of decreed water rights associated with the principal creeks. These water rights were transferred to the Service when the Baca Refuge was established in 2003. As water rights were established on this property and others around the valley, significant hydrological changes occurred after the installation of diversions, ditches, water control structures, and wells, which allowed for the artificial expansion of hay meadows, grasslands, and the short-emergent habitat type overall. However, with the downtrend in water availability, refuge resources are now invested in maximizing the efficiency of refuge irrigation practices. Therefore, because refuge managers are also using scarce surface water to irrigate other habitat types such as riparian habitat and playa wetlands, attempting to maximize short-emergent vegetation is more difficult.

One of our goals is to focus available refuge resources on applying irrigation water effectively and efficiently to areas where short-emergent wetlands occurred historically. A hydrogeomorphic analysis completed for the Baca Refuge in 2013 provides a context to understand the physical and biological formation, features, and ecological processes of lands on the refuge and in the surrounding region (Heitmeyer and Aloia 2013b). This research may help refuge managers in their efforts to restore the natural patterns and processes of this short-emergent habitat while continuing to irrigate other wetland habitat types such as riparian habitat and playa wetlands. Figure 45 shows what the potential future habitat conditions could be like.

Our major management priority is to maintain and improve the health and vigor of short-emergent native vegetation. The productivity and stability of this plant community is supported through the regeneration and growth of native graminoids. The use of flood and sub-irrigation can promote dense

stands of native graminoids, but can also promote the growth of undesirable invasive plants such as Canada thistle and tall whitetop, especially in areas where the vigor of native plants has been compromised. Invasive weeds reduce the health of this plant community, so efforts will continue to control and eradicate weed populations. Proactive efforts will be taken to prevent extreme buildups of decadent vegetation through grazing, prescribed fire, and mowing and haying. When surveys of this habitat type show that live stem density is in significant decline, and when live-to-dead ratios of graminoids decrease beyond suitable conditions for wildlife, managers will begin corrective actions, and new growth of native plants will be encouraged by reducing or removing decadent vegetation.

### **Strategies for Short Emergent 1:**

- Using historical soil and vegetation maps, use available refuge resources to focus water application efforts on areas where this habitat type occurred naturally. Actively divert water to flood the uppermost reaches of the creek drainages within the refuge. In the middle reaches of the creek drainages, leave water in the natural channels to provide sub-irrigation to adjacent vegetation. Since the lower reaches of the creek systems will receive little supplemental irrigation, portions of these areas will likely change to grassland.
- Use management treatments such as flooding, prescribed fire, prescribed grazing and haying, and herbicides to promote native plant communities and reduce and control invasive plant species.
- Map the distribution of weeds on the refuge. Continue to investigate weed control methods, including integrated pest management strategies, and monitor weed control efforts.

**Short Emergent Objective 2.** Use flood irrigation to inundate 50–70 percent of the potential irrigable acreage to a depth of ≤6 inches to promote conditions suitable for nesting shorebirds such as Wilson’s phalarope. For example, if the surface water supply will allow for flood irrigation on 8,000 acres, then 4,000–5,600 acres will be shallowly flooded.

**Rationale for Short Emergent 2.** Short-emergent habitat can provide valuable nesting ground for shorebirds such as Wilson’s phalarope. Previous studies have shown that Wilson’s phalarope uses the short-emergent vegetation in and around wet mead-

ows for nesting (Bent 1962, Colwell and Oring 1990, Stewart 1975). Prior studies on bird use of this habitat on the Baca Refuge have shown that more research was needed to document species presence and preferences with regards to nesting (Murphy 2009; Dieni 2010a, 2010b). In 2013, a small-scale study was started on the presence of nesting species in this irrigated habitat type. This research showed that the two most common nesting waterbird species in the short-emergent vegetation on the Baca Refuge were red-winged blackbird and Wilson’s phalarope. Less common species included Wilson’s snipe, mallard, teal, and American avocet. Various ground-nesting songbirds also reproduced in the upland edges and islands next to irrigated areas. Nationwide trends from the North American Breeding Bird Survey show that red-winged blackbird numbers have been in decline over the past 40+ years, while phalarope numbers appear to be more stable (Sauer et al. 1997). On a more local scale, numbers of both red-winged blackbirds and Wilson’s phalaropes are in decline. From the limited research that has been conducted on nesting waterbirds on the Baca Refuge, it appears that continuing to provide short-emergent habitat will help these species. Nesting habitat characteristics vary widely for Wilson’s phalarope (Dechant et al. 2003), but on the refuge, nests were most commonly found in irrigated meadows where live vegetation was <4 inches in height at the beginning of the growing season and little to no residual vegetation was present. Red-winged blackbird nests were also common in the irrigated meadows regardless of management treatments. Studies such as these are necessary to document the value of this habitat type for native, nesting birds, and to collect baseline data on the refuge’s breeding bird species. Further research is necessary, especially with regard to habitat choice of birds under various management treatments.

### **Strategies for Short Emergent 2:**

- In addition to managing hydrology, use a combination of treatments such as prescribed fire, grazing, and haying to provide a diversity of vegetative structure for foraging, roosting, and nesting birds.
- Rely on biological consultants, seasonal staff, interns, students, or volunteers to have sufficient resources to continue research efforts.
- Expand research to collect more information related to habitat use by native birds and quantify use of short emergent habitat, including spatial relationships of nests to topographical and water features, estimates

of plant species richness and diversity, invertebrate abundance and diversity, and landscape-level influences such as weather and overall availability of habitat.

- Monitor and evaluate effects of management on wildlife species, particularly native birds and their habitats.

**Short Emergent Objective 3.** Maintain dry conditions on 10–20 percent (832–1,666 acres) of this habitat type to help upland ground-nesting passerines such as horned larks, Savannah sparrows, vesper sparrows, and western meadowlarks.

**Rationale for Short Emergent 3.** In 2011 and 2012, we conducted research to gain baseline knowledge on the importance of non-irrigated, dry meadow habitat for ground-nesting native passerines on the Baca Refuge. Species such as horned larks, Savannah sparrows, vesper sparrows, and western meadowlarks are common on the Baca Refuge, and they use dry meadows for nesting and raising their young. Research shows that population trends for horned larks, Savannah sparrows, vesper sparrows, and western meadowlarks have been in overall decline for the past 40+ years across the country. (Sauer et al. 2012). According to the same study, on a more local scale, horned lark and western meadowlark numbers are in decline, while local numbers of Savannah and vesper sparrows are stable or rising. Dry meadows on the refuge may provide important breeding habitat for these species, and using tools such as prescribed fire, grazing, and haying will provide a matrix of suitable habitat conditions for these species.

#### **Strategies for Short Emergent 3:**

- Direct flood irrigation away from selected areas so they will be intentionally left dry.
- Use a combination of treatments such as prescribed fire, grazing, and haying to reduce encroachment of woody vegetation and provide a diversity of vegetative structures for foraging, roosting, and nesting passerines.
- Monitor and evaluate effects of management on wildlife species and their habitat.

**Short Emergent Objective 4.** Develop and advance research on native wildlife (emphasizing migratory birds), their habitats, and the effects of management practices on a minimum of 5–10 percent (about 416–833 acres) of this habitat type.

**Rationale for Short Emergent 4.** Vegetation within the short-emergent habitat type is similar across the refuge complex in that certain plant species are common and have a wide distribution. Graminoids such as Baltic rush, common spikerush, woollyfruit sedge, field sedge, and various native grass species are dominant; forbs that commonly occur include silverweed cinquefoil, wild mint, blunthead yellowcress, wild iris, and false dandelion (FWS 2005, Dieni 2010b). Many factors also exist that cause heterogeneity within this plant community, affecting plant species composition, diversity, structure, regeneration, relative abundance, and distribution. This heterogeneity may be attributable to features and processes within this habitat type that include past management actions, differing topographical patterns, varying hydroperiods, soil conditions and type, occurrence of invasive plants, and vegetative conditions ranging from decadent to vigorous. We are interested in learning how these factors affect native wildlife species, and if there are ways to influence these factors to promote conditions that will improve wildlife productivity and reduce conditions that are not beneficial for wildlife. Previous research conducted at the refuge has been insufficient in addressing this variability and correlating it to habitat use by native wildlife, so future research efforts will emphasize these topics.

#### **Strategies for Short Emergent 4:**

- Work with the refuge inventory and monitoring program to acquire resources that will allow for collection of baseline information that relates to refuge management concerns, such as ground water levels, vegetation assemblages and condition, and wildlife species.
- Rely on professional biological consultants, seasonal staff, interns, students, and volunteers to have sufficient resources to continue research efforts.
- Monitor and evaluate effects of management on the plant community and wildlife species.

### **PLAYA WETLANDS**

Playas are shallow, temporary bodies of water with clay substrates that lie in the lowest point of a closed watershed; their hydrological inputs are typically limited to precipitation and extremely localized surface runoff. Within the refuge complex, playa habitat is found primarily in the western portions of the Baca Refuge. Playas provide important foraging habitat for migrating and nesting waterbirds because of their macroinvertebrate populations.

## Objectives for Playa Wetlands

### *Baca National Wildlife Refuge.*

**Playa Objective 1.** Adaptively rotate delivery of 20-30 percent of all available surface water directly to the playa habitats from four different input points a minimum of once every 3 years from one or more creeks annually to provide playa habitat during as much of the spring migration and summer nesting periods as possible for waterbirds and shorebirds.

**Rationale for Playa 1.** Playa habitat has likely experienced the greatest amount of modification and degradation of all wetland habitat types, including riparian habitat, in the San Luis Valley. The only remaining functioning playa habitat in the San Luis Valley is on the Blanca Wetland Habitat Area and Russell Lakes State Wildlife Area, where hydrologic inputs come primarily from artesian wells.

Playa wetlands serve as important reservoirs of biodiversity (Haukos and Smith 1994). Although wildlife species such as waterfowl, passerines, and amphibians rely on playa habitat for breeding and foraging, shorebirds are perhaps the most dependent on these saline wetlands. Throughout North America, shorebird numbers have experienced declines (in some cases >70 percent) in the last 40 years (Howe et al. 1989, Page and Gill 1994, Brown et al. 2001, Fellows et al. 2001, International Wader Study Group 2003). The importance of playa habitat to shorebirds for migration and breeding has been well documented, especially in the Playa Lakes Region and Southern Great Plains (Reeves and Temple 1986; Davis and Smith 1998; Brown et al. 2001; Conway et al. 2005a,b; Andrei et al. 2006). Although the San Luis Valley does not receive as many migrant shorebirds as other areas such as the Great Basin and Playa Lakes Region, playas within the San Luis Valley still provide important migration habitat for many shorebird species. For example, the Blanca Wetland Habitat Area is a significant migration stop-over for Baird's sandpiper, Wilson's phalarope, and American avocet. During migration, shorebirds select wetlands that offer sparse vegetation, mudflats, and shallow water where foraging conditions are favorable (Weber and Haig 1996, Davis and Smith 1998). In addition to providing needed resources for migrating shorebirds, playas are extremely important nesting areas for many shorebirds (Conway 2001, Conway et al. 2005a).

The current source of water for the playa habitats on the Baca Refuge is the creeks originating in the Sangre de Cristo Mountains, and water availability is dependent on the timing, duration, and volume of spring snowmelt. Consequently, water application to



*Great Plains toads are found on the refuge complex.*

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the playas may not coincide with spring shorebird migration. Peak shorebird migration in the San Luis Valley in the spring is typically during the first two weeks of May (S. Swift-Miller, personal communication). During the years when we will apply water to the playas, water will be delivered as early as possible using ditches and bypassing wet meadows in the attempt to create optimal conditions during as much of the spring migration as possible. This will also create conditions that are suitable for shorebirds and other waterbirds that breed in playa habitats in the San Luis Valley. During summer, conditions should be suitable for nesting Wilson's phalarope, which is a species of high concern under the U.S. Shorebird Conservation Plan; American avocet, which is a species of moderate concern under the plan; killdeer, which is a species of moderate concern under the plan; and black-necked stilt, which is a species of low concern under the plan.

During years when water is successfully applied to playa habitats, refuge staff will maintain suitable hydrologic conditions for as long as possible and water will not be diverted to other locations or habitats before the creeks cease flowing during summer (during the irrigation season) as annually determined by the Colorado Division of Water Resources Division Engineer. In other playa areas when playas dried too early, there was a decrease in shorebird nesting success. Conway et al. (2005a,b) found that the loss of surface water by the middle of June resulted in abandonment of nests (particularly by American avocets) and the discontinuation of nesting by shorebirds in playas. As surface water disappeared, playa habitats changed as the amount of dry mudflat with vegetation increased, effectively reducing potential brood rearing grounds. The duration of surface water also influences invertebrate abun-

dance, diversity, and community structure in wetlands (Neckles et al. 1990, Batzer and Resh 1992). Because invertebrates provide needed food for shorebird survival and reproduction, all attempts will be made to maintain the longest hydroperiod possible.

During years when water is delivered to the playas, some wet meadow habitats will remain dry because there will not be an adequate volume of water within the creek drainages for both the wet meadow habitat and the playa habitat during the same year. Therefore, following drought cycles in these habitats is essential for maintaining long-term productivity and overall wetland health.

#### **Strategies for Playa 1:**

- When available, divert water to specific playas for approximately 4 months.
- Work with BOR to better understand how irrigation of playa wetlands affects local ground water recharge and water supply for the Closed Basin Project.

### **UPLANDS**

Dominant upland species include rabbitbrush and greasewood. This native vegetation type occurs on all the refuges in the refuge complex as well as on an estimated 30 percent of the San Luis Valley.

#### **Objectives for Upland**

For all the refuges in the complex, we will provide and manage shrub and grassland habitat, mimicking to the greatest extent possible natural hydrologic and disturbance regimes, to promote sustainable native ecological communities and provide habitat for songbirds and other wildlife species.

#### **Alamosa and Monte Vista National Wildlife Refuges**

**Upland Objective 1.** Enhance and maintain habitat diversity for migrating and breeding songbirds such as Brewer's sparrow, sage thrasher, and loggerhead shrike, and treat from 35 percent to 50 percent of the total estimated 3,667 acres of upland shrub habitat on the Monte Vista Refuge by incorporating disturbances such as prescribed fire and grazing.

**Upland Objective 2.** Within 1–2 years, begin restoration on a minimum of 50 acres of artificial wetlands on the Monte Vista Refuge by phasing out irrigation of these areas. By year 10–15 of the CCP, achieve 20–30 percent shrub cover and less than 10–15 percent invasive weeds in these areas.

**Upland Objective 3.** Within 2–3 years, begin restoration on a minimum of 100 acres of retired farmland on the Monte Vista Refuge. By year 10–15 of the CCP, achieve 20–30 percent shrub cover and less than 10–15 percent invasive weeds in these areas.

**Upland Objective 4.** Enhance and maintain habitat diversity for migrating and breeding songbirds and treat from 35 percent to 50 percent of the estimated 2,696 acres of upland shrub habitat on the Alamosa Refuge by incorporating disturbances such as prescribed fire and grazing into these habitats.

**Upland Objective 5.** Within 1–2 years, begin restoration on a minimum of 100 acres of artificial wetlands on the Alamosa Refuge by phasing out irrigation of these areas. By year 10–15 of the CCP, achieve 20–30 percent shrub cover and less than 10–15 percent invasive weeds in these areas.

**Upland Objective 6.** Within 2–3 years, begin restoration on a minimum of 100 acres of areas of retired farmland on the Alamosa Refuge. By year 10–15 of the CCP, achieve 20–30 percent shrub cover and less than 10–15 percent invasive weed cover in these areas.

**Rationale for Upland 1–6.** Although the Alamosa and Monte Vista Refuges are known for their wetland resources, these wetlands are part of a mosaic that includes upland (predominantly shrublands). While many of these upland areas have remained relatively undisturbed, some areas have been greatly altered by past management. In attempts to expand wetlands (primarily short-emergent wetlands), many areas of native shrubland habitat were inundated, which created hydric conditions on soil types that did not naturally support wetland plant growth. While wetland vegetation can persist in some of these created wetland areas if sufficient amounts of water are available, other areas have not become established because the volume, timing, and duration of water is insufficient and abiotic factors such as soils are not conducive to the formation of wetlands.

These artificially maintained wetlands rely on more water than is currently available and tend to be susceptible to nonnative invasions when only intermittently wetted. Thus wetland habitat quality is low to marginal and invasive weeds, particularly tall whitetop, readily become established. There is not sufficient water available to maintain quality wetland vegetation, and these areas are largely infested with invasive weed species. Therefore, we will return these areas to native shrubland communities. Within 10–15 years, we will restore a minimum of 50 acres of native upland on the Monte Vista Refuge and a minimum of 100 acres on the Alamosa Refuge by adjust-

ing irrigation practices, incorporating disturbances such as fire and grazing, and selectively applying herbicides and other integrated pest management techniques to these areas.

Some created wetlands will be maintained where there is sufficient control over the volume, timing, and duration of water to maintain productivity and wetland function over the long term. Many of these areas provide specific resources to meet life cycle requirements of wetland-dependent animals. For example, although much of management unit 9 has been irrigated to convert native upland habitat to wetlands, in the past this area has consistently supported a greater density of nesting waterfowl than any other region in North America (Gilbert et al. 1996). Between 1964 and 1990, this area averaged 2,381 nests per square mile with minimal additional management needed. Portions of management units 19 and 20 have also been converted from native shrubland to wetland habitat. Because these areas are some of the most important and heavily used roosting areas for migrating sandhill cranes, they will be maintained.

Portions of native upland habitat on the Monte Vista and Alamosa Refuges were converted to farmland for the purpose of growing crops such as small grains and alfalfa. Much of this farmland has been retired, and the current vegetation in these areas consists primarily of annual and perennial invasive weeds such as tall whitetop and Russian knapweed. By employing various management strategies, we will restore native upland communities on a minimum of 100 acres of retired farmland on the Monte Vista Refuge and 50 acres on the Alamosa Refuge.

Restoration of upland habitats will be a top priority. This includes many created wetland areas as well as former farmland areas. We will reduce the number and extent of invasive weeds and promote the establishment, spread, and health of native shrubs and herbaceous species. In addition to the areas identified for restoration, there are thousands of acres of existing native upland habitat on the refuges which will be maintained and enhanced. However, management of the existing upland communities on the refuges, as compared to other habitat types, may be more limited because the structure and composition of these uplands are greatly affected by abiotic factors that we have no control over. For example, soil type, soil chemistry, and precipitation largely determine the species and density of this community.

Native upland communities tend to be dynamic and most likely require periodic disturbance, such as fire and grazing, to remain healthy and productive. Wildlife species using upland habitats are adapted to changes in short- and long-term environmental conditions. Managing for diverse vegetation types in the upland community will result in greater biodiversity

of animal species, including insects, in this habitat. Our strategies, including prescribed fire, grazing, and hydrologic conditions, will mimic, to the greatest extent possible, natural disturbance regimes. By using these management actions periodically, we will provide a diversity of age classes and structure of shrubs as well as maintain or promote understory herbaceous vegetation to make sure that songbird nesting, brood rearing, foraging, and migration needs are met. Many of the songbird species found in the upland habitats on the refuges have experienced population declines throughout their range (Robbins et al. 1986, Askins 1993, Sauer et al. 1997).

### ***Baca National Wildlife Refuge***

Baca Refuge has several subclasses of upland habitat (see figure 31, chapter 3) including greasewood shrubland, sandsheet rabbitbrush, and the unique shrub–grass component (transition habitat), which consists of large homogenous stands of rubber rabbitbrush with a grass understory and which is influenced by the adjacent wet meadows.

**Upland Objective 7.** To enhance habitat diversity for migrating and breeding songbirds, treat from 35 percent to 50 percent of the estimated 51,790 acres of greasewood shrubland and sandsheet rabbitbrush on the Baca Refuge by incorporating disturbances such as fire and grazing into these habitats. Maintain the diversity of the upland component by mimicking the natural disturbance regimes to create a variety of structural habitat conditions for breeding songbirds such as loggerhead shrikes, sage thrashers, Brewer's sparrows, vesper sparrows, and western meadowlarks.

**Rationale for Upland 7.** In addition to enhancing the greasewood shrubland and sandsheet rabbitbrush components through the use of a variety of management tools, we will select areas in the shrub–grass habitat and create disturbances of different types, sizes, frequencies, and intensities to create a matrix of different ages and densities. The promotion of diversity within this habitat is expected to have positive effects on its overall productivity, stability, and sustainability.

The shrub–grass habitat type shares characteristics with the sandsheet rabbitbrush, short-emergent, and grassland habitat types. Rabbitbrush shrubs are the dominant mid-sized plant, and these are generally taller and have denser crowns than those found in the upland type. These shrubs respond well to disturbance and readily establish on disturbed areas on lands affected by fire or grazing. Their presence does not exclude other herbaceous species, and seed



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*The Brewer's sparrow is a rare grassland focal bird that will benefit from the conversion of the shrubgrass (transition grass) to more of the sandsheet rabbitbrush habitat type.*

germination and viability are generally high. Rabbitbrush can reach maturity in 2–4 years, and its lifespan is usually between 5–20 years (McArthur and Taylor 2004). Herbaceous vegetation occupies the understory in shrub-grass areas, and includes a variety of species such as alkali sacaton, inland saltgrass, and Baltic rush. Shrub-grass areas receive sub-irrigation from adjacent flood-irrigated short-emergent habitats, and promoting more heterogeneity within shrub-grass areas will likely provide habitat for both shrub- and grassland-nesting birds. Poole (1992) found that loggerhead shrike nesting territories contained patchy mosaics of tall shrubs and grass or sand openings. In shrubsteppe and desert grassland, western meadowlarks prefer low shrub density and cover, patchy vegetative structure, varying heights of shrubs and forbs, and high coverage levels of grass, forbs, and litter (Lanyon 1962, Rotenberry and Wiens 1980, Wiens and Rotenberry 1981, Wiens et al. 1987, McAdoo et al. 1989, and Knick and Rotenberry 1995). In Nevada and Oregon, Wiens and Rotenberry (1981) found that vesper sparrows preferred areas with a diversity of plant structural types.

#### **Strategies for Upland 1–7 (All Refuges):**

- Continue to collect grazing, haying, and water lease fees in accordance with Region 6 policies.
- Monitor for small mammals as an indicator of upland health.
- If needed, limit visitor use to reduce the spread of invasive species.
- Continue control of invasive weeds and integrated pest management using a variety of tools such as grazing and biological, chemical, and mechanical controls. We will continue to work in partnership with others to reduce weed infestations.
- Manage hydrology in a way that mimics, to the greatest extent possible, natural hydrologic conditions that will have existed on each site.
- Plant or seed native shrub and grass species on retired farmland areas.
- Carry out all prescribed fire activities under an approved and current fire management plan that conforms with DOI and FWS policies.
- Use a combination of treatments, such as rest, prescribed fire, herbicides, grazing, and mowing to reduce and control invasive weed species.
- Study songbird use of native shrub and grassland communities.
- On the Alamosa and Monte Vista Refuges, limit water on upland areas by diverting it to flow paths.
- On the Alamosa and Monte Vista Refuges, remove the roads that promote impoundment of water. Remove obsolete water control structures and levees in former uplands.
- On the Baca Refuge, control invasion of rabbitbrush into shrub-grass communities as necessary.
- On the Baca Refuge, use a wide range of disturbance types, intensities, and frequencies to maintain or improve upland habitats based on existing community conditions. These disturbances may include prescribed fire, grazing, chemicals, and mowing. Study the short- and long-term effects of these disturbances and how they influence wildlife and overall habitat health.
- On the Baca Refuge, continue to irrigate adjacent meadows to promote subirrigation of shrub-grass areas, which is likely a major



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*Managing for diverse vegetation types in the upland community will benefit a variety of grassland birds.*

influence on density and coverage levels of herbaceous vegetation in this habitat type.

- On the Baca Refuge, determine how strategic, short-term changes in meadow irrigation affect adjacent shrub-grass areas.
- On the Baca Refuge, monitor the effects of habitat management actions on Gunnison's prairie dog populations and adjust irrigation practices, reduce invasive species, or enhance habitat as necessary. Work with partners to conserve the prairie dog population by monitoring for disease and reducing the risk of disease such as sylvatic plague. Techniques could include using experimental methods to reduce the risk, such as vaccine-laden bait. Enhance prairie dog habitat through noxious weed control, planting native plants, or eliminating water irrigation in existing prairie-dog habitat.
- On the Baca Refuge, map distribution of slender spiderflower and determine the primary factors that contribute to its presence within this habitat type.

## WILDFIRE

### Objectives for Wildfire

#### *All Refuges on the Complex*

**Wildfire Objective 1.** Follow all wildland-urban interface (WUI) guidelines and reduce potential damage to private property and loss of human life from wildfires on refuge lands.

**Rationale for Wildfire 1.** For years, refuge staff and rural fire protection districts have been concerned about the high fuel load on the Alamosa and Monte Vista Refuges and the nearness of homes and other structures. This concern was heightened in 2003 with the creation of the Baca Refuge, which is adjacent to the Baca Grande Subdivision and downhill and upwind from the town of Crestone. The subdivision alone contains approximately 1,200 homes scattered through grassland and piñon and juniper woodlands. These concerns were identified and discussed in an assessment of the WUI issues for each refuge (Greystone Environmental Consultants 2004).

#### **Strategies for Wildfire 1:**

- Minimize the construction of new facilities that will increase WUI obligations on the refuge.
- Maintain fire breaks on refuge lands where it is critical to human health and safety to contain wildfire or prescribed fire on refuge land.
- Explore other funding opportunities to conduct wildfire prevention projects in WUI areas.
- Evaluate WUI issues as part of wilderness review.
- Pursue hiring more staff to develop a burn monitoring program and detailed burn criteria in an effort to better understand the effects of prescribed fire and to better use fire in meeting management objectives.
- Work with the San Luis Valley Interagency Fire Management Unit, the State, counties, rural fire protection districts, municipalities, and landowners where needed to jointly address WUI concerns on refuge boundaries.

- Improve public education and interpretation about the interface between wildlands (refuge) and the urban environment.
- Hire a staff member dedicated to coordinating fire planning, implementing projects, and serving on an interagency resource team.
- Allow wildfires to be managed for multiple objectives as appropriate within the refuge complex and the fire management plan.

**Wildfire Objective 2.** Conduct research and a literature review to better understand fire's role in the environment of the refuge complex, especially in regard to land use development, climate change, and refuge mission and purposes.

**Rationale for Wildfire 2.** We do not know a lot about the plant communities or the frequency and extent of wildfires before Euro-American development in the San Luis Valley, so we do not have a baseline for restoring ecological processes such as fire. The effect of wildfire on plant communities is not well understood, which limits our ability to manage fire for the benefit of the refuge complex.

#### **Strategies for Wildfire 2:**

- Institute a monitoring program to assess ecological effects of all wildfires within the refuge complex.
- Use volunteers, students, contractors, or staff to conduct in-depth literature reviews of wildfire effects across various habitat types.

**Wildfire Objective 3.** Increase involvement with interagency partners including rural volunteer fire departments and develop new memoranda of understanding.

**Rationale for Wildfire 3.** Given the substantial investment that the USFS and BLM have made in wildfire suppression resources in the San Luis Valley and the geographic proximity of these other public lands to the refuge complex, it makes economic and operational sense that we integrate our wildfire suppression needs with these agencies. The Alamosa and Monte Vista Refuges have had a long history of relying on their respective rural fire protection districts for the initial attack on wildfires. Recent formation of the Baca Grande Fire Protection District offers opportunities for other partners to assist with initial attack on any wildfires on the Baca Refuge. In 2010,

we entered into an agreement under the National Service First authority with the USFS, BLM, NPS, and the State of Colorado to share resources to support wildfire suppression and conduct prescribed fire operations. This agreement provides an excellent tool for us to achieve this objective, including integration with rural fire protection districts.

#### **Strategies for Wildfire 3:**

- Continue active involvement with the San Luis Valley Interagency Fire Management Unit.
- Annually review memoranda of understanding with the Alamosa and Monte Vista Rural Fire Protection Districts and use agreements to increase involvement of volunteers in the Incident Command System and their associated qualifications so these individuals and departments can be reliably used in wildfire response and prescribed fire programs.

### **WILDLIFE MANAGEMENT: THREATENED AND ENDANGERED SPECIES — SOUTHWESTERN WILLOW FLYCATCHER**

One endangered species is found on the refuge complex, the southwestern willow flycatcher.

#### **Objectives for Southwestern Willow Flycatcher**

##### **Alamosa National Wildlife Refuge**

**Southwestern Willow Flycatcher Objective 1.** Contribute to the recovery goals as described in the southwestern willow flycatcher recovery plan of 2002.

**Southwestern Willow Flycatcher Objective 2.** By year 5, maintain and enhance a minimum of 50 acres of existing suitable habitat (dense patches of willow or flowing water) on the Alamosa Refuge, and by year 10-15, restore or establish a minimum of 25-50 acres of suitable habitat at locations off the main channel of the Rio Grande.

**Rationale for Southwestern Willow Flycatcher 1-2.** The southwestern willow flycatcher is a small neotropical migrant whose breeding habitat is restricted to relatively dense stands of trees and shrubs in riparian ecosystems in the arid southwestern United States (FWS 2002). Concern about the southwestern willow flycatcher on a range-wide scale became a

focus when Unitt (1987) described declines in flycatcher abundance and distribution throughout the Southwest. The southwestern willow flycatcher was listed as federally endangered in 1995 (FWS 1995). At that time, the distribution and abundance of nesting individuals, their natural history, and areas occupied by breeding southwestern willow flycatchers were not well known and only 359 breeding territories among 30 sites were known to exist (Sogge et al. 2003). Since that time, thousands of presence and absence surveys have been conducted throughout the historical range of the flycatcher. As a result of these efforts, in 2007 the population was estimated at approximately 1,300 territories distributed among approximately 280 breeding sites (Durst et al. 2008). Surveys conducted on the Alamosa Refuge in 1996 and 1997 documented 29 territories. In the early 2000s, the number of documented territories began to decline, coinciding with a decline in habitat quality (see below), and by 2004, there were only 5 territories in the same survey areas (refuge files). By 2010, the number of documented territories had declined to 3. In 2013, critical habitat was designated, encompassing 8,345 acres of the Alamosa Refuge (FWS 2013b), which included the entirety of the riparian corridor along the Rio Grande as well as off-channel areas.

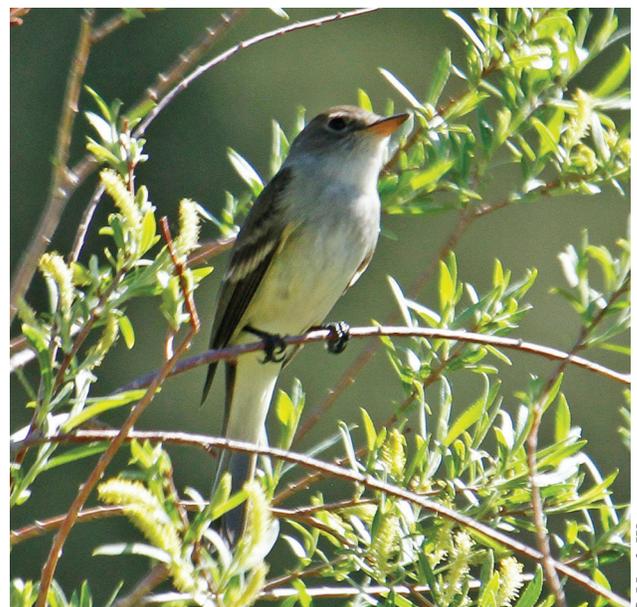
The greatest factor in the decline of the southwestern willow flycatcher is the extensive loss, fragmentation, and modification of riparian breeding habitat (FWS 2002). Habitat losses and changes have occurred and continue to occur as a result of urban and agricultural development, livestock grazing, water diversion and impoundment, stream channelization, and human disturbance (Marshall and Stoleson 2000, FWS 2002).

Hydrological changes, especially those that are human induced and long term, such as altered river flows due to water diversion as well as lowering of ground water tables due to withdrawals, can negatively affect breeding flycatchers because of deleterious effects to riparian habitat quality and extent as well as a reduction in prey availability. On the Alamosa Refuge, riparian habitat suitable for southwestern willow flycatcher has been severely degraded, especially in the last 10 years. There appears to be a current lack of recruitment and survival of young willows and cottonwoods, and refuge staff as well as Keigley et al. (2009) surmise that hydrology, rather than browsing, is the current driving factor in the lack of willow and cottonwood recruitment, growth, and survival. It is anticipated the willow community will eventually adjust to the lowered water table by moving to lower elevations that are nearer the water table.

Prior to refuge establishment in 1963, the Alamosa Refuge was a working cattle ranch. Conse-

quently, it is presumed that livestock grazing within the riparian corridor likely had a negative influence on willow and cottonwood regeneration, growth, and survival. Since the establishment of the Alamosa Refuge, livestock grazing within the riparian corridor has been minimal to non-existent in at least the last 20 years. Although elk numbers on the Alamosa Refuge have grown from occasional animals before 1998 to approximately 450 in the late 2000s, they do not appear to be a dominant influence, except in localized areas, on willow and cottonwood growth and survival (Keigley et al. 2009) along the Rio Grande.

In 2000, the New Ditch diversion dam on the main stem of the Rio Grande completely washed out because of high river flows. As a result, water was no longer artificially backed up immediately upstream of the dam and river levels, along with the corresponding water table, fell. Refuge staff noted almost immediate mortality in many willows within this reach, presumably as a result of water tables dropping below the root zone of these willows. Shortly after, the extremely low snow pack in 2002 resulted in the worst drought year on record and river flows in the Rio Grande were virtually non-existent throughout much of the Alamosa Refuge. In 2003, another extreme drought year, river levels continued to remain low. As a result, there was a significant level of mortality of riparian vegetation throughout all reaches of the Rio Grande on the Alamosa Refuge, presumably because water tables declined below the root zone. Although drought is a natural event, the effects are compounded by human-induced alterations in the hydrology of the Rio Grande because of upstream water diversions, bank stabilization proj-



*The southwestern willow flycatcher is an endangered species found on Alamosa Refuge.*

ects, water storage, and ground water pumping. As a consequence, hydroperiods and flow volumes have been altered to such an extent that regeneration and survival of riparian vegetation on the Alamosa Refuge has been negatively affected, even during years of average or above average snow pack. Furthermore, river morphology, sediment transport, formation of point bars, lateral movement of the river bed, and other factors have also been affected by these hydrologic changes. These factors have dramatically reduced the areas suitable for seed deposition and germination, creating a further decline in the natural regeneration of riparian vegetation.

Because the alterations upstream in the Rio Grande as well as the hydrology of the Rio Grande are beyond our control, management strategies will primarily involve using existing water rights to irrigate (via water diversion from irrigation canals), in the most practicable manner and to the greatest extent possible, existing areas of suitable southwestern willow flycatcher habitat to maintain and enhance the quality and integrity of riparian vegetation on about 50 acres on the Alamosa Refuge.

Although habitat characteristics such as plant species composition, size and shape of habitat patches, canopy structure, vegetation height, and vegetation density vary across the range of the willow flycatcher, suitable habitat usually consists of dense vegetation in the patch interior, or an aggregate of dense patches (Sogge et al. 2010). These dense patches are often interspersed with small openings, open water, or shorter and sparser vegetation, creating a mosaic that is not uniformly dense. Southwestern willow flycatchers nest in patches as small as 0.25 acres and as large as 173 acres, with a median patch size of 4.5 acres (FWS 2002). Nest sites typically have dense foliage from the ground level up to approximately 13 feet above ground (Sogge et al. 1997, Sogge et al. 2010). Of particular importance is the presence of slow-moving or still surface water or saturated soil at or next to breeding sites (Sogge et al. 2010).

In addition to maintaining or enhancing existing willow flycatcher habitat along the main stem of the Rio Grande on the Alamosa Refuge, efforts will begin to restore or establish another 50 acres of suitable habitat on off-channel sites. Restoration efforts will consider the habitat qualities and configurations described above, as well as provide open water next to or interspersed within habitat patches. Areas selected for these efforts will consider water management capabilities, soil type, and other factors.

In consideration of the special management actions that may be needed to maintain the integrity of flycatcher habitat (FWS 2013b), visitor use on the existing Rio Grande walking trail as well as any proposed new trails will be restricted to on-trail use to

reduce disturbance to birds, especially during migration, nesting, and fledging periods. We will inform visitors using these trails about the effects of human disturbance on southwestern willow flycatchers and how they can reduce disturbance through certain actions or behaviors.

### **Strategies for Southwestern Willow Flycatcher 1–2:**

- At least once every three years throughout the life of the CCP, evaluate levels of wild ungulates and other wildlife species browsing within willow and cottonwood habitats.
- If browse surveys show that browse levels are preventing plants from reaching full stature, employ techniques such as fencing or, in cooperation with CPW, develop an adaptive management plan which may include elk dispersal and harvest as well as the temporary control of beavers and porcupines.
- Establish a hydrologic monitoring plan and install ground water measurement devices to study ground water levels.
- Develop a vegetation monitoring plan to assess the influence of hydrologic conditions on willow and cottonwood growth and survival.
- Plant willows and cottonwoods in suitable locations.
- Manage hydrologic conditions within riparian habitats along the Rio Grande and off-channel locations to the greatest extent possible to promote the regeneration, growth, and survival of willows and cottonwoods.
- Carefully manage and monitor agricultural practices in or next to riparian habitats.
- Manage, control, and use fire to enhance or promote the regeneration and growth of vegetation.
- Improve the morphology of the Rio Grande to manage erosion and sediment transport and stop further channel incising.
- Monitor southwestern willow flycatcher populations to document changes in habitat use and possible correlations to changes in

habitat quantity and quality as well as visitor use of existing and proposed trails.

- Restrict visitors to on-trail use along the Rio Grande walking trail and proposed trails within riparian habitats.
- As necessary, use signs, seasonal closures, trail and road rerouting, or other measures to limit and reduce potential disturbance in areas where there is active restoration of willow and cottonwood riparian habitat.
- Inform visitors using methods such as visitor contacts, signage, and information pamphlets about how they can reduce disturbance to southwestern willow flycatchers during migration, nesting, and fledging periods.
- Ensure compliance (Section 7 consultation) with the Endangered Species Act for any disturbance (mechanical or human) within areas designated as critical habitat.
- Monitor southwestern willow flycatcher nests to determine if rates of parasitism by brown-headed cowbirds are of concern and if cowbirds need to be controlled.

### SANDHILL CRANES

This applies only to the Monte Vista Refuge, where we have provided small grains for migrating sandhill cranes and waterfowl.

## Objectives for Sandhill Cranes

### *Monte Vista National Wildlife Refuge*

**Sandhill Crane 1.** In support of the Pacific and Central flyway population goals for sandhill cranes, continue to support about 18,000-20,000 greater sandhill cranes from the Rocky Mountain population and 5,000-6,000 lesser Canadian sandhill cranes by producing adequate agricultural grains (up to 190 acres depending on rotation and water availability) for fall and spring migration on the Monte Vista Refuge.

**Sandhill Crane 2.** Over 15 years, provide adequate roost habitat by shallowly flooding (less than 15 inches) traditional crane roost areas.

**Rationale for Sandhill Crane 1–2.** For centuries, the San Luis Valley has been an important migratory staging area for sandhill cranes as they migrate from their wintering grounds in New Mexico to their

breeding grounds to the north. In addition to providing roost habitat for roosting, loafing, and foraging sandhill cranes, the refuge's agricultural fields provide essential food supplies in the spring when they are limited elsewhere in the San Luis Valley. Sandhill cranes have changed how and when they use the San Luis Valley due in part to the many alterations in the quantity and quality of wintering and migratory habitat. Cranes and other wildlife have adapted to the current condition of the landscape, which is dominated by agriculture and other human practices. It is believed that there were historically more shallow water wetlands throughout the San Luis Valley, which provided a matrix of potential feeding sites (Drewien and Bizeau, 1974). Under current conditions there may not be enough wetlands in the San Luis Valley to provide the amount of natural food required by the more than 20,000 cranes that visit the area as there was in the past. It is also thought that cranes historically migrated through the valley later in the spring when more wetlands had thawed and invertebrates were more abundant. Currently, sandhill cranes migrate in February when most wetlands are frozen and cannot support invertebrate populations, but plant foods from the fall may still be available. Almost the entire Rocky Mountain population of greater sandhill cranes and several thousand lesser and Canadian sandhill cranes are now dependent on agricultural foods during their spring and fall migration. In the spring, these birds must replenish fat reserves to complete the migration to the breeding grounds and begin breeding efforts.

**Sandhill Crane 3.** Within 1-5 years, initiate a research study to determine the amount of waste grain and standing grain available to foraging spring migrating sandhill cranes on private lands and on the Monte Vista Refuge and determine how changes in farming practices on private lands are affecting cranes during their spring migration.

**Rationale for Sandhill Cranes 3.** Because of lack of consistent water availability and to take advantage of strategic restoration of historic water flows where possible, there will be small reductions in the acreage for grain production (refer to figure 43). Recent changes in water regulations for the San Luis Valley are likely to require augmentation of groundwater use and could affect the amount of small grain produced in the San Luis Valley over the next 15 years. As the cost of using ground water for irrigation of agricultural crops increases as a result of augmentation requirements, it is anticipated that there may be a greater reduction in the acres of small grains produced as private farmers make even greater shifts to more profitable crops such as alfalfa. Because little data exists regarding the current availability of

waste grain on private fields, and the anticipated changes that may occur in the near future, we will initiate a research study to determine whether the amount of waste grain available in private fields, coupled with the barley production on the Monte Vista Refuge, is adequate to meet the energetic demands of sandhill cranes migrating through the San Luis Valley in the spring.

### **Strategies for Sandhill Crane 1–3.**

- Continue to assess the amount and distribution of food for sandhill cranes in the San Luis Valley and plan the refuge farming program in response. In addition, work with the agricultural community to monitor changes in farming practices that may influence food availability for sandhill cranes.
- Explore the feasibility of providing more native foods for sandhill cranes in the spring and fall.
- Use livestock grazing, prescribed fire, and no-till drill, and control invasive species with chemicals and herbicides as necessary.
- Initiate a research project that will assess:
  - Amount and distribution of small grain (primarily barley) production in the San Luis Valley on private lands
  - Amount and distribution of waste grain available to spring migrating cranes
  - Amount of barley seed available on Monte Vista Refuge to spring migrating cranes
  - Trends in agricultural practices (e.g., fall tillage and irrigation) on private lands
  - Determine energetic demands of spring migrating sandhill cranes in the San Luis Valley
  - Determine whether other changes to the refuge’s farming program are needed
- Maintain existing ground water rights that allow for flexibility in water application during the spring and fall.
- Through ground water pumping, provide shallowly flooded (less than 15 inches) roost habitat on a minimum of two of the three traditional roost areas.

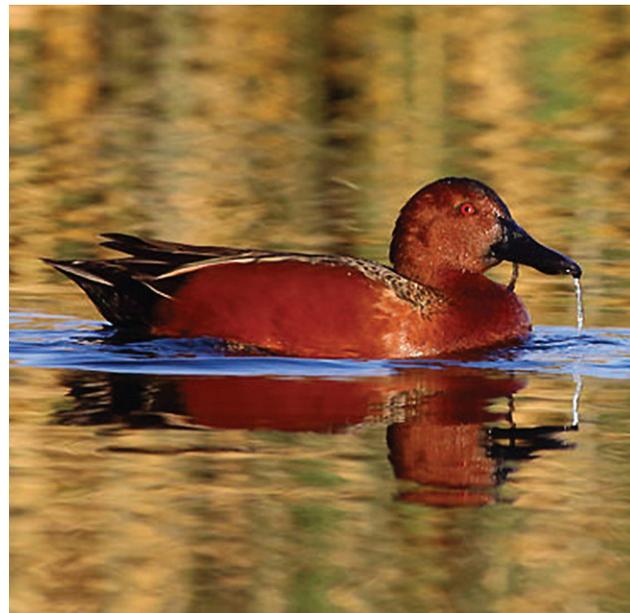
- Work with partners and the agricultural community to identify other farming practices that could benefit migrating cranes in the San Luis Valley.

## **WILDLIFE MANAGEMENT: FOCAL BIRD SPECIES**

### ***All Refuges in the Complex***

**Focal Bird Objective 1.** Manage refuge habitats as described below using water management and other tools such as prescriptive grazing, haying, mowing, and prescribed fire to create diverse hydrologic and vegetative conditions necessary to provide habitat for focal birds listed in tables 13 (wetland habitat), 14 (upland habitats), and 15 (riparian habitats) below.

**Rationale for Focal Bird 1.** At the outset of the CCP planning process, we decided to approach future management with an emphasis on maintaining or restoring the composition, structure, and function of natural and modified habitats with the goal of long-term sustainability. We developed a vision of desired future habitat conditions, considering ecological site characteristics, wildlife needs, and strategies that will maintain or restore the ecological integrity, productivity, and biological diversity of refuge habitats that are sustainable over the long term. Thus, habitat-based, rather than wildlife-species-based objectives were developed and management strategies were identified that emphasize the restoration and maintenance of system-based processes, communities, and resources that ultimately will help support local and regional populations of native plant and



*Cinnamon teal is a focal bird species that breeds on Alamosa and Monte Vista Refuges.*

**Table 13. Focal bird species for wetland habitats.**

<i>Associated bird species</i>	<i>Habitat</i>	<i>Species of concern lists</i>
<i>Wilson's phalarope (Phalaropus tricolor)</i>		
Wilson's snipe	<p><b>Habitat:</b> Sedge, grass, and rush meadows.</p> <p><b>Microhabitat:</b> Moist to shallowly flooded (&lt;6"). Prefers low vegetation height (6"-12").</p> <p><b>Nest site:</b> Nests on the ground in a shallow scrape lined with grasses near water.</p> <p>Food: Small aquatic invertebrates (dipterans and crustaceans, particularly brine flies and brine shrimp) in freshwater or hypersaline environments. They also feed on some terrestrial invertebrates and occasionally on seeds of aquatic plants.</p>	U.S. Shorebird Conservation Plan, Intermountain West Joint Venture
<i>American avocet (Recurvirostra americana)</i>		
Black-necked stilt, killdeer	<p><b>Habitat:</b> Prefers exposed, sparsely vegetated salt flats, sandbars, peninsulas, mudflats, or islands adjacent to shallow (&lt;3' deep) water, conditions that occur in wetlands or lakes.</p> <p><b>Microhabitat:</b> Moist to shallowly flooded (&lt;6") for foraging. Prefers sparsely vegetated areas for foraging and nesting.</p> <p><b>Nest site:</b> Nests near shallow water in small scrapes (lined with vegetation, small gravel, and feathers) on unvegetated ground (gravel or mud) or on elevated piles of debris with short, sparse vegetation that provides an unobstructed view from the nest. Often nest in loose colonies of 15–20 pairs with average distances of 100–260 feet between nests.</p> <p><b>Food:</b> Variety of aquatic insects and their larvae (particularly Chironomidae and Ceratopogonidae), crustaceans, and seeds of aquatic plants.</p>	U.S. Shorebird Conservation Plan, Intermountain West Joint Venture, San Luis Valley Waterbird Plan.
<i>Cinnamon teal (Anas cyanoptera)</i>		
Blue-winged teal, northern shoveler, northern pintail	<p><b>Habitat:</b> Uses freshwater (including highly alkaline) seasonal and semipermanent wetlands of various sizes throughout the intermountain West, including large marsh systems, natural basins, reservoirs, sluggish streams, ditches, and stock ponds.</p> <p><b>Microhabitat:</b> Prefers wetland basins with well-developed stands of emergent vegetation; uses emergent zones to a greater extent than open-water portions of basins.</p> <p><b>Nest site:</b> Nests near water in low, dense perennial vegetation such as Baltic rush (<i>Juncus balticus</i>), saltgrass (<i>Distichlis spicata</i>), spikerush (<i>Eleocharis macrostachya</i>), tufted hairgrass (<i>Deschampsia caespitosa</i>), western wheatgrass (<i>Agropyron smithii</i>), foxtail barley (<i>Hordeum jubatum</i>), and various forbs; less often at the base of greasewood (<i>Sarcobatus vermiculatus</i>), rabbitbrush (<i>Chrysothamnus</i> spp.).</p> <p><b>Food:</b> Omnivorous diet consisting of seeds and aquatic vegetation, aquatic and semiterrestrial insects, snails, and zooplankton. Forages in shallowly flooded zones (&lt;8 inches) along wetland margins; in deeper water, feeds at surface or in emergent or submergent vegetation. Feeds in emergent vegetation about twice as much as over open water. In the San Luis Valley, they prefer shallow, seasonally flooded open water and short emergent vegetation to other foraging habitats.</p>	Intermountain West Joint Venture

**Table 13. Focal bird species for wetland habitats.**

Associated bird species	Habitat	Species of concern lists
<i>Mallard (Anas platyrhynchos)</i>		
Gadwall, lesser scaup, short-eared owl, northern harrier	<p><b>Habitat:</b> Wide variety of habitats with dense cover, including grasslands, marshes, bogs, riverine floodplains, dikes, road-side ditches, and pastures.</p> <p><b>Microhabitat:</b> Although commonly nests on uplands, in the San Luis Valley the preferred vegetation is tall dense (&gt;15 inches) Baltic rush or other grasses with moist ground and interspersed with bodies of water. They commonly nest over water on the refuges. Early water application (2 weeks before peak spring migration) greatly enhances the probability of nesting.</p> <p><b>Nest site:</b> Nests on ground in upland areas or meadows with moist ground near water or shallowly flooded wetlands. Nests are typically placed under overhanging cover or in dense vegetation for optimal concealment. Hen forms shallow depression or bowl on ground in moist earth and lines the bowl with vegetation and plant litter using what she can reach and pull toward her with bill while sitting on nest. Hen also pulls and bends tall vegetation over to conceal herself and nest. After incubation begins, plucks down from breast to line nest and cover eggs. Overwater nests range from simple bowls on floating vegetation mats to elaborate structures woven into emergent vegetation.</p> <p><b>Food:</b> Omnivorous and opportunistic, generalist feeder. During breeding season, eats mostly animal foods, including insects such as midge larvae (<i>Chironomidae</i>) and other Diptera, dragonflies (<i>Odonata</i>), and caddisfly (<i>Trichoptera</i>) larvae, aquatic invertebrates such as snails and freshwater shrimp, and terrestrial earthworms. Outside of breeding season, diet predominantly seeds from moist-soil plants, aquatic vegetation, and cereal crops (especially corn, rice, barley, and wheat).</p>	Intermountain West Joint Venture
<i>Savannah sparrow (Passerculus sandwichensis)</i>		
Western meadowlark, vesper sparrow, red-winged blackbird	<p><b>Habitat:</b> Uses grassy meadows, cultivated fields (especially alfalfa), lightly grazed pastures, roadsides, wet meadows, sedge bogs, and edge of salt marshes.</p> <p><b>Microhabitat:</b> In the more arid parts of their range like the San Luis Valley, generally restricted to irrigated areas or to the grassy margins of ponds. Dense ground vegetation, especially grasses, and moist microhabitats favored. Generally avoid areas of extensive tree cover.</p> <p><b>Nest site:</b> Nests are placed on the ground and well-hidden. Preferred sites include shallow depressions formed by nesting individuals in grass clumps or occurring naturally in the ground. Most nests are concealed by a canopy of dead grasses and herbs, or tucked under a tussock with a tunnel averaging 2 inches in length. Nests may be simple open cups, especially when hidden beneath shrubs, goldenrods, or other thick vegetation late in the season.</p> <p><b>Food:</b> Primarily adult and larval insects, spiders, seeds and fruits, but occasionally insect eggs, millipedes, isopods, amphipods, decapods, mites, small mollusks.</p>	San Luis Valley Waterbird Plan

**Table 13. Focal bird species for wetland habitats.**

<i>Associated bird species</i>	<i>Habitat</i>	<i>Species of concern lists</i>
<i>American bittern (Botaurus lentiginosus)</i>		
Common yellow-throat, sora, Virginia rail, yellow-headed blackbird, marsh wren, redhead, black tern	<p><b>Habitat:</b> Freshwater tall, dense emergent wetlands.</p> <p><b>Microhabitat:</b> Dense emergent vegetation over water 2–8 inches in depth. Nests often over water in standing cattails, bulrushes and sedges; less often on dry ground. Nest becomes well hidden as surrounding vegetation grows.</p> <p><b>Nest site:</b> Nest consists of a platform of reeds, sedges, cattail, or other available emergent vegetation, and is lined with fine grasses. Nests constructed by gathering surrounding dead vegetation into a platform and lining that with a layer of dry vegetation.</p> <p><b>Food:</b> Insects, amphibians, small fish and mammals, crayfish. Forages along vegetation fringes and shorelines; seem to avoid even-aged stands of older, dense, or dry vegetation.</p>	North American Waterbird Conservation Plan, Intermountain West Joint Venture, USFS Region 2 sensitive species, U.S. Fish and Wildlife Service Birds of Conservation Concern (BCR 16 and Region 6), Colorado State Wildlife Action Plan (Tier 1 species), San Luis Valley Waterbird Plan
<i>White-faced ibis (Plegadis chihi)</i>		
Snowy egret, black-crowned night-heron, common yellow-throat, sora, Virginia rail, yellow-headed blackbird, marsh wren, redhead, American coot, black tern, pied-billed grebe	<p><b>Habitat:</b> Freshwater tall, dense emergent wetlands.</p> <p><b>Microhabitat:</b> Dense emergent vegetation over water 1–3 feet in depth.</p> <p><b>Nest site:</b> Nests often over water primarily in standing bulrush but also cattails. Nests can be well hidden under dense canopy or out in open with no shielding vegetation. In latter situation, nest contents are fully exposed to direct sunlight but are blocked from cooling breezes.</p> <p><b>Food:</b> Aquatic and moist-soil invertebrates, especially earthworms and larval insects (mainly Orthoptera, Odonata, Hemiptera, Coleoptera, and Diptera), but also leeches and snails. Forages in shallowly flooded wetlands, reservoirs, and marshes. Also feeds in recently flooded agricultural fields, especially young alfalfa, where vegetation is relatively short.</p>	North American Waterbird Conservation Plan, Intermountain West Joint Venture, Bureau of Land Management sensitive species, San Luis Valley Waterbird Plan
<i>Greater sandhill crane (Grus canadensis tabida)</i>		
Mallard, northern pintail, cinnamon teal, blue-winged teal, green-winged teal, northern shoveler, gadwall	<p><b>Habitat:</b> Shallow water wetlands for roosting and foraging, agricultural fields planted to small grains for foraging.</p> <p><b>Microhabitat:</b> Roosts and forages in shallow water wetlands/wet meadows with typically &lt;6 inch water depths. Prefers roost sites with short (&lt;1 feet) vegetation height. Forages in agricultural fields on waste grain or on refuge farm fields after mowing standing crop.</p> <p><b>Nest site:</b> Spring and fall migrant through the San Luis Valley only.</p> <p><b>Food:</b> Opportunistic foragers, which allows them to adapt to changes in food availability. Natural food items consist of roots, browsed vegetation, snails (<i>Helisoma</i> spp.), crayfish (<i>Cambarus</i> spp.), small mammals, frogs, snakes, toads, earthworms, and various insects. Cultivated small grains such as wheat or barley make up significant portions of diet during spring and fall migration.</p>	Colorado State species of concern, Intermountain West Joint Venture, San Luis Valley Waterbird Plan

**Table 14. Focal bird species for upland habitats.**

<i>Associated bird species</i>	<i>Habitat</i>	<i>Species of concern lists</i>
<i>Brewer's sparrow (Spizella breweri)</i>		
Loggerhead shrike, sage thrasher, western kingbird	<p><b>Habitat:</b> Shrubland habitat with big sagebrush, black greasewood, and occasionally rubber rabbitbrush.</p> <p><b>Microhabitat:</b> Prefers nest shrubs that are mostly alive. Foliage of live shrubs provides concealment from predators and protection from elements. Although nests are typically placed in live shrubs with foliage, there is no preference for denser-than-average foliage. No preference for shrubs with discontinuous (gaps) versus continuous canopies. Compared with surrounding habitat, nests are usually located in taller, denser shrubs with reduced bare ground and herbaceous cover.</p> <p><b>Nest site:</b> Nest is compact cup of dry grasses, weed stems, and rootlets; outermost material may consist of small sagebrush twigs. Cup lined with fine grasses, small strips of sagebrush bark, rootlets, and hair, often abundant horsehair. Typical shrub height of nest shrubs ranges from 16–40 inches with an average of 27 inches.</p> <p><b>Food:</b> Small insects, mainly gleaned from foliage and bark of shrubs or dwarf trees; also seeds, usually taken from the ground. Forages mostly in shrubs; forages relatively little on open ground between shrubs or at base of bunchgrasses.</p>	Partners in Flight Landbird Conservation Plan, Fish and Wildlife Service Birds of Conservation Concern (National and BCR 16), USFS Region 2 Sensitive Species, Intermountain West Joint Venture, Colorado State Wildlife Action Plan (Tier 1)
<i>Western meadowlark (Sturnella neglecta)</i>		
Vesper sparrow, lark sparrow	<p><b>Habitat:</b> Primarily native grasslands and former agricultural fields converted to perennial grassland cover.</p> <p><b>Microhabitat:</b> Preference shown for habitats with good grass and litter cover as well as forbs. Avoids nesting in areas where vegetation is tall and dense. Nest density is also negatively influenced by the amount of woody vegetation in the patch or landscape matrix surrounding breeding sites.</p> <p><b>Nest site:</b> Well concealed, on ground, often in shallow depression and usually in fairly dense vegetation. Nest sites and nest patches typically have greater visual obstruction, vertical vegetation density and height, grass cover, and litter cover and depth.</p> <p><b>Food:</b> Diet consists largely of vegetable (grain and weed seeds) and animal matter (insects). Favorite insect foods include beetles, weevils, wireworms, cutworms, grasshoppers, and crickets. Forages on the ground in open areas.</p>	None

**Table 15. Focal bird species for riparian habitats.**

<i>Associated bird species</i>	<i>Habitat</i>	<i>Species of concern lists</i>
<i>Southwestern willow flycatcher (Empidonax traillii extimus)</i>		
Yellow warbler, song sparrow, American robin, American goldfinch, western kingbird, common yellowthroat	<p><b>Habitat:</b> Riparian thickets, especially of willow, though other shrubs or trees may be used.</p> <p><b>Microhabitat:</b> The breeding site must have a water table high enough to support riparian vegetation, and near (less than 60 feet) water or saturated soil in the form of large rivers, smaller streams, springs, or marshes. Requires dense vegetation, usually throughout all vegetation layers present. Characteristics of flycatcher nesting areas usually consist of dense vegetation in the patch interior, or an aggregate of dense patches. These dense patches are often interspersed with small openings, open water, or shorter/sparser vegetation, creating a mosaic that is not uniformly dense. Nest sites occur in patches as small as 0.25 acre and as large as 173 acres with a median patch size of about 4.5 acres. Nest sites typically have dense foliage from the ground level up to approximately 13 feet above ground. Of particular importance is the presence of slow-moving or still surface water and saturated soil at or adjacent to breeding sites.</p> <p><b>Nest site:</b> Constructed in a fork or on a horizontal limb of willow or shrub. Nest is formed of forb stems, plant fibers, shreds of bark, and dry grasses. Nest cup is lined with feathers, hair, rootlets, and finer materials.</p> <p><b>Food:</b> Somewhat of an insect generalist, taking a wide range of invertebrate prey including flying, and ground-, and vegetation-dwelling species of terrestrial and aquatic origins. Common food items include wasps, bees, flies, beetles, butterflies, moths, caterpillars, and spittle bugs.</p>	Federally Endangered Species, Colorado State Endangered Species, U.S. Fish and Wildlife Service Birds of Conservation Concern (National, Region 6, and BCR 16), Intermountain West Joint Venture, Partners in Flight Landbird Conservation Plan, North American Wetland Conservation Act
<i>Western wood-pewee (Contopus sordidulus)</i>		
Yellow warbler, American robin, western kingbird, common yellowthroat, Brewer's blackbird, Bullock's oriole, American kestrel, mourning dove, black-headed grosbeak, Swainson's hawk	<p><b>Habitat:</b> Riparian woodland and forest with large cottonwoods, especially along forest edge.</p> <p><b>Microhabitat:</b> Large tree diameters (primarily narrowleaf cottonwoods), open understory, and dead trees or trees with dead limbs.</p> <p><b>Nest site:</b> Nests placed in forks of horizontal branches, from near ground level or higher in height, in living and dead trees. Typically placed closer to the outer edge of the foliage than to the trunk in live trees. Compact, neatly woven of grasses, plant fibers, bark, plant down, feathers, and hair bound with spiders' webs; lined with fine grasses, hair; decorated with moss, insect puparia, exuvia, or bud scales.</p> <p><b>Food:</b> Flying insects, especially flies, ants, bees, wasps, beetles, moths, and bugs. Primarily a sit-and-wait predator; flycatches (sallies) from open perches, usually returning to same or nearby perch; infrequently hover-gleans from vegetation.</p>	Partners in Flight Landbird Conservation Plan

animal species. Although we developed habitat-based (rather than species-based) objectives, it is still important to have an understanding of the life-cycle requirements of wildlife species and develop a list of focal species (see tables 14, 15, and 16) that will be used to guide these habitat-based objectives.

Lambeck (1997) recommends monitoring and evaluating focal species whose life history requirements define the habitat attributes that must be present if a landscape is to meet the needs for all the species that occur there. The key characteristic of a focal species is that its status and trend provide insights into the integrity of the larger ecological system to which it belongs. The rationale for using focal species is to draw immediate attention to habitat features and conditions that are most in need of conservation or that are most important in a functioning ecosystem.

Our focal bird objectives are tied to achieving our habitat objectives. For example, because hydrologic conditions during the breeding season directly affect whether breeding sites are suitable for wetland focal birds, refuge water management decisions will consider the species' needs for timing, depth, and duration of water application. Because, along with water management, vegetative structural conditions affect the suitability of nesting areas for focal species, actions such as prescribed fire and prescribed grazing, mowing, or haying will be used to create the required vegetative conditions and mimic natural disturbance regimes that help maintain the productivity and overall health of wetland habitats.

#### **Strategies for Focal Bird 1:**

- Manage water using natural flowpaths and created wetlands in a way that mimics, to the greatest extent possible, natural hydrologic regimes to restore and maintain wetland function, productivity, and sustainability. Use information available on life cycle requirements of focal species to guide management decisions.
- Monitor vegetation to assess if each focal bird's habitat needs are being met during each season of the year.
- Monitor focal species' population size, density, and habitat use to assess the effectiveness of habitat management strategies.

#### **WILDLIFE MANAGEMENT: BISON**

With the passage of the Great Sand Dunes National Park and Preserve Act of 2000 and the subsequent acquisition of BLM and Colorado State Land Board lands within the Medano Ranch, portions of

TNC's Medano Ranch now lie within the Baca Refuge's authorized acquisition boundary. At the time of the acquisition, an arrangement or understanding was put into place allowing for continued grazing on refuge lands formerly controlled by TNC until a CCP could be developed.

#### **Objectives for Wildlife Management: Bison**

##### ***Baca National Wildlife Refuge.***

**Bison Objective 1.** Within 1-3 years, phase out the existing arrangement that allows TNC to graze bison on the Baca Refuge lands that were formerly part of TNC's Medano Ranch (about 5,570 acres).

**Rationale for Bison 1.** TNC has been temporarily permitted to graze bison on those portions of the refuge that were acquired from BLM and Colorado State Land Board, where they formerly held grazing leases. This current arrangement will be phased out within 1-3 years of the CCP completion. The approach with which TNC manages bison on its Medano Ranch property is inconsistent with both how the Service uses livestock to meet specific habitat goals and objectives identified in this CCP.

**Bison Objective 2.** By years 1-5, pursue funding and resources necessary to develop and conduct a 5-10 year research project on the Baca Refuge to determine the feasibility of accommodating some semi-free ranging bison on a year round basis (contingent on research objectives) in a designated area (about 12,140 acres) (refer to figure 42). The research area will have habitat-type acreages that are roughly in proportion to the habitat types found on the greater landscape that includes NPS, TNC, and refuge lands (part of the greater Sand Dunes area). The objective of the research will be to determine if the refuge could support any number of bison to contribute to FWS bison conservation goals without compromising the refuge's purpose and the habitat goals for the areas where they will be grazed.

By semi-free ranging, we mean that although bison will still be subject to annual roundups and removal of animals to maintain the herd size within the population level defined in the study design, the overall movements of bison on the landscape will not be managed or controlled.

**Rationale for Bison 2.** The 2008 Department of the Interior Bison Conservation Initiative (Initiative) outlines a framework for DOI bison conservation efforts, including principles and priorities for health and genetics management. We contribute to bison conservation through metapopulation management of

our herds to conserve genetic diversity, minimize introgression and manage bison as wildlife to the extent practicable while meeting refuge purposes and goals. We recognize the intent of the Initiative and that some of our partners and stakeholders have long been interested in whether the larger landscape including the Baca Refuge, Great Sand Dunes National Park and Preserve, and TNC's Medano Ranch could support bison conservation as part of a larger metapopulation. The NPS is currently considering alternatives for bison management on park lands; a decision as to whether or how to manage bison on the park has not been made. Since bison are not singled out in the Baca Refuge's purpose, and much uncertainty exists regarding the potential impacts from bison on native wildlife species and their habitats, a temporary experimental herd will be prescribed on refuge land first, which will provide information that will assist us in decisionmaking regarding the potential of future semi-free ranging bison on the Baca Refuge. Initially, we will introduce a temporary year-round bison herd in a designated area and develop a specific monitoring program that will help us identify impacts to the plants, wildlife, and soils, in addition to gaining an understanding of the needed infrastructure that are unique to bison. This information will be valuable in determining any possibility of long-term future use or occurrence of a

semi-free ranging bison herd on the Baca Refuge. We are especially interested in bison habitat selection and their potential impacts to breeding and migratory birds, plant community structure and function, and other native wildlife species. Within the research area, normal land management actions will not be excluded.

### **Strategies for Bison 2:**

- Pursue funding and resources to conduct a research project on the Baca Refuge to determine the feasibility of long term bison presence on the landscape.
- Work with partners to create the bison and habitat research project on the Baca Refuge.
- Use computer modeling to determine the acceptable range of animals to use in the research area, with the major consideration being the desire to maintain suitable habitat conditions for other native species. Allow for (and maintain) an acceptable range of animals in the research area, based on what will be appropriate for overall habitat conditions. Continue to prescribe any necessary



FWS

*American bison cow and calf.*

- actions to maintain or enhance wildlife habitat within the research area, such as using fire, grazing, haying, mechanical and chemical treatments, etc. (as is done in other parts of the refuge).
- Design the research to answer in part some of the following questions:
    - the appropriate number of bison to introduce into the research area based on computer modeling results;
    - the specific patterns and trends of habitat and resource selection by bison;
    - the differences in bird nesting density and success between areas with and without bison;
    - the differences in avian species richness and abundance for breeding and migratory birds between areas with and without bison;
    - how the presence and movement of bison affect the presence and movement of elk herds;
    - how bison grazing affects plant structure, composition, and productivity (particularly in riparian and wetland plant communities);
    - overall differences in bison impacts between normal and drought years;
    - the effects on soils from bison grazing (particularly with regard to hoof impacts);
    - whether traditional habitat management tools continue to be effective (or enhanced) with the presence of bison on the landscape; and
    - whether the habitat can support bison as part of a larger metapopulation over the long term.
  - If applicable, coordinate with the NPS and other partners to implement complementary bison management approaches in a manner that upholds the habitat goals and objectives for the Baca Refuge.

- As necessary, use adequate boundary fencing that also allows for other wildlife to migrate through.
- Consider vehicle access, interpretive signage, and considerations for visitor safety.
- Allow the research period to extend to, but not beyond, the life of the CCP if such a timeframe is necessary to inform future decisions about the long-term occurrence of semi-free ranging bison on the Baca Refuge.

### **WILDLIFE MANAGEMENT: ROCKY MOUNTAIN ELK**

The Monte Vista Refuge is part of GMU 80, the Alamosa Refuge is part of GMU 83, and the Baca Refuge is part of GMU 82 (refer to figure 36 in chapter 3 for location of GMUs and approximate location of elk concentration areas).

### **Objectives for Wildlife Management: Rocky Mountain Elk**

#### ***All Refuges in the Complex***

**Elk Objective 1.** Over 15 years, continue to conduct population surveys to monitor the density and distribution of the elk population on the refuges.

**Elk Objective 2.** Over 15 years, continue to cooperate with CPW in efforts to reduce and redistribute the elk population as necessary.

***Rationale for Elk 1–2.*** Resident elk herds are found on all three refuges, with about 200 elk remaining on the Alamosa Refuge year round and up to 75 remaining on the Monte Vista Refuge year round. Currently, the refuge elk population on the Baca Refuge is estimated to average approximately 1,000 animals on a fairly consistent basis (Ron Garcia, personal communication). We have documented that elk frequently browse in the riparian areas, which are in a degraded condition from several factors. It has been found that recovery of riparian areas is not possible if the current browse levels continue (Keigley et al. 2009). Restoration of riparian plant communities is a major priority for refuge staff, mostly because of the high value of this habitat for neotropical migratory birds. Refuge elk herds will continue to be redistributed and culled in an effort to reduce the browse pressure on riparian areas in accordance with the interim elk management plan (FWS 2013d). In addition, by monitoring the population, we will continue to evaluate the effectiveness of these management actions.

**Strategies for Elk 1–2:**

- Continue to conduct surveys of the refuge elk population on a monthly basis to monitor density and distribution of population.
- Monitor and evaluate the effects of management activities on the elk population and riparian plant communities.
- As monitoring dictates the need, we will remove elk from sensitive riparian areas of the refuge using various hazing techniques including lethal removal.
- Cooperate with the State in culling and harassment operations to reduce and redistribute the refuge elk population to meet the State’s goals for numbers and sex ratios.

**Elk Objective 3.** By year 1-3, on all the refuges develop and implement a hunt plan (see “Hunting” in “Visitor Services” section) that will assist managers to strategically reduce and redistribute the elk population to help meet CPW’s goals for GMUs 80 (Monte Vista Refuge), 83 (Alamosa Refuge), and 82 (Baca Refuge); reduce the browsing pressure on riparian areas and other high use areas; and provide the public with high-quality big game hunting opportunities on the refuge complex.

**Rationale for Elk 3.** The need to reduce and redistribute elk is an issue on all the refuges, In particular, on the Baca Refuge, the elk herd in GMU 82 has grown significantly since the late 1980s, and is now estimated to be about 5,000 animals (Weinmeister 2010). The bull to cow sex ratio has also increased from an average of 26 bulls to 100 cows from 1988 to 2008 to about 39 bulls to 100 cows currently (Weinmeister 2010). The population and sex ratio have increased because a high percentage of the elk in the GMU occupy lands where hunting is prohibited, such as the refuge, Great Sand Dunes National Park (excluding the national preserve), and large private ranches. CPW is concerned about the impact of elk on vegetation and other ungulate populations such as deer, pronghorn, and bighorn sheep in GMU 82. In addition, the State is concerned about potential game damage to crops. The agency has been trying to maximize harvest by hunters to reduce the population (Weinmeister 2010). CPW recommends an elk herd of 3,000-4,000 with a sex ratio of 17 to 23 bulls per 100 cows for GMU 82 (Weinmeister 2010). We will cooperate with the State to reduce and redistribute the refuge’s elk population to assist in meeting these goals. The implementation of a public hunt plan will provide hunter access to new areas (by special refuge

permit) in GMU 82, and provide us, together with CPW and NPS, with an additional tool for the management of elk on the landscape. Additional hunting pressure in and around riparian areas will likely reduce elk browse on young willows and cottonwoods, improving chances for survival and recovery of riparian plant communities. A reduction in overall elk numbers and altered distribution patterns due to hunting pressure will also likely have similar positive results on riparian plant communities. It will also enable us to provide a high-quality elk hunting opportunity on the refuge (FWS 2006b and 2006e; refer to visitor services objectives below).

**Strategies for Elk 3:**

- Develop a public hunt plan for the refuge complex that helps managers to meet elk management goals. Conduct a minimum requirements analysis for recommended wilderness study area.
- Monitor and evaluate the effects of public hunting on the elk population and riparian plant communities on the Alamosa and Baca Refuges.
- Take steps to ensure that the quality of elk hunting opportunities provided are kept at a high standard. This will be accomplished primarily by controlling the number of hunters allowed on the refuge during any given season.
- Maximize the tools and options for managing elk populations to reduce habitat impacts. Work closely with CPW for agency dispersal, culling, and distribution.
- Coordinate and collaborate with NPS and other landowners to measure and determine how our management actions affect areas off the refuges.
- Work with NPS and CPW to address any hunting encroachment onto park lands (i.e., pushing elk back and forth across the boundaries).

**Elk Objective 4.** Within 5-7 years, develop a comprehensive monitoring plan for chronic wasting disease.

**Rationale for Elk 4.** Chronic wasting disease is a fatal neurological disease found in deer, elk, and moose. As of 2010, it has not been detected in wild populations in the San Luis Valley. Since this disease

is a serious wildlife health issue with possible public health consequences and the potential exists for it to reach the refuge, managers should stay vigilant in monitoring for its presence. Appropriate actions will be taken if chronic wasting disease is detected in refuge complex elk, with specific details outlined in a chronic wasting disease monitoring plan.

#### **Strategies for Elk 4:**

- Work with CPW to monitor elk populations for the presence of chronic wasting disease.

### **WILDLIFE MANAGEMENT: RIO GRANDE SUCKER AND RIO GRANDE CHUB**

Rio Grande suckers and Rio Grande chub are found on the Baca Refuge.

#### **Objectives for Wildlife Management: Rio Grande Sucker and Rio Grande Chub**

##### **Baca National Wildlife Refuge**

**Sucker and Chub 1.** Continue to monitor and evaluate the condition of Rio Grande sucker and chub habitat. Where obvious degradation is occurring to the habitat through factors such as a reduced perennial water supply, take corrective actions.

**Rationale for Sucker and Chub 1.** The Rio Grande sucker is a State-listed endangered species, and the Rio Grande chub is a State-listed species of concern. We will work with CPW to maintain a perennial water supply for these fish species.

#### **Strategies for Sucker and Chub 1:**

- Monitor and evaluate the effects of other refuge management activities on the riparian plant communities.
- Improve spawning and feeding habitat by installing cobble and gravel substrates.

**Sucker and Chub 2.** Within 5 years, initiate a study on riparian restoration, and over 15 years, monitor the effects of riparian restoration efforts on the sucker and chub population (refer to riparian restoration objectives above).

**Sucker and Chub 3.** Work with CPW to set specific priorities, identify projects, and enhance and increase sucker habitat on the refuge.

**Rationale for Sucker and Chub 1–3.** The Baca Refuge has one of only two aboriginal (native) Rio Grande



*The Rio Grande sucker and Rio Grande chub (pictured) are found along Crestone Creek on Baca Refuge.*

sucker populations in the State; therefore this population is crucially important for genetic conservation of the species. Although much of Crestone Creek is considered to be in degraded condition, this population has persisted. We want to understand more about the population trends, distribution, and habitat use of the sucker populations as we move forward in restoring riparian conditions on the refuge, specifically the establishment of woody vegetation such as willows and cottonwoods, or making in-stream modifications, such as inducing proper meandering, elevating the streambed, and reducing siltation and erosion. These efforts should benefit the Rio Grande sucker and chub populations, but we will work closely with CPW before large-scale restoration took place.

#### **Strategies for Sucker and Chub 1–3:**

- Map fish habitat and important stream features such as spring upwellings and other features that provide refugia for suckers.
- Cooperate with CPW to sample and monitor the fish population on a regular schedule, including sampling at different times of year.
- Acquire and use resources from the Service's inventory and monitoring program area to research habitat use by suckers.

## **4.4 Water Resources**

Management of water resources is important for providing wildlife habitat and visitor services within the refuge complex.

Water, including several associated issues such as future legal constraints, limited staff, financial constraints, invasive species, and climate change, is one of the biggest management challenges for the refuge complex.

## Objectives for Water Resources

### *All Refuges in the Refuge Complex*

These objectives are in addition to the specific habitat, wildlife, and visitor services objectives specified elsewhere.

**Water Resources 1.** Over the next 15 years, maintain all water rights, thereby enabling optimal use of ground and surface water for maintenance of wildlife habitat on all refuge lands.

**Rationale for Water Resources 1.** The value of water and the competition for this increasingly scarce resource, especially in the arid west, grows every year. This trend is exacerbated by a changing climate and increased human demands. It is crucial to the mission of the Alamosa, Baca, and Monte Vista Refuges that we establish and maintain an accurate, regular, and reliable water use program that documents actual consumptive use, identifies all physical water facility needs and deficiencies, stays abreast of all legal and administrative water use changes, and provides an effective liaison between refuge staff and the professional water community and water user groups in the San Luis Valley.

#### **Strategies for Water Resources 1:**

- By law and policy, continue to abide by all State water regulations regarding the use of surface and ground water. It is important to note that the ability to use all water sources on these national wildlife refuges is the result of the adjudication process of the Colorado Water Court. The resulting court decrees often define when, where, and for what beneficial use water can be diverted, used, and consumed. All changes in water use described in this plan must either be within the limits described in the existing decree for the specific water source or result from a successful application to and approval by the State Engineer and the court.
- Establish a database of information that tracks historic use of all non-exempt ground

and surface water sources and documents observed ecosystem benefits.

- Identify funding sources to rehabilitate failing wells. This is especially important on the Monte Vista and Baca Refuges. Each of these refuges has a significant number of important but old wells where the casings and mechanical systems are nearing the end of their functional lives.
- Develop a consistent, accurate, and defensible water use monitoring program (see Water Resources 10).
- Establish a hydrology program on the refuge complex in collaboration with the Region 6 division of water resources, with staff dedicated to maintaining water use records, collecting of water use data, maintaining proficiency in Colorado water law, advising the project leader in administrative and legal water matters, and representing the Service in all venues pertaining to San Luis Valley water management as it affects refuge operations.

### *All Refuges in the Complex*

**Water Resources 2.** By year 3, establish a repeatable and quantitative water quality monitoring program on all refuges to identify contaminants, toxins, and other possible contributors to poor soil and water quality.

**Rationale for Water Resources 2.** The ecological integrity of a number of national wildlife refuges has suffered from use of contaminated water. Although we do not have current evidence of water quality problems on refuges in the San Luis Valley, a systematic water quality monitoring program should be established to ensure that problems from poor water quality do not become an issue.

#### **Strategies for Water Resources 2:**

- Request help from the Service's division of water resources and environmental contaminants program, USGS, and Colorado Department of Natural Resources in designing a monitoring program.
- Identify resources required, including added staff, to begin water quality monitoring.

**Water Resources 3.** By year 5–6, complete area and capacity surveys of the most important wetlands on all refuge lands to enable a better understanding of the water resources required to maintain productivity.

**Rationale for Water Resources 3.** During most years, we plan water movement and flooding for the refuge complex based on annual biological objectives and water supply. Practical decisions about which wetlands are feasible to flood in any given year are always based on the experience of refuge staff members. This works well as long as experienced staff members are available and nothing unconventional is under consideration for the year. Since the CCP describes a substantially different approach to flooding wetlands on the Monte Vista and Alamosa Refuges, access to engineering data will save an enormous amount of trial and error and likely prevent damage to refuge water control facilities.

**Strategies for Water Resources 3:**

- Conduct ground surveys.
- Conduct area capacity surveys.

**Water Resources 4.** Continue to irrigate small grain crops using the most labor- and water-efficient methods.

**Rationale for Water Resources 4.** Center pivot irrigation is far more labor and water efficient than flood irrigation practices and is the most practical technique available for raising grain with the least amount of labor and financial investment.

**Strategies for Water Resources 4:**

- Continue to use center pivot irrigation systems on these fields.
- Continue to evaluate the efficiency of water use by periodic evaluation of each system by an agricultural engineer.

**Water Resources 5.** Within 1-5 years, use ground and surface water together to achieve biological requirements.

**Rationale for Water Resources 5.** In order to use ground water in a sustainable manner, it must be more heavily relied on during those periods of high runoff that result in greater amounts of aquifer recharge and used less during drier periods. Rules and regulations pertaining to ground water pumping

will require all non-exempt wells (wells that are governed by the priority system for water allocation) to be augmented to prevent ongoing injury to senior surface water users. Use of wells by the Service must be managed in a fashion that maximizes efficiency of use and meets the requirements of the rules and regulations. Surface water must also be managed to maximize efficiency of use and to augment ground water wherever possible.

**Water Resources 6.** In order to comply with upcoming Colorado ground water regulations and to contribute to the sustainable use of ground water, all depletions to streams caused by the use of wells on the three national wildlife refuges will be replaced during the next 15 years or earlier as regulations dictate.

**Rationale for Water Resources 6.** Once new regulations are put in place, all ground water users in the San Luis Valley will be required to replace stream depletions that negatively affect senior surface water users so that the surface water is augmented or replaced in time and place. The effects to senior surface users will be predicted by use of sophisticated ground water modeling. Currently, Colorado is perfecting a modeling program that, once completed, will be used by ground water users to design successful augmentation plans. With this tool, ground water users will be able to identify the drainages that their water use is affecting and quantify the effect. Once these objectives are defined, ground water users, including the Service, will have to decide on the most effective and efficient strategies or combination of strategies to accomplish augmentation requirements.

**Strategies for Water Resources 5-6:**

- Contract with ground water management sub-districts of the Rio Grande Water Conservation District. Although we cannot be a member of these self-taxing entities, the law allows us (and other government entities) to derive the augmentation benefits offered by the sub-districts through contractual arrangements.
- Prepare individual augmentation plans for individual wells or groups of wells on the refuges. This places the burden on us and DOI for all legal and engineering planning and the identification of replacement water sources for the drainages that are affected by our wells.

- Form partnerships with other agency ground water users to collectively augment wells by taking advantage of each agency's unique water resources.

**Water Resources 7.** Restore irrigation facilities historically used to irrigate playa wetlands on the Baca Refuge. Apply water to these playas based on availability of water and biological objectives. (Refer to habitat objectives above.)

**Rationale for Water Resources 7.** Functioning playa wetlands are the most under-represented type of wetland in the San Luis Valley. (Refer to playa habitat above.) These wetlands also provide important migratory bird foraging and nesting habitat. The Baca Refuge contains 17,048 acres of playa habitat, mostly along the San Luis Creek drainage on the west side of the refuge. Most of the playa habitat is within the Closed Basin Project and adjoins the largest well field in the San Luis Valley. This agricultural area is experiencing dramatic depletion of the unconfined aquifer, as documented by the ongoing monitoring program conducted by Davis Engineering, Inc., for the Rio Grande Water Conservation District entitled "Change in Unconfined Aquifer Storage, West Central San Luis Valley" (Rio Grande Water Conservation District 2014). This study relies on a system of unconfined aquifer well measurements and has monitored water table levels since 1976. Due to chronic lack of runoff from the Sangre de Cristo Range, there have been stream depletions in San Luis, La Garita, and Saguache Creeks. In addition to these hydrologic restrictions, authorizing legislation requires the Secretary to reduce effects to other water users by using decreed water rights on the refuge in approximately the same manner as they were used historically. Finally, a significant amount of irrigation infrastructure servicing the playa area was allowed to deteriorate during prior ownership.

#### **Strategies for Water Resources 7:**

- Maintain and restore irrigation facilities used to deliver water to formerly irrigated meadows containing playa habitat such as the January Meadow to most effectively deliver water during higher runoff events.
- Enter into partnerships with BOR, the Rio Grande Water Conservation District, and any other downstream water users to assess effects of various refuge irrigation strategies on water supply for the Closed Basin Project and any other potentially affected water user.

- Conduct hydrologic analyses of different water scenarios to determine whether water delivery to playas results in effects to other water users.

**Water Resources 8.** Within 5 years, evaluate the Monte Vista Refuge as a site for confined and unconfined aquifer recharge.

**Rationale for Water Resources 8.** The west side of the Monte Vista Refuge overlays a zone of ground water recharge for the confined aquifer. The rest of the refuge is over the unconfined aquifer. Both the Monte Vista and Empire Canals periodically have water decreed for recharge. Two recharge ponds were constructed in the early 2000s along the west border of the refuge to accept water from the Monte Vista Canal and allow it to infiltrate into the confined aquifer. Historically, the refuge has been used by the Empire Canal to recharge the unconfined aquifer. However, that practice was recently stopped. In all cases, management of refuge wetlands will benefit from restored ground water levels promoted by these recharge opportunities.

#### **Strategies for Water Resources 8:**

- Discuss with the Monte Vista Water Users (Monte Vista Canal) their interest in and ability to expand the use of the refuge as a recharge site for their recharge decree. This will benefit the confined aquifer.
- Discuss with the Commonwealth Irrigation Company (Empire Canal) its interest in and ability to return to the practice of using the refuge as a site for unconfined aquifer recharge.
- Conduct geologic evaluation of additional recharge sites to predict the specific location and effectiveness of recharge.
- Construct more recharge facilities in response to the results from these investigations.

**Water Resources 9.** Establish the legal and practical feasibility of using Closed Basin Project mitigation water in different proportions and locations than described in the BOR's Project Authorization Act of 1972.

**Rationale for Water Resources 9.** Operation of the Closed Basin Project requires that wetland habitat lost as a result of project construction and operation be mitigated. The mitigation plan covers a number of

projects that acquired land and water and placed them under agency management for the benefit of wetland habitat and associated wildlife. The project is authorized to annually deliver water to the Alamosa Refuge and the BLM-administered Blanca Wetlands. As knowledge of the wetland dynamics in the San Luis Valley grows, having greater flexibility with this mitigation water becomes increasingly appealing and could result in more effective wetland habitat mitigation. For example, this water could be combined and cyclically applied to selected playa wetlands that receive no water, which will result in an improvement in the overall health and function of the entire playa system.

**Strategies for Water Resources 9:**

- Within 1 year, determine whether this concept is legally consistent with the Closed Basin Project's authorizing legislation and the associated Fish and Wildlife Coordination Act Report.
- If there are no substantial legal impediments, work with BLM, BOR, CPW, and the Rio Grande Water Conservation District to reach an agreement on the feasibility of this approach during the first year of the plan.
- With these partners, develop a modified plan for potential use of this mitigation water during the second year of this comprehensive plan.

**Water Resources 10.** Develop a water monitoring program that measures the quantity, timing, and location of surface and ground water sufficient to comply with Colorado law and the refuges' biological management objectives.

**Rationale for Water Resources 10.** Competition for water in the San Luis Valley is steadily increasing as supply appears to be dwindling from climate change and increased human demand. As regulations tighten and scrutiny from other water users increases, it is essential that refuge use of water is well tracked and documented to defend current uses and maintain our ability to meet refuge objectives that require water.

**Strategies for Water Resources 10:**

- Deploy instrumentation on all surface water sources. Maintain meters on all wells pumped at >50 gpm.
- Within 3 years, establish adequate ground water monitoring methods to understand

the relationship between irrigation practices on the Baca Refuge, including effects on the Closed Basin Project.

- Within 5 years, establish a ground water monitoring program along the Rio Grande floodplain on the Alamosa Refuge that can be used to explain the relationship between river flows, adjacent irrigation practices, ground water levels, and the health of riparian vegetation.
- Within 3 years, establish a program to monitor well water levels to show short-term seasonal trends and long-term trends associated with aquifer depletion and restoration.
- Within 3 years, find and acquire adequate resources to accomplish this increased monitoring effort.

**Water Resources 11.** Evaluate the need to supplement existing water supplies, especially on the Monte Vista and Alamosa Refuges.

**Rationale for Water Resources 11.** Although wetland and riparian systems should be managed within a naturally occurring range of hydrologic conditions, having more water rights will be useful to help mitigate hydrology that has been greatly altered by human uses such as upstream diversions and ground water depletions that have significantly affected natural water regimes. Also, added water rights may be used in augmentation plans. In some circumstances, purchase of more surface water rights may be more cost effective than other alternatives that provide replacement water.

**Strategies for Water Resources 11:**

- Investigate potential water rights that may become available for sale. This may or may not include purchasing associated land.
- Investigate which water rights owned by others are having the greatest detrimental effect on the refuges or could supply the greatest benefit to the refuges and target these for potential acquisition.

## 4.5 Visitor Services

Visitor services includes the six priority public uses: fishing, wildlife observation, photography, interpretation, and environmental education.

### OBJECTIVES FOR HUNTING

Hunting for migratory game birds, primarily waterfowl, and some small game (cottontail rabbit, white-tailed jackrabbits, and pheasant) is a popular activity on the Monte Vista and Alamosa Refuges. It is a compatible wildlife-dependent recreational activity. The alternatives described in the final CCP and EIS considered options for expanding the hunting program to include big game on all three refuges and limited small game hunting on the Baca Refuge. These included opening the Baca Refuge for recreational public hunting. All other wildlife is precluded.

The hunt program will be expanded.

### All Refuges in the Refuge Complex

**Hunting 1.** Within the refuge complex, expand the current hunting program by providing for diverse and quality hunting opportunities for big and limited small game hunting, as defined in the Service's guidelines for wildlife-dependent recreation (FWS 2006b). By year 1-3, develop and implement a refuge complex hunting plan that is at least 50 percent implementable by year 4. By year 7, implement 100 percent of the hunting plan.

**Hunting 2.** Within 6–7 years, complete a survey on user preferences and include questions needed to evaluate harvest success and quality of the hunts within the complex. Within 8 years, expect 60–70 percent of hunters to report a reasonable harvest opportunity and satisfaction with the overall experience.

**Hunting 3.** Within 1–4 years, working with CPW and within the State's hunting-season framework, expand opportunities for young people to hunt with at least one new hunt that is available only to young hunters.

**Hunting 4.** Within 1–5 years, improve existing accessible hunting facilities such as blinds, parking, and other facilities, and evaluate the demand for more access for hunters with mobility impairments. If warranted, within 10 years, provide one more hunting access point for hunters with mobility impairments within the refuge complex.

### Alamosa and Monte Vista Refuges

The existing hunting program on Monte Vista and Alamosa Refuges will be maintained.

**Hunting 5.** Continue to provide safe and sustainable waterfowl and small game opportunities within designated hunt boundaries.

**Rationale for Hunting 5.** Hunting has long been an important cultural and social use of the lands that make up the refuge complex. On Alamosa and Monte Vista Refuges, we will continue to provide for quality and diverse hunting experiences (about 800–1,000 hunter visits annually depending on available water and habitat).

**Hunting 6.** At the Alamosa and Monte Vista Refuges, limit big game hunting to a restricted public hunt.

### Baca Refuge

**Hunting 7.** As part of creating diverse hunting opportunities (see 2 above), open limited small game hunting on the southwest corner during State-regulated seasons by year 3, and allow for a permitted archery hunting area north of Crestone Creek beginning in late August. As resources become available, fully open other portions of the refuge to big game hunting and expand limited small game hunting to include the three northwest sections.

**Rationale for Hunting 1–7.** The Service's wildlife-dependent recreation policy (FWS 2006e) emphasizes providing quality hunting experiences as an important part of a hunting program (605 FW1, 605 FW2). Promoting safety, providing reasonable opportunities for success, and working collaboratively with State wildlife agencies are just a few of the key elements that should be considered in providing for quality experiences. For example, a quality experience could mean that participants could expect reasonable harvest opportunities, uncrowded conditions, fewer conflicts between hunters, relatively undisturbed wildlife, and limited interference from, or dependence on, mechanized aspects of the sport. Although informal conversations with hunters can provide feedback to refuge managers about the quality of the experience, it will be important to ultimately conduct a formal survey of hunters to evaluate the hunting program within the refuge complex.

We will expand hunting opportunities and provide for diverse experiences, which will include opening the Baca Refuge for recreational hunting and providing opportunities for big game hunting on all three refuges in the complex. On Baca Refuge we will

require a refuge permit and a mandatory check-in for unaccompanied hunters and during any big game hunt. On a daily basis, we expect only a few hunters, which provides for a higher quality hunt as well as ensuring that we have the available resources to manage the hunting program.

Because there are more adjacent roads near the Monte Vista Refuge, many safety concerns exist, and unaccompanied rifle hunting for big game will not be allowed.

By expanding opportunities across the refuge complex, we hope to engage more young people in wildlife-dependent recreation, build a conservation ethic, and engender long-term enthusiasm and support for hunting, wildlife conservation, and the mission of the Refuge System. Early season or preseason hunts are best suited for youth because these seasons provide the best harvest opportunities. These programs will spark interest in hunting and hopefully lead to the recruitment of more young refuge supporters. There is also a demand for hunting opportunities that are accessible to hunters with special needs, such as hunters with mobility impairments; the current facilities to serve these hunters are in need of improvement.

Increasing hunting opportunities on the refuge and promoting the refuge complex's hunting program will increase license sales for CPW and boost economic activity in the San Luis Valley.

#### **Strategies for Hunting 1–7.**

- Continue to manage game in accordance with Service policy. All hunters will be required to possess valid State-issued hunting licenses and Federal and State stamps for waterfowl hunting (as applicable) and must have these with them while hunting. Hunting will be allowed only in designated hunting areas as posted and shown on the maps. Hunters will be required to park in designated parking areas and must abide by all other refuge-specific regulations. Bird collection for falconry will not be allowed.
- Conduct periodic hunter surveys.
- Implement a waterfowl hunter education program.
- Provide consistent law enforcement.
- Conduct an annual informal evaluation of hunting program.



*Waterfowl hunting supports wildlife conservation and is allowed on Monte Vista and Alamosa Refuges.*

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- Continue to respond to inquiries and provide information about current refuge hunting opportunities.
- Continue yearly review of refuge hunting regulations to ensure clarity and to address any emerging issues or concerns and give the public an opportunity to review and comment on any significant changes.
- Update the refuge hunting regulations brochure to inform the public of hunting opportunities, including accessible opportunities and refuge-specific regulations.
- Distribute the refuge brochure more widely.
- Work with CPW to develop a new hunt plan for the refuge complex that expands the hunting program on Monte Vista and Alamosa Refuges to include limited big game and opens Baca Refuge to limited small game and big game hunting. Following approval of the hunt plan by the Washington, D.C. office, publish new hunting regulations in the Federal Register. Begin phased implementation of the new hunting program as resources permit.
- On the Baca Refuge, adopt CPW hunting seasons and regulations for those species for which harvest is allowed on the refuges.

- For all the refuges in the complex, work with CPW to determine what level of hunting permits for elk will achieve habitat objectives related to herd populations and herd composition. Biological integrity and landowner tolerance will be considered when setting permit levels for elk hunting or other big game.
- Assess habitat and better understand big game behavior on the Baca Refuge. Determine where to apply hunting pressure and clearly establish hunting methods such as archery, muzzle loading, shotgun, or guided dispersal hunts.
- At the Baca Refuge, require mandatory check-in for unaccompanied hunters and during any big game hunt.
- Hunters must retrieve all game by walk-in or horseback only; no motorized vehicles will be allowed off established access areas. Horseback and game carts could be used. Consider game retrieval access on established roads in limited areas.
- Use annual wildlife surveys, car count data, and trail-cams to monitor and evaluate hunting use.
- Use a refuge permit system to control the number of hunters (about 10-15 hunters a day).
- Maintain the ability of the refuge complex to set refuge-specific bag limits, season lengths, or other regulations.
- Work with the CPW to establish and coordinate hunter days or events for hunters with special needs.
- Work cooperatively with CPW to conduct law enforcement patrols at the refuge to enforce compliance.
- Work with partners (such as Wheeling Sportsmen and Wilderness on Wheels) to improve the current accessible blind at the Alamosa Refuge.
- Identify whether accessible hunting sites are needed and, if there is a demand for accessible sites, where they could be developed.

- Increase outreach about the refuge's accessible and youth hunting opportunities by developing a one-page tear sheet that explains the accessible and youth hunting opportunities and facilities. Post information on the Web site.
- Issue certain licenses to youth or special-needs hunters only.
- Work with the CPW to establish a special permitted weekend hunt for elk, small game, and waterfowl that is available to only young hunters.
- Improve information via mapping, kiosks, brochures, and signage on all three refuges.

### OBJECTIVES FOR FISHING

There is a limited fishery for northern pike and carp within the refuge complex along the Rio Grande. We provide for the Kid's Fishing Day at one of the ponds on the Monte Vista Refuge. The Friends group provides support in managing this event.

**Fishing 1.** Maintain Kid's Fishing Day at the Monte Vista Refuge.

**Rationale for Fishing 1.** We host an annual Kid's Fishing Day at the Monte Vista Refuge during National Fishing Week. This event is geared toward teaching children how to fish.

#### **Strategies for Fishing 1:**

- Work with CPW and local partners to organize and run Kid's Fishing Day at the Monte Vista Refuge.

**Fishing 2.** Within 1-5 years, allow walk-in fishing access and bank fishing just below and above the Chicago Dam.

**Rationale for Fishing 2.** Prior to our acquisition of the property near the Chicago Dam, local citizens will access the area to fish for northern pike and carp. We closed the access down due to safety concerns about people walking across the dam or fishing off the dam. There has been long-time desire voiced by the public for us to reopen this area. Through the use of barriers, signage, law enforcement, volunteers, and other ways, many of the safety concerns can be mitigated. Currently, there are no nesting territories for southwestern willow flycatcher in this area; however, should nesting territories be established, temporary closures will be used.

**Strategies for Fishing 2.**

- Work with CPW or other partners to sponsor a fishing event for young anglers
- Prohibit fishing from the dam. Use signs, barriers, increased law enforcement, volunteers, or other techniques to address any safety concerns that arise.
- Use closures or other measures as needed should southwestern willow flycatcher territories be established.

**OBJECTIVES FOR WILDLIFE OBSERVATION, PHOTOGRAPHY, AND INTERPRETATION**

The abundant wildlife resources found on the refuge complex attract many visitors to the San Luis Valley. The largest draw is the Monte Vista Crane Festival, which attracts thousands of people annually during the spring migration of sandhill cranes. This event, which is put on in partnership with the refuges' Friends group and the local community, provides a significant boost to the local economy. Other visitors explore the auto tour routes at the Monte Vista and Alamosa Refuges, walk the nature trails (defined as trails with some type of interpretation, either signs or brochures), or enjoy the spectacular vistas from the Bluff Overlook at the Alamosa Refuge. Overall, access for visitors wanting to enjoy nonconsumptive recreation has been limited.

**Alamosa and Monte Vista National Wildlife Refuges****Strategies for Observation, Photography, and Interpretation A1–A2:**

- Maintain or upgrade existing facilities, signs, Web site, brochures, exhibits, and other programs.

**Objectives for Observation, Photography, and Interpretation**

The objectives and strategies will be geared toward enhancing existing visitor services.

**All Refuges in the Refuge Complex**

**Observation, Photography, and Interpretation 1.** Within 5 years, develop and complete a visitor service plan for the refuge complex that identifies specific programming elements including interpretive themes, messages, and audiences for wildlife observation, photography, and interpretation.

**Observation, Photography, and Interpretation 2.** Within 4–6 years, hire an outdoor recreation planner for the refuge complex. (Refer to objectives for refuge operations.)

**Alamosa and Monte Vista National Wildlife Refuges**

**Observation, Photography, and Interpretation 3.** Increase participation and enhance opportunities for wildlife observation, photography, and interpretive activities on the Alamosa and Monte Vista Refuges by improving the quality (FWS 2006e) and number of programs and facilities that are offered for wildlife observation, photography, and self-guided and staff-dependent interpretation. By year 15, increase annual visits to the refuges by 15–25 percent (1,500 to 4,000 more visits per year), with most visitors (75+ percent) reporting satisfaction with their experience and the facilities that we offer.

**Observation, Photography, and Interpretation 4.** Maintain the existing auto tour routes and nature trails.

Within 2–3 years, from mid-July to the end of February (end of the waterfowl season), open more access opportunities on a seasonal basis (outside nesting periods) for walking or other compatible modalities such as bicycles and skis using existing trails or Service two-track roads within the refuge complex and areas that are now only available to hunters. Work with partners to develop a trail system that ties the current city trails to the Alamosa and Monte Vista Refuges (figures 40 and 41), providing for some year-round access or loops where compatible.

**Observation, Photography, and Interpretation 5.** At the Alamosa Refuge, within 3–7 years, extend the auto tour route to the east to connect with Bluff Road and allow for walking and biking along the road. Improve the accessibility of the Rio Grande nature trail and enhance the quality of the experience by providing better visitor amenities such as seating, shelter at the end of the current trail, and improved interpretation such as updated brochures, interpretive panels, directional signs, and viewing platforms. Expand the Bluff interpretive nature trail down to parking area 4 and link a new trail from the town of Alamosa to connect with the refuge (figure 41).

**Observation, Photography, and Interpretation 6.** At the Monte Vista Refuge, within 4–5 years, improve visitor access, facilities, and information to include 1) accessibility modifications to Meadowlark Nature Trail with information about trail length (1 and 4 miles) and add a viewing blind; 2) replace small



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*The Meadowlark Nature Trail on Monte Vista Refuge will be improved and provide for more interpretation and accessibility.*

kiosks at parking areas 1, 2, and 3 with three-sided standard kiosks; 3) develop bird viewing area north and east of parking area 3, including an accessible parking area, trailhead, viewing blind, trail, and observation platform; develop one crane observation pull-off and parking off county road 6S and replace the signs at the crane pull-offs (figure 40).

**Observation, Photography, and Interpretation 7.** By year 15, design and build a new visitor center and office at either Monte Vista or Alamosa Refuge. Link trails from the new visitor center with connections, the auto tour route, and other destinations. Repurpose or remove the existing buildings at the headquarters office at the Alamosa Refuge and construct volunteer recreational vehicle pads.

**Observation, Photography, and Interpretation 8.** Within 10 years, work with partners to develop a trail from the town of Monte Vista to connect to the Monte Vista Refuge. In coordination with BLM, develop a trailhead on the refuge on county road 6S with a parking area large enough for horse trailers to provide nonmotorized access to BLM land.

### **Baca National Wildlife Refuge**

**Observation, Photography, and Interpretation 9.** Within 1–2 years, open the Baca Refuge for compatible, wildlife-dependent public uses (about 1,000–3,000 visits initially), including access by nonmotorized modalities such as biking, walking, and

limited horse access and allowing public access in hunting areas (except archery) during the hunting season. By year 15, improve outreach and opportunities and increase visitation gradually to 10,000–15,000 visits per year.

**Observation, Photography, and Interpretation 10.** Within 5–10 years, develop an auto tour route, install wayside interpretive panels along the auto tour route, and develop several looped interpretive trails around the refuge's headquarters area (old Baca Ranch) with several interpretive panels or other interpretive media positioned along the trail route (figure 42).

**Observation, Photography, and Interpretation 11.** Work with agency partners, our Friends group, and others to adaptively re-use one of the cattle headquarters buildings to serve as a staffed orientation and interpretation center for natural and cultural resources throughout the San Luis Valley.

**Observation, Photography, and Interpretation 12.** Work with NPS to manage and interpret the Trujillo Homestead.

**Rationale for Observation, Photography, and Interpretation 1-12.** The refuges are centrally located to the communities of Alamosa, Monte Vista, and Crestone. Currently, outside of waterfowl hunting, opportunities to view wildlife on the Alamosa and Monte Vista Refuges are limited. Many members of our Friends group, along with other visitors, have expressed a desire to have more opportunities for wildlife observation, interpretation, and other nonconsumptive uses. Several respondents in the visitor survey conducted by the USGS for the Monte Vista Refuge also expressed these views (USGS 2011b). Funds to support a quality visitor services program have been nonexistent. Concerns about disturbance to wildlife as well as safety concerns about general visitation occurring at the same time as waterfowl hunting have also been a factor. Initially, Service resources will be spent on improving habitat conditions on the refuge complex, and improvements to visitor services will likely take 15 years to fully implement. Partnerships, volunteers, and Service outreach efforts will be essential for successful implementation. Any new or enhanced visitor opportunities will have to be compatible with the primary purposes of the refuges (refer to appendix E), and we will continue to limit access during critical breeding and nesting periods across the refuge.

Even with the current funding challenges and other concerns, it will be realistic to increase and enhance the opportunities available to see wildlife

and enjoy nonconsumptive activities by a modest to moderate amount. Birding is growing faster than any other form of outdoor recreation. Providing facilities like viewing blinds that enhance viewing experiences represents an investment in the local economy and helps to create a conservation constituency (CDOW 2007). To increase visitor use days by 10–25 percent (approximately 1,000–4,000 more visits annually at the Monte Vista and Alamosa Refuges) or to open the Baca Refuge to public use and increase visitation to 10,000 visitor use days, the refuge complex will need to invest in better viewing facilities and programs (for example, building viewing blinds and platforms or by improving access and linkages) for visitors to enjoy and appreciate the role of the Service both within the San Luis Valley and across the Refuge System. We will also need to encourage visitation to the refuges through better outreach at the local level.

An essential part of achieving our objectives and strategies, particularly with the opening of the Baca Refuge for public uses, is to hire an outdoor recreation planner for the refuge complex. Much can be accomplished with even one FTE dedicated to this position. This person can help set the direction for visitor services, manage the program, work with volunteers, and seek funding opportunities such as grants or other partnerships. As the visitor services program is put in place, visitor surveys will be important for evaluating the success of our efforts at getting our messages out to the public.

In the short term, even within existing funding constraints, there are ways we can work in partnership with others to improve and develop facilities. Initially, we will begin by allowing access to the refuges outside of the critical breeding period from about mid-July to the end of February on Monte Vista and Alamosa Refuges. Visitors could take advantage of existing two-track roads to walk or bike. Simple markers could be used to post suggested routes. New and expanded wildlife observation and photography facilities could be designed to complement the natural settings within the refuge.

***Strategies for Observation, Photography, and Interpretation 1–12 (All Refuges):***

- We will continue to manage all Visitor Services programs (including hours of operation, pets, and other refuge regulations) in accordance with existing Service policy and refuge regulations.
- Inventory, maintain, and replace interpretive panels, signs, or kiosks, as needed.
- Maintain existing auto tour routes or refuge access points.
- Create brochures that interpret each of the complex's interpretive themes and highlight how they are relevant to each of the three refuges. Also consider publishing brochures that address complex and Valley-wide topics such as hydrology and landscape conservation.
- Provide interpretive materials in Spanish.
- Identify observation areas through signage and maps.
- Develop separate brochures for each refuge in the complex.
- Develop more interpretive exhibits and materials.
- Develop Web site-based materials such as bird lists and information, maps, and Webcams.
- Routinely update Web site and incorporate changing interpretive content into design.
- Increase advertising of events, activities, and special programming.
- Recruit more volunteers.
- Coordinate partners and other specialists to conduct guided interpretive tours.
- When expanding auto tour routes, improve roads to be all-weather roads and inform visitors if travel will be difficult or require high-clearance vehicles.
- Work with the NPS to manage and interpret the Trujillo Ranch on the Baca Refuge.
- Continue to cosponsor special events related to wildlife and habitat conservation.
- Determine locations where the refuge road and trail system could tie into community trail systems. Determine whether existing trails should be re-routed in places to minimize impacts or improve linkages.
- Coordinate closely with BLM in developing the trail access on the Monte Vista Refuge to BLM lands off of CR6 South.
- Use protective measures such as seasonal closures, signage, education, or trail rede-

sign as necessary to limit the potential impact to southwestern willow flycatcher or other wildlife. Require visitors to stay on the Rio Grande Nature Trail and Bluff Nature Trail on the Alamosa Refuge.

- Staff the visitor contact station at Alamosa 2–3 days per week.
- At the Alamosa Refuge, replace the kiosk at the visitor station and worn interpretive panels at the visitor station and along the auto tour route.
- On the Baca Refuge, consider trails that connect with adjacent land where biking and equestrian use is allowed.
- On the Baca Refuge, open elk and limited small-game hunting areas to non-hunters (excluding archery-only areas). Limit access to seasonal use on elk units. Allow access on small game units by non-hunters.
- Acquire and establish a system for using temporary and moveable observation facilities at the playas and other viewing areas, particularly on the Baca Refuge where wildlife viewing opportunities are directly related to precipitation or movement of wildlife.
- Allow virtual geocaching on open areas of the refuges to enhance the environmental education experience.
- In developing an auto tour route at the Baca Refuge, use the footprints of existing roads where practical. Follow design guidelines that reduce visual and resource effects and intrusions on the landscape.
- Allow for year-long and seasonal walking and biking opportunities on the Alamosa and Monte Vista Refuges and improve linkages if necessary. Consider linking one-way trails to provide for a loop trail where practical.
- On the Baca Refuge, allow for seasonal horse access on the auto tour route and specific trails.
- Evaluate visitor programs and the Service's visitor services standards.

- Apply for grants to stabilize the significant buildings and structures at the two Baca Ranch complexes.

### OBJECTIVES FOR ENVIRONMENTAL EDUCATION

Environmental education is a process designed to teach citizens and visitors the history and importance of conservation and biological and scientific information about our Nation's resources. Within the Refuge System, we use on-site, off-site, and distance learning materials, activities, and programs (FWS 2006a) to achieve our objectives.

The environmental education program will be expanded.

#### *All Refuges in the Refuge Complex*

**Education 1.** Within 5–10 years, working with our partners and area educators, improve the existing environmental education programs on- and off-refuge by developing an Educator's Guide and more curriculum-based educational programming. Provide refuge-taught environmental education programming to a minimum of two school or teacher training groups per year.

**Education 2.** Within 3 years, form partnerships with local school districts and other educational organizations and collaboratively develop curriculum and programming. By year 5–7, launch the environmental education program with school districts and teachers throughout the refuge complex.

**Education 3.** Work with partners to update existing environmental education curricula tailored to the refuge complex; potential partners include BLM, BOR, the State of Colorado, Project Wild, Project Wet, Nature Learning, and Project Learning Tree.



*School children participate in an environmental education class on Alamosa Refuge.*

Include potential topics such as hydrology, sandhill cranes, climate change, and riparian ecosystems.

### **Alamosa and Monte Vista National Wildlife Refuges**

**Education 4.** At the Alamosa Refuge, use the existing visitor center for environmental education programming. By year 5, install new accessible kiosks, retrofit the building to be accessible to all users, and develop interpretive panels for inside and outside the building. By year 10, establish a discovery station geared toward school groups and young visitors that provides hands-on learning and nature play opportunities.

### **Baca National Wildlife Refuge**

**Education 5.** By year 5–8, host environmental education and interpretive programs and activities six times per year and increase programming if demand exists.

**Rationale for Environmental Education 1-5.** We support connecting people with nature through various initiatives such as “Let’s Go Outside” (FWS 2013h). Louv (2005) highlighted the importance of connecting children with nature, contending that the lack of nature, or “nature deficit disorder,” in the lives of today’s wired generation contributes to disturbing childhood trends such as rises in obesity, attention disorders, and depression. Because the refuge complex is near the communities in the area, it offers unique opportunities for engaging children and adults in the area. With a university and a college adjacent to the Alamosa Refuge in Alamosa, we have an opportunity to partner and work with the students and faculties of these schools.

To achieve our objectives, we will need to hire an outdoor recreation planner. We need to also develop a visitor services plan that identifies the elements of an environmental education program for the refuge. Previously, the refuge complex had an outdoor recreation planner, but that position was cut as a result of budget cuts. With more staff, we could increase the number of environmental education programs that we could offer. The programs will focus on wildlife biology and habitat needs and will update existing curricula to highlight refuge issues. Because environmental education is curriculum-based and labor intensive, initial efforts will be limited to the Alamosa Refuge, but these efforts could be expanded to include the other refuges in the complex.

### **Strategies for Environmental Education 1–5:**

- In addition to school districts, work with migrant schools, Boys and Girls Clubs, La Puente, and other groups.
- Increase curriculum-based opportunities for environmental education.
- Work with other Federal agencies to support an interagency environmental education specialist for the San Luis Valley.
- Work with Teaching Environments Naturally.
- Partner with NPS to provide environmental education in the local area. For example, we could have an NPS education specialist lead programs at the refuge complex, and we could adopt their online curriculum and wetland educator’s guide. In turn we could lead an event at the Great Sand Dunes (such as during July Wetlands Month).
- Develop an interpretive timeline that communicates the story of the Baca property from the Luis Maria Baca Grant #4 to conservation by TNC, NPS, and FWS in 2004–2005.
- Pursue “Connecting People with Nature” grants.
- Look into participating in other events and programs outside the refuge that have an educational focus, such as Beaver Creek Youth Camp, Ducks Unlimited Green-Wing Day, and Water Fest.
- Recruit more volunteers and use volunteers and seasonal employees to staff facilities and support environmental education programming.
- Link refuge complex Web site to other online educational resources and Friends group curriculum.
- Develop an environmental education program as part of the visitor services step-down plan.
- Align teacher- and refuge-taught school programs with State and local educational standards.

- Find gaps in environmental education materials and programs, conduct a visitor experience survey, and identify other themes to expand through improved programming.
- Promote teacher-taught and refuge-taught programming that incorporates the “Children in Nature” initiative in both structured and unstructured ways. Encourage family visits and family awareness of the refuge and the Refuge System. Promote programs to get all ages of children outdoors.
- Respond to requests for technical help with curriculum-based environmental education such as Range Days, Bio-Blitz, Envirothon, and Field Days.
- Use the refuge Web site to promote environmental education; include a downloadable podcast.
- Annually offer two teacher workshops to all interested school districts in the San Luis Valley to promote refuge-based (local community) and regional-based information.

### OBJECTIVES FOR OUTREACH

Outreach to the local communities helps to educate people about the refuge complex and its needs. Outreach involves communication between the refuge and the public, interested groups, local communities, and city, county, State, and Federal officials. It may include formal meetings or informal discussions with visitors or landowners, as well as news releases, organized programs, tours, and presentations.

#### *All Refuges in the Refuge Complex*

**Outreach 1.** Develop an outreach plan as part of the visitor services plan. Increase the visibility of the refuge complex and help visitors find the refuge with improved roadside signage and directional signs on roads that border the refuge.

**Outreach 2.** By year 5, develop a new refuge complex map and brochure that highlights the refuge’s resources, public use opportunities, and interpretive themes. Develop separate general brochures for each refuge, highlighting specific regulations, activities, and points of interest.

**Outreach 3.** Within 5 years, update and improve the Web site and social media to keep information fresh and current.

**Outreach 4.** Maintain and strengthen links with area tourism centers and other tourism sites such as Fort Garland, Great Sand Dunes National Park and Preserve, and the Colorado Welcome Center to make sure that more visitors are aware of the refuges and that correct information is distributed.

**Rationale for Outreach 1–4.** Greater outreach will help us to target new audiences, recruit more volunteers, and help get our conservation message out to larger audiences. The outreach message will be focused on the refuge’s goal of increasing wildlife resources and restoring habitat.

#### **Strategies for Outreach 1–4:**

- Incorporate refuge maps into kiosks at trailheads and other refuge entrance points to help orient visitors. Include a context map of the San Luis Valley, so visitors know that the refuge they are at is part of a larger complex.
- Use events like the Monte Vista Crane Festival to increase awareness about and visibility of the refuge complex.
- Use written translation and guided tours offered in Spanish.
- Update the Web site to provide trip planning, weather and safety information, and information on events or activities.
- Work with the Colorado Tourism Office, local chambers of commerce, and the Sangre de Cristo National Heritage Area to promote the refuges and their resources.
- Actively take part in State and local events, such as State, county, and school career fairs.
- Annually conduct two information-sharing events with the media, such as interviews, public service announcements, and written articles, and provide information to chambers of commerce, congressional contacts, and tourism outlets.

### OBJECTIVES FOR COMMERCIAL RECREATION

Commercial recreational uses are uses of a national wildlife refuge where an economic gain is derived. Commercial recreational uses of a refuge may be compatible if they directly support a priority public use, or if they are specifically authorized by a statute. Examples of commercial uses are concession-

operated activities or commercial outfitting, photography or guiding. Commercial uses must be compatible with the mission of the Service, the Refuge System, and the purpose for which the refuge was established. Commercial uses that are not compatible are not allowed.

**Commercial Recreation 1.** Continue to allow commercial use only by special permit. Allow for additional limited commercial uses under special use permits such as horseback rides or photography.

**Rationale for Commercial Recreation 1.** We receive few requests for commercial recreation opportunities and they can easily be handled on a case-by-case basis. To increase opportunities for visitor services, we will consider expanding commercial permits. For example, we could allow users of the stables at the nearby Baca Grande subdivision to take rides into Baca Refuge, or allow for some professional photography, classes, nature tours, or packing elk out of an area for a hunter.

**Strategies for Commercial Recreation 1.**

- Require all photographers to allow us to use photos for refuge complex purposes.
- Determine whether a special use permit or concession permit is needed on a case-by-case basis.

## 4.6 Cultural Resources

Although many prehistoric and historic resources have been recorded within the refuge complex, the vast majority of the refuge lands have not been surveyed for cultural resources. Additional surveys and an assessment of the significance and appropriate management of the resources are needed to assure protection.

### OBJECTIVES FOR CULTURAL RESOURCES

The cultural resource objectives focus on adhering to current laws; protecting resources; maintaining partnerships; and providing education and outreach.

**Cultural Resources 1.** Continue adherence to cultural resources laws including Section 106 of the National Historic Preservation Act; the Archaeological Preservation Act; and the Native American Graves Protection and Repatriation Act (NAGPRA).

Avoid adverse effects to significant resources when possible.

**Rationale for Cultural Resources 1.** The refuge complex contains many significant cultural resources, which we will continue to protect. Our Friends group and other members of the public have a lot of interest in the history of the refuge complex and are willing to help us with our preservation needs.

**Strategies for Cultural Resources 1:**

- Significant cultural resources will be identified and protected. Individual projects may require consultation with the Colorado State Historic Preservation Office, tribal historic preservation offices, and other interested parties.
- Offer educational outreach in the form of occasional presentations and limited use of signage.
- Work with Friends group and other members of the public to accomplish preservation and research objectives.
- Maintain law enforcement monitoring of known sites and sensitive areas.
- Within 10 years, complete an assessment of the two Baca Ranch complexes and determine whether the facilities could be used for other purposes.
- Continue working with the tribes and other agencies who are parties to the NAGPRA agreement on the continued reinterment of individuals on refuge lands through the NAGPRA process.

**Cultural Resources 2.** By year 15, develop a step-down plan (or assessment) for cultural resources at the Baca Refuge and develop partnerships with our friends groups and other stakeholders to protect cultural resources on the refuge

**Rationale for Cultural Resources 2.** All the refuges contain many significant prehistoric sites and historic areas, many of which have not yet been properly surveyed. The San Luis Valley has a rich history of Native American and Euro-American presence. Additionally, the Baca headquarters and purebred cattle headquarters area are eligible to be on the Register of Historic Places. A step-down plan is needed to manage cultural resources in all refuge

operations and establish priorities for cultural resources protection.

To increase the public's appreciation of and encourage support for cultural resources in the area, interpretation should be incorporated into the overall visitor services program. Tribal members, long-term and past employees, local residents, and members of regional historic societies can provide a wealth of information about the history of the refuge and the location of specific resources.

### **Strategies for Cultural Resources 2:**

- Offer educational outreach in the form of occasional presentations and enhance use of signage, brochures, and the refuge complex Web site to disseminate information.
- Work with the Friends group and other stakeholder groups to accomplish preservation and research objectives. Develop partnerships to carry out targeted surveys and perform investigations to locate and preserve cultural resources. Work with neighbors and partners to acquire more information on the resources that can be used for interpretation.
- Increase law enforcement monitoring of known sites and sensitive areas.
- As necessary, complete reconnaissance surveys in response to Section 110 of the National Historic Preservation Act.
- Bring in guest speakers for presentations about refuge complex cultural resources.
- Develop exhibits and signs at the Baca Refuge interpreting cultural resources.
- Explore potential for interpretation at the cattle and ranch headquarters areas; cultural landscapes; and other outbuildings and cow camps.
- Provide guided tours.
- Increase dialogue with tribal representatives about locations of sites and collections.
- Recruit volunteers and partners to carry out targeted surveys and investigations to locate and preserve cultural resources.
- Develop partnerships with the Sangre de Cristo National Historic Area and other groups that have a cultural, historic, and archaeological focus.
- Involve the Friends group in preparing National Register of Historic Places forms and surveys.
- Increase partnering with NPS, BLM, and USFS Heritage teams.
- Increase outreach to tribes and San Luis Valley residents to gain traditional insight into resource locations, collections from the refuges, and significance of these resources.
- Reach out to Native American tribes regarding their oral traditions and regional knowledge concerning the history of the San Luis Valley.
- Assist in the development of a policy for Region 6 regarding reinterment of individuals to guide future burials as part of the NAGPRA process.

**Cultural Resources 3.** By year 15, stabilize and rehabilitate the house at Baca headquarters and fully record cow camps at the Baca Refuge.

**Rationale for Cultural Resources 3:** These are significant cultural resources on the Baca Refuge.

### **Strategies for Cultural Resources 3:**

- Pursue a State Historic Fund Grant to pay for restoration of any demonstration buildings deemed suitable for reuse.
- Identify future uses for historic buildings and interpret cow camps.

## **4.7 Partnerships and Refuge Operations**

We work in partnership with a number of Federal, State, and local governmental agencies throughout the San Luis Valley. We also work with other conservation partners and stakeholders to accomplish our management goals and objectives. Our facilities, infrastructure, and staff facilitate our ability to accomplish the conservation work we do.

## OBJECTIVES FOR PARTNERSHIPS

The refuge complex and its resources are within the larger landscape of the San Luis Valley and the adjacent high mountains. Partnerships, including agreements with landowners next to the refuges and other interested agencies and stakeholder groups, are essential in achieving our habitat, wildlife, and visitor services objectives.

### *All Refuges in the Refuge Complex*

**Partnerships 1.** Maintain existing partnerships including our Friends group.

**Partnerships 2.** Continue to work with the Partners program to support privately owned habitats vitally important to the refuge complex and the Southern Rockies Landscape Conservation Cooperative (see chapter 1, figure 5.)

**Rationale for Partnerships 1–2.** Currently, the Service works cooperatively with many agencies and jurisdictions; these efforts have been quite successful and will continue. For example, the sheer size of the Baca Refuge and its juxtaposition to other conservation entities in the Great Sand Dunes ecosystem has required a Service commitment to working with neighboring agencies, local groups, and individuals on common areas of interest.

#### **Strategies for Partnerships 1–2:**

- Protect habitat through fee-title and easements and by participating in partnerships with other land conservation trusts and entities.
- Continue collaboration with our partner agencies or organizations for established agreements, including the BOR Project Authorization Act of 1972, the Fish and Wildlife Reclamation Project Authorization of 1972, and the Fish and Wildlife Report for the Closed Basin Division, San Luis Valley Project, Colorado, 1982. Cooperation and collaboration with Federal, State, tribal, and local governments; nongovernmental organizations; and adjacent private landowners will continue. Section 3.11 describes existing and potential partnerships.
- Integrate refuge planning with the Partners program.

**Partnerships 3.** Establish new partnerships, such as with local universities, local trails groups, and

many other organizations that can help us achieve our habitat, wildlife, and visitor services objectives.

**Rationale for Partnerships 3.** Because of the central location of the refuges, we have numerous opportunities to reach out and establish new partnerships to assist us in accomplishing our objectives and getting the message out about the work of the Service.

#### **Strategies for Partnerships 3:**

- Work with our partners to share resources.

### *Baca National Wildlife Refuge*

**Partnerships 4.** Work with NPS to interpret and manage the Pedro Trujillo Homestead.

**Rationale for Partnerships 4.** The Pedro Trujillo homestead is a Hispanic homestead located on the Baca Refuge that dates to the mid-19th century. It was designated as a National Historic Landmark in 2012 as a representation of the expansion of Hispano-American settlement in the American Southwest following the 1848 Treaty of Guadalupe-Hidalgo (National Park Traveler 2012). Because the NPS has substantial expertise in interpreting historic properties, including those in the San Luis Valley, it is a logical partner; the NPS has expressed interest in partnering with us to interpret this significant landmark. Because of its remote location and limited staff resources, limited access or guided tours will be necessary to protect the site from vandalism.

#### **Strategies for Partnerships 4:**

- Continue to work with the Baca branch of the Friends group to achieve refuge objectives.
- Work with partners in Monte Vista and Alamosa to link the towns to the refuges via a trail.
- Pursue joint visitor services programming with other agencies such as NPS and BLM.
- Work actively with partners such as the Colorado Wetlands Program, Ducks Unlimited, and Colorado Division of Water Resources to maximize efficiencies in water management.
- Pursue an interagency environmental education position with other agencies.

## OBJECTIVES FOR REFUGE OPERATIONS

Refuge operations include management of facilities, structures, and other land and water use. The refuge relies on staff, equipment, and facilities to carry out both the day-to-day operations and the long-term programs such as land acquisition. The following objectives describe how the Service uses money and staff to meet the refuge complex goals.

### *All Refuges in the Refuge Complex*

**Operations and Staffing 1.** Over 15 years, to accomplish habitat and public use objectives, justify and obtain new FTEs for the following positions: Convert one office support assistant from term to full-time for refuge headquarters; add one office support assistant for the Baca Refuge; add one outdoor recreation planner for the refuge complex; add one hydrologist for the refuge complex; add one wildlife biologist for the refuge complex; change one biological technician from Alamosa to refuge headquarters; add one biological technician for the refuge headquarters; add one refuge manager for the Monte Vista Refuge; add one supervisory range technician for interagency fuel planning (GS-9); convert existing ½ FTE for interagency fire technician to full-time (GS-7); add one FTE (two seasonal ½ FTEs) tractor operators for refuge headquarters and add ½ FTE tractor operator for Baca Refuge; and more seasonal positions (see table 18.)

**Operations and Staffing 2.** By year 7–10, replace all unreliable heavy equipment and vehicles.

**Rationale for Operations and Staffing 1–2.** In order to open the Baca Refuge to public access and to provide more opportunities across the refuge complex, we will need to increase refuge complex staff (table 18) and several seasonal positions. When the Baca Refuge was authorized and established, greater operations funding did not accompany this significant acquisition of Refuge System lands. Existing staff from the Monte Vista and Alamosa Refuges assumed the responsibility for managing this added land. In addition to opening Baca Refuge to hunting and wildlife-dependent recreational uses and increasing staff for the other refuges, other key staff resources needs include increased law enforcement presence, a refuge manager for the Monte Vista Refuge, and an outdoor recreational planner. Given the central location of the refuges to the towns of Alamosa, Monte Vista, and Crestone, we believe it is necessary to have an outdoor recreation planner for the refuge complex's visitor services program. Although the refuge complex is fortunate to have an active Friends group, a Service position devoted to this task is

needed to manage active visitor services and volunteer programs for the refuge complex. Currently, the refuge manager for the Alamosa and Monte Vista Refuges manages this program in addition to the other habitat and management duties.

In order to achieve our habitat and visitor services objectives, we will also replace some of our heavy equipment and other vehicles that are old, unreliable, and costly to maintain.

### **Strategies for Operations and Staffing 1-2:**

- Spread limited staff resources across the refuge complex to accomplish habitat objectives and provide limited public use.
- Continue to acquire land within the authorized boundary areas of the refuge complex. These lands will be purchased from willing sellers as money becomes available.
- Assist Region 6 Realty Division in checking Service easements within the Sangre de Cristo conservation area and the proposed San Luis Valley Conservation area when it is established.
- Prioritize the positions and equipment that are needed to achieve our habitat and visitor services objectives.
- Where possible, use the following principles to minimize impacts of all roads in refuge complex:
  - locate roads away from streams and riparian areas;
  - locate roads away from steep slopes, landslide prone areas, and erosive soils;
  - when road stream crossings are unavoidable, construct roads during periods of low flow to avoid fish spawning and incubation periods, and dewater relevant stream segments prior to construction;
  - provide adequate drainage and control of erosion to avoid routing sediment into streams;
  - use bottomless or textured bottom culverts; and
  - design roads around natural drainage patterns.

- Access to private inholdings and facilities involving BOR's Closed Basin Project will continue.
- Adhere to all Service polices regarding rules and regulations for oil, gas, and mineral extraction on refuge lands. Many of the minerals underlying the Baca Refuge are privately owned (not owned by the United States). Access to these minerals by the private owner is regulated by Federal and State law which, in part, requires the U.S. Fish and Wildlife Service, as owner of the surface estate, to place reasonable restrictions on the mineral owner's access so as to reduce disturbance to the surface estate.
- We will conduct surveys as necessary for New Mexico jumping mouse prior to habitat management, restoration activities, or improvements for visitor services.

### ***Alamosa and Monte Vista National Wildlife Refuges***

**Operations and Staffing 3.** By year 15, build a visitor center and refuge complex headquarters at the Monte Vista or Alamosa Refuges.

**Operations and Staffing 4.** Within 5–7 years, redesign the auto tour route on the Alamosa Refuge to provide an alternative route to access the Bluff Overlook off the existing auto tour route (about 2 miles and follows existing Service road). By year 3, on the Alamosa Refuge, allow for seasonal access for biking and walking in areas that have been traditionally opened only to hunters during hunting season. Using existing roads or trails, open 6–7 more miles of nature (interpretive) trails on the Alamosa Refuge, including a trail link from Alamosa to the refuge. Open about 1 mile of new interpretive trail on the Monte Vista Refuge. Open existing trails in the hunting area on the Monte Vista Refuge to visitor access seasonally for foot and bicycle access.

**Operations and Staffing 5.** By year 15, repurpose or remove the Lillpop house on the Alamosa Refuge, which serves as the existing headquarters office, as well as the single and double-wide trailer with a small bunkhouse and two recreational vehicle sites for volunteers.

**Operations and Staffing 6.** By year 15, improve the recreational vehicle sites for volunteers to make them accessible for larger motorhomes and provide thermal breaks.

**Operations and Staffing 7.** Within 10 years, rehabilitate the existing Alamosa visitor and environmental education center to be fully accessible. Update all fixtures to environmentally friendly models.

**Operations and Staffing 8.** Within 10 years, rehabilitate all living quarters to be more energy efficient.

**Operations and Staffing 9.** Within 2–3 years, identify accessibility needs for trails, blinds, kiosks, pull-outs, observation platforms, and other visitor services facilities.

**Operations and Staffing 10.** Within 2–3 years, identify new or replacement infrastructure for managing water more efficiently (refer to habitat and water resources objectives) and set priorities for replacement.

**Rationale for Operations and Staffing 3–10.** Currently the operations office for the refuge complex is located at the Lillpop office on Emperius Road in Alamosa. The building, a former house, is not ideally designed for an office environment. For example, the ventilation of the current office is not always conducive to a productive working environment for staff. The building is not universally accessible for members of the public or employees with disabilities. It is tucked away from visitors and members of the public who may need information or services. Current access to the building is down Emperius Road, which requires an unsafe railroad crossing (blind crossing with no gates) and presents a safety hazard for visitors and employees that is difficult to remedy.

Much of the refuge complex visitation occurs at the Monte Vista Refuge. The existing small office at the refuge does not serve as a visitor contact station, particularly when the refuge hosts the Monte Vista Crane Festival, which draws large numbers of visitors to the refuge. By building the refuge complex headquarters at the Monte Vista Refuge, including designing it to serve as a visitor center, it will solve a number of significant issues such as providing a central Service presence and improving safety, accessibility, energy efficiency, and ventilation. Additional site planning will be done to determine the best location for a new visitor center and headquarters area (at either Monte Vista or Alamosa Refuge). At a minimum, a contact station is needed at Monte Vista Refuge.

### ***Strategies for Operations and Staffing 1-10:***

- Acquire funds for site planning, design, and construction for a new visitor center.

- Work with partners, volunteers, and regional office staff to find opportunities and efficiencies.
- Work with the county to find ways to improve safety on road into existing Alamosa headquarters area.

### ***Baca National Wildlife Refuge***

**Operations and Staffing 11.** At the Baca Refuge, within 1–2 years, begin a cleanup of the Baca Ranch headquarters area.

**Operations and Staffing 12.** Within 3 years, develop visitor and hunter access at the Baca Refuge to include an auto tour route, trails, and signed entry points from highways. (Refer to figure 42.)

**Operations and Staffing 13.** Work with any future mineral developers to reduce disruption to visitors.

**Rationale for Operations and Staffing 11–13.** Primary access onto the Baca Refuge is located just outside of Crestone at the old ranch headquarters. To open the refuge to public use, the former boneyard needs to be cleaned up and access to the refuge provided. There are opportunities to partner with other agencies such as the NPS, USFS, and CPW to provide information in the northern parts of the San Luis Valley and achieve mutual objectives. Should future mineral development occur on the site, we will want to make sure that we minimize impacts to refuge operations.

#### ***Strategies for Operations and Staffing 11-13:***

- Recruit volunteers to help with cleanup of the Baca Ranch headquarters area.
- Partner with other agencies.
- Work with the Cultural Resources Specialist in Region 6 to submit grant proposals to stabilize significant buildings and structures at the two Baca Ranch complexes.
- Work with mineral developers to reduce any effect on the visitor experience. Require mineral developers to site any facilities away from visitor access areas.

## **4.8 Research, Science, and Wilderness Review**

The following objectives specifically address climate change, research, science, monitoring, and wilderness.

### **OBJECTIVES FOR CLIMATE CHANGE**

Although there is considerable uncertainty about what effects can be attributed to climate change in the San Luis Valley, the magnitude, timing, distribution, and type of precipitation with corresponding effects on surface and ground water resources (see chapter 3) are changing. Our habitat management objectives, particularly re-establishing historic flow patterns, have been developed in response to changing conditions that we have been seeing across the refuge complex. (Refer to habitat objectives and water management objectives above.) We have also identified several specific objectives aimed at monitoring potential effects, communicating with the public, and reducing our carbon footprint.

**Climate Change 1.** Incorporate and follow Secretarial Order 3289 (DOI 2009), Executive Orders 13514 and 13423, and policies as defined by 565 FW 1 in all facets of refuge management and operations including:

- landscape conservation design with biological outcomes at broader landscape levels as well as refuge-level scales
- landscape conservation that supports climate change adaptations by fish, wildlife, and plant populations of ecological and societal significance
- monitoring and research partnerships
- achieving carbon neutrality by 2020
- building capacity to understand, apply, and share terrestrial carbon sequestration science and work with partners to sequester atmospheric greenhouse gases while conserving fish and wildlife habitat at landscape scales
- providing educational and training opportunities for Service employees about the implications and urgency of climate change as it relates to the Service mission and engage them in seeking solutions

- public education
- partnerships – locally, nationally, and internationally

**Climate Change 2.** Over 15 years, study the effects of climate change on the refuge complex (including water availability, timing, duration, and volume), as it relates to wetland habitat health, sustainability, and wildlife use on the refuge complex.

**Climate Change 3.** Within 5 years, and as part of the visitor services stepdown plan, incorporate climate change messaging and themes in all of our visitor services programs. At least 70 percent of visitors to the refuge complex will understand the major climate change issues affecting our management of migratory birds and other wildlife within the refuge complex.

**Rationale for Climate Change 1–3.** The San Luis Valley, including the refuge complex, has experienced significant alterations over the last century, such as habitat loss and fragmentation, introduction of non-native plants, increased presence of chemicals such as fertilizers and pesticides, and altered disturbance regimes such as the frequency, timing, and magnitude of fire, herbivory, and hydrology. These alterations have affected habitat quantity, quality, and sustainability. The effects of these stressors are likely being exacerbated by climate change, which is predicted to include higher temperatures; changes in the hydrologic cycle that affect aquatic species, including reduction in overall streamflow, an ongoing shift to earlier spring runoff, and warming of water temperatures; northward and upward shift in animal ranges, causing shifts in ecosystem composition; increased range and spread of wildlife pathogens; increase in plant mortality because of drought stress; increased risk of desertification in dryland ecosystems; and an overall reduction in biodiversity because of the above effects (Averyt et al. 2011).

While many of the current and potential effects of climate change on the habitats of the refuge complex are not known at this time, there have already been changes in hydrology. The wetland habitats have changed in recent years and will continue to change. Because hydrology is the primary abiotic factor that drives habitat quantity, quality, and function, we chose water availability, including timing, duration, and volume, as the best measure to monitor because it exerts the greatest influence on the vegetation composition and structure of refuge habitats as well as the availability of resources for wildlife populations.

### **Strategies for Climate Change**

- Continue maintaining solar power production and recycling efforts, increase energy efficiency, and adopt other ways to reduce the refuge complex’s carbon footprint.
- Integrate sustainability-based approaches into partnerships, contracts, and other external stakeholder efforts.
- Provide staff and external stakeholder training for sustainability-based principles and practices, social justice and equity, community development, and partnership performance standards.
- Establish performance benchmarks within the environmental management system (515 DM 4) as the essential first step, then create metrics and benchmarks for all other sustainability-based practices (environmental, social, economic, and community).
- Develop projects to retrofit facilities, infrastructure, equipment, and the vehicle fleet to maximize energy efficiency and production. Seek funding through Refuge Operations Needs and Deferred Maintenance databases, and other opportunistic and entrepreneurial funding sources.
- Reduce the carbon footprint of the refuge complex’s operations and continue “greening” efforts to meet climate change initiatives, such as upgrading facilities to green standards, teleconferencing, carpooling, limiting excessive idling of vehicles and equipment, turning off lights and heat sources when not needed, and recycling.
- Monitor climate information from established weather stations throughout the San Luis Valley.
- Collaborate with the Colorado State Division of Water Resources, the Rio Grande Water Conservancy District, and other partners to monitor river flows and ground water levels throughout the Upper Rio Grande watershed.
- Collect information on the timing, volume, and duration of surface water delivery to each refuge.

- Collect information about the timing, volume, and duration of ground water use on the refuges.
- Annually, on each refuge, collect information on the amount of surface acres covered by water throughout the year as it relates to water inputs (both surface water delivery and ground water).
- Monitor changes in vegetative communities and wildlife use in all habitats.
- Install ground water monitoring devices on each refuge to monitor local ground water levels.
- Incorporate discussions about climate change and its effects on refuge habitats during public events such as the Monte Vista Crane Festival, Kid’s Fishing Day, and other public interactions.
- Develop interpretive materials such as signs, brochures, and outreach that focus on climate change issues affecting migratory and breeding birds.
- Conduct riparian plant surveys designed to measure the effects of large ungulate browsing and hydrologic conditions on willow and cottonwood reproduction, growth, spread, and survival and whether the objectives for riparian areas should be modified in any way.
- Survey riparian birds with an emphasis on the effects of plant structure, diversity, and extent on riparian bird species richness and abundance during nesting and migration periods.
- Survey vegetation with an emphasis on habitat management activities that are necessary to improve and promote habitat health, function, and sustainability.
- Conduct inventories related to wildlife species presence and absence, population trends, and level and timing of use on refuge habitats under various vegetative and hydrologic conditions.
- Coordinate with CPW to monitor status and trends for Rio Grande chub and sucker populations in the Crestone Creek system and Willow Creek as they relate to hydrology and other habitat conditions.
- Monitor aquatic macroinvertebrate richness and abundance as they relate to water management activities (such as timing of application, duration, and depth) and their effects on avian use.
- Monitor ground water levels and river and creek flows to assess effects on vegetation throughout the refuge complex’s habitats, particularly riparian areas.

### OBJECTIVES FOR RESEARCH, SCIENCE, AND MONITORING

In addition to research-related topics addressed in the sections above, this section identifies research issues specific to CCP implementation.

**Research 1.** Conduct research, inventory, and monitoring activities specifically related to CCP implementation that are designed to assess and evaluate the effects of habitat management and public use. Determine wildlife and vegetation responses to various habitat management activities such as water management, rest, prescribed grazing, prescribed fire, and invasive weed control as well as public use in various habitats during different times of the year. Expand our knowledge of wildlife species diversity, abundance, and timing of use of refuge habitats under various vegetative and hydrologic conditions. The highest priority projects include:

- For focal bird species and other specific wildlife species, research the effects of habitat management activities on species richness and abundance during nesting, post-nesting, and migration periods throughout various habitats on the refuge complex. Determine how public use affects these species on the refuge complex.

**Rationale for Research 1.** The Improvement Act requires us to “monitor the status and trends of fish, wildlife, and plants in each refuge.” The Conserving the Future document (FWS 2011a) also describes specific recommendations for the need and importance of collecting scientific information relating to our refuges’ wildlife, plant, and abiotic resources to use the principles of adaptive management. Research, inventories, and monitoring will be used primarily to evaluate resource responses to habitat management and restoration activities such as water management; prescriptive grazing; prescribed fire; grass, shrub, and tree plantings; and invasive weed control. We will evaluate any effects such as distur-

bance or displacement that public uses may have on wildlife.

Research and monitoring projects will address such things as habitat use and life-history requirements for specific species and species groups; practical methods for habitat management and restoration; responses of vegetation and wildlife to various habitat management activities such as water management; prescriptive grazing; prescribed fire and invasive weed control; extent and severity of environmental contaminants; effects of climate change on environmental conditions and associated habitat and wildlife response; and responses of habitat and wildlife to disturbance from public uses. Projects may be species-specific or refuge-specific or they may evaluate the relative contribution of the refuges to issues and trends at a regional or national level. These projects will increase available scientific information and promote adaptive management on refuge lands.

#### **Strategies for Research 1:**

- Minimize wildlife disturbance habitat effects in any data collection. Collect the minimum number of samples required for analysis for identification and experimentation and use established scientific techniques for data collection and analysis.

### **OBJECTIVES FOR WILDERNESS**

In keeping with the Service's planning policy, we conducted a wilderness review as part of the CCP process. The review process has three phases including inventory, study, and recommendation (FWS 2008).

**Wilderness 1.** Over 15 years, manage the southeastern portions of the Baca Refuge, which includes lower Deadman Creek, South Antelope Spring, and Sand Creek (see figure 47, appendix F), as a wilderness study area. Within 5 years, complete the inventory and review process, and forward final recommendations to the Director and the Secretary of the Department of the Interior.

**Rationale for Wilderness 1.** Based on our review of the lands within the refuge complex, we found that the southeastern portion of the refuge (about 13,800 acres) possesses the following wilderness characteristics and values: 1) it is larger than 5,000 acres; 2) it is mostly intact and has few intervening roads and infrastructure; 3) it generally has little sign of human intervention and it shares a boundary with a current wilderness study area on Great Sand Dunes National Park and Preserve; 4) it is not easily accessible and is located nearly as far from regular human activity as possible on the valley floor; and 5) it is associated with the rare and significant Great Sand Dunes com-

plex and contains unique native habitats and rich historic and prehistoric resources.

We divided the recommended land into several units (see above) to provide access for fire or other management purposes. Our review did not find areas on the Alamosa Refuge or the Monte Vista Refuge that meet the criteria for wilderness protection. (Refer to appendix F, table 19.)

#### **Strategies for Wilderness 1:**

- As necessary, conduct and complete a minimum tool evaluation for activities such as wildland fire, wildlife management, or other research-related activities.
- Ensure that wildland fire suppression activities can be carried out effectively.
- Maintain the ability to use prescribed fire and livestock grazing as needed to manage habitats in these areas.
- Maintain access to monitoring and stock wells for maintenance.
- Work with CPW to ensure optimal harvest of elk.
- Include those inholdings that are currently owned by TNC, once they have been acquired.
- Work cooperatively with NPS in managing shared wilderness values and characteristics on both park lands and refuge lands.

## **4.9 Partnerships**

We value the many partnership organizations we work with in the San Luis Valley. We could not accomplish our mission without the help of these organizations. Many existing and potential partnership opportunities exist near the refuge complex, including:

- Federal agencies including BLM, NPS, USFS, and NRCS.
- The Partners program, which has been active in the San Luis Valley since 1990.
- Colorado Parks and Wildlife, Colorado Division of Water Resources, and other State agencies.



FWS

*Eastern portions of the Baca Refuge, adjacent to the Great Sand Dunes National Park and Preserve, will be recommended for wilderness protection.*

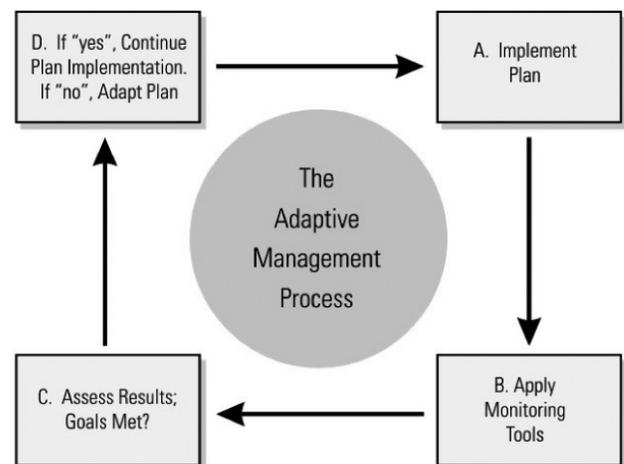
- Rio Grande Water Conservation District, county commissioners, fire wardens, fire districts, weed districts, and sheriff's departments.
- Nongovernmental organizations including the invaluable work of the Friends of the San Luis Valley National Wildlife Refuges, TNC, Colorado Open Lands, Adams State College, Wildlife Conservation Society, Ducks Unlimited, Rocky Mountain Elk Foundation, Rio Grande Headwaters Land Trust, Colorado Cattleman's Agricultural Land Trust, American Farmland Trust, Sangre de Cristo Natural Heritage Area, Manitou Foundation, San Luis Valley Ecosystem Council, and many others.
- Neighboring private landowners, local communities, and chambers of commerce.

## 4.10 Monitoring and Evaluation

Adaptive management is a flexible approach to long-term management of biotic resources. Adaptive management is directed, over time, by the results of ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are carried out within a framework of scientifically driven experiments to test the predic-

tions and assumptions outlined within a CCP (see figure 46).

To apply adaptive management, specific survey, inventory, and monitoring protocols will be adopted for the refuge complex. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and find out how effectively the objectives are being accomplished. Evaluations will include participation by Service staff and other partners. If monitoring and evaluation shows that a particular management approach is producing undesirable effects for target and non-target species or communities, alteration to the management approach will be altered and the CCP will be revised.



**Figure 46. Map of the adaptive management process for implementing the CCP.**

## 4.11 Plan Amendment and Revision

The final CCP will be reviewed annually to assess whether there is any need for revision. A revision will occur if significant information becomes available that makes change necessary, such as a change in ecological conditions. Revisions to the CCP and subsequent stepdown management plans will be subject to public review and compliance with NEPA. At a minimum, this plan will be evaluated every 5 years and revised after 15 years. Subsequent stepdown plans include:

- habitat management plan
- fire management plan
- visitor service management plan
- cultural resources management plan
- wilderness management plan
- water management plan
- transportation plan”

## 4.12 Funding and Personnel

Refuge budgets generally include ongoing operations funds for staff, maintenance, and utility needs. Table 14 summarizes the estimated costs over 15 years.

Table 15 compares the current staff plan with the proposed staff needed to carry out the CCP. Projects will be funded through two separate systems, as follows: (1) the refuge operations needs system is used to document requests to Congress for money and staff needed to carry out projects above the existing base budget; and (2) the Service asset maintenance management system is used to document the equipment, buildings, and other existing properties that require repair or replacement.

**Table 14. Costs over 15 years to carry out the CCP.**

<i>Refuge complex budget (\$)</i>	
Budget Fiscal Year 2013	2,288,060
Salary expenditures	1,724,236
Non-salary expenditures	563,824
Fixed costs*	284,705
Discretionary**	279,119 (52)
<i>*Fixed costs related to operating refuge complex</i>	
Monte Vista and Alamosa canal charges	30,000
Fuel, electricity, propane	109,500
Phone, garbage, internet, office, septic	38,205
Pumping costs	107,000
<i>Breakdown of Costs (\$) by Activity to Implement Over 15 Years</i>	
<i>Management cost item by refuge</i>	
<i>Habitat and Wildlife*</i>	
<i>Alamosa Refuge</i>	
Riparian	45,000
Wetland	450,000
Upland	22,000
<i>Monte Vista refuge</i>	
Riparian	n/a
Wetland	675,000
Upland	150,000
<i>Baca Refuge</i>	
Riparian	445,000
Wetland	160,000
Playa	42,000
Upland	225,000
Bison management	350,000
<i>Research and Monitoring (All Refuges)</i>	
Habitat management and wildlife	375,000
Climate change	150,000
<b>Total Biological Program All</b>	<b>3,089,000</b>

\*Costs for habitat and wildlife management includes costs for contracting out some infrastructure purchase, repair, construction, and modification as well as equipment rental costs or purchase of materials for refuge staff to perform these activities in-house. Note that costs associated with water (pumping, horsepower charges, and ditch assessments) have been listed elsewhere.

\*\* Discretionary costs include: Building and vehicle maintenance and repair, field supplies, technicians, shop supplies, herbicides, travel, volunteers, research, inventory and monitoring, safety, personnel training and awards, computers, law enforcement overtime and law enforcement supplies, and janitorial services. Yearly cost of living adjustments and salary step increases are not included.

**Table 14. Costs over 15 years to carry out the CCP.**

Cost Analysis for Visitor Services	
<i>Management cost item</i>	
Alamosa Refuge	
Hunting big game, blinds	20,000
Fishing	0
Wildlife Observation	
Rehab Environmental Education Center	20,000
Trail Improvements	
River Trail	40,000
Town to refuge	20,000
Bluff trail parking	10,000
South loop trail	10,000
Auto tour route extension	500,000
Signage improvements	50,000
Overlooks, boardwalks, blinds	75,000
Kiosks with accessible parking	215,000
Parking improvements	500,000
<b>Total Wildlife Observation</b>	<b>1,440,000</b>
Outreach	20,000
Environmental Education	10,000
<b>Total Visitor Services Alamosa Refuge</b>	<b>1,490,000</b>
Monte Vista Refuge	
Visitor Center and Offices	3,000,000
Hunting big game, blinds	10,000
Fishing	5,000
Wildlife Observation	
Crane pullouts, pave 8S, new 6S, accessibility	150,000
Meadowlark trail accessibility	10,000
New trails, Town, Parker Pond, visitor center	50,000
Non-motorized road improvements	250,000
Signs, directional and interpretive	30,000
Parking improvements	250,000
Overlooks, boardwalks	250,000
Total Wildlife Observation	990,000
Outreach	20,000
Environmental Education	10,000
<b>Total Visitor Services Monte Vista</b>	<b>4,035,000</b>
Baca Refuge	
Visitor contact station and office	25,000
Hunting	110,000
Fishing	0

**Table 14. Costs over 15 years to carry out the CCP.**

Wildlife Observation Activities	
Auto tour route development	1,220,000
Non-motorized trail development	52,000
Lunching area development	30,000
Parking area development	48,000
Signs, directional and interpretive	292,000
Wildlife viewing area development	45,000
Baca history interpretive	135,000
Total wildlife observation	1,820,000
Outreach	65,000
Environmental Education	10,000
<b>Total Visitor Services Baca Refuge</b>	<b>2,030,000</b>
Total Cost Analysis for All Activities and Programs within the Refuge Complex	
<i>Management cost item</i>	<i>Alternative B</i>
Salaries, Fixed and Discretionary Costs	2,288,060
Total Biological Program	3,089,000
Cultural Resources Program	375,000
<b>Total Visitor Services All</b>	<b>7,557,000</b>
<b>Grand Total All Activities (\$)</b>	<b>13,309,060</b>

**Table 15. Personnel to carry out the CCP.**

Headquarters (Alamosa, Colorado)	
Project leader	GS-0485-14
Deputy project leader	GS-0485-13
Wildlife biologist	GS-0485-12
Land Management LE Officer	GS-025-7/9
None	
Supervisory Range Technician (interagency fuels planner)	GS-455-9
Convert to 1 FTE Interagency Supervisory Range Technician (Fire)	GS-455-7/9
Budget Analyst	GS-560-9 (Business Team)
Office Support Assistant	GS-0303-4 (1) (converted from term position to full-time)
Wildlife biologist	GS-0486-7/9
Biological Technician	GS-404-5 (moved from Alamosa)
Outdoor Recreation Planner	GS-1315-9/11
None	
None	
Hydrologist	GS-1315-9/11
None	
Alamosa and Monte Vista National Wildlife Refuges	
Refuge manager Alamosa	GS-0485-12
Refuge Manager Monte Vista	GS-485-12
Position moved to Headquarters	GS-0404-05
Biological Technician	GS-0404-0455-5

**Table 15. Personnel to carry out the CCP.**

Maintenance Mechanic	WG-4749-9 (Monte Vista)
Maintenance Worker	WG-4749-8 (Alamosa)
Tractor Operator	(WG-6) (½ FTE-career seasonal)
Tractor Operator	(WG-6) (½ FTE-career seasonal)
Baca National Wildlife Refuge	
Wildlife Refuge Manager	GS-0485-12
Wildlife Refuge Specialist	GS-0485-09
Maintenance Worker	WG-4749-8
Office Support Assistant	GS-0303-4
None	
Tractor Operator	(WG-6) (½ FTE-career seasonal)
Seasonal Employees	
Range Technician	GS-0455-5 (fire) (1)
Biological Technician	GS-404-5 Biology program (6)
Biological Technician	GS-404-5 weeds (3)
Social Services Assistant	GS-0185-5 (1)
None	(position converted to full time at headquarters)
None	