

Chapter 3—Alternatives



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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 proposed management alternatives for Monte Vista, Alamosa, and Baca Refuges. Alternatives are different approaches to management that are designed to achieve the purposes of each refuge, promote the vision and goals of each refuge, and further the mission of the Refuge System. We have formulated four alternatives, including the no-action alternative, to address significant issues that have been identified by the Service, cooperating agencies, interested groups, tribal governments, and the public during the public scoping period and throughout the development of the draft plan. Chapter 1 contains a discussion of the issues addressed in this CCP and EIS.

3.1 Criteria for Alternatives Development

Following the initial scoping process during the spring of 2011, we held meetings and workshops with the cooperating agencies and the public and identified a range of preliminary alternatives. Some ideas were

eventually dropped, and those are discussed in section 3.10. We selected the following four alternatives for detailed discussion and analysis in the EIS:

- Alternative A—No-action Alternative
- Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)
- Alternative C—Habitat Restoration and Ecological Processes
- Alternative D—Maximize Public Use Opportunities

These alternatives examine different ways of restoring and permanently protecting fish, wildlife, plants, habitats, and other resources and for providing opportunities for the public to engage in compatible, wildlife-dependent recreation. Each alternative incorporates specific actions that are intended to achieve the goals described in chapter 2. The no-action alternative would continue the current refuge management strategies and may not meet every aspect of every goal. The no-action alternative provides a basis for comparison with action alternatives B, C, and D. The action alternatives may vary with regards to how well they meet each of the goals. This is discussed further in chapter 5, section 5.12.

3.2 Elements Common to All Alternatives

Regardless of the alternative selected, the Service will comply with all applicable laws, regulations, and policies for management activities that could affect refuge resources such as soil, water, air, threatened and endangered species, and archaeological and historical sites. A list of key legislation and policies that we adhere to is found in appendix A. All the alternatives would adhere to the following guidelines:

- 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.
- Access to private inholdings and facilities involving BOR's Closed Basin Project will continue.
- Grazing, haying, and water lease fees will continue to be collected in accordance with Region 6 policies.
- Collaboration with our partner agencies or organizations will continue 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.
- All prescribed fire activities will be carried out under an approved and current fire management plan that conforms with DOI and FWS policies.
- Control of invasive weeds and integrated pest management will continue, 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.
- By law and policy, we will 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/or the court.
- We will 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.
- We will 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.
- All Service policies regarding rules and regulations for oil, gas, and mineral extraction on refuge lands will be adhered to. 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.

3.3 Structure of Alternative Descriptions

Since each alternative is designed to address the goals described in chapter 2, the alternatives 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

3.4 Alternative A (No Action)

Under the no-action alternative, we would make few changes in how we manage the various habitats and wildlife populations throughout the refuge complex. We would continue to manage habitats on the Monte Vista and Alamosa Refuges through the manipulation of water as described in the 2003 CCP (FWS 2003). Water management on the Baca Refuge would continue under the guidance found in the conceptual management plan for Baca Refuge. All the refuges would adhere to new State regulations regarding water use. There would be few added public uses outside of those that already occur on the Monte Vista and Alamosa Refuges (figure 13 and figure 14). Baca Refuge would remain closed to public use except for potential access to a refuge office or contact station (figure 15). We would keep our existing partnerships in and around the refuge complex.

Habitat and Wildlife Resources

On all three refuges, we would continue to manage wetland areas, especially wet meadows, to provide for a variety of waterbirds. Riparian and upland habitats would be managed for migratory birds. We would continue to produce small grains at current levels on the Monte Vista Refuge (up to 270 acres) to provide food for spring-migrating sandhill cranes.

There would be few changes made in managing big game populations. Elk numbers would continue to fluctuate from 1,000 to 4,000 individuals, with most of the population on the Baca Refuge. Population distribution and control would be limited to nonlethal dispersal, agency culling, and public dispersal hunts (also called distribution hunts) on the former State

lands of Baca Refuge. Details of these proposals are now available as part of an interim elk management plan (FWS 2013e).

We would continue to protect populations of and manage habitats for threatened and endangered species as well as for species of concern. These species include southwestern willow flycatcher, Rio Grande sucker, Rio Grande chub, and northern leopard frog.

We would phase out the existing arrangement with TNC for season-long bison use on those parts of the Medano Ranch that are within the Baca Refuge boundary, and we would not use bison as a management tool in the future.

We would continue to use prescriptive livestock grazing, haying, and cooperative farming as management tools for maintaining habitats within the refuge complex. We would continue to control invasive and noxious weeds. Similarly, we would continue to follow fire funding guidelines in the prioritization of fuels treatments and use of fuels funding. We would pursue alternative funding sources for prescribed fire implementation.

Water Resources

We would maintain our ability to use our water rights within the refuge complex. The use of ground water would continue, except as modified by changing State rules, regulations, and policies. All the refuges within the refuge complex will continue to use and augment water supplies in accordance with State law.

Visitor Services

Compatible, wildlife-dependent public uses, including waterfowl and small game hunting, would continue to be allowed on the Monte Vista and Alamosa Refuges, but we would not seek to establish elk hunting on any of the refuges other than the authorized distribution hunts on the Baca Refuge (FWS 2013e) (figures 13,14, and 15).

The auto tour routes on the Alamosa and Monte Vista Refuges, along with the existing nature and walking trails, would continue to provide some wildlife observation, interpretation, and photographic opportunities. We would open the visitor center on the Alamosa Refuge on a part-time basis as volunteer resources allow. Our primary environmental education events such as the Monte Vista Crane Festival, the Kids Crane Festival in the fall, the Kid's Fishing Day, and other activities would continue.

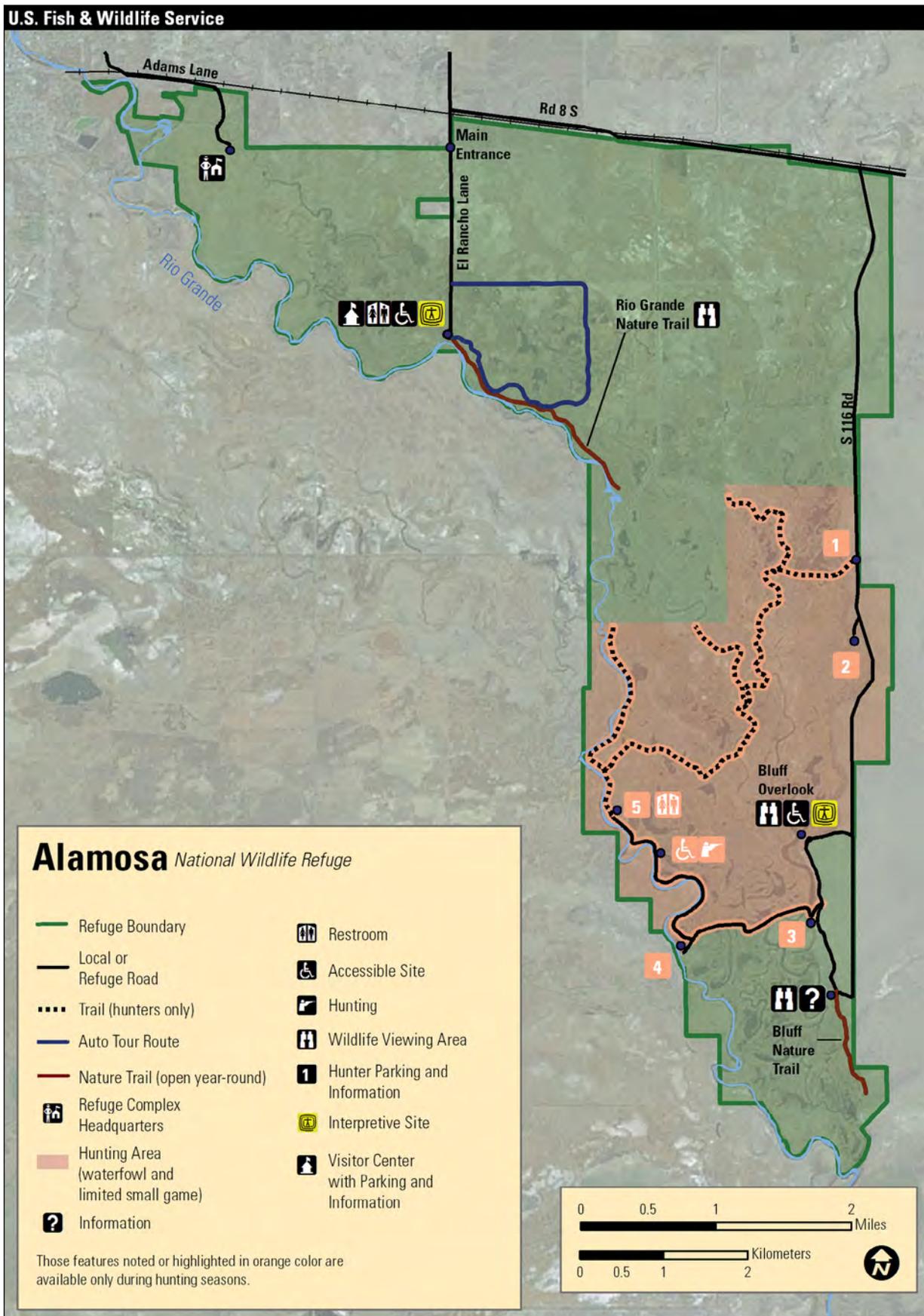


Figure 14. Map of alternative A for Alamosa National Wildlife Refuge, Colorado.

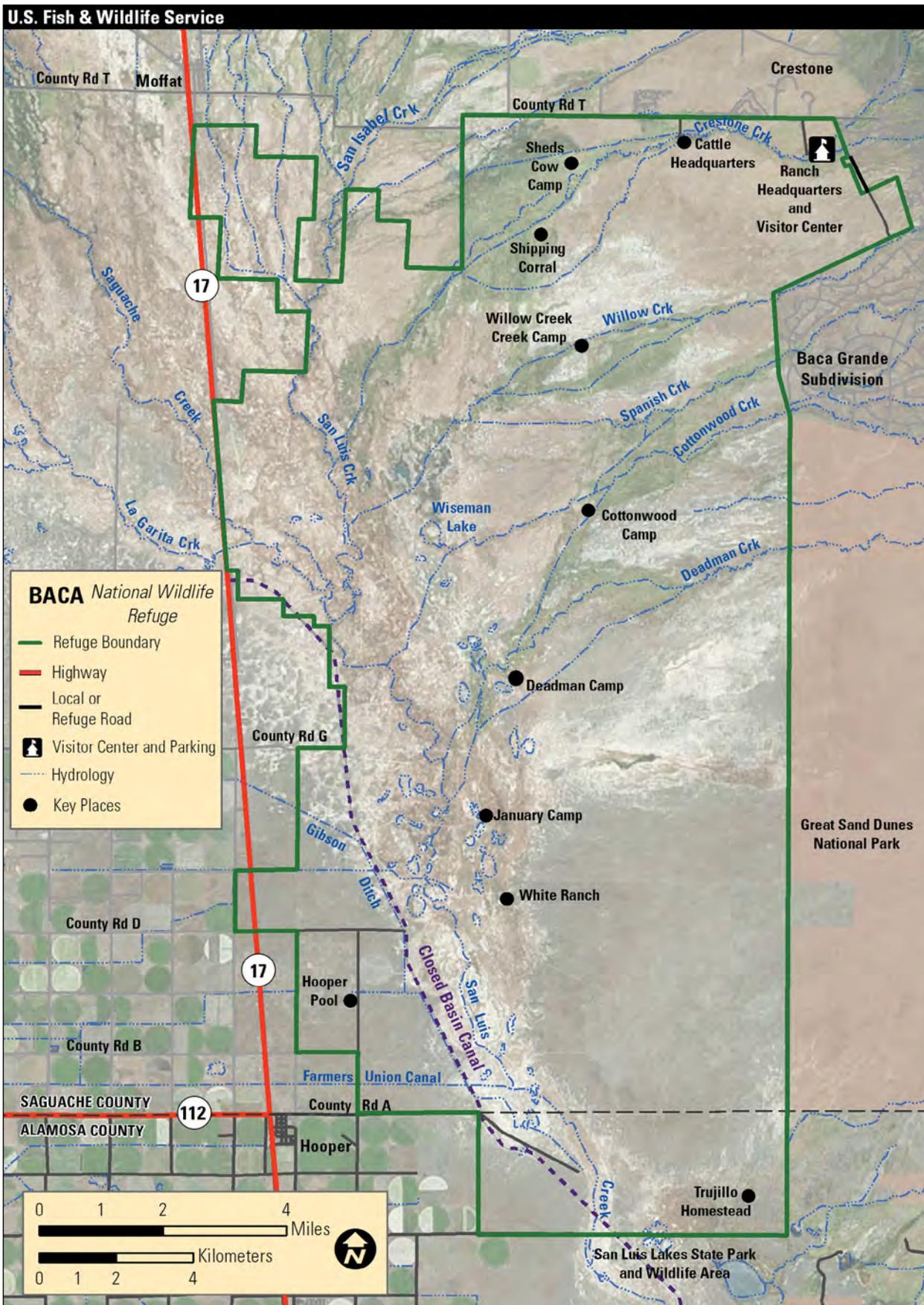


Figure 15. Map of alternative A for Baca National Wildlife Refuge, Colorado.

Public access via trails or a tour route would not be established on the Baca Refuge, and the refuge would remain closed to the public except for occasional staff-led tours and access to an office or visitor contact station. A refuge office with a visitor contact station was recently approved for construction at the Baca Refuge, and a few interpretive kiosks or other facilities would be installed.

Cultural Resources and Tribal Coordination

Under Section 106 of the National Historic Preservation Act, we would continue to conduct cultural resource reviews for projects that disturb the ground or that could affect buildings or structures over 50 years of age. We would avoid disturbing significant cultural resources unless such disturbance is required by unusual circumstances. In addition, we would continue to conduct law enforcement patrols and monitor sensitive sites. As required, we would consult with the Colorado State Historic Preservation Office and Native American tribes and we would adhere to other cultural resource laws.

Partnerships and Refuge Complex Operations

We would continue to work with a variety of other agencies and non-profit organizations including our Friends group (refer to 3.17 for a list of the many partnership organizations we work with in the San Luis Valley) to achieve our goals for habitat and wildlife management. Refuge complex operations would continue within existing funding levels. As such, there would be few new financial resources available to increase programs or services.

We would continue to coordinate and work with adjacent landowners to reduce potential conflicts.

In accordance with the provisions of the interim elk management plan (FWS 2013e), we would work with CPW to coordinate dispersal hunts, hazing, and lethal removal of elk by agency staff to reduce damage to neighboring lands as well as riparian habitats on the refuges.

The use of haying, livestock grazing, and other habitat management tools with an economic benefit would be managed through special use permits and would conform to all Service policies. We would work with owners of separated mineral rights to limit potential effects on the surface estate and other asso-

ciated resources. We would continue to be active and contributing partners in the San Luis Valley Inter-agency Fire Management Unit. This partnership includes the USFS, NPS, BLM, the State of Colorado, and the Service.

On all three refuges, we would continue to inventory, maintain, rehabilitate, and replace structures, including those with historic significance. When practical, unneeded structures that are not historically significant would be removed and not replaced. We would continue to maintain our fencing, including constructing new fences, removing unnecessary fences, and retrofitting fences for compatibility with wildlife.

Research, Science, and Wilderness Review

Within existing funding levels, we would continue to inventory and monitor habitat and wildlife resources with existing refuge staff as well as by working with the USGS and other agencies and organizations.

No lands within the refuge complex would be recommended for wilderness protection.

3.5 Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)

Under this alternative, we would 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 would 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 biological diversity. We would 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 would be enhanced and expanded to include all three

refuges (figures 16, 17, and 18). Figures 25, 26, and 27 below show the potential future habitat conditions for the three refuges under alternative B. Refer to chapter 4, section 4.3 for maps of the current vegetation conditions for the three refuges. We would facilitate the protection, restoration, and conservation of important water resources through partnerships, public education, and stewardship.

Habitat and Wildlife Resources

We would manage our natural and constructed wetland areas within the refuge complex to achieve a variety of wetland types and conditions. These wetlands would 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 would work to restore historical flow patterns through more effective water management practices and the continued use of prescriptive grazing, haying, and fire. We would prioritize the restoration of our riparian areas to improve habitat conditions for many species. We would place our highest priority on restoring riparian habitat along streams in the Baca Refuge as well as on 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 would 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 would use public hunting to complement the State's management, working together to keep elk populations at levels that would allow us to sustain healthy plant communities both in the refuge complex and on neighboring lands. This would 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 would work with our partners (CPW, NPS, BLM, USFS, and other conservation organizations) to manage elk populations.

We would 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 would be on riparian areas, which are habitat for southwestern willow flycatcher, and riverine 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 would be protected,

restored, and enhanced where practical and necessary.

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

We would also use traditional prescriptive live-stock grazing and haying to manage habitats within the refuge complex. We would 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 would occur to make sure that objectives were being met.

We would 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 would make every effort to increase weed control in sensitive habitats or where there is a risk of weeds spreading to neighboring private land.

We would strengthen the fire program within the refuge complex by improving fire management planning and by increasing coordination with partners. Whenever possible, we would use prescribed fire to help achieve our habitat management objectives (refer to section 3.9), and we would conduct prescribed fires on a more consistent basis. We would pursue more funding to protect property and human safety under the wildland-urban interface guidelines, and, where possible, we would reduce the number of individual facilities that would require fire protection.

Water Resources

We would continue to work with other landowners and agencies throughout the watershed to keep flexibility as well as to protect and, if necessary, augment our water rights as State regulations evolve. Water quality standards would be established and studies would be initiated to help protect water rights; prioritize habitat management and planning; and develop concise water use reporting methods. Our ground water use would comply with new State

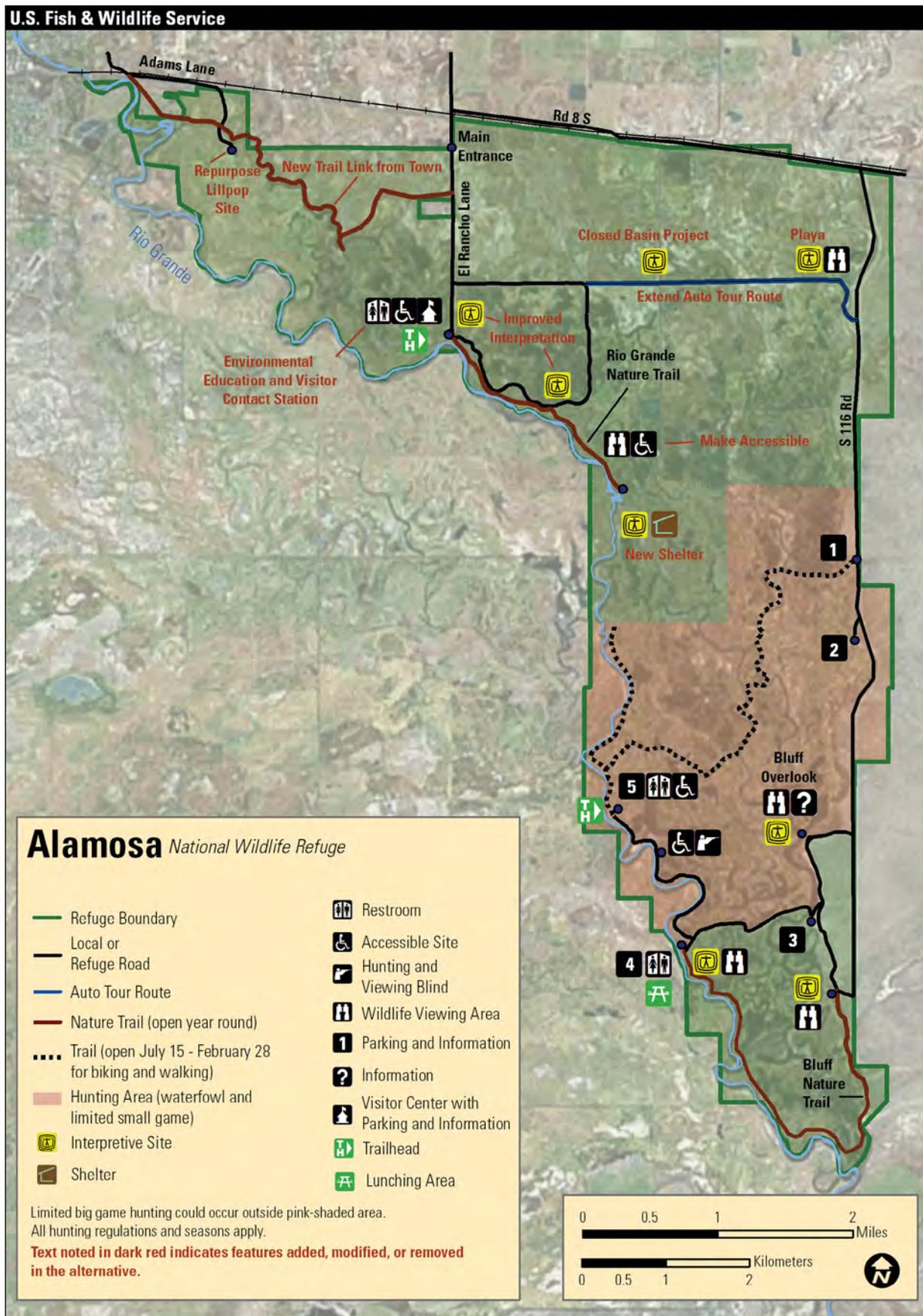


Figure 17. Map of alternative B for Alamosa National Wildlife Refuge, Colorado.

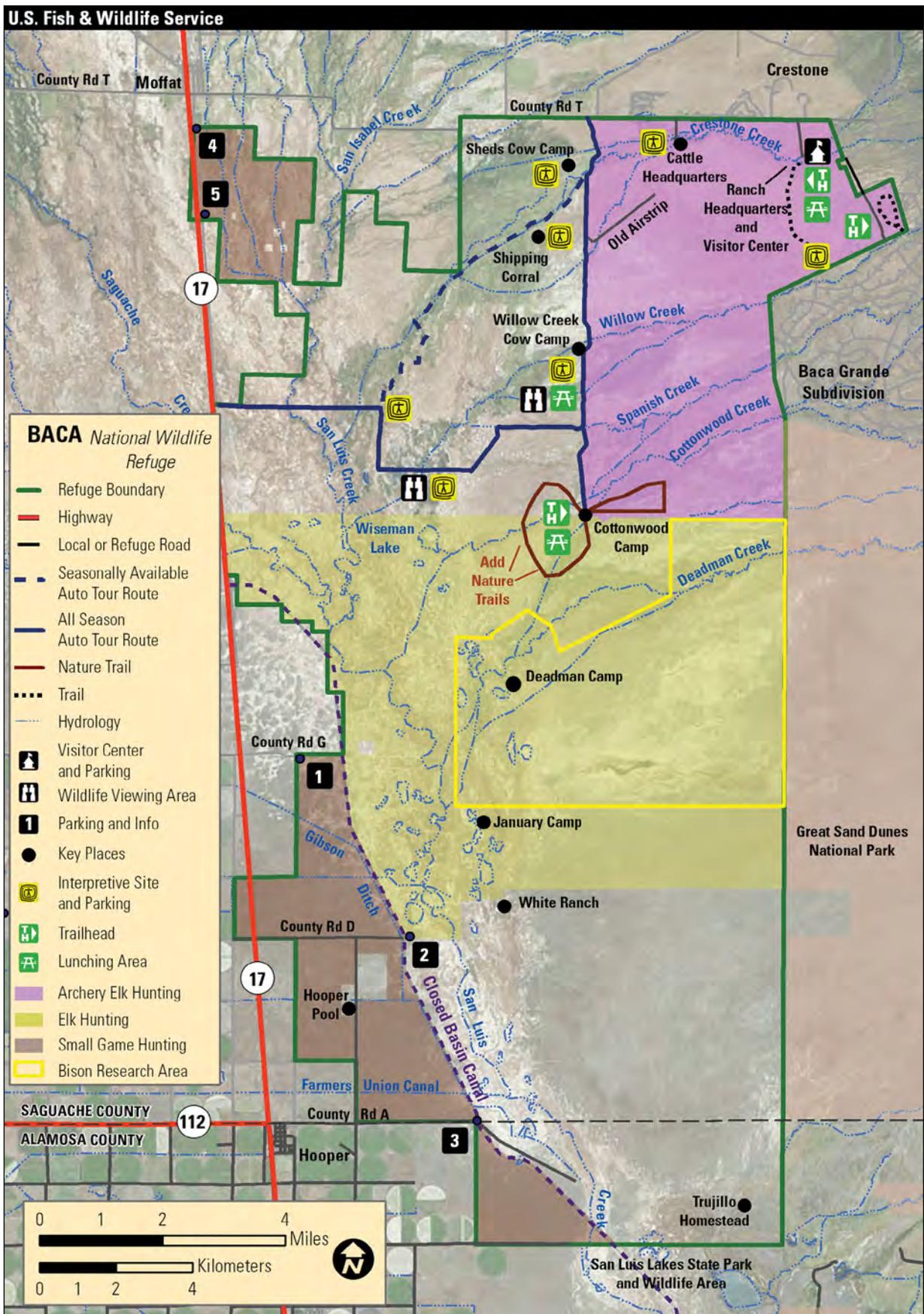


Figure 18. Map of alternative B for Baca National Wildlife Refuge, Colorado.

ground water rules and regulations through augmentation plans or by working with others and contracting with ground water management subdistricts.

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

Visitor Services

We would continue to offer hunting for waterfowl and small game on the Monte Vista and Alamosa Refuges. We would open the Baca Refuge for big and small game hunting, and we would offer public dispersal elk hunts and conduct agency dispersal hunting on the Monte Vista and Alamosa Refuges. This would provide recreational opportunities while enabling us to manage the numbers and distribution of elk. Access points and parking areas would be developed on the Baca Refuge (figures 16, 17, and 18).

General public access would be improved on the Monte Vista and Alamosa Refuges and established on the Baca Refuge. We would allow for more access for wildlife viewing and interpretation from about July 15 to February 28 on roads that are currently only open to hunters during hunting season. Modes of access such as cross-country skiing and bicycling that facilitate wildlife-dependent uses would be favored on all three refuges. Portions of the Baca Refuge would be opened for limited public use, and nonmotorized access, including walking, biking, and limited horseback riding, would be allowed. An auto tour route would be built on the Baca Refuge. The construction of more trails or viewing platforms on the Monte Vista and Alamosa Refuges would be considered. Limited commercial opportunities such as photography could be considered. We would seek funding to build a visitor center and refuge complex staff offices at the Monte Vista 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 would continue to host the Kid's Fishing Day on the Monte Vista Refuge.

Cultural Resources and Tribal Coordination

Most of our actions would be similar to alternative A, plus we would increase our efforts toward identifying and protecting significant resources.

Partnerships and Refuge Complex Operations

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. In order to meet our management objectives, we would seek more funding for the refuge complex for habitat conservation, visitor services, and maintenance. Overall, refuge complex offices are inadequate and provide for little visitor contact. We would 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 would continue to collaborate with CPW and other agencies to effectively manage elk, which would hopefully result in an improved distribution across the local game management units (GMUs).

We would 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 would seek funding for a more dependable prescribed fire program. We would develop working relationships with neighboring landowners and others to address interface issues such as invasive species control, shared fence management, elk management, and other concerns.

As with alternative A, the use of haying, livestock grazing, and other habitat management tools with an economic benefit would be managed through special use permits and would conform to all Service policies.

On the Baca Refuge we would 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.

Research, Science, and Wilderness Review

We would increase monitoring efforts to gain a better understanding of the effects of management actions on habitat conditions, wildlife populations, and water resources. We would also research the effects of climate change. We would 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 E1 in appendix E).

3.6 Alternative C—Habitat Restoration and Ecological Processes

We would take all feasible actions to restore or mimic, where needed, the native vegetation community based on site characteristics, ecological processes, and other factors. We would continue to have compatible wildlife-dependent public uses, but they could be adapted in response to changes in area management (figures 19, 20, and 21). Our partnership efforts would be broadened and geared toward restoring native vegetation communities and mimicking natural hydrologic conditions. Figures 25, 26, and 27 identify potential habitat conditions for the three refuges under alternative C.

Habitat and Wildlife Resources

We would restore vegetative communities in the refuge complex to mimic ecological conditions that existed before Euro-American settlement of the area. For example, we would restore the function of the riparian areas and playas on the Baca Refuge. We would apply natural disturbance regimes such as prescribed grazing and fire in other habitats. Where practical, we would restore natural waterflow patterns. We would stop producing small grains for spring migrating sandhill cranes on the Monte Vista Refuge.

We would use hunting to manage the size or distribution of elk populations and improve the long-term health of riparian habitat. Similar to alternative B, our priority would be to improve habitat for all native species, but particularly threatened and endangered species and other species of concern. For example, we would protect or restore riparian areas for southwestern willow flycatcher along the Rio Grande on the Alamosa Refuge and reintroduce Rio Grande chub and Rio Grande sucker to the creeks on the Baca Refuge where they historically occurred.

As with alternative B, we would phase out the existing arrangement with TNC for bison on former State lands. Knowing that bison historically occurred at least to some extent in the San Luis Valley, we would attempt to periodically use bison on the Baca Refuge to mimic the ecological services they may have once provided.

Similar to alternative B, we would intensify our efforts to combat invasive plants. Steps would be taken to strengthen the fire program within the refuge complex and use prescribed fire to restore and maintain native plant communities.

Water Resources

We would manage water to restore the hydrologic conditions with less focus on habitat management for specific species or for providing wildlife viewing. We would evaluate the need to supplement existing water supplies while considering restoration of historic hydrology, especially on the Monte Vista and Alamosa Refuges. In some years, water might not be available to meet life cycle needs for some waterfowl species. Existing water infrastructure would be removed or modified as needed. Water quality monitoring would also be increased.

Visitor Services

We would continue to allow waterfowl and limited small game hunting on the Monte Vista and Alamosa Refuges. Similar to alternative B, we would open the Baca Refuge for big game and small game hunting. On the Monte Vista and Alamosa Refuges, we would rely on public hunting or agency dispersal methods for elk management (figures 19, 20, and 21).

There may be changes in public use, depending on the habitat management action. Some areas could be closed. Current public access would be evaluated on the Alamosa and Monte Vista Refuges. If existing roads or trails are not needed or if these facilities fragment habitat, they could be removed or altered. Viewing areas for sandhill cranes may be moved, depending on restoration efforts. Service participation in the Monte Vista Crane Festival could be adjusted, depending on changes in the location and concentration of sandhill cranes. We would provide on-site interpretation and environmental education programs on the Alamosa and Monte Vista Refuges as funding allows, and our key messages would relate to our restoration efforts.

Except for limited hunting access to achieve management objectives, there would be no facilities or programs on the Baca Refuge. For example, an auto tour route, nature trails, and restrooms would not be developed.

Cultural Resources and Tribal Coordination

Actions would be similar to those under alternative B.

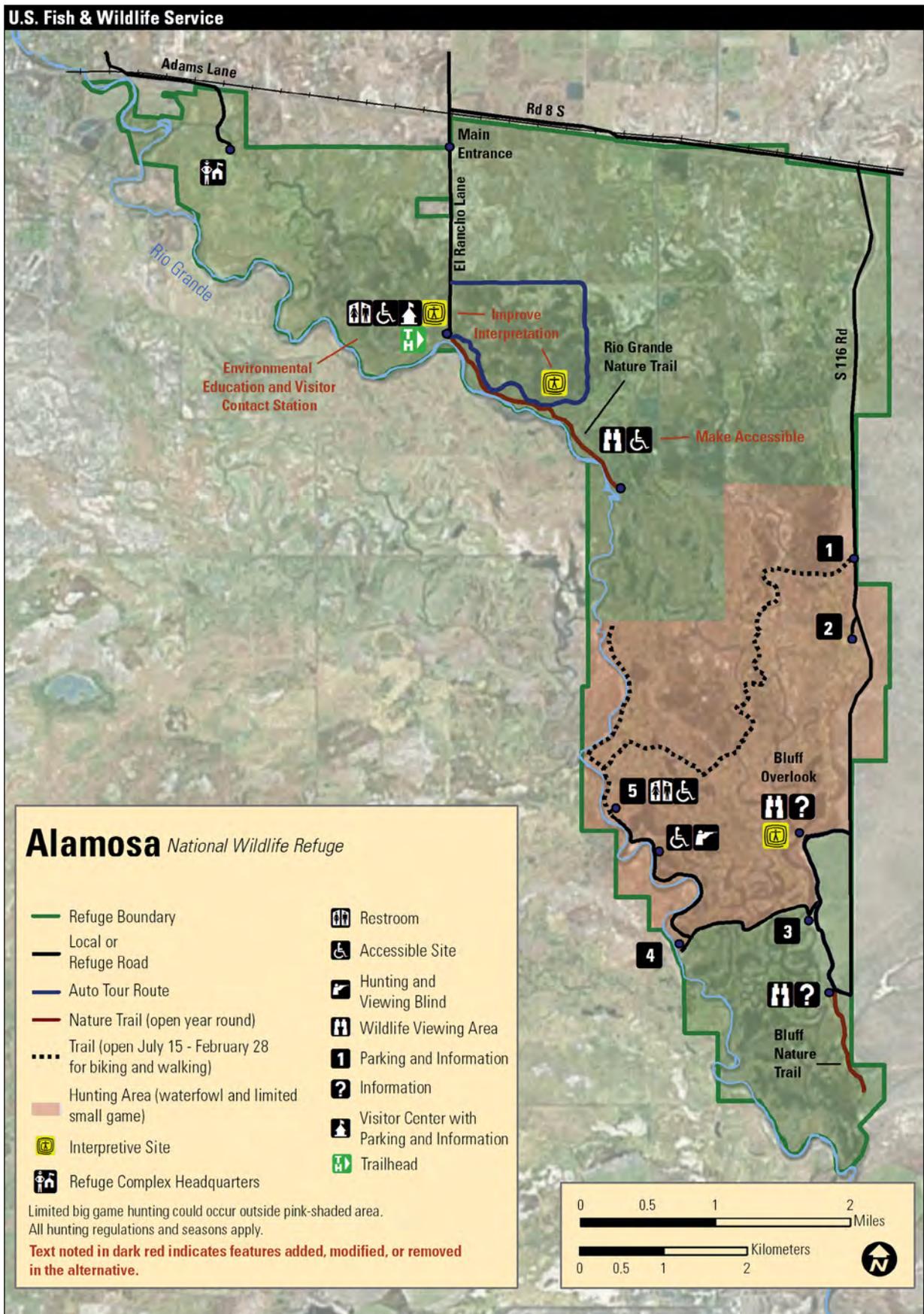


Figure 20. Map of alternative C for Alamosa National Wildlife Refuge, Colorado.

Partnerships and Refuge Complex Operations

We would seek to increase partnerships with a variety of agencies, organizations, and universities to achieve management objectives, restore ecological processes, and improve the efficiency of overall refuge management operations. On the Baca Refuge, current Lexam and gravel roads would be evaluated, and roads that are not needed or that are fragmenting habitat would be removed. As with alternative A, the use of haying, livestock grazing, and other habitat management tools with an economic benefit would be managed through special use permits and would conform to all Service policies.

Research, Science, and Wilderness Review

Similar to alternative B, we would increase efforts in studying habitats and wildlife, particularly with respect to climate change as well as to land and water protection.

Similar to alternative B, we would recommend that about 13,800 acres along the southeastern boundary of the Baca Refuge (refer to figure E1, appendix E) be managed as a wilderness study area.

3.7 Alternative D— Maximize Public Use Opportunities

We would manage wildlife and habitats consistent with our mission and purposes for the refuges while emphasizing quality visitor experiences and compatible wildlife-dependent public uses. Partnerships that complement our efforts to accommodate and provide for the priority public uses would be strengthened (figures 22, 23, and 24). Figures 25, 26, and 27 show the potential future habitat conditions for the refuges under alternative D.

Habitat and Wildlife Resources

Similar to alternative A, we would manage wetlands to maximize waterbird production at the Monte

Vista and Alamosa Refuges. We would also irrigate areas that are closer to public access and viewing areas at the Baca Refuge to enhance wildlife viewing. Riparian and upland habitats would be conserved for migratory birds. We would continue the agricultural production of small grains for sandhill cranes on the Monte Vista Refuge (about 230 acres), except grain production could also be used in a specific place or time to enhance wildlife viewing. A key difference from alternatives A and C, but similar to alternative B, is that we would improve public education about, and interpretation of, the role that the refuge complex plays in the San Luis Valley and across the Refuge System.

We would offer opportunities for elk hunting and viewing. Elk numbers would be managed at levels that would restore and foster the long-term health of native plant communities.

We would collaborate with other agencies for public access, law enforcement, and elk management. Similar to alternative B, habitats for native species and threatened, endangered, and other species of concern would also be improved, but we would emphasize public education in our restoration efforts.

Similar to alternatives B and C, the existing arrangement with TNC for bison management on former State lands at the Baca Refuge would be phased out. We would introduce and manage a small bison herd on a confined area of the Baca Refuge. Wildlife viewing and interpretation opportunities would be emphasized and incorporated into this program.

Similar to all other alternatives, invasive and noxious weeds would be controlled using chemical, mechanical, or manual methods or through the use of livestock grazing. Under this alternative, however, public education and awareness of the effects that weeds have on native plant communities would be a key message for interpretation.

As under all alternatives, prescribed fire would be used. As under alternatives B and C, wildfires would be managed for multiple objectives. There would be a concerted effort to talk with the public about the role of fire on the landscape and garner support for strengthening the fire program. Similar to alternative B, we would pursue more funding for the protection of human safety following local, State, and National guidelines and strategies, but we would limit having to maintain facilities that could increase the Service's legal obligations on and off the site.

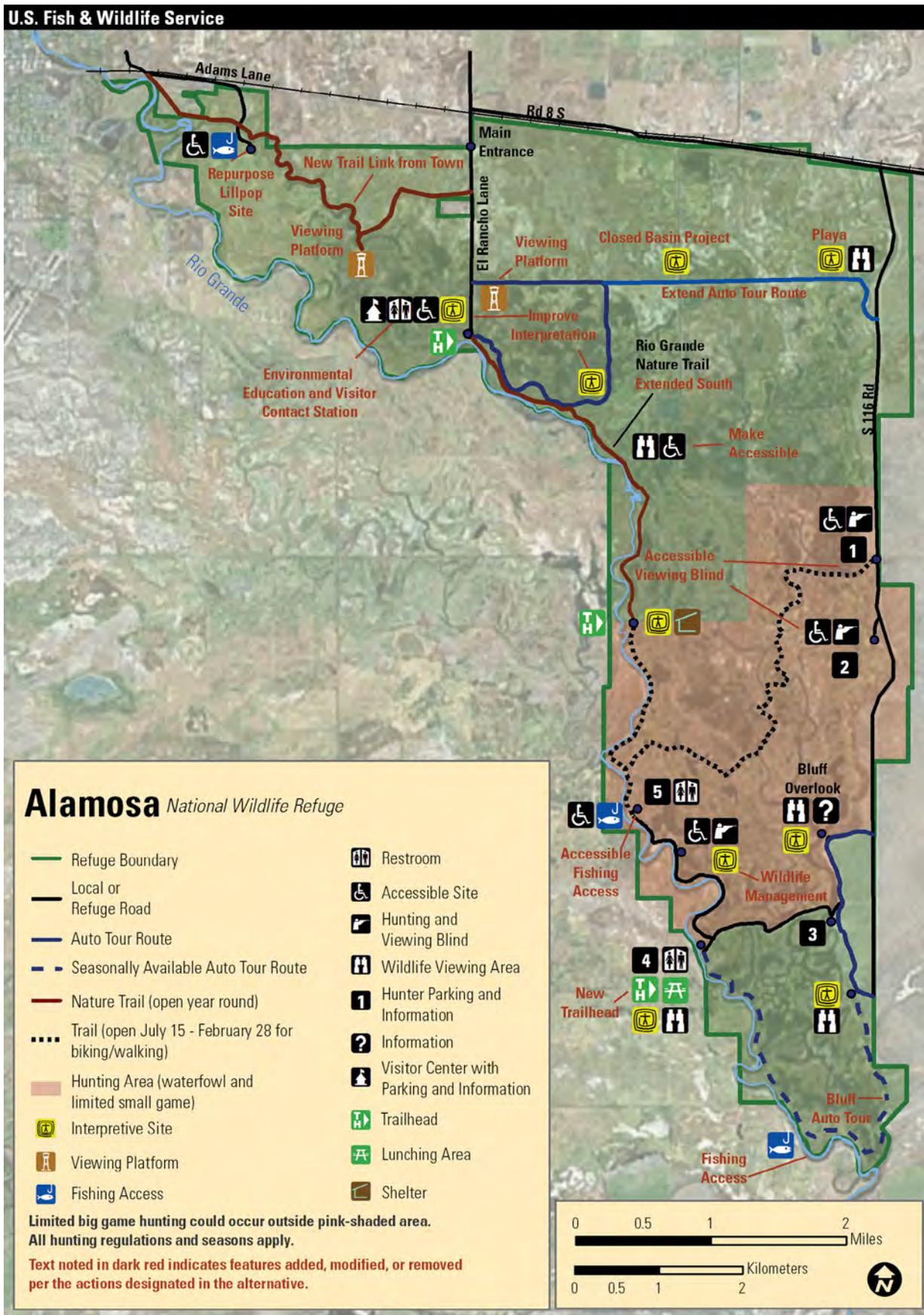


Figure 23. Map of alternative D for Alamosa National Wildlife Refuge, Colorado.

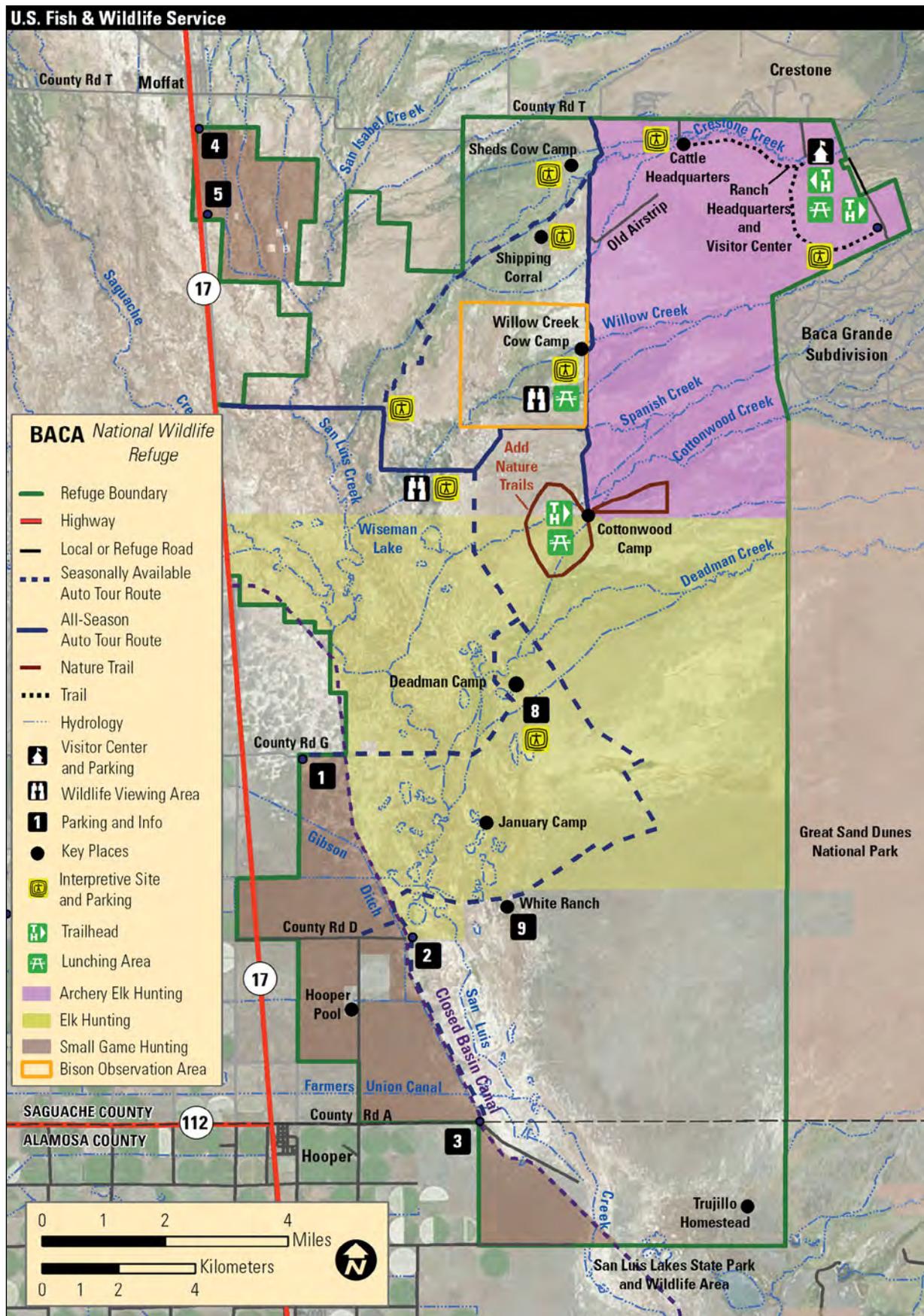


Figure 24. Map of alternative D for Baca National Wildlife Refuge, Colorado.

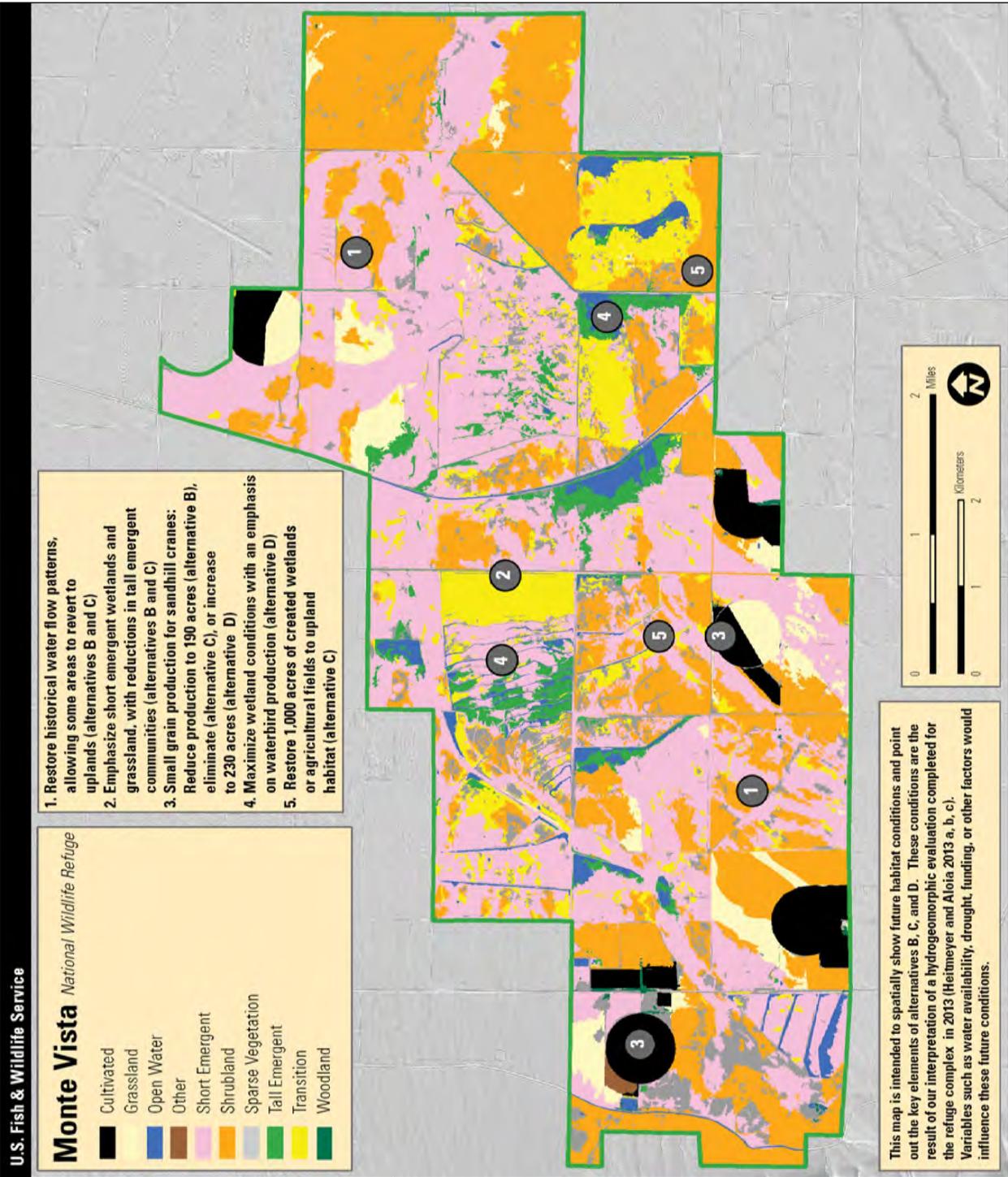


Figure 25. Map of alternatives B, C, and D of the potential future habitat conditions for Monte Vista Refuge, Colorado.

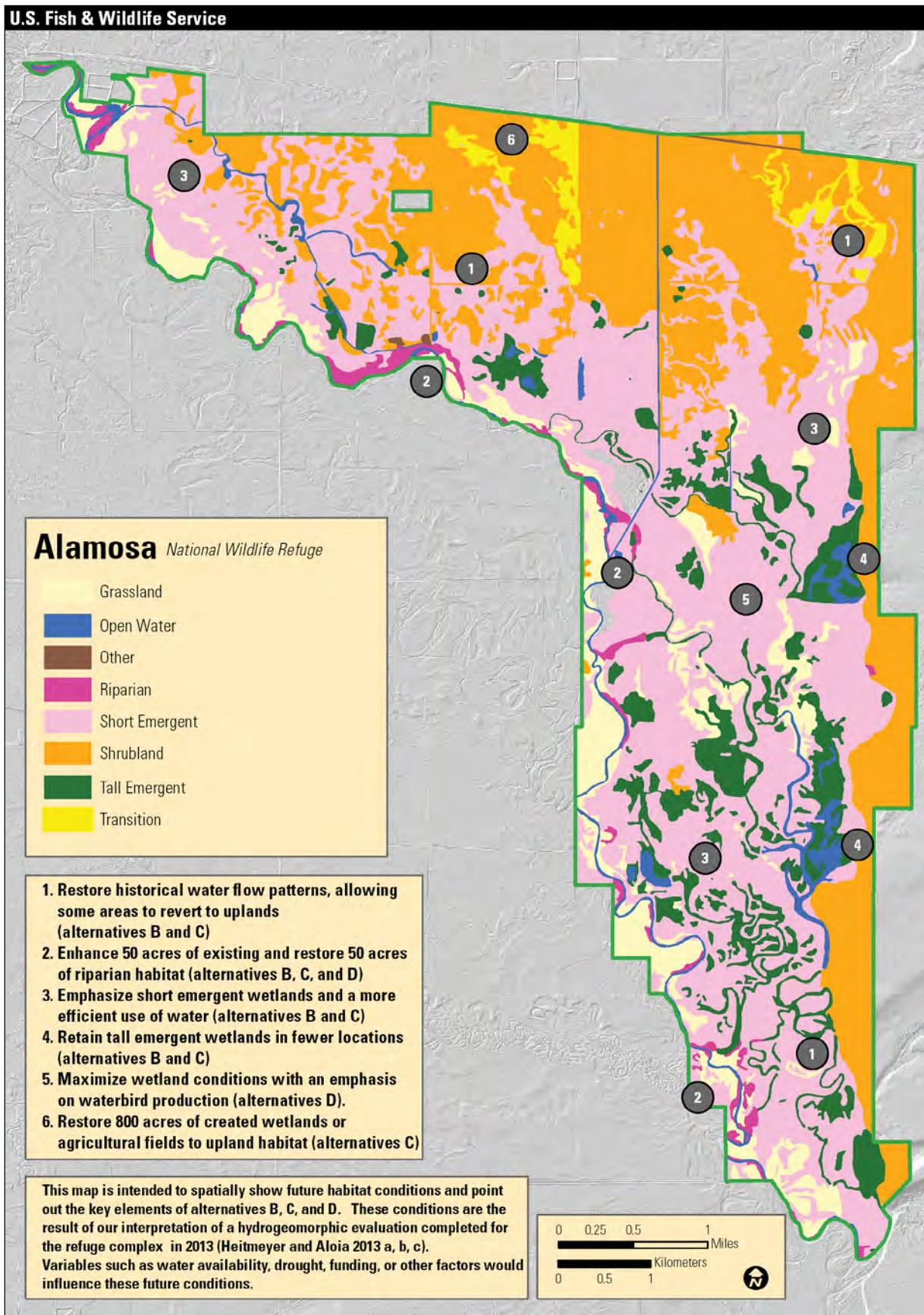


Figure 26. Map of alternatives B, C, and D potential future habitat conditions for Alamosa Refuge, Colorado.

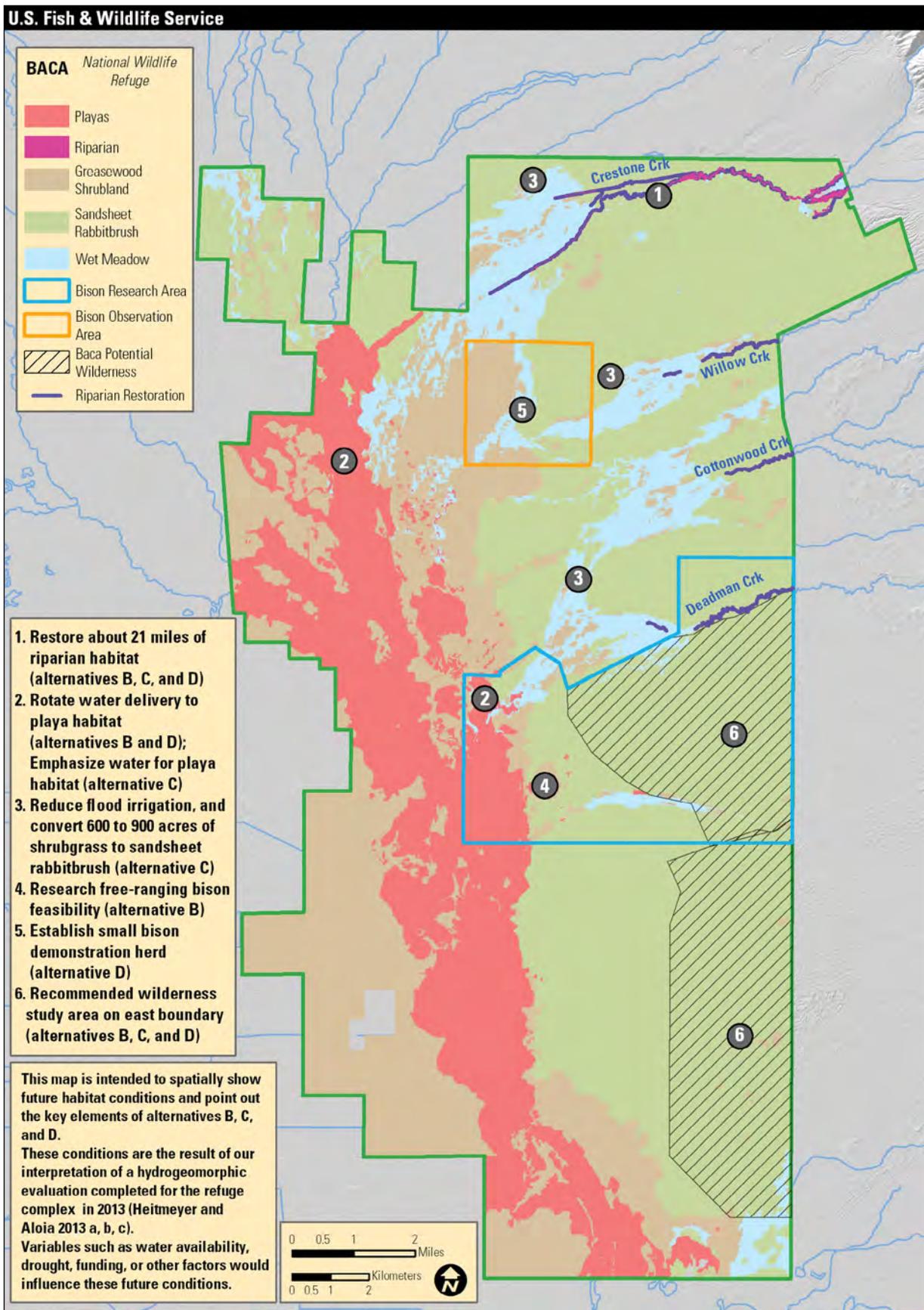


Figure 27. Map of alternatives B, C, and D potential future habitat conditions for Baca Refuge, Colorado.

Water Resources

We would manage water in a manner similar to alternative B except that more effort would be given to making sure there is water in specific areas or at a specific time to enhance wildlife viewing. The spatial distribution of water would be managed to make the visitor's experience richer. A high priority would be placed on maintaining operation of wells that provide important wildlife viewing habitat. All of our wells will be augmented and will comply with Colorado law. More water could also improve viewing opportunities. Ground water and surface water could be used to enhance areas used by sandhill cranes or provide more opportunities to see wildlife rather than merely providing for the life cycle needs of species less important to public uses. Similarly, we would improve infrastructure in areas that are highly valued by visitors to better facilitate wildlife observation. Water quality monitoring would be increased, and collaboration with a citizen scientist group or with schools or universities would be sought.

Visitor Services

This alternative would provide for the widest variety of compatible wildlife-dependent recreation (figures 22, 23, and 24). We would encourage and provide for big game hunting on the Baca Refuge, with public dispersal hunts on the Monte Vista and Alamosa Refuges and limited small game hunting opportunities for all, including youth hunts and considerations for accessibility. Similar to alternative B, access would be expanded for all refuges, including opening the Baca Refuge for public uses. More trails, viewing blinds, restrooms, parking areas, and access points would be constructed.

Although our responsibilities for habitat and wildlife management come first, we would also emphasize visitor experience when designing or locating visitor access or using existing infrastructure. With more staff and volunteers to support a wider range of compatible programs and facilities, we would increase interpretation and educational opportunities. Limited fishing access would be allowed on the Alamosa Refuge. Commercial uses, such as photography or art groups, would be considered. Public education and interpretation would highlight how visitor behavior can be modified to reduce wildlife disturbance.

Cultural Resources and Tribal Coordination

Actions would be similar to alternative B, except there would be a greater emphasis on using students or volunteers to survey areas with high potential for cultural resources. We would work with local and tribal educators to develop interpretive materials.

Partnerships and Refuge Complex Operations

Actions would be similar to alternative B, except we would pursue partnerships and funding for priority public uses as well as securing resources to protect, enhance, and interpret significant cultural resources.

Similar to alternative B, we would work with mineral developers to place resource extraction away from public use facilities. Management of any acquired fee-title lands would be consistent with habitat, wildlife, and public use objectives.

Research, Science, and Wilderness Review

Similar to alternative B, we would increase efforts to study habitats and wildlife, particularly with respect to understanding climate change and its effects on the resources of the San Luis Valley. How climate change affects the resources on the refuge complex would be incorporated into public use themes and messages.

Similar to alternative B, we would recommend wilderness protection for about 13,800 acres along the southeastern boundary of Baca Refuge (refer to figure E1 in appendix E).

3.8 Objectives and Strategies

As discussed in sections 3.1 and 3.3, the alternatives were developed from the planning identified in chapter 2. This section describes the specific objectives that would achieve the goals and meet the emphases of each alternative. Timeframes for the

objectives are based on the assumption that implementation would begin immediately after the record of decision for the final CCP is issued and would continue over the following 15 years.

Objectives are concise statements of what needs to be achieved; how much, when, and where they would be achieved; and who would 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 in conjunction with the alternative's emphasis. 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 for each of the four alternatives, A, B, C, and D. Where an objective or strategy is similar to or the same as, one for another alternative, this is noted and, for conciseness, is generally not repeated.

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 threatened and endangered species, focal bird species, greater sandhill cranes, and other species. Other subtopics are also included.

In large part, the habitat objectives and strategies under alternative A (the no-action alternative) are based on the management guidelines from the 2003 CCP for the Alamosa and Monte Vista Refuges and the 2005 conceptual management plan for the interim management of the Baca Refuge. Not all management actions under alternative A would remain the same, but the intent would be to manage the habitats within the refuge complex according to the overall direction set forth by these earlier planning efforts and within existing funding and resource levels. The earlier plan blended goals, objectives, and strategies, and we have attempted to separate these out to follow the current format for CCP development. In some places, we eliminated objectives from the 2003 CCP that were too vague or are not being implemented. The rationale statements were con-

densed from the earlier plan or are based on the direction given for implementing these plans.

Objectives for visitor services; partnerships; refuge operations; cultural resources and tribal coordination; 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.

Habitat and Wildlife Resources

Habitat and wildlife resources on the refuge complex are diverse and varied. Our wildlife resources are a direct result of how we manage the various habitats. 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 objectives 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 way. This type of habitat is found on the Alamosa and Baca Refuges. In fact, the name "Alamosa" 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. Despite its limited availability, a disproportionate number of avian species depend on it (Knopf et al. 1988).

Objectives for Riparian Habitat, Alternative A

To the extent practical, under the no-action alternative, we would continue to follow the riparian objectives as described in our 2003 CCP and the conceptual management plan for the Baca Refuge.

Alamosa National Wildlife Refuge. Riparian Objective A1. On the Alamosa Refuge, we would continue to manage and enhance the Rio Grande corri-



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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. We would restore these areas under alternatives B, C, and D.

corridor and its tributaries to provide habitat for riverine, riparian-dependent, and other wetland species.

Riparian Objective A2. On the Alamosa Refuge, we would continue to provide dense multilayered native riparian vegetation such as willows and cottonwoods for breeding and migrating riparian species, particularly the southwestern willow flycatcher, yellow warbler, other songbirds, and other wildlife.

Rationale for Riparian A1–A2. Since Euro-American settlement in the San Luis Valley, many rivers and aquifers have been drastically altered (Siebenthal 1910; Natural Resources Committee Report 1938; Emery et al. 1973; San Luis Valley Water Conservancy District 2001). The Rio Grande upstream of the Alamosa Refuge has been extensively altered by diversion dams, the drilling of thousands of wells in the unconfined and confined aquifers, and other modifications (see chapter 4). It appears that these alterations have resulted in the degradation and reduction of riparian vegetation and wetlands along the entire Rio Grande corridor, including on the Alamosa Refuge, which lies within the river's floodplain and which used to regularly flood.

The Alamosa Refuge has a corridor of riparian habitat along the Rio Grande, as well as along old oxbows and canals within the interior of the refuge. A 2-year study in the 1990s documented more southwestern willow flycatcher territories (29) on the Alamosa Refuge than on any of the other 16 study sites

outside of the refuge (Owen and Sogge 1997); however, in recent years there have been fewer than five territories found on the refuge, which is largely attributed to chronically low stream flows, reduced return flows from adjoining irrigated meadows, removal of the New ditch diversion dam, or all three factors.

Strategies for Riparian A1–A2:

- Continue to evaluate riparian habitats and species needs outside of the refuge complex boundaries through partnership programs and the Service's land protection planning program.
- Gather and interpret data on hydrology, riparian ecosystems, and historic riverine habitats along the Rio Grande to be used in deciding how, if, and when to begin riparian restoration. Investigate how best to use seasonal irrigation to restore riparian vegetation with our available water rights.
- Monitor and map noxious weeds such as tall whitetop, Russian knapweed, Canada thistle, and Eurasian water milfoil within the Rio Grande corridor and other riparian habitat and, if necessary, contain and reduce weed infestation.

- Monitor beaver and porcupine populations, and if porcupine populations are contributing to loss of willows along the Rio Grande on the Alamosa Refuge, control these populations if necessary.

Baca National Wildlife Refuge (2005 CMP). Riparian Objective A3. Continue to evaluate the condition of the riparian vegetation on the Baca Refuge and map areas of degradation and invasive species. Address obvious signs of degradation such as active downcutting of streambanks where feasible using existing levels of staff and funding (same as objectives B3, C3, and D3.).

Rationale for Riparian A3. There is a basic need to understand the current conditions of riparian areas on the Baca Refuge as well as the factors that are influencing those current conditions. This will give us the information needed to properly restore the condition and function of these systems.

Since the establishment of the Baca Refuge in 2005, we have been working to mitigate damage to riparian habitats and restore these communities. Haying and grazing by cattle occurred on areas of the Baca Refuge for over a century while it was managed as a ranch. Since the establishment of the national wildlife refuge, these practices have been removed from this sensitive habitat type as a component of the restoration process.

Many miles of fences have been installed and repaired in an effort to exclude cattle from riparian areas, with exceptions for maintaining water gaps (small bends in fencing that allow cattle access to a small portion of the stream for obtaining water). In addition, in areas along riparian areas where fencing is absent, grazing permittees are required to exclude their cattle (except for water gaps) with the use of electric fences.

Strategies for Riparian A3:

- Use corrective actions such as realigning streambanks, adding more fences, keeping cattle away from riparian habitats, and using dispersal techniques for elk.
- Monitor and control invasive species.
- Continue to gather baseline data on wildlife use in riparian areas.

Objectives for Riparian Habitat, Alternative B (Draft Proposed Action)

Under this alternative, we would restore the riparian community with native plants to provide

quality habitat for birds, mammals, reptiles, and amphibians.

Alamosa National Wildlife Refuge. Riparian Objective B1. 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 (same as alternatives C and D).

Riparian Objective B2. 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 44 in chapter 4), would ensure long-term health, sustainability, and ecological function (same as alternatives C and D).

Baca National Wildlife Refuge. Riparian Objective B3. On the Baca Refuge prioritize addressing ongoing degradation and encroachment of invasive species in riparian areas (same as objectives A3, C3, D3).

Riparian Objective B4. 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 would be based on hydrology, seedling regeneration, and other factors (see figure 39 which shows flow paths and potential riparian restoration areas, chapter 4). On average, achieve >35 percent canopy cover of about 15–30 feet wide to help riparian species, with an emphasis on breeding songbirds (same as alternatives C and D) (see table 5, below, for the focal birds that use riparian habitats).

Riparian Objective B5. On the Baca Refuge, by year 15, achieve or maintain low browse levels by elk on >25 percent or 5 miles out of 21 miles of riparian corridors (same as alternatives C and D).

Riparian Objective B6. On the Baca Refuge maintain hydrologic conditions in creek channels and off-channel locations along 21 miles within the 4 creek drainages (same as alternatives C and D) (refer to figure 39, chapter 4).

Rationale for Riparian B1–B6. Same for alternatives C and D. 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 Layser 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 would contribute toward the recovery efforts for this species. Maintenance, enhancement, and restoration efforts would 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 would be aimed at restoring a minimum of 50 acres of riparian habitat along the river and another 50 acres in off-channel areas.

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 would 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 would 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 would restore riparian habitat along all the creeks, achieving the greatest width possible (minimum 15–30 feet wide on average), 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 B1–B6: Same for alternatives C and D.

- Evaluate levels of ungulate, beaver, and porcupine browsing within willow and cottonwood habitats at least once every 3 years.
- Develop thresholds that would trigger increased management levels to prevent or reduce browse. Use fencing to exclude browsing animals and, in cooperation with the CPW, develop additional strategies including elk dispersal and harvest as well as the temporary control of beaver and porcupine.
- If willow and cottonwood communities become healthy enough, consider allowing beaver populations to naturally help with creek restoration and enhancement.
- 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).
- Manage grazing and browsing by all domestic ungulates such as cattle, sheep, and bison; and only allow grazing where there is an expected improvement in riparian vegetation and soils.

Objectives for Riparian Habitat, Alternative C

Because of the importance of riparian areas to the refuge, the objectives would be the same as or very similar to those for alternative B.

Alamosa National Wildlife Refuge Riparian Objective C1–C2. Same as B.

Rationale for Riparian C1–C2. Same as B.

Strategies for Riparian C1–C2. Same as B.

Baca National Wildlife Refuge. Riparian Objective C3–C6. Same as B.

Rationale for Riparian C3–C6. Same as B.

Strategies for Riparian C3–C6. Same as B.

Objectives for Riparian Habitat, Alternative D

Because of the importance of riparian areas to the refuge, the objectives would be the same as or very similar to those for alternative B.

Alamosa National Wildlife Refuge Riparian Objective D1–D2. Same as alternative B.

Baca National Wildlife Refuge. Riparian Objective D3–D4. Same as B except differing use patterns.

Rationale for Riparian D3–D4. Same as B.

Strategies for Riparian D3–D4. Same as B and C except:

- Locate bison pastures near public access points. Use conservative stocking rates and use frequent rotation to ensure sustainability. Bison grazing would not be allowed in riparian areas.

Wetlands

In the 2003 CCP for the Monte Vista and Alamosa Refuges, wetlands were 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. Under the action alternatives (B, C, and D) below, where practical we combined or summarized the various subcategories, except for on the Baca Refuge, where only objectives for short emergent wetlands are discussed. Existing vegetation classes for the three refuges are shown in figures 43, 44, and 45 in section 4.3.1 in chapter 4.

Objectives for Wetlands, Alternative A

Alamosa and Monte Vista National Wildlife Refuges. Short Emergent Objective A1. Shallowly flood 25 percent of the existing 5,426 acres of short-emergent plant community on the Alamosa Refuge and 6,667 acres on the Monte Vista Refuge during February and March to provide food and cover for migratory and breeding birds including sandhill cranes, Canada geese, and other waterfowl.

Short Emergent Objective A2. Shallowly flood 50 percent of the existing shallow short-emergent plant community on the refuge complex from April through mid-June to support plant, invertebrate, and vertebrate food sources for migrating and breeding ducks, shorebirds, waders, rails, and Canada geese.

Short Emergent Objective A3. Decrease the amount of shallow water to 30 percent of the existing acres of short-emergent vegetation from mid-June through mid-July to limit the encroachment of tall-emergent plants while continuing to provide cover and food for waterfowl broods, shorebirds, waders, rails, and others.

Short Emergent Objective A4. Maintain the health and manage species composition of short-emergent plant communities by decreasing shallowly flooded areas to 26 percent of the existing acres of short-emergent vegetation from mid-July to mid-September while continuing to provide habitat for foraging rail and duck broods, young white-faced ibis, migrating shorebirds, and post-breeding waterfowl.

Short Emergent Objective A5. Provide habitat for nesting mallard, gadwall, cinnamon teal, short-eared owl, northern harrier, marsh-nesting passerines,



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Cinnamon teals are focal bird species that breed on Alamosa and Monte Vista Refuges.

rails, and small mammal populations by providing cover of 12 inches or more and excluding tall whitetop on 20 percent of the existing acres of short-emergent vegetation in April and May.

Short Emergent Objective A6. Provide habitat for nesting gadwall, northern pintail, northern shoveler, Wilson's snipe, Wilson's phalarope, and short-eared owl populations by providing a moderate cover of 6 to 12 inches on 40 percent of the existing acres of short-emergent vegetation from May to mid-June.

Short Emergent Objective A7. Provide habitat for nesting Savannah sparrow, vesper sparrow, Wilson's snipe, Wilson's phalarope, and northern shoveler populations by providing a sparse cover of 6 inches or less on 15 percent of the existing acres of short-emergent vegetation from April through July.

Short Emergent Objective A8. Reduce the area of short-emergent habitat infested by noxious weeds such as tall whitetop and Canada thistle by 20 percent.

Rationale for Short Emergent A1–A8. Dense short-emergent vegetation provides cover and food for breeding, wintering, and foraging birds and other wildlife species. Short-emergent vegetation occurs throughout the San Luis Valley on private lands as well as State and federally owned wildlife areas. It is associated with high water tables along streams and is a result of irrigation practices. Few places in the San Luis Valley can be managed for production of dense, un-harvested stands of short-emergent vegetation to help wildlife. Most short-emergent vegetation on private land is managed for the production of hay and forage for cattle. As a result, most of the

vegetation on private land is too short for most ground-nesting birds, but it often provides good foraging habitat for many bird species. Land owned by the State of Colorado, the Federal government (primarily the Service), nongovernmental organizations, and several private landowners has been dedicated to the production of this habitat type and condition.

Strategies for Short Emergent A1–A8:

- When available, use recharge water, as designated by the Colorado Division of Water Resources, to shallowly flood 5 percent or more of the existing short-emergent vegetation in November and December to recharge ground water supplies and to saturate the soil for more effective irrigation of these areas the following spring.
- Maintain existing water rights. Allow for flexibility in water application and management.
- Develop protocols to better monitor water application and resulting effects on habitat, including vegetation distribution and succession, nutrient cycling, invertebrate production, noxious weed distribution, and other factors.
- Maintain and improve water management infrastructure.
- Develop a protocol to quantify the amount and type of wetland vegetation on the refuge complex and assist others with similar efforts on a valley-wide scale.
- Map the distribution of weeds on the refuge complex, and continue to investigate weed control methods including integrated pest management strategies. Monitor the success of weed control efforts.
- Use management treatments such as flooding, prescribed grazing, haying, fire, and herbicides to promote native plant communities and reduce and control invasive plant species.

Tall Emergent Objective A1. Provide habitat for migrating and breeding waterbirds and passerines by flooding 1,561 acres of existing tall-emergent vegetation on the Alamosa Refuge and 600 acres on the Monte Vista Refuge beginning in mid-February.

Tall Emergent Objective A2. Maintain islands of bulrush in non-fluctuating reaches of open water

from May to mid-July for colonial-nesting waterbirds such as white-faced ibis and black-crowned night-heron.

Tall Emergent Objective A3. Provide shallow water (less than 12 inches) within tall-emergent wetlands for foraging waterfowl broods; post-breeding shorebirds, waders, coots, rails, and waterfowl; molting waterfowl; and migrating shorebirds by drawing down water from mid-July to mid-September.

Tall Emergent Objective A4. Provide habitat for mating, nesting, brood rearing, molting, and post-breeding waterbirds, such as colonial nesters, by maintaining a mosaic of cover and water interspersed (half cattail and bulrush and half open water) on 60 percent of the existing acres of tall-emergent vegetation on the complex.

Tall Emergent Objective A5. Develop one additional rookery area of tall-emergent vegetation of adequate size for colonial-nesting waterbirds.

Tall Emergent Objective A6. Investigate and begin control methods for monocultural phragmites stands on the Alamosa Refuge.

Rationale for Tall Emergent A1–A6. These objectives came from goal 4 of the 2003 CCP, which was to provide tall-emergent vegetation and other suitable habitat conditions for breeding waterbirds and marsh passerines on the refuge complex. Tall-emergent vegetation with favorable nesting conditions for species of management concern, such as white-faced ibis, American bittern, and black tern as well as other colonial waterbirds and marsh passerines, is provided only on some Federal, State, and private lands in the San Luis Valley. The refuge complex can manage this habitat type to provide stable water conditions, proximity to short-emergent foraging habitat, and protection from disturbance. This habitat type on the Monte Vista Refuge supports the second-largest colony of colonial-nesting waterbirds in the State (Refuge files, Ron Ryder, personal communication, February 1999).

Strategies for Tall Emergent A1–A6:

- Maintain the current annual water regime in Parker Pond and Bowen Pond. Once colonial nesting is begun, water will be held at static levels.
- Continue to evaluate the protection needs of other colonial waterbird nesting areas in the San Luis Valley by monitoring and evaluating suitable property and collaborating with our partners.
- Investigate the amount of tall emergent habitat that is needed to support the goals

of the San Luis Valley Water Bird Plan, Intermountain West Water Bird Plan, and the North American Water Bird Conservation Plan.

- Assist in collecting data to test assumptions about the amount and distribution of this habitat type required in the San Luis Valley.

Baca National Wildlife Refuge (2005 CMP). Short Emergent Objective A9. Continue to monitor overall grass, sedge, and rush health in this habitat type. Where obvious degradation is occurring, such as through encroachment of invasive species, take corrective action.

Rationale for Short Emergent A9. One of the unique features of the short-emergent habitat type on the Baca Refuge is that invasive plants are sparse across most of the refuge. We believe that this is largely attributable to relatively consistent management practices on the property over the last 120+ years. These management practices include fairly stable patterns of surface water irrigation, haying, and grazing. To a large extent, historical irrigation practices have created this wetland plant community. Short-emergent habitat on the refuge is irrigated using a relatively simple set of diversion structures and ditches diverting from all the creeks crossing the refuge. In addition to the creeks, several wells are used for irrigation. Irrigation generally begins in late spring with the onset of increased flows from melting snow and continues into the summer (FWS 2005). We have found that when areas are repeatedly irrigated and then left idle for several seasons, decadent plant material accumulates and regeneration of native plants is inhibited. We have found that if idle conditions continue, noxious weeds will typically establish themselves and out-compete native plant species. Since the acquisition of Baca Refuge in 2005, our management of the wet meadow habitat type has been similar to historic management practices on the property. Our primary management strategy has been to stop the spread and new establishment of invasive weeds within this habitat type. Some problem areas with invasive plants do occur on the refuge, and efforts continue to reduce and control the spread of weeds in these areas.

Strategies for Short Emergent A9:

- Maintain existing water rights to allow for flexibility in water application and management.

- Maintain and improve water management infrastructure.
- Continue to investigate weed control methods, including integrated pest management strategies, and monitor weed control efforts.
- Use various management techniques to control invasive plants, including combinations of prescribed fire, grazing, chemical applications, and mowing and haying.

Short Emergent Objective A10. Continue collecting baseline information on wildlife and plants, and researching effects of management practices on native wildlife species with an emphasis on nesting birds.

Rationale for Short Emergent A10. Since the Baca Refuge was established fairly recently, a baseline inventory of native and invasive species is still being collected, and this effort would be continued. We have little information about the potential value of this habitat type for native wildlife species, especially for wetland bird species. Depending on plant structure and density as well as on water depth and duration, wet meadows may offer tremendous foraging and nesting opportunities for a variety of wetland birds, including many species of waterfowl, sora, Virginia rail, white-faced ibis, American avocet, Wilson's snipe, and Wilson's phalarope. Wet meadows also provide habitat for a variety of rare amphibian species such as northern leopard frog and Plains spadefoot toad. Previous research conducted at the Baca Refuge provides important information about associations between habitat conditions and native bird species (Murphy 2009; Dieni 2010a, 2010b). In 2008, Murphy (2009) conducted a baseline inventory of breeding bird presence in short-emergent habitat. Dieni (2010a) evaluated bird species composition and use in wet meadows and associated habitats during the post-breeding period and fall migration. Dieni (2010b) also conducted research on the effects of haying on habitat structure and the breeding bird community. During the summers from 2011 to 2013, refuge researchers have conducted research on the associated effects of various management treatments such as fire, grazing, and haying on nesting birds. However, these short-term studies are insufficient for providing managers with enough information to guide future best management practices for this habitat type, so more studies are needed.

Strategies for Short Emergent A10:

- Rely on seasonal staff, interns, or volunteers for continued research efforts.

- Continue to study effects of management on the plant community and wildlife species.

Objectives for Wetlands, Alternative B (Draft Proposed Action)

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 25 and 26 show the potential future habitat conditions on the Alamosa and Monte Vista Refuges, and figure 27 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 B1. 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 B2. 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 habitat for waterfowl, shorebirds, wading birds, and rails. Tolerance level of invasive plant species is ≤ 15 percent (densities exceed more than 20 stems per meter²).

- 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 B3. 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 B4. 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 ≤ 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 B5. From mid-February through March (spring migration), provide water to accomplish the following:

- 25 percent (+/- 10 percent) of the 5,528 estimated maximum potential acres of short-emergent habitat flooded to depths of <15 inches to provide foraging and pairing habi-

tat for waterfowl. Tolerance level of invasive plant species is ≤ 10 percent.

- 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 B6. 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 ≤ 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 <3 inches for short durations (<60 days) to provide foraging and nesting areas for shorebirds.

Alamosa Wetland Objective B7. 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 B8. 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 ≤ 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 B1–B8. 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 25 and 26 which show the potential future habitat conditions under alternative B). 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/meter², detrimental effects are most likely occurring to wetland habitat quality. At these densities, we would aggressively control weed infestations using a combination of tools such as prescriptive grazing; prescribed fire; haying and mowing; and herbicide application.

Strategies for Wetlands B1–B8:

- 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 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.
- In addition to managing hydrology, use a combination of treatments such as using 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 B1. 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 B1. 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 our available refuge resources on applying irrigation water effectively and efficiently to areas where short-emergent wetlands occurred historically. A hydrogeomorphic analysis that was 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 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 27 shows what the potential future habitat conditions could like under alternative B.

A 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 would continue to control and eradicate weed populations. Proactive efforts would 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 would begin corrective actions, and new growth of native plants would be encouraged by reducing or removing decadent vegetation.

Strategies for Short Emergent B1:

- 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 would receive little supplemental irrigation, portions of these areas would 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 B2. 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 would allow for flood irrigation on 8,000 acres, then 4,000–5,600 acres would be shallowly flooded.

Rationale for Short Emergent B2. 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 meadows for nesting (Bent 1962, Colwell and Oring 1990, Stewart 1975). Prior studies on bird use of this habi-

tat 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 B2:

- 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 B3. Maintain 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 B3. 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 B3:

- 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 B4. 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 B4. 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, blunt-leaf 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 would 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 would emphasize these topics.

Strategies for Short Emergent B4:

- Work with the refuge inventory and monitoring program to acquire resources that would 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.

Objectives for Wetlands, Alternative C

Under alternative C, our goal for wetlands management would emphasize the restoration of ecological processes. By comparing the aerial maps from 1941 (figures 10, 11, and 12) with current vegetation classes (figures 43, 44, and 45), we identified the potential future conditions (figures 25, 26, and 27) under Alternative C that we would seek to achieve during the life of this document and beyond.

Alamosa and Monte Vista National Wildlife Refuges. Monte Vista Wetland Objective C1. From mid-February through March (spring migration), provide water to accomplish the following:

- Restrict water application to the historic Spring Creek and Rock Creek drainages (primarily the main channels) to provide foraging and pairing habitat for waterfowl as well as some roosting habitat for sandhill cranes. The tolerance level for invasive plant species is ≤10 percent.

Monte Vista Wetland Objective C2. From April through mid-June (nesting), provide water to accomplish the following:

- Restrict water application to natural water-flow paths and depressions associated with Spring Creek, Rock Creek, and Cat Creek to provide foraging and nesting habitat for waterfowl, shorebirds, rails, and other waterbirds. Tolerance level of invasive plant species is ≤10 percent.

Monte Vista Wetland Objective C3. From mid-June through August (brood rearing), provide water to accomplish the following:

- Flood to a depth of 1-3 feet about 250 acres annually, as a 5-year average, of open water and tall-emergent habitat to provide brood rearing areas for waterfowl and waterbirds throughout the refuge.

Monte Vista Wetland Objective C4. From September through October (fall migration), provide water to accomplish the following:

- Restrict water application to the Spring Creek and Rock Creek drainages to provide brood rearing areas for waterfowl and waterbirds throughout the refuge. Water application outside the main channels (in associated flowpaths and depressions) would be limited depending on snowpack levels. For example, in years with a large snowpack, water application would be extended to mimic natural runoff patterns.

Alamosa Wetland Objective C5. From mid-February through March (spring migration), provide water to accomplish the following:

- Restrict water application to irrigating vegetation in and adjacent to the deepest natural sloughs and oxbows formed by old

channels of the Rio Grande to provide foraging and pairing habitat for waterfowl. Tolerance level of invasive plant species is ≤10 percent.

Alamosa Wetland Objective C6. From April through mid-June (nesting), provide water to accomplish the following:

- Restrict water application to irrigating vegetation in and adjacent to natural flowpaths, sloughs, and oxbows associated with the Rio Grande and its floodplain to provide foraging and nesting habitat for waterfowl, shorebirds, rails, and other wading birds. Tolerance level of invasive plant species is ≤10 percent.

Alamosa Wetland Objective C7. From mid-June through August (brood rearing), provide water to accomplish the following:

- Water application during this period would be primarily restricted to irrigating vegetation in and adjacent to the deeper portions of natural flowpaths, sloughs, and oxbows associated with former channels of the Rio Grande to provide brood-rearing areas for waterfowl and waterbirds throughout the refuge. Water application in the shallower portions of natural flow paths would be limited, depending on snowpack levels. For example, in years with a large snowpack, water application would be extended to mimic natural runoff patterns.

Alamosa Wetland Objective C8. From September through October (fall migration), provide water to accomplish the following:

- Restrict water application during this period to irrigating vegetation in and adjacent to the deepest natural sloughs and oxbows formed by old channels of the Rio Grande to provide foraging habitat for waterfowl.

Rationale for Wetland C1–C8. Under alternative C, we would restore ecological processes for all aspects of wetland management with the goal of returning native vegetative communities to their natural conditions (see Heitmeyer and Aloia 2013a,c). In particular, our water management would involve applying water only in locations where wetlands occurred, as determined by soil type, historic aerial photography, maps, and site descriptions. On the Monte Vista Refuge, those areas are primarily

located along historic creek drainages such as Spring Creek, Rock Creek, and Cat Creek. Water application would strictly follow the natural hydroperiod. In essence, other than in the main channels themselves, water would be applied primarily to the natural flowpaths and depressions associated with these creek systems during periods when snowmelt runoff would naturally occur. Water management at the Alamosa Refuge would be similar. The timing of water application would follow natural snowmelt runoff patterns, and water would only be applied to natural wetland areas such as the flowpaths, sloughs, and oxbows associated with the floodplain of the Rio Grande.

Under natural conditions, water inputs would have been highly dynamic and would have varied seasonally and annually, with most water available during spring and early summer from snowmelt and runoff from the surrounding mountains. Most of the natural wetlands probably dried up by fall in most years, although deeper wetland depressions may have had retained some water during wet years or when ground water levels were high. As a result, native wildlife species are adapted to dynamic wetland habitats.

Compared with alternative B, we would expect to see a significant decrease in the amount of wetland habitat because all artificial wetland habitats would be restored to the native vegetation that was historically found on these sites. This would be accomplished through the removal or modification of much of the existing water management infrastructure such as levees, which were constructed to create wetland basins. Many of these basins were designed to spread water at varying depths across a broad area regardless of historic vegetative communities or soil types. Also, some basins located within portions of natural flow paths may be modified to change the depth of water, and the timing and duration of water application would be changed to mimic natural runoff patterns and other hydrologic changes, such as natural droughts. Overall, this alternative would not only result in a significant decrease in the amount of wetland habitat on the refuges, but would also change the type of many wetlands in some areas (see Heitmeyer and Aloia 2013a,c).

In addition to changes in hydrology, other management tools such as prescribed fire, prescribed grazing, and haying would be used to manage vegetative health and wetland productivity; however, the intensity, timing, and duration of these management activities would follow as closely as possible those disturbances that occurred naturally. For example, the use of prescribed fire would be used to enhance habitat quality, but under this alternative, a greater emphasis would be placed on natural fire frequency than in alternative B, where specific habitat objec-

tives, such as removal of decadent vegetation, would be emphasized regardless of historic fire frequency. Similarly, rather than using prescribed grazing to achieve a specific vegetative structure required by some nesting bird species, the emphasis of grazing under this alternative would be to mimic natural grazing disturbance, which may not necessarily benefit some nesting birds.

Our policy and guidance documents highlight the importance of restoring historical processes, to assess opportunities and limitations for maintaining and restoring habitats in pre-Euro-American settlement conditions, and to encourage management that restores or mimics natural ecosystem processes or functions to achieve refuge purpose(s) (Meretsky et al. 2006, FWS 2001). Our policies also recognize that this is not always possible or desired.

Strategies for Wetlands C1–C8:

- Evaluate water infrastructure and manage water in a way that mimics natural hydrologic conditions.
- Fix or remove water management infrastructure as needed to facilitate the delivery and maintenance of waterflow in natural creek channels, flowpaths, depressions, sloughs, and oxbows.
- Fix obstructions such as roads, ditches, and levees that significantly alter surface and subsurface waterflows and that hinder restoration and management of natural wetland areas.
- Manage water to restore native upland and transition habitats based on ecological site characteristics.
- Manage the timing, duration, and volume of water in natural creek channels, flow paths, depressions, sloughs, and oxbows to mimic natural hydrologic regimes and subsequently restore and maintain wetland function, productivity, and sustainability.
- Use management treatments such as irrigation, prescribed fire, grazing, haying, and chemical herbicides to promote native plant communities and to reduce and control invasive weeds.
- Continue to provide wetland mitigation for the Closed Basin Project following the Fish and Wildlife Coordination Act Report and subsequent agreements (Coordination Act).

Evaluate 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 C1. Use flood and sub-irrigation on 10–20 percent of irrigable acreage by confining surface water to natural channels, oxbows, sloughs, and depressions. Shallowly inundate only the low areas that are beyond diversions.

Rationale for Short Emergent C1. Ditches, water control structures, diversions, and wells have significantly changed the hydrology and ecological integrity of the valley. Because of these changes, the valley’s ecosystem is now largely artificial, and it no longer works as a natural system. It is probable that long-term factors such as reduced snowpack levels, changes in precipitation patterns, and larger landscape-level influences that affect aquifer levels also affect hydrological systems on the Baca Refuge. The refuge also has an expansive network of ditches, diversions, and water control structures that allow for flood irrigation over thousands of acres. This irrigation system allows managers to have flexibility in the management and application of water to different areas.

We would use this flexibility to keep most surface water in natural channels, which may help to contribute to a more natural hydrological system on the refuge. The hydrogeomorphic analysis completed for the Baca Refuge (Heitmeyer and Aloia 2013b) advocates that refuge managers restore sheet flow to natural floodplains. This may help restore the short-emergent habitat in areas where it naturally occurred. However, keeping surface water in the natural creek channels and only allowing for flooding in low areas would reduce the amount of artificially irrigated short-emergent habitat. The acreage that is no longer irrigated would then likely convert to the shrub–grass habitat type. Birds that nest in shrub–grass habitat include western meadowlark, Brewer’s sparrow, vesper sparrow, loggerhead shrike, and sage thrasher.

Strategies for Short Emergent C1:

- Fix or remove water management infrastructure as needed to facilitate the delivery and maintenance of waterflow in natural creek channels, flowpaths, depressions, sloughs, and oxbows.
- Fix obstructions such as roads, ditches, and levees that significantly alter surface and subsurface waterflows and hinder restora-

tion and management of natural wetland areas.

- Manage hydrology that mimics the historic locations of wetland habitat to restore native upland and transition habitats based on ecological site characteristics.
- Use management treatments such as water, prescribed fire, prescribed grazing, haying, and herbicides to promote native plant communities and reduce and control invasive plant species.
- Discontinue the use of water infrastructure located on high ground beyond points of diversion. Use current infrastructure for irrigation in low areas along natural channels.

Objectives for Wetlands, Alternative D

Our wetland management objectives under alternative D would be mostly similar to the approach used under alternative A with some differences. By comparing the aerial maps from 1941 (figures 10, 11, and 12) with current vegetation classes (figures 43, 44, and 45), we identified the potential future conditions (figures 25, 26, and 27) that we would achieve under Alternative D.

Alamosa and Monte Vista National Wildlife Refuges. Wetlands Objective D1. Similar to alternative A except we would focus more irrigation water in areas that are closer to public use areas.

Rationale for Wetlands D1. Similar to alternative A except we would focus available irrigation water in areas where public use occurs to create more wildlife viewing opportunities.

Baca National Wildlife Refuge. Short Emergent Objectives D1–4. Same as A except we would irrigate more areas closer to public use areas (refer to figures 22, 23, and 24).

Rationale for Short Emergent D–4. Same as A except irrigate more areas close to public use areas.

Objectives for Playa Wetlands

Playas are shallow, temporary bodies of water with clay substrates; 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 shorebirds because of their macroinvertebrate populations.

Objectives for Playa Wetlands, Alternative A

Baca National Wildlife Refuge. Playa Objective A1. After wet meadows are sufficiently irrigated, allow excess water to enter the playa habitat to provide foraging and nesting habitat for waterbirds, particularly shorebirds and teal.

Rationale for Playa A1. Under this alternative, the wet meadow habitat on the Baca Refuge is the priority for water application during average or below average water years. Little to no water would be applied to the playa habitat until all the wet meadow acres associated with each watershed, including Crestone Creek, Willow Creek, Spanish Creek, Cottonwood Creek, and Deadman Creek, have been wetted for a sufficient period of time. After all the wet meadows have been sufficiently irrigated, any remaining water would either be allowed to continue to flow across the landscape into the playa habitat or would be diverted around short emergent habitats directly into playa habitat through ditch infrastructure using decreed points of diversion.

Under this alternative, water would not be applied to the playa habitat until later in the snowmelt runoff period, which would result in no available playa habitat for spring migrating waterbirds. Depending on the volume and duration of snowmelt runoff, water would not be applied, if at all, to playa habitat until in the middle or end of the breeding season, rendering the playa habitat largely unsuitable for many nesting waterbirds. However, there would be foraging habitat for a variety of shorebirds, wading birds, and waterfowl.

Strategies for Playa A1:

- Using decreed points of diversion, direct water to playa habitats after all the wet meadows associated with Crestone Creek, Willow Creek, and Deadman Creek have been wetted by allowing water to continue to flow across the landscape or by diverting water directly into the playa habitat through ditch infrastructure.
- Maintain the integrity of water diversion structures at decreed points of diversion.
- Evaluate the hydrologic and biologic response to water application in the playa habitat.

Collect information to assess the relationship between water application to the playa habitat and pumping from the Closed Basin Project.

Playa Objective A2. On years where above average water is available, divert a minimum of 20 percent of all available water to playa habitats using decreed points of diversion. In addition, playa habitats will be supplemented with any tail water available from the irrigation of short emergent habitats.

Rationale for Playa A2. During years when above average water is available in the creek systems entering the Baca Refuge, the refuge has the ability to use more of the decreed water rights. These additional water rights that come into priority are located in areas that allow this additional water to be used directly on playa wetlands. In addition, irrigation infrastructure associated with the short-emergent habitat areas cannot contain the volumes of water in the stream systems, and water must be diverted in playa diversions to protect against structure failure and to keep from excessive sediment buildup in the upper portions of the short-emergent habitats. This allows for the creation of suitable conditions for the widest range of species in both habitat types, and results in population explosions of species of importance such as tadpole shrimp, other invertebrates, and several species of amphibians which in turn attract species such as black-crowned night herons and nesting white-faced ibis that normally do not use refuge habitat.

Strategies for Playa A2:

- When above average water is available, refuge staff will divert a minimum of 20 percent of all water directly to playa habitats.

Objectives for Playa Wetlands, Alternative B (Draft Proposed Action)

Baca National Wildlife Refuge. Playa Objective B1. 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 (same as D1).

Rationale for Playa B1. 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 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, pers. comm.). During

the years when we would apply water to the playas, water would 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 would 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 would maintain suitable hydrologic conditions for as long as possible and water would 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 abundance, 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 would be made to maintain the longest hydroperiod possible.

During years when water is delivered to the playas, some wet meadow habitats would remain dry because there would 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 Playas B1:

- 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.



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Great Plains toads are found on the refuge complex.

Objectives for Playa Wetlands, Alternative C

Baca National Wildlife Refuge. Playa Objective C1. Direct, through decreed diversion points, at least 90 percent of the available water in each hydrological system (creek) into the lowest (elevation) flow path available (historic channels) to allow it to reach playa habitats in a manner that would provide some spring migration as well as summer nesting habitat for waterbirds, especially shorebirds and teal, while still maintaining suitable minimum flows in select off channel flowpaths where native fish occur within the Crestone Creek system.

Rationale for Playa C1. The biological benefits under this alternative would be similar to those under alternative B. Water would be allowed to enter the playas to provide waterbird foraging and resting habitat during as much of the spring migration as possible as well as to provide summer nesting habitat. The primary difference under this alternative is that water would annually be diverted from decreed points of diversion into the natural creek channels in all creeks as compared to only select creeks each year. This would result in more playa habitat being wetted annually, providing more food resources and more nesting areas for waterbirds, especially shorebirds and teal. Water would likely enter the playas sooner in the spring until it eventually reaches the playa habitat. Water would continue to enter the playa habitat throughout the duration of the snowmelt runoff period.

Strategies for Playa C1:

- Using decreed points of diversion, annually direct water into the creeks and allow water to flow into the playa habitat.
- Maintain the integrity of water diversion structures at decreed points of diversion.
- Allow water to enter the playa habitat throughout the entire snowmelt runoff period.
- Evaluate the hydrologic and biologic response of water application to the playa habitat.
- Collect data to assess the relationship between water application to the playa habitat and pumping from the Closed Basin Project.



USFWS/Koerner

The Brewer's sparrow is a rare grassland focal bird that would benefit from the conversion of the shrubgrass (transition grass) to more of the sand sheet rabbitbrush habitat type described under alternative C.

Objectives for Playa Wetlands, Alternative D

Baca National Wildlife Refuge. Playa Objective D1. Same as B1.

Rationale for Playa D1. Same as B.

Strategies for Playa D1. Same as B.

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, Alternative A

Alamosa and Monte Vista National Wildlife Refuges. Upland Objective A1. Continue to provide about 3,337 acres on the Monte Vista Refuge and about 2,696 acres on the Alamosa Refuge of native greasewood and rabbitbrush shrub communities for the benefit of nesting, migrating, and wintering migratory birds and other wildlife species (similar to alternative D).

Upland Objective A2. Continue to provide native shortgrass communities on the Alamosa Refuge (about 491 acres) and Monte Vista Refuge (about 330 acres), for the benefit of nesting, migrating, and wintering birds and other wildlife species (similar to alternative D).

Rationale for Upland A1–A2. Although upland shrub vegetation is relatively common, it is important

for refuge managers to protect and maintain it on the refuge complex because it is a historic habitat type and contributes to the biodiversity of native species (similar to alternative D).

Strategies for Upland A1–A2. (Similar to alternative D):

- Research the use of these communities by wildlife and the amount and condition (relative to species composition of understory) of habitat needed on the refuge complex.
- Keep uninfested areas free of noxious weeds. In infested areas, reduce infestation by 40 percent over the life of this plan.
- Investigate the use of this habitat type by migratory birds through literature searches, analysis of existing data, and, if necessary, monitoring programs.
- Investigate the historic condition of shrubland communities in the San Luis Valley for potential restoration activities on the refuge complex.
- Use management treatments such as water, prescribed fire, prescribed grazing, haying, and herbicides to promote native plant communities and reduce and control invasive plant species.

Baca National Wildlife Refuge (2005 CMP). Upland Objective A3. Continue to manage shrublands on the Baca Refuge, taking corrective action when obvious degradation is occurring from invasive species.

Rationale for Upland A3. We would continue to manage the uplands, including the shrublands, using livestock grazing, prescribed fire, mowing, haying, or herbicides as we continue to learn more about the uplands on the Baca Refuge.

Strategies for Upland A3:

- Use a variety of tools to manage upland shrub communities including prescribed fire, herbicides, grazing, mowing, and haying.

Objectives for Upland, Alternative B (Draft Proposed Action)

For all the refuges in the complex, under alternative B, we would 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 B1. 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 B2. 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 B3. 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 B4. 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 B5. 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 B6. 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 B1–B6. 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 would return these areas to native shrubland communities. Within 10-15 years, we would 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 adjusting 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 would 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 would 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 would 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 would be a top priority. This includes many created wetland areas as well as former farmland areas. We would 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 would 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 would result in greater biodiversity of animal species, including insects, in this habitat. Our strategies, including prescribed fire, grazing, and hydrologic conditions, would mimic, to the greatest extent possible, natural disturbance regimes. By using these management actions periodically, we would 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 on the refuge (see figure 45, chapter 4) 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 B7. 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 B7. In addition to enhancing the greasewood shrubland and sandsheet rabbitbrush components through the use of a variety of management tools, we would 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 germination and viability is 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 would 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 B1–B7 (All Refuges):

- Monitor for small mammals as an indicator of upland health.
- If needed, limit visitor use to reduce the spread of invasive species.
- Manage hydrology in a way that mimics, to the greatest extent possible, natural hydrologic conditions that would have existed on each site.
- Plant or seed native shrub and grass species on retired farmland areas.
- 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 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 prairie dog populations and adjust irrigation practices, reduce invasive species, or enhance habitat as necessary.
- On the Baca Refuge, map distribution of slender spiderflower and determine the primary factors that contribute to its presence within this habitat type.

Objectives for Upland, Alternative C

Alamosa and Monte Vista National Wildlife Refuges. Upland Objective C1. Same as B1.

Upland Objective C2. Within 4–5 years, begin restoration on a minimum of 1,000 acres of the Monte Vista Refuge that were formerly converted to wetland. By year 15 of the CCP, achieve 20–30 percent shrub cover and less than 10–15 percent invasive weeds in these areas.

Upland Objective C3. Within 2–3 years, begin restoration on a minimum of 450 acres of retired farmland on the Monte Vista Refuge. By year 15 of the CCP, achieve 20–30 percent shrub cover and less than 10–15 percent invasive weed cover in these areas.

Upland Objective C4. Same as B4.

Upland Objective C5. Within 4–5 years, begin native upland habitat restoration of a minimum of 800 acres of the Alamosa Refuge in areas that were formerly converted to wetland. By year 15 of the CCP, achieve 20–30 percent shrub cover and less than 10–15 percent invasive weed cover in these areas.

Upland Objective C6. Within 2–3 years, begin restoration on a minimum of 50 acres of areas of retired farmland on the Alamosa Refuge. By year 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 C1–C6. The hydrologic changes on the Monte Vista and Alamosa Refuges have resulted in extensive conversion of native upland habitats to wetlands. This conversion was accomplished through the construction of water management infrastructure without consideration of soil type and other abiotic factors. Subsequently, many areas of native shrubland habitat were inundated, creating hydric conditions on soil types that naturally do not support wetland plant growth. Under alternative C, because water will be applied only to natural wetland areas, such as creek channels, flowpaths, depressions, sloughs, and oxbows, many created wetland areas would be restored back to a native upland vegetative community. The result would be a significant increase in the amount of native upland habitat available for wildlife species such as Brewer's blackbird, loggerhead shrike, and sage thrasher, while the amount of wetland habitat on the refuges would experience a proportionate decline.

Portions of native upland habitat on the Monte Vista and Alamosa Refuges were converted to farmland for the purpose of growing small grains and alfalfa. Much of this farmland has been retired, and the current vegetation consists primarily of annual and perennial invasive weeds such as tall whitetop

and Russian knapweed. Similar to alternative B, at least 100 acres on the Monte Vista Refuge and at least 50 acres on the Alamosa Refuge would be restored to native upland communities. Under this alternative, because farming would no longer take place, another 350 acres of farmland on the Monte Vista Refuge would be restored to native upland habitat.

Similar to alternative B, we would employ strategies that mimic natural disturbance regimes, such as prescribed fire and grazing, to promote long-term sustainability of the system as well as provide the vegetative structure and diversity that are vital to songbirds for nesting, brood rearing, foraging, and migration.

Strategies for Upland C1–C6. Alamosa and Monte Vista Refuges. Similar to alternative B except:

- Manage hydrology to mimic natural hydrologic conditions. For example, on the Alamosa and Monte Vista Refuges, restrict flooding of upland habitats to periodic, short duration events instead of the traditional prolonged flooding which has caused a conversion to wetland vegetation.
- Restrict large hydrologic inputs to natural creek channels, wetland flowpaths, depressions, sloughs, and oxbows.
- Plant or seed native shrub and grass species on retired farmland areas.
- Study the use of native upland communities by songbirds.
- Evaluate decrees for all water sources on the Alamosa and Monte Vista Refuges. Where needed, work with Colorado Division of Water Resources to change use, place of use, or points of diversion to accommodate new management objectives.

Baca Refuge. Upland Objective C7. Mimic historic disturbance regimes on upland habitats of the Baca Refuge by periodically using fire and grazing on 50–75 percent of the estimated 51,790 acres of upland shrub habitat to enhance habitat diversity for migrating and breeding songbirds and other resident wildlife. Convert 40–60 percent of the shrubgrass (transitional) habitat type (which would be 600–900 acres) to the sandsheet rabbitbrush habitat type through reducing nearby flood irrigation, which would diminish or eliminate subirrigation in this habitat type.

Rationale for Upland C7. Irrigation on the refuge would be reduced and natural processes would be restored or recreated to the extent possible. Surface water would not be diverted onto meadows through ditches and laterals. Instead, water would be restricted to natural channels. Wet meadow acreage would be significantly reduced, and the shrub-grass habitat type next to meadows would receive little to no subsurface water. Reducing the water supply would likely result in changes to shrubs and herbaceous vegetation. Rubber rabbitbrush shrub size would likely be reduced; shrub distribution would likely become sparser; crown density would lessen; the distribution, abundance, and species richness of herbaceous vegetation would shrink; and areas of bare soil would increase. Large amounts of shrub-grass acreage would likely convert to the sandsheet rabbitbrush habitat type, resulting in benefits to species such as Brewer's sparrows and sage thrashers. Studies from the Great Basin showed that Brewer's sparrow abundance is positively correlated with percent shrub cover, percent bare ground, and percent forb cover, and negatively correlated with percent litter cover and percent grass cover (Rotenberry and Wiens 1980; Wiens and Rotenberry 1981). Rotenberry and Wiens (1980) conducted research in a sagebrush plant community and found a positive correlation between sage thrashers and shrub height, horizontal patchiness, and bare ground, and a negative correlation with annual grass cover.

Strategies for Uplands Baca Refuge:

- Cease active flood irrigation practices on the refuge and allow surface water to remain in natural stream channels.
- Document correlations between changes in meadow irrigation and effects on adjacent shrub-grass areas.
- Study vegetation changes in areas that convert from shrub-grass to sandsheet rabbitbrush.
- Study the use of this habitat type by shrub- and grassland-nesting songbirds.
- Alter management strategies and objectives as habitats shift to sandsheet shrub type habitats.
- Map distribution of slender spiderflower and determine primary factors that contribute to its presence within this habitat type.

- Refine objectives as more information is gathered about this habitat type and its wildlife value.
- Evaluate decrees for all water sources on the Alamosa and Monte Vista Refuges. Where needed, work with Colorado Division of Water Resources to change use, place of use, or points of diversion to accommodate new management objectives.

Objectives for Upland, Alternative D

Alamosa and Monte Vista National Wildlife Refuges. Upland Objective D1. Similar to alternative A1. Upland Objective D2. Similar to alternative A2.

Baca Refuge. Upland Objective D3. Similar to B7.

Wildfire

Objectives for Wildfire, Alternative A

All Refuges on the Complex. The 2003 CCP did not identify specific objectives for wildfire suppression. The current approach comes from Service policies and guidelines.

Wildfire Objective A1. Follow the following guidelines for wildland fire management:

- Suppress wildfires on the refuge complex using the most effective methods.
- Continue participation in the interagency fire management team to conduct wildfire suppression as well as prescribed fire.

Rationale for Wildfire A1. Although wildfires are infrequent on the refuge complex, they can result in significant loss of wildlife habitat and human property, both on and off the refuges. The USFS and the BLM maintain significantly more firefighting resources in the San Luis Valley than the Service does. Great potential exists to share and better use firefighting resources, not only among the Federal agencies, but also with State, county, and individual rural fire protection districts. In order to join in this partnership, we need to contribute resources proportional to those expended on refuge projects. Currently, wildfire mitigation projects associated with the refuge complex are often unfunded through the national fire plan and will remain so under the current fuels scoring system. This situation has demanded creative partnerships to accomplish needed reduction in wildfire threats on refuge lands.

Strategies for Wildfire A1:

- Continue involvement with the San Luis Valley interagency fire management team by contributing one half of full time equivalent (FTE), engine, and operating funding.
- Identify alternative funding to treat refuge lands to reduce hazards to adjoining property.

Objectives for Wildfire, Alternatives B–D

All Refuges on the Complex. Wildfire Objectives B1–D1. 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 B1–D1. 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 B1–D1. Same as alternative A plus:

- Minimize the construction of new facilities that would 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 need for WUI within the refuge complex.
- 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 Objectives B2–D2. 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 B2–D2. 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 B2–D2:

- 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 Objectives B3–D3. Increase involvement with interagency partners including rural volunteer fire departments, and develop new memoranda of understanding.

Rationale for Wildfire B3–D3. 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 B3–D3:

- 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

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

Objectives for Southwestern Willow Flycatcher, Alternatives A–D

Alamosa National Wildlife Refuge. Southwestern Willow Flycatcher Objectives A1, B1, C1, and D1. Contribute to the recovery goals as described in the southwestern willow flycatcher recovery plan of 2002.

Southwestern Willow Flycatcher Objectives B2, C2, and D2. By year 5, maintain and enhance a minimum of 50 acres of existing suitable habitat 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 A1–D1 and B2–D2. 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



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

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. Consequently, 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 altera-

tions in the hydrology of the Rio Grande because of upstream water diversions, bank stabilization projects, 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 would 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 would begin to restore or establish another 50 acres of suitable habitat on off-channel sites. Restoration efforts would 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 would 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 would be restricted to on-trail use to reduce disturbance to birds, especially during migration, nesting, and fledging periods. We would 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 A1–D1 and B2–D2:

- At least once every three years throughout the life of the CCP, evaluate levels of wild ungulate 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, Alternative A

Sandhill Crane A1. Continue to support sandhill cranes by producing adequate agricultural grains (currently up to 270 acres depending on rotation and water availability) for fall and spring migrating waterfowl and 15 percent of the fall and 85 percent of the spring sandhill crane population on the Monte Vista Refuge.

Monte Vista National Wildlife Refuge

Rationale for Sandhill Crane A1. 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. Changes in agricultural practices in the past 10 to 15 years may have reduced the amount of waste grain available to migrating birds on private lands in the spring. There is sufficient water on the refuge in early spring to grow enough natural foods to feed the current flock. Therefore, the refuge's agricultural fields provide essential food supplies in the spring, when they are limited elsewhere in the San Luis Valley.

Strategies for Sandhill Crane A1:

- 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.
- Attempt to lessen sandhill crane dependence on the Monte Vista Refuge farm fields in the spring. About 85 percent of the population uses the refuge for feeding and roosting during spring staging. We assume that this concentration exposes the population to risk of catastrophic loss.
- 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.

Objectives for Sandhill Cranes, Alternative B (Draft Proposed Action)

Monte Vista National Wildlife Refuge. Sandhill Crane B1. Similar to A1. In support of the Pacific and central flyway population goals for the Rocky Mountain population of greater sandhill cranes, produce a minimum of 190 acres of small grains (primarily barley) for spring migrating sandhill cranes on the Monte Vista Refuge.

Sandhill Crane B2. In both spring and fall, provide adequate roost habitat by shallowly flooding traditional crane roost areas.

Rationale for Sandhill Crane B1–B2. For centuries, the San Luis Valley has been an important migratory staging area for the Rocky Mountain population of greater sandhill cranes. During spring migration, an estimated 18,000–20,000 greater sandhill cranes and approximately 5,000–6,000 lesser and Canadian sandhill cranes inhabit the San Luis Valley between late February and early April, with most using the Monte Vista Refuge for roosting, loafing, and foraging. During this period, sandhill cranes need to build up energy reserves to finish migration to their nesting grounds (Tacha et al. 1987) breed successfully. The loss of natural shallow water wetlands because of land use modifications and alterations to hydrology has reduced the amount of potential foraging areas throughout the San Luis Valley (R. Drewien personal communication [date unknown]). It is believed that sandhill cranes did not migrate through the San Luis Valley until later in the spring when natural wetlands would have been largely free of ice and more invertebrates and other natural food sources would have been available. With the advent of agricultural production of small grains in the San Luis Valley over the last century, sandhill cranes began arriving as early as mid-February to take advantage of the waste grain left in agricultural fields after harvest. Sandhill cranes may have altered the timing of migration to take advantage of this readily available food source and now arrive to the San Luis Valley in late winter when most wetland areas are still frozen and natural food sources are largely unavailable in sufficient amounts to provide the energy required to build fat reserves. As a result, they have become dependent on small grain production in the San Luis Valley.

Sandhill cranes forage for small grains in the existing farm fields on the Monte Vista Refuge and on private agricultural fields. In recent years, fall tillage and irrigation of privately owned small grain fields have become increasingly widespread in the San Luis Valley. Farmers use these practices to encourage the growth and then subsequent freezing

of waste seeds to get a clean field for spring planting. Since the late 1990s, the amount of acres in small grain production in the San Luis Valley has been dramatically reduced by replacement with alfalfa, which is a more profitable crop. These changes in farming practices have resulted in a reduction in waste grain availability for sandhill cranes during spring and have prompted concern over whether current or future food resources are adequate to meet spring demands for migrating cranes (Subcommittees on Rocky Mountain Population Greater Sandhill Cranes 2007; personal communication with Dave Olson, FWS Division of Migratory Birds, April 24, 2014). Therefore, we would continue agricultural production of small grains (primarily barley) on a minimum of 190 acres on the Monte Vista Refuge to make sure that this essential food resource is available for cranes in the spring.

Strategies for Sandhill Crane B1–B2:

- Continue to assess the amount and distribution of food for sandhill cranes in the San Luis Valley and plan the refuge’s farming program in response to monitoring. 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.
- Maintain existing ground water rights that allow for flexibility in water application during the spring and fall.
- Through ground water pumping, provide adequate roost habitat (i.e., shallowly flooded (less than 15 inches)) on a minimum of two of the three traditional roost areas.

Objectives for Sandhill Cranes, Alternative C

Sandhill Crane Objective C1. Within 5-10 years, end grain production on the Monte Vista Refuge.

Monte Vista National Wildlife Refuge

Rationale for Sandhill Crane C1. As described for the wetland and upland objectives, we would restore and sustain historic vegetative communities based on natural hydrology and ecological site characteristics. Subsequently, the areas we have traditionally managed as roosting habitat (primarily in units 14, 19, and 20) would be restored back to upland habitat. This would result in the reduction of suitable roost habitat for sandhill cranes. Water application on

the refuge would follow natural patterns. With the exception of water in the historic Spring and Rock Creek drainages, little to no water would be available for cranes when they are migrating and spending time in the San Luis Valley.

The effects of eliminating small grain production on sandhill crane body condition, future breeding success, and ultimately population size are largely unknown. Cranes may simply redistribute and increase their reliance on natural foods on the refuge as well as food resources provided on private agricultural fields where there is waste grain left following traditional harvesting practices. It is also not clear whether eliminating grain production could affect the timing of crane arrival in the spring or their departure south in the fall. If food resources are more limited, it is possible that they could remain on their wintering grounds longer. Additionally, the length of time cranes spend in the San Luis Valley may decrease if food resources are more limited.

Water that is now being used for farming operations could be used to promote and maintain native plant communities. This could also increase our pumping costs. Under the current Cooperative Farming Agreements, all pumping costs associated with refuge farming operations are now being paid by the permittee.

Strategies for Sandhill Crane C1:

- Remove all center pivots and restore all agricultural fields to native uplands on the Monte Vista Refuge.
- Reduce production of small grain steadily but slowly, allowing adequate time for cranes to adjust to this diminishing food source.

Objectives for Sandhill Cranes, Alternative D

Monte Vista National Wildlife Refuge. Sandhill Crane Objective D1. Produce a minimum of 230 to 270 (increase of 40 acres) acres of small grains (primarily barley) to provide food and energy resources for spring migrating sandhill cranes on the Monte Vista Refuge.

Sandhill Crane Objective D2. Similar to B2.

Rationale for Sandhill Crane D1. Visitor use would be emphasized and another 40 acres of small grain production would be established on former farm fields next to existing public use areas to maximize crane viewing opportunities. In the past, when these fields were farmed for the production of small grains, the refuge incurred all or most costs associated with the preparation, planting, and irrigation of

these fields, which were extensive. Due to financial and time constraints, farming these fields was abandoned. It was felt that the amount of labor and the significant costs associated with farming these fields were too great and contributed little to the conservation of sandhill cranes. However, the production of small grains on these fields provided quality crane viewing because the fields are next to existing public use areas. Under this alternative, the production of small grains in these fields would occur. The refuge would explore ways to work cooperatively with a permittee where the permittee would incur most associated costs. If that is not possible, the refuge will incur all associated costs, including labor.

Strategies for Sandhill Crane D1. Same as alternative B plus:

- Improve public education about why the refuge produces grain on the Monte Vista Refuge.
- Return farm fields along the east side of Highway 15 to small grain production.
- Work with a cooperative farmer (permittee) to prepare, plant, and irrigate the added farm fields.

Wildlife Management: Focal Bird Species

All Refuges in the Complex. Focal Bird Objective A1. No specific focal bird objectives under current management.

Focal Bird Objective B1, C1, and D1. 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 3 (wetland habitat), 4 (upland habitats), and 5 (riparian habitats) below.

Rationale for Focal Bird B1, C1, and D1. 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 and wildlife needs, and developed sound management strategies that would maintain or restore the ecological integrity, productivity, and biological diversity of refuge habitats that are sustainable over the long term (described under habitat objectives, chapter 3). 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 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 3, 4, 5) that would 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 would consider the species' needs for timing, depth, and duration of water application. Because vegetative structural conditions affect the suitability of nesting areas for focal species, along with water management, actions such as prescribed fire and prescribed grazing, mowing, or haying would 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 B1:

- Manage water using natural flow paths 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.

Table 3. 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>Habitat: Sedge, grass, and rush meadows.</p> <p>Microhabitat: Moist to shallowly flooded (<6"). Prefers low vegetation height (6"–12").</p> <p>Nest site: 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>Habitat: Prefers exposed, sparsely vegetated salt flats, sandbars, peninsulas, mudflats, or islands adjacent to shallow (<3' deep) water, conditions that occur in wetlands or lakes.</p> <p>Microhabitat: Moist to shallowly flooded (<6") for foraging. Prefers sparsely vegetated areas for foraging and nesting.</p> <p>Nest site: 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>Food: 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>Habitat: 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>Microhabitat: 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>Nest site: Nests near water in low, dense perennial vegetation such as Baltic rush (<i>Juncus balticus</i>), saltgrass (<i>Distichlis spicatum</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>Food: Omnivorous diet consisting of seeds and aquatic vegetation, aquatic and semiterrestrial insects, snails, and zooplankton. Forages in shallowly flooded zones (<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 3. Focal bird species for wetland habitats.

<i>Associated bird species</i>	<i>Habitat</i>	<i>Species of concern lists</i>
<i>Mallard (Anas platyrhynchos)</i>		
Gadwall, lesser scaup, short-eared owl, northern harrier	<p>Habitat: Wide variety of habitats with dense cover, including grasslands, marshes, bogs, riverine floodplains, dikes, roadside ditches, and pastures.</p> <p>Microhabitat: Although commonly nests on uplands, in the San Luis Valley the preferred vegetation is tall dense (>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>Nest site: 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>Food: 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>Habitat: Uses grassy meadows, cultivated fields (especially alfalfa), lightly grazed pastures, roadsides, wet meadows, sedge bogs, and edge of salt marshes.</p> <p>Microhabitat: 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>Nest site: 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>Food: 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 3. 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>Habitat: Freshwater tall, dense emergent wetlands.</p> <p>Microhabitat: 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>Nest site: 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>Food: 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, Inter-mountain 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>Habitat: Freshwater tall, dense emergent wetlands.</p> <p>Microhabitat: Dense emergent vegetation over water 1–3 feet in depth.</p> <p>Nest site: 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>Food: 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, Inter-mountain 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>Habitat: Shallow water wetlands for roosting and foraging, agricultural fields planted to small grains for foraging.</p> <p>Microhabitat: Roosts and forages in shallow water wetlands/wet meadows with typically <6 inch water depths. Prefers roost sites with short (<1 feet) vegetation height. Forages in agricultural fields on waste grain or on refuge farm fields after mowing standing crop.</p> <p>Nest site: Spring and fall migrant through the San Luis Valley only.</p> <p>Food: 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 4. 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>Habitat: Shrubland habitat with big sagebrush, black greasewood, and occasionally rubber rabbitbrush.</p> <p>Microhabitat: 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>Nest site: 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>Food: 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>Habitat: Primarily native grasslands and former agricultural fields converted to perennial grassland cover.</p> <p>Microhabitat: 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>Nest site: 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>Food: 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 5. 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>Habitat: Riparian thickets, especially of willow, though other shrubs or trees may be used.</p> <p>Microhabitat: 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>Nest site: 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>Food: 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>Habitat: Riparian woodland and forest with large cottonwoods, especially along forest edge.</p> <p>Microhabitat: Large tree diameters (primarily narrowleaf cottonwoods), open understory, and dead trees or trees with dead limbs.</p> <p>Nest site: 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>Food: 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

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. In this CCP and EIS, we are analyzing what role, if any, bison could have in the future on the Baca Refuge.

Objectives for Wildlife Management: Bison, Alternative A

Baca National Wildlife Refuge. Bison Objective A1. 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 A1. Currently, 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 would be phased 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 and EIS as well as to the stated purposes of the Baca Refuge (refer to chapter 2, section 2.1.6). Under alternative A, bison would not be used on the Baca Refuge.

Objectives for Wildlife Management: Bison, Alternative B

Baca National Wildlife Refuge. Bison Objective B1. Same as A1, C1, and D1.

Bison Objective B2. By year 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 (refer to figure 18). The research area would 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 would be to determine if the refuge could support any number of bison to contribute to FWS



There has been interest expressed in the reintroduction of American bison on Baca Refuge. The alternatives consider whether the Baca Refuge could support free-roaming bison without negatively affecting other species.

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bison conservation goals without compromising the refuge's purpose and the habitat goals for the areas where they would be grazed.

By semi-free ranging, we mean that although bison would 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 would not be managed or controlled.

Rationale for Bison B2. 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 would

be introduced on refuge land first, which would provide information that would assist us in decisionmaking regarding the potential of future semi-free ranging bison on the Baca Refuge. Initially, we would introduce a year-round bison herd in a designated area and develop a specific monitoring program that would 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 would be valuable in determining any possibility of 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 would not be excluded.

Strategies for Bison B2:

- 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 would be appropriate for overall habitat conditions. Continue to prescribe any necessary 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/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.
- Use adequate boundary fencing as necessary.
- 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.

Objectives for Wildlife Management: Bison, Alternative C

Baca National Wildlife Refuge. Bison Objective C1. Same as A1, B1, and D1.

Bison Objective C2. Use bison prescriptively (not necessarily every year) to meet the habitat objectives on the Baca Refuge.

Rationale for Bison C2. Bison could potentially be used as a valuable management tool since neighboring herds could be conveniently located and may be readily available. Bison may be effective in creating specific habitat conditions desired by management, in contrast to results achieved by sheep or cattle. Archeological evidence and limited historical accounts show that bison are native to the San Luis Valley (Espinosa 1939, Spencer 1975, Meaney 1993). Their numbers and distribution, the timing of their presence, and their overall contribution to ecosystem patterns and processes are largely unknown. This lack of information prevents a full understanding of the ecological role of bison in the San Luis Valley. It is likely that bison may have played some role in shaping and maintaining various plant communities by providing a variety of effects such as soil disturbance from hoof impacts, stimulating regeneration of plants through grazing, fertilization with body waste, creating topographical depressions through wallowing, and so forth. These influences might be reproduced by the occasional, temporary prescribed use of bison in targeted areas on the Baca Refuge.

Strategies for Bison C2:

- Use bison to periodically to mimic ecological processes. Remove bison if habitat objectives are not being met.
- 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.
- Use adequate boundary fencing as necessary. Consider vehicle access, interpretive signage, and considerations for visitor safety.

Objectives for Wildlife Management: Bison, Alternative D

Baca National Wildlife Refuge. Bison Objective D1. Same as A1, B1, and C1.

Bison Objective D2. Within 15 years, introduce a small (less than 25) demonstration bison herd in a designated area (similar to Sully's Hill National Wildlife Refuge) for public observation.

Rationale for Bison D2. Bison are a native, charismatic species that would attract more visitors to the Baca Refuge and better assist the Service with interpretation and education on overall bison conservation efforts by the Department of Interior and others. Under this alternative a small herd of bison (less

than 25) would be introduced and maintained in a confined area near public access points on the refuge for the primary purpose of viewing and interpretation (see figure 24 and figure 27). Even though we would strive to maintain suitable habitat for other trust species (as part of the refuge's purpose) within the area where the bison are occurring, having bison on the refuge for educational and possible conservation purposes could outweigh overall habitat condition concerns. Thus, we would be willing to introduce bison without having habitat impact questions answered first, as proposed in alternative B. The bison area would be subdivided by cross fences and grazing impacts of the animals would be actively monitored and managed to ensure minimum negative impacts to rangeland health. These animals would be owned by us and subject to all health surveillance and genetic monitoring programs used by the Service, including annual roundups as required.

Strategies for Bison D2:

- Devote about 2,600 acres on the Baca Refuge for bison observation and interpretation (refer to figure 24 and figure 27).
- Use adequate boundary fencing to ensure that bison stay on the refuge and in designated areas.
- Construct round up and handling facilities if an arrangement to use privately owned facilities near the refuge cannot be made.
- Follow the Service's policy for disposal of excess animals.
- Consider vehicle access, interpretive signage, and considerations for visitor safety.

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.

Objectives for Wildlife Management: Rocky Mountain Elk, Alternative A

All Refuges in the Complex. Elk Objective A1. Continue to conduct population surveys to monitor the density and distribution of the elk population on the refuges.

Elk Objective A2. Continue to cooperate with CPW in efforts to reduce and redistribute the elk population as necessary.

Rationale for Elk A1–A2. Resident elk herds are found on all three refuges, with about 200 elk remaining on the Alamosa Refuge year round and about 50 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 2013e). In addition, by monitoring the population, we will continue to evaluate the effectiveness of these management actions.

Strategies for Elk A1–A2:

- 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.

Objectives for Wildlife Management: Rocky Mountain Elk, Alternative B

All Refuges in the Complex. Elk Objective B1. Same as A1.

Elk Objective B2. Same as A2.

Rationale for Elk B1–B2. Same as A.

Strategies for Elk B1–B2. Same as A.

Elk Objective B3. On all the refuges, develop and implement a hunt plan (see “Hunting” in “Visitor services” section) that would 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 B3. 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 would 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 would 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 would 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 would also likely have similar positive results on riparian plant communities. It would 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 B3:

- Develop a public hunt plan for the refuge complex that helps managers to meet elk management goals.
- 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 would be accomplished primarily by controlling the number of hunters allowed on the refuge during any given season.
- 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 manage any hunting encroachment onto park lands (i.e., pushing elk back and forth across the boundaries).
- Coordinate closely with CPW and BLM in developing the trail access from the Monte Vista Refuge to BLM lands off of CR6 South.
- Coordinate on the use of all management tools including dispersal, hunter orientation and education, and law enforcement.

Elk Objective B4. Create a comprehensive monitoring plan for chronic wasting disease.

Rationale for Elk B4. 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 would 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 B4:

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

Objectives for Wildlife Management: Rocky Mountain Elk, Alternative C

Elk Objective C1 and C2. Same as A1 and A2.

Rationale for Elk C1. Same as A1 and A2.

Elk C3–C4. Similar to B3 and B4 except the emphasis would be placed on achieving our overall habitat management objectives. There would be less emphasis on trying to ensure a wide range of quality elk hunting opportunities.

Rationale for Elk C3. Although many of the actions would be similar to be alternative B, under alternative C, the emphasis would be on achieving habitat management objectives and not necessarily on providing a wide range of quality recreational hunting opportunities.

Strategies for Elk C3. Similar to Elk B3–B4.

Objectives for Wildlife Management: Rocky Mountain Elk, Alternative D

Elk D1–D4. Same as B1–B4.

Rationale for Elk D1–D4. Similar to B1–B4 only there would be a greater emphasis would be on maximizing hunting opportunities.

Strategies for Elk D1–D4. Similar to B1–B4 plus:

- Work with CPW to determine the appropriate level of hunting permits for elk to achieve habitat objectives related to herd populations and herd composition, while also focusing on providing high quality opportunities for hunters involved.
- Take into account biological integrity and landowner tolerance when setting permit levels for elk hunting.
- Assess habitat and better understand big game behavior on the Baca Refuge.
- Determine where to apply pressure and clearly establish hunting methods, such as archery, muzzle loading, shotgun, and guided dispersal hunts.
- Work with the CPW to establish special hunts for elk, such as hunts that are available to only young hunters.

Wildlife Management: Rio Grande Sucker

This fish species is found on the Baca Refuge.

Objectives for Wildlife Management: Rio Grande Sucker, Alternative A

Baca National Wildlife Refuge. Sucker A1. Continue to monitor and evaluate the condition of Rio Grande sucker habitat. Where obvious degradation is occurring to the habitat through factors such as a reduced perennial water supply, take corrective actions.



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The Rio Grande sucker and chub (pictured) are found along Crestone Creek on Baca Refuge. The Rio Grande sucker was recently proposed for listing on the endangered species list.

Rationale for Sucker A1. This is a State endangered species which has been proposed for listing under the Endangered Species Act (2013). We would work with CPW to maintain a perennial water supply for Rio Grande sucker.

Strategies for Sucker A1:

- 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.

Objectives for Wildlife Management: Rio Grande Sucker, Alternative B

Baca National Wildlife Refuge. Sucker B1. Same as A1.

Sucker B2. Within 5 years, initiate a study on riparian restoration, and over 15 years, monitor the effects of riparian restoration efforts on the sucker population (refer to riparian restoration objectives above).

Sucker B3. Work with CPW to set specific priorities, identify projects, and enhance and increase sucker habitat on the refuge.

Rationale for Sucker B1–B3. The Baca Refuge has one of only two aboriginal (native) Rio Grande sucker populations in the State; therefore this population is crucially important for genetic conservation of the species. Although much of Crestone Creek is considered degraded, 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, as well as making in-stream modifications, such as inducing proper meandering, elevating the streambed, introducing cobble to provide substrate, and reducing siltation and erosion. These efforts should benefit the Rio Grande sucker population, but we would work closely with CPW before large-scale restoration takes place.

Strategies for Sucker B1–B3:

- 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.

Objectives for Wildlife Management: Rio Grande Sucker, Alternative C

Sucker C1. Similar to B, except restoring natural flow paths on the Baca Refuge would prevent fish from being trapped in the artificially created wetlands.

Objectives for Wildlife Management: Rio Grande Sucker, Alternative D

Sucker D1. Similar to B except for information where suckers typically occur.

Rationale for Sucker D1–D4. Similar to B1.

Strategies for Sucker D1–D4: Similar to B1.

Water Resources

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

Water Management

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, Alternative A

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

Water Resources A1. Starting immediately and continuing 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. (Same as B1, C1, and D1.)

Rationale for Water Resources A1. 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 A1:

- 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 B10).
- 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.

Water Resources A2. Continue to irrigate small grain crops using the most labor- and water-efficient methods.

Rationale for Water Resources A2. 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 A2:

- 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.

Objectives for Water Resources, Alternative B (Draft Proposed Action)

All Refuges in the Complex. Water Management B1. Same as A1, C1, and D1.

Water Resources B2. 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. 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:

- 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 B3. 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. 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 alternative B is describing 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:

- Conduct ground surveys.
- Conduct area capacity surveys.

Water Resources B4. Continue to irrigate small grain crops using the most labor and water efficient methods. (Same as A2, and D4.)

Rationale. Alternative B calls for continued production of small grain for sandhill cranes on the Monte Vista Refuge. Center pivot irrigation is far more labor and water efficient than flood irrigation and is the most practical technique available for raising grain with the least amount of labor and financial investment.

Strategies:

- 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 B5. Within 1-5 years, use ground and surface water together to achieve biological requirements.

Rationale. 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 B6. In order to comply with upcoming Colorado ground water regulations and to contribute to sustainable use of ground water, all depletions to streams caused by use of wells on the three national wildlife refuges will be replaced during the next 15 years or earlier as regulations dictate.

Rationale. 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 B5-B6:

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

Water Resources B7. 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. 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:

- 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 B8. Within 5 years, evaluate the Monte Vista Refuge as a site for confined and unconfined aquifer recharge.

Rationale. 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 overlaid by 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 would benefit from restored ground water levels promoted by these recharge opportunities.

Strategies:

- During the first year of the plan, 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 would benefit the confined aquifer.
- During the first year of the plan, discuss with the Commonwealth Irrigation Company (Empire Canal) their interest in and ability to return to the practice of using the refuge as a site for unconfined aquifer recharge.
- During the first 5 years of the plan, conduct geologic evaluation of additional recharge sites to predict the specific location and effectiveness of recharge.
- During the life of the plan, construct more recharge facilities in response to the results from these investigations.

Water Resources B9. 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. 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 would result in an improvement in the overall health and function of the entire playa system.

Strategies:

- During the first year of the plan, 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 B10. 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. Competition for water in the San Luis Valley is steadily increasing as supply appears to dwindle 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:

- 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 B11. Evaluate the need to supplement existing water supplies, especially on the Monte Vista and Alamosa Refuges.

Rationale. Although wetland and riparian systems should be managed within a naturally occurring range of hydrologic conditions, having more water rights would 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:

- 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.

Objectives for Water Resources, Alternative C

All Refuges in the Complex. Water Management C1. Same as A1, B1, and D1.

Water Management C2. Same as B2 and D2.

Water Management C3. Same as B3 and D3.

Water Management C4. Not included in this alternative.

Water Management C5. Same as B5 and D5.

Water Management C6. Same as B6 and D6.

Water Management C7. Same as B7 and D7.

Water Management C8. Same as B8 and D8.

Water Management C9. Same as B9 and D9.
Water Management C10. Same as B10 and D10.

Rationale. Similar to alternative B except C4 would not apply. We would not use pivot irrigation on the Monte Vista Refuge.

Strategies. Similar to alternative B except:

- Manage water to restore ecological processes to the extent possible. Water management for restoration of ecological processes would be given priority over visitor services or for the management of particular species.
- Pursue partnerships that maximize the ability of the refuge complex to effectively restore habitat.

Objectives for Water Resources, Alternative D

Water Management D1–D11. Same as B.

Rationale. Same as B.

Strategies. Same as B plus:

- Pursue partnerships that maximize the ability of the refuge complex to effectively restore habitat.
- Prioritize water management with a consideration for improving visitor experiences such as wildlife viewing.
- Collaborate with schools, Friends group, or volunteers to help with collecting water quality and quantity data.

Visitor Services

Visitor services includes the six priority public uses: hunting, 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 consider options for expanding the hunting program to include big game on all three refuges and small game hunting on the Baca Refuge. This would include opening the Baca Refuge for recreational public hunting. All other wildlife is precluded.

Objectives for Hunting, Alternative A

The existing hunting program would be maintained.

Monte Vista and Alamosa Refuges. Hunting A1. Continue to provide safe and sustainable waterfowl and small game opportunities within designated hunt boundaries.

Rationale for Hunting A1. 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 would continue to provide for quality and diverse hunting experiences (about 800–1,000 hunter visits annually depending on available water and habitat).

Strategies for Hunting A1:

- Conduct periodic hunter surveys. (Same as B, C, and D.)
- Implement a waterfowl hunter education program. (Same as B, C, and D.)
- Provide consistent law enforcement. (Same as B, C, and D.)
- Conduct an annual informal evaluation of hunting program. (Same as B, C, and D.)
- Continue to respond to inquiries and provide information about current refuge hunting opportunities. (Same as B, C, and D.)
- Continue yearly review of refuge hunting regulations to ensure clarity and to address any emerging issues or concerns and give to the public an opportunity to review and comment on any changes. (Same as B, C, and D.)
- Update the refuge hunting regulations brochure to inform the public of hunting opportunities, including accessible opportunities and refuge-specific regulations. (Same as B, C, and D.)
- Distribute the refuge brochure more widely. (Same as B, C, and D.)

Objectives for Hunting, Alternative B (Draft Proposed Action)

The hunt program would be expanded under alternative B.

All Refuges in the Refuge Complex. Hunting B1. Within the refuge complex, expand the current hunting program (refer to A1) by providing for diverse and quality hunting opportunities for big and small game hunting, as defined in the Service's guidelines for wildlife-dependent recreation (FWS 2006b). By year 3, develop a refuge complex hunting plan that is 50 percent implementable by year 4. By year 7, implement 100 percent of the hunting plan (same as C1 and D1).

Hunting B2. Within 6 years, work with partners to create diverse, quality hunting opportunities across the refuge complex. 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 B3. Within 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 B4. Within 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. Hunting B5. Same as A1 (waterfowl and limited small game hunting).

Hunting B6. At the Alamosa and Monte Vista Refuges, limit big game hunting to a restricted public hunt and agency-only culling. (Same as C3 and D6.)

Baca Refuge. Hunting B7. As part of creating diverse hunting opportunities (see B2 above), open 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. By year 7, open other portions of the refuge to big game hunting (primarily elk but could include deer or pronghorn if populations increase) and expand small game hunting to include the three northwest sections.

Rationale B1–B7. 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 would be important to ultimately conduct a formal survey of hunters to evaluate the hunting program within the refuge complex.

We would expand hunting opportunities and provide for diverse experiences, which would include opening the Baca Refuge for recreational hunting and providing opportunities for big game hunting on all three refuges in the complex. Because there are more adjacent roads near the Monte Vista Refuge, many safety concerns exist, and unaccompanied rifle hunting for big game would 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 would 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 would increase license sales for CPW and boost economic activity in the San Luis Valley. Although this alternative could add more hunters than are now using the refuges and that would be expected under alternative A, it is anticipated that the vast majority of hunters would report satisfaction with their overall experience.

Strategies for Hunting B1–B7. Same as A plus:

- On the Baca Refuge, adopt CPW hunting seasons and regulations for those species for which harvest is allowed on the refuges. On the Baca Refuge, open small game hunting on the Southwest corner during State-regulated seasons and allow for a permitted archery hunting area north of Crestone Creek beginning in late August. By year 7, open other portions of the Baca Refuge to big game hunting and expand small game

- hunting to include the three northwest sections.
- For all the refuges in the complex, work with CPW to determine what level of hunting permits for elk would achieve habitat objectives related to herd populations and herd composition. Biological integrity and landowner tolerance would 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 would 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.
 - If it becomes necessary because of increased hunting pressure and overharvest of certain species, use a refuge permit system to control the number of hunters.
 - 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 Hunting, Alternative C

The current program would be expanded over alternative A, but would be more focused on achieving wildlife and habitat objectives. It would take longer to bring to fruition than alternative B.

All Refuges in the Refuge Complex. Hunting C1. By year 5, develop a refuge complex hunting plan that is 50 percent implementable by year 10. By year 15, the hunting plan would be 100 percent implemented and the refuge complex would offer opportunities for big and small game hunting on the Baca Refuge and small game and waterfowl hunting on the Alamosa and Monte Vista Refuges.

Alamosa and Monte Vista National Wildlife Refuges. Hunting C1. Same as B1.

Hunting C2. Same as A1 (waterfowl and limited small game only).

Hunting C3. Same as B6 (big game-restricted public dispersal hunts and agency-only culling).

Baca National Wildlife Refuge. Hunting C4. At the Baca Refuge, by year 5, open small game hunting on the southwest corner during State-regulated seasons and open permitted big game archery hunting area north of Crestone Creek beginning in late August. By year 10, open the refuge to big game hunting and expand small game hunting to the three northwest sections.

Rationale C1–C4. The actions would be similar to B, except hunting activities would be more focused on achieving habitat and wildlife population objectives,

such as targeting female elk or changing distribution, and there would be less emphasis on providing a recreational opportunity; therefore, it would take longer to phase in the hunting program across all the sections.

Strategies C1–C4. Similar to B.

Objectives for Hunting, Alternative D

We would maximize opportunities for recreational hunting.

All Refuges in the Refuge Complex. Hunting D1. Same as B1.

Hunting D2. Within 3 years, work with partners to create diverse, quality hunting opportunities across the refuge complex. Within 4–5 years, complete a survey on user preferences, and include questions needed to evaluate harvest success and the quality of the hunts within the complex. Within 10 years, expect 70–80 percent of hunters to report a reasonable harvest opportunity and satisfaction with the overall experience.

Hunting D3. Within 4 years, working with CPW and within the State’s hunting-season framework, expand opportunities for young people to hunt with at least two new hunts that are available to only young hunters.

Hunting D4. Within 4 years, improve existing accessible hunting facilities and evaluate the demand for more access for hunters with mobility impairments. If warranted, within 8 years, provide a minimum of two more accessible hunting facilities or access points for hunters with mobility impairments at the Monte Vista and Alamosa Refuges. For hunters with mobility impairments, allow all terrain vehicles for game retrieval only.

Alamosa and Monte Vista Refuges. Hunting D5. Same as A1, B5 (waterfowl and limited small game only).

Hunting D6. Same as B6 (big game-restricted public dispersal hunts and agency-only culling).

Baca Refuge. Hunting D7. Similar to B7 (by year 3 open small game hunting in the southwest corner and allow for permitted archery), plus: As small game hunting and big game hunting are opened on refuge, increase quality opportunities for both hunters with mobility impairments and youths.

Rationale D1–D7. The actions would be similar to B, but efforts would be made to encourage more hunting opportunities across the complex, with a focus of increasing the number of accessible facilities and mentored opportunities for youths. Although providing for quality opportunities would be impor-

tant, a larger number of licensed hunters could be allowed in D than B.

Strategies D1–D7 (all refuges). Same as B plus:

- Add 1 FTE employee for law enforcement to existing collateral duty FTEs. (Refer to table 7, chapter 3 below.)
- Provide more accompanied hunting.
- Solicit help from CPW to organize more mentored hunts.
- Offer more specialized hunts.
- Restrict access by others at specific times to increase harvest opportunities for hunters with mobility impairments.
- Allow motorized vehicle access on specific closed refuge roads for hunters with mobility impairments.

Objectives for Fishing

There is a limited fishery for northern pike and carp within the refuge complex along the Rio Grande. On the Alamosa Refuge, some anglers fish from the Chicago ditch dam when water is low and fish are concentrated within a small area; however, considerable safety issues exist, and fishing is prohibited. 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.

Objectives for Fishing, Alternative A

Fishing A1. Maintain Kid’s Fishing Day at the Monte Vista Refuge (same as B1, C1, D1).

Rationale A1. 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 A1:

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

Objectives for Fishing, Alternative B (Draft Proposed Action)

Fishing B1. Same as A1, C1, and D1.

Rationale B1. Same as A1, C1, and D1.

Strategies B1. Same as A1, C1, and D1.

Objectives for Fishing, Alternative C

Fishing C1. Same as A1, B1, and D1.

Rationale C1. Same as A1.

Strategies C1. Same as A1.

Objectives for Fishing, Alternative D

Fishing D1. Same as A1, B1, and C1.

Fishing D2. Within 5 years, permit walk-in fishing access along the Rio Grande at the Alamosa Refuge south of the parking area 5. Also develop a safe access point and pier to allow people to fish at the Chicago Dam on the Alamosa Refuge.

Fishing D3. Within 3 years, evaluate and establish another fishing opportunity or event at the Alamosa Refuge to encourage more local youth participation from the Alamosa community.

Fishing D4. Within 4 years, build an accessible trail and fishing dock on the Rio Grande at the Alamosa Refuge.

Rationale D1-D4. The Service would work with partners on ways to increase fishing opportunities, especially for youth. The opportunity to expand and develop a closer partnership with CPW and others to expand youth fishing opportunities would further the refuge complex's goal of introducing youth to the Refuge System.

Strategies D1-D4:

- Work with CPW and other local partners to sponsor a fishing event for young anglers.
- Seek partnerships or alternative funding for establishment of more fishing access points and fishing programming.
- Use protective measures as necessary to safeguard any southwestern willow fly-catcher habitat.

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.

Objectives for Observation, Photography, and Interpretation, Alternative A

The objectives and strategies would be aimed at maintaining existing facilities.

Alamosa and Monte Vista National Wildlife Refuges. Observation, Photography, and Interpretation A1. Maintain existing wildlife observation and interpretive facilities and programs (about 15,000–20,000 nonconsumptive visitor use days, including special events) (figure 13 and 14).

Observation, Photography, and Interpretation A2. Maintain the existing auto tour routes and nature trails.

Rationale A1–A2. Under alternative A, provide and maintain the same level of visitor services for these activities. Facilities that support these activities include auto tour routes, nature trails, signs, parking areas, and kiosks. A survey conducted by the USGS found that visitors who come to the refuges for nonconsumptive activities found birding and wildlife observation to be the most important activities. The auto tour routes and interpretive trails help facilitate these activities (USGS 2011b).

Strategies A1–A2:

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

Baca National Wildlife Refuge. Observation, Photography, and Interpretation A3. Develop primitive wildlife observation and interpretive facilities along the boundary with the Baca Grande subdivision.

Observation, Photography, and Interpretation A4. Develop an accessible trail (compliant with the Americans with Disabilities Act) at the entrance to the Baca Refuge along Saguache County Road T.

Observation, Photography, and Interpretation A5. Develop limited interpretive facilities in and around the Baca Refuge office and visitor contact station.

Rationale A3–A5. Under alternative A, even though the Baca Refuge wouldn't be open for public use, there is still considerable interest in the refuge and some limited facilities would be needed.

Strategies A3–A5:

- Develop a kiosk with signage and information and provide limited interpretation in and around the Baca Refuge office.

Objectives for Observation, Photography, and Interpretation, Alternative B (Draft Proposed Action)

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

All Refuges in the Refuge Complex. Observation, Photography, and Interpretation B1. 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 B2. 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 B3. 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 B4. Same as A2 plus: Within 2–3 years, from July 15 to about February 28 (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 for walking or other compatible access. Work with partners to develop a trail system that ties the current city trails to the Alamosa and Monte Vista Refuges (figures 16 and 17).

Observation, Photography, and Interpretation B5. At the Alamosa Refuge, within 3–7 years, extend the auto tour route to the east to connect with Bluff 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



Under alternatives B and D, the Meadowlark Nature Trail on Monte Vista Refuge would be improved and provide for more interpretation and accessibility.

platforms. Provide increased seasonal availability (about July 15 to February 28 or the end of the waterfowl season) by opening about 5.4 miles of existing trails and Service two-track roads for walking, biking, or cross-country skiing that are now only available to hunters during the hunt season. 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 17).

Observation, Photography, and Interpretation B6. 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 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 16). Seasonally open about 9 miles of trails within the hunt boundary for biking, walking, and cross-country skiing.

Observation, Photography, and Interpretation B7. By year 15, design and build a new visitor center and office at the Monte Vista Refuge and the refuge complex (figure 16). Link trails from the new visitor center with connections to the Meadowlark Nature Trail, 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 B8. 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 county road 6S with a parking area large enough for horse trailers to provide non-motorized access to BLM land.

Baca National Wildlife Refuge. Observation, Photography, and Interpretation B9. 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. By year 15, improve outreach and opportunities and increase visitation gradually to 10,000–15,000 visits per year.

Observation, Photography, and Interpretation B10. Within 5–10 years, develop an auto tour route, install wayside interpretive panels along the auto tour route, and develop a looped interpretive trail around the refuge’s headquarters area (old Baca Ranch) with several interpretive panels or other interpretive media positioned along the trail route (figure 18).

Observation, Photography, and Interpretation B11. 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 B12. Work with NPS to manage and interpret the Trujillo Homestead.

Rationale B1–B12. 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 non-consumptive 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 would be spent on improving habitat conditions on the refuge complex, and improvements to visitor services would likely take 15 years to fully implement. Partnerships, volunteers, and Service outreach efforts would be essential for successful implementation. Any new or enhanced visitor opportunities would have to be compatible with the pri-

mary purposes of the refuges (refer to appendix D), and we would continue to limit access during critical breeding and nesting periods across the refuge.

Even with the current funding challenges and other concerns, it would 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 would 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 would 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 would 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 would begin by allowing access to the refuges outside of the critical breeding period from about July 15 to February 28. 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 B1–B12 (all refuges):

- 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.
- If demand arises or is identified, 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 the Web site and incorporate changing interpretive content into the 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 would 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 CPW and 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 redesign as necessary to limit 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 small-game hunting areas to non-hunters (excluding archery-only areas). Limit access to seasonal use on elk units. Allow year-round 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 seasonal walking and biking opportunities on the Alamosa and Monte Vista Refuges and improve linkages if necessary.
- Allow for some year-round walking, biking, and horse access on the Baca Refuge.
- 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 Observation, Photography, and Interpretation, Alternative C

The objectives and strategies would be aimed at maintaining or adapting public uses.

All Refuges in the Refuge Complex. Observation, Photography, and Interpretation C1. Same as B1 (develop visitor services plan).

Observation, Photography, and Interpretation C2. Same as B2 (hire outdoor recreation planner).

Alamosa and Monte Vista National Wildlife Refuges. Observation, Photography, and Interpretation C3. Same as A1 (maintain existing programs and facilities).

Observation, Photography, and Interpretation C4. Same as A2 (maintain auto tour route and nature trails).

Observation, Photography, and Interpretation C5. Within 5–7 years, from about July 15 through February 28, open about 5.4 miles of existing trails or Service two-track roads on the Alamosa Refuge that are currently available only to hunters for walking or other compatible access such as bicycles or skis (figure 20).

Observation, Photography, and Interpretation C6. Within 4 years, upgrade the existing contact station and visitor center on the Alamosa Refuge, focusing on environmental education and serving administrative needs such as offices and storage. Replace outdated interpretive panels in the visitor center, at kiosks, and along the auto tour route. Improve part of the Rio Grande Nature Trail to be accessible.

Observation, Photography, and Interpretation C7. Within 5 years, improve the Meadowlark Nature Trail on the Monte Vista Refuge with information about trail length, make accessibility modifications, and provide a viewing blind.

Rationale C1–C7. Due to changes in water management, some of the observation facilities would be removed and other observation locations may need to be shifted.

Strategies C1–C7:

- Inventory, maintain, and replace signs, as needed.
- Maintain the auto tour route.
- Coordinate partners and other specialists to conduct guided interpretive tours.

- Continue to cosponsor special events related to wildlife and habitat conservation.

Baca National Wildlife Refuge. Observation, Photography, and Interpretation C7. (Similar to alternative A).

Objectives for Observation, Photography, and Interpretation, Alternative D

The objectives and strategies would be geared toward maximizing and emphasizing compatible public use.

All Refuges in the Refuge Complex. Observation, Photography, and Interpretation D1. Same as B1 and C1.

Observation, Photography, and Interpretation D2. Within 2 years, hire two outdoor recreation planners for the refuges, and by year 5, hire an environmental education specialist.

Observation, Photography, and Interpretation D3. Within 5 years, conduct a visitor experience survey to obtain an estimate of the number of visitors and their desired needs and experiences for wildlife observation.

Alamosa and Monte Vista National Wildlife Refuges. Observation, Photography, and Interpretation D4. By year 15, increase participation in wildlife observation, photography, and interpretive activities by 25–40 percent (approximately 4,000–6,000 more visits over alternative A).

Observation, Photography, and Interpretation D5. By year 15, improve the quality and increase the number of programs or facilities for wildlife observation, photography, and self-guided and staff-dependent interpretation by approximately 15–25 percent over alternative A.

Observation, Photography, and Interpretation D6. Allow year-round wildlife observation and photography within designated areas.

Observation, Photography, and Interpretation D7. Within 3 years on the Alamosa Refuge, staff the visitor center 4–5 days per week, and within 5 years, design and build new interpretive exhibits.

Observation, Photography, and Interpretation D8. Within 3 years on the Alamosa Refuge, extend the auto tour route to the east, and within 8 years, improve the roads in the southern part of the refuge and develop signs along an added auto tour route loop. Enhance both routes with more pull-offs and interpretive media (figure 23).

Observation, Photography, and Interpretation D9. At the Alamosa Refuge, within 5 years, build approximately 4 more miles of trails and roads along the Rio Grande so that the south and north portions of the refuge are connected by the trail. Within 5 years,

incorporate viewing blinds, observation platforms, viewing scopes, fishing access, and a southern trail-head into the new trail.

Observation, Photography, and Interpretation D10. At the Alamosa Refuge, within 5 years, develop several viewing towers to orient visitors to the refuge and facilitate wildlife observation.

Observation, Photography, and Interpretation D11. Within 5 years, begin working with partners and the communities of Alamosa and Monte Vista to connect the refuges to the town trail systems.

Observation, Photography, and Interpretation D12. Same as B7 (new visitor center and offices). By year 15, design and build a new visitor center and office at the Monte Vista Refuge for the entire refuge complex. Link trails from the new visitor center with connections to the Meadowlark Nature Trail, 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.

Baca National Wildlife Refuge. Observation, Photography, and Interpretation D13. Within 8 years on the Baca Refuge, extend the auto tour route to the south with more pull-offs and interpretive media (figure 24).

Observation, Photography, and Interpretation D14. By year 8–10, work with others to establish a multi-agency visitor contact station at the Baca Ranch headquarters and construct another trail that connects both the cattle and ranch headquarter areas. By year 10–12, work with NPS and others to build a trail connection to Great Sands National Park and Preserve (figure 24).

Rationale D1–D14. Under alternative D, we would maximize the compatible public use opportunities for all the alternatives to reach out to nonconsumptive user groups. In order to increase visitor days at the Monte Vista and Alamosa Refuges by 6,000 or more and reach 15,000 or more visitor use days at the Baca Refuge, we would need a minimum of three FTEs dedicated to visitor services (outdoor recreation planners plus an education specialist) along with more seasonal and temporary employees and a strong volunteer program. Strong partnerships with other agencies and local communities would be crucial for implementing this effort.

Strategies D1–D14 (all refuges). Same as B plus:

- Host bird identification events in conjunction with International Migratory Bird Day in May and other special events.

- Explore new areas to promote for wildlife observation and photography.
- Where feasible, develop a simple map within each visitor center where visitors can record what they saw and where (for example, a laminated refuge map that people can write on with a dry-erase marker).
- Develop materials such as exhibits and pamphlets as well as educational programs that explain the region's conservation priorities and the refuge resources.

Objectives for Environmental Education

Environmental education is a process designed to teach citizens and visitors the history and importance of conservation and biological and the 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.

Objectives for Environmental Education, Alternative A

Education A1. Maintain limited educational programs such as the Monte Vista Crane Festival and Kids Crane Festival.

Rationale A1. Environmental education opportunities are limited because of lack of appropriate staff. The San Luis Valley has a variety of opportunities for environmental education. Refuge wetlands provide a unique place to explore nature and science. Wetland programs exist on other refuges and could be expanded and adapted to our refuges.

We would maintain existing levels of environmental education and interpretation that include sporadic, internally led environmental education programs as staff or volunteer time allows. For



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

example, the Alamosa Refuge used to be staffed half days during the week depending on staff availability, and there is a K-5 curriculum for wetland education; (Friends of the San Luis Valley National Wildlife Refuges 2013).

Strategies A1:

- Work with the Friends group to put on the Monte Vista Crane Festival, Kid’s Fishing Day, and Kids Crane Festival.

Objectives for Environmental Education, Alternative B (Draft Proposed Action)

Under this alternative, the environmental education program would be expanded.

All Refuges in the Refuge Complex. Education B1. 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 B2. 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 B3. 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. Include potential topics such as hydrology, sandhill cranes, climate change, and riparian ecosystems.

Alamosa and Monte Vista National Wildlife Refuges. Education B4. 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 B5. By year 5–8, host environmental education and interpretive programs and activities six times per year, and increase programming if demand exists.

Rationale B1-B5. We support connecting people with nature through various initiatives such as “Let’s Go Outside” (FWS 2013i). 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 would 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 in the number of environmental education programs that we could offer. The programs would focus on wildlife biology and habitat needs and would update existing curricula to highlight refuge issues. Because environmental education is curriculum-based and labor intensive, initial efforts would be limited to the Alamosa Refuge, but these efforts could be expanded to include the other refuges in the complex.

Strategies B1–B5:

- 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 CPW.
- Partner with NPS to provide environmental education in the local area. For example we could have a NPS education specialist lead programs at the Alamosa refuge, 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 Environmental Education, Alternative C

We would maintain limited interpretive and environmental education programs within the refuge complex, including providing limited programming on the Baca Refuge.

All Refuges in the Refuge Complex. Education C1. Maintain limited on-site interpretation and environmental education opportunities.

Alamosa and Monte Vista National Wildlife Refuges. Education C2. Continue to take part in the Kids Crane Festival and make adjustments based on changes to habitat management.

Baca National Wildlife Refuge. Education C3. Offer about 10 guided tours per year.

Education C4. At the Baca Refuge, establish a visitor contact station at the Ranch Headquarters and host about six programs (environmental education and interpretive). Increase the number of programs after year 5 if demand exists.

Rationale C1–C4. Because most of the emphasis, including resource allocation, would be focused on habitat and wildlife management, there would be less focus on providing environmental education opportunities, but current programs would be continued. Nonetheless, some limited environmental education opportunities could be established on the Baca Refuge.

Strategies C1–C4:

- Work with partners and volunteers to increase off-site programming.
- Focus on interpreting restoration efforts and new approaches to management.

Objectives for Environmental Education, Alternative D

Opportunities for environmental education would be maximized.

All Refuges in the Refuge Complex. Education D1–D3. Same as B1–B3 plus, within 5–10 years, expand the quantity of hands-on environmental education programs (on- and off-refuge) by up to 20 school visits per year. Offer regular interpretive programming (1 per month) which would include workshops, presentations, guided tours, or activities geared toward families and children. Seek funding for and produce a refuge complex orientation and

educational film (or animated slideshow) to be shown at the visitor facilities and available online.

Education D4. Establish a San Luis Valley-wide auto tour route that connects the auto tour routes available at each of the three refuges and interprets some of the valley's natural resources, cultural sites, and views experienced when driving between the refuges. There could be a physical brochure and travel itinerary or an online tour description.

Alamosa and Monte Vista National Wildlife Refuges. Education D5. Same as B4.

Baca National Wildlife Refuge. Education D6. Same as B5 plus: By year 15, convert the barn on the Baca Refuge to an environmental education and interpretation center. Use it for youth programming, camps, classroom space, and exhibits as well as inter-agency orientation.

Rationale D1–D5. Several actions would be similar to those under alternative B; however, because public use is emphasized under this alternative, we would substantially expand the refuge complex's environmental education program with a particular focus on threatened and endangered species, reintroduced species, and restoration activities. Existing curricula would be modified to highlight these issues, and several new curricula would be developed in compliance with State standards. Because it would be more labor-intensive, a minimum of two FTEs would be needed as well as seasonal employees and volunteers.

Strategies D1–D5. Same as B plus:

- Invest in more innovative technologies and digital media to interpret the stories of the refuges for visitors both onsite and offsite.
- Work with partners to create up to 15 environmental education curricula unique to the refuge and update existing curricula tailored to the refuge.
- Request that researchers working at the refuge share information they collect through presentations at schools.

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.

Objectives for Outreach Alternative A

All Refuges in the Refuge Complex. Outreach A1. Continue outreach activities as staff resources permit.

Rationale A1. Our outreach efforts help us communicate with the public and other agencies and organizations about the work we do.

Strategies A1:

- Take part in State and local events such as State, county, and school career fairs. Make presentations as requested.
- Recruit volunteers to support staff.
- Seek grants in partnership with others to pay for special events or programs.
- Keep the public informed about refuge programs and activities via Web site.

Objectives for Outreach, Alternative B (Draft Proposed Action)

Many of the outreach activities would be in addition to existing efforts, as listed under alternative A.

All Refuges in the Refuge Complex. Outreach B1. 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 B2. 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 B3. Within 5 years, update and improve the Web site and social media to keep information fresh and current.

Outreach B4. 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 B1–B5. Greater outreach would help us to target new audiences, recruit more volunteers, and help get our conservation message out to larger audi-

ences. The outreach message would be focused on the refuge's goal of increasing wildlife resources and restoring habitat.

Strategies B1–B5:

- 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 Outreach Alternative C

Generally, outreach efforts under this alternative would be similar to those in alternative B.

All Refuges in the Refuge Complex. Outreach C1–C4. Same as B1–B4.

Rationale C1–C4. Same as B.

Strategies C1–C4. Same as B.

Objectives for Outreach, Alternative D

Outreach efforts under alternative D would be increased over those under alternatives B and C.

All Refuges in the Refuge Complex. Outreach D1–D4. Same as B1–B4.

Outreach D5. By year 5, work with Friends group to develop and circulate an E-newsletter twice a year. The newsletter would contain information on activities, events, resources, and safety.

Rationale D1–D5. Same as B.

Strategies D1–D5. Same as B plus:

- Place greater emphasis on outreach for both communicating wildlife and habitat goals as well as for increasing visitation to the refuge.
- Annually conduct five 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.

Objectives for Commercial Recreation, Alternative A

Commercial Recreation A1. Continue to allow commercial use only by special permit.

Rationale A1. We receive few requests for commercial recreation opportunities and they can easily be handled on a case-by-case basis.

Strategies A1.

- Require all photographers to allow us to use photos for refuge complex purposes.

Objectives for Commercial Recreation, Alternative B (Draft Proposed Action)

Commercial Recreation B1. Same as A1 plus allow for additional limited commercial uses under special use permits such as horseback rides or photography.

Rationale B1. To increase opportunities for visitor services, we would consider expanding commercial permits. For example, we could allow 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 B1. Same as A1 plus:

- Determine whether a special use permit or concession permit is needed on a case-by-case basis.

Objectives for Commercial Recreation, Alternative C

Commercial Recreation C1. Same as A1.

Rationale C1. Same as A1.

Strategies C1. Same as A1.

Objectives for Commercial Recreation, Alternative D

Commercial Recreation D1. Same as B1.

Rationale D1. Same as B1.

Strategies D1. Same as B1.

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.

Objectives for Partnerships, Alternative A

All Refuge in the Refuge Complex. Partnerships A1. Maintain existing partnerships including our Friends group (see section 3.17 for a list of our many partnership organizations). (Same as B1, C1, and D1.)

Partnerships A2. 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 4). (Same as B2, C2, and D2.)

Rationale A1–A2. Currently, the Service works cooperatively with many agencies and jurisdictions; these efforts have been quite successful and would 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 A1–A2:

- Protect habitat through fee-title and easements and by participating in partnerships with other land conservation trusts and entities.
- Integrate refuge planning with the Partners program.

Objectives for Partnerships, Alternative B (Draft Proposed Action)

All Refuges in the Refuge Complex. Partnerships B1. Same as A1, C1, and D1.

Partnerships B2. Same as A2, C2, and D2.

Partnerships B3. 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 B3. 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 B3:

- Work with our partners to share resources.

Baca National Wildlife Refuge. Partnerships B4. Work with NPS to interpret and manage the Pedro Trujillo Homestead.

Rationale B4. 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 would be necessary to protect the site from vandalism.

Strategies B4:

- 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 Partnerships, Alternative C

Partnerships C1. Same as A1, B1, and D1.

Partnerships C2. Same as A2, B2, and D2.

Partnerships C3. Pursue more partnerships to support restoration and natural resource conservation.

Rationale and Strategies C1–C3. Similar to B1–B4.

Objectives for Partnerships, Alternative D

Partnerships D1. Same as A1 and C1.

Partnerships D2. Same as A2, B2, and C2.

Partnerships D3. Seek more partnerships with other agencies and organizations that would help us facilitate better wildlife-dependent recreational opportunities and visitor service.

Partnerships D4. Work with NPS, BLM, the Sangre de Cristo National Heritage Area, and other agencies and organizations to incorporate the three refuges into heritage tourism programming.

Rationale D1–D4. The Sangre de Cristo National Heritage Area encompasses the refuge complex and NPS lands, private lands, and communities. One of the primary interpretive themes is how the interplay of wind, water, and sand have shaped the San Luis Valley's unique landforms and contributed to its biological diversity (NPS 2012b). There is a lot of oppor-

tunity to share expertise with our partners in wetland interpretation.

Strategies D1–D4. Similar to B.

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.

Objectives for Refuge Operations, Alternative A

All Refuges in the Refuge Complex. Operations and Staffing A1. Over 15 years, maintain staff levels as identified in table 7, section 3.20.

Rationale A1. There are 11.5 FTE positions as well as several seasonal or term positions at the refuge. (Refer to table 7.) These are the general staff levels that would continue to be funded over 15 years, although all funding is dependent on annual funding allocations.

Strategies A1:

- Spread limited staff resources across the refuge complex to accomplish habitat objectives and provide limited public use.



A water structure along Crestone Creek. There are many infrastructure needs for managing water more efficiently across the refuge complex.

Alamosa and Monte Vista National Wildlife Refuges. Operations and Staffing A2. Maintain 2.5 miles of auto tour route on the Monte Vista Refuge and 3.2 miles on the Alamosa Refuge; provide about 9 miles of trails and two-track roads available for hunting only on the Monte Vista Refuge and 10.5 miles on the Alamosa Refuge; and provide a 0.25 mile nature trail (nature trails include some interpretation) on the Monte Vista Refuge and 2.6 miles of nature trails on the Alamosa Refuge.

Rationale A2. With existing staff resources, we would continue to provide limited opportunities for access on the Monte Vista and Alamosa Refuges on the existing trail and road network. Opportunities for wildlife observation would be limited outside of the existing auto tour route, access roads, and nature trails. Hunters would continue to access hunt areas during the hunting season.

Strategies A2:

- Institute seasonal closures as needed.

Baca National Wildlife Refuge. Operations and Staffing A3. Continue to provide limited access to the Baca headquarters area and approximately 9 miles of roads that cross refuge lands.

Rationale A3. With limited staff and funding, we would continue to keep the Baca Refuge closed. Only limited access to the headquarters area or along county roads that cross refuge lands would be permitted.

Strategies A3:

- Post signs and provide some limited information and interpretive signs or kiosks.

Objectives for Refuge Operations Alternative B (Draft Proposed Action)

All Refuges in the Refuge Complex. Operations and Staffing B1. Same as A1 plus: 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.

Operations and Staffing B2. By year 7–10, replace all unreliable heavy equipment and vehicles.

Rationale B1–B2. In order to open the Baca Refuge to public access and to provide more opportunities across the refuge complex, we would need to increase refuge complex staff (table 7) 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 or visitor services objectives, we would also replace some of our heavy equipment and other vehicles that are old, unreliable, and costly to maintain.

Strategies B1–B2:

- Prioritize the positions and equipment that are needed to achieve our habitat and visitor services objectives.

Alamosa and Monte Vista National Wildlife Refuges. Operations and Staffing B3. By year 15, build a visitor center and refuge complex headquarters at the Monte Vista Refuge (Same as alternative D).

Operations and Staffing B4. Same as A2 plus: 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 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 (July 15–February 28) for foot and bicycle access.

Operations and Staffing B5. By year 15, repurpose 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 B6. By year 15, improve the recreational vehicle sites for volunteers to make them accessible for larger motorhomes and provide thermal breaks.

Operations and Staffing B7. 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 B8. Within 10 years, rehabilitate all living quarters to be more energy efficient.

Operations and Staffing B9. Within 2–3 years, identify accessibility needs for trails, blinds, kiosks, pullouts, observation platforms, and other visitor services facilities.

Operations and Staffing B10. 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 B3–B10. 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 would solve a number of significant issues such as providing a central Service presence and improving safety, accessibility, energy efficiency, and ventilation.

Strategies B1-B10:

- 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 B11. At the Baca Refuge, within 1–2 years, begin a cleanup of the Baca Ranch headquarters area.

Operations and Staffing B12. 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 18)

Operations and Staffing B13. Work with any future mineral developers to reduce disruption to visitors.

Rationale B11–B13. 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 would want to make sure that we minimize impact to refuge operations.

Strategies B11-13:

- 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.

Objectives for Refuge Operations, Alternative C

All Refuges in the Refuge Complex. Operations and Staffing C1. Similar to alternative B1 plus: one engineering equipment operator for extensive habitat work.

Rationale C1. Overall, the staff requirements would be similar to alternative B, but the emphasis would be on habitat restoration work. We would be trying to improve our existing visitor services program on Alamosa and Monte Vista Refuges, but not to the level as described under alternatives B and D.

Strategies C1:

- Justify increases in staffing to accomplish refuge complex objectives.

Alamosa and Monte Vista National Wildlife Refuges. Operations and Staffing C2. S. Over 15 years allow for seasonal access for biking and walking on existing trails and roads that have been traditionally opened only to hunters.

Operations and Staffing C3. By year 15, renovate the existing environmental education and visitor contact station and make it fully accessible and update all fixtures (similar to B8).

Operations and Staffing C4. Same as B6

Operations and Staffing C5. Same as B7

Operations and Staffing C6. Same as B9

Operations and Staffing C7. Same as B9

Operations and Staffing C8. Same as B11

Rationale C2–C8. With the emphasis on restoration, staff resources would be used for habitat restoration work. We would minimize the number and extent of developed roads. Develop access in ways that least interfere with natural processes and hydrological function. However, there would still be a need to rehabilitate the existing environmental education and visitor contact station and living quarters; replace infrastructure across the refuge complex; and improve safety of the access into the headquarters area.

Strategies C2–C8:

- 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 C9. Similar to A3, except: On the Baca Refuge, provide for hunting access to achieve habitat objectives.

Rationale C9. On the Baca Refuge, staff resources would be needed to manage hunting access and to achieve habitat objectives.

Strategies C9:

- On the Baca Refuge, evaluate current roads and consider road removal to reduce habitat fragmentation.

Objectives for Refuge Operations, Alternative D

All Refuges in the Refuge Complex. Operations and Staffing D1 and D2. Similar to B1 and B2 plus: one outdoor recreation planner (two total for complex); one environmental education specialist; one law enforcement officer (GS 7/9); three maintenance workers and three seasonal employees for public use.

Rationale D1–D2. Similar to B1 and B2 except: Due to the increased levels of visitor access under this alternative and management of the bison operation by the Service, several more FTEs would be needed.

Strategies D1–D2:

- Similar to B1 and B2 except: there would be a greater emphasis on seeking partnerships, grant money, and creative ways to accomplish the habitat and visitor services objectives.

Alamosa and Monte Vista National Wildlife Refuges. Operations and Staffing D3–D10. Similar to B3–B10 plus: Expand the auto tour routes at the Monte Vista and Baca Refuges. Repurpose the Alamosa visitor contact station for use as an environmental education center with new interpretive media and interior and exterior exhibits (see figures 22, 23, and 24).

Rationale D3–D10. Access to the existing visitor contact station is on the existing auto tour route off of Highway 160 and does not have the same safety issues as the Lillpop office. Repurposing the Alamosa visitor contact station would provide an environmental education facility closer to Alamosa.

Strategies D3–D10:

- Similar to B.

Baca National Wildlife Refuge. Operations and Staffing D11–D13. Similar to B11–B13, but there would be a lot more additional infrastructure required.

Rationale D11–D13. Similar to B11–B13 with the need for additional infrastructure.

Strategies D11–D13:

- Similar to B and seek creative solutions to accomplish the objectives.

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.

Objectives for Cultural Resources, Alternative A

Cultural Resources A1. 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. Avoid adverse effects to significant resources when possible.

Rationale A1. The refuge complex contains many significant cultural resources, which we would 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 A1:

- 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.

Objectives for Cultural Resources, Alternative B (Draft Proposed Action)

Cultural Resources B1. Same as A1.

Rationale B1. Same as A1.

Strategies B1: Same as A1.

Cultural Resources B2. 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 B2. 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. The objectives listed above would enable the staff to better consider cultural resources in refuge operations and establish the 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. Long-term and past employees, as well as 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 B2:

- 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 archeological 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 tribal and San Luis Valley residents to gain traditional insight into resource locations, collections from the refuges, and significance of these resources.

Objective B3. By year 15, stabilize and rehabilitate the house at Baca headquarters and fully record cow camps at the Baca Refuge.

Rationale B3: These are significant cultural resources on the Baca Refuge.

Strategies:

- 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.

Objectives for Cultural Resources, Alternative C

Cultural Resources C1. Same as A1.

Cultural Resources C2. Same as A except: offer more educational outreach in the form of occasional presentations and limited use of signage (less than alternative B).

Cultural Resources C3. By year 15, remove structures or buildings that are not significant.

Rationale. Because the focus of management would be to restore natural processes, some non-significant structures would be removed if they are intrusive on the landscape.

Strategies:

- Identify any structures and buildings that are not needed for refuge operations and remove them.

Objectives for Cultural Resources, Alternative D

D1–D3. Same as B1–B3.

Rationale D1–D3. Similar to alternative B1–B3.

Strategies D1–D3: Same as B1–B3 plus:

- Improve adherence to cultural resource laws and avoid adverse effects on significant resources when possible.
- Work with local schools to incorporate refuge prehistory, history, and historic preservation into the curriculum.
- Work with local and tribal educators to develop interpretive materials.
- Involve local universities in targeted surveys of high potential areas. Also use volunteers for survey projects.
- Involve various programs (Historicorps and universities) to evaluate, design, and perform restoration and adaptation work on the barns and main house at the Baca Refuge.
- Increase opportunities for public involvement with archaeological resources and restoration of historic buildings.

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 4) 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.

Objectives for Climate Change, Alternatives A–D

Climate Change A1–D1. 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 A2–D2. 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 A3–D3. 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 A1–A3 and D1–D3. 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 A–D.

- 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.

Research, Science, and Monitoring

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

Objectives for Research, Science, and Monitoring Alternatives A–D

Research A1. Conduct research and monitoring efforts as opportunities arise and funding allows.

Research B1–D1. 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.

- 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 trend for Rio Grande chub and sucker populations in Crestone Creek, North Crestone ditch, 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.

Rationale A1–D1. 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. Under all alternatives, research, inventories, and monitoring would be used primarily to evaluate resource responses to habitat management and restoration activities such as water management; prescriptive grazing; pre-

scribed fire; grass, shrub, and tree plantings; and invasive weed control. We would evaluate any effects such as disturbance or displacement that public uses may have on wildlife.

Depending on which alternative is selected, there may be slight differences on the focus of research and monitoring that would be conducted. Under alternative A, our abilities to conduct further research and monitoring activities would be limited to what we could accomplish within existing staff and funding levels or partnership opportunities. Under alternative B, our emphasis would be a blend alternatives B and C. Under alternative C, our emphasis would be on determining the effects of management activities on wildlife and plant resources that result from managing in a way that mimics natural ecological processes. Under alternative D, our emphasis would be on understanding the effects of increased public use on wildlife and plant resources. Under all alternatives, the data that are collected would be used to refine habitat and public use management strategies, and where necessary, to achieve resource objectives and reduce detrimental effects.

Research and monitoring projects would 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 would increase available scientific information and promote adaptive management on refuge lands.

Strategies A1–D1:

- 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 are conducting a wilderness review as part of the CCP process. The review process has three phases including inventory, study, and recommendation (FWS 2008). We will use the findings of the study to



Eastern portions of the Baca Refuge, adjacent to the Great Sand Dunes National Park and Preserve, would be recommended for wilderness protection in alternatives B, C, and D.

determine if we should recommend the area for designation in the final CCP. (Refer to appendix E.)

Objectives for Wilderness, Alternative A

Wilderness A1. Under this alternative, there would be no wilderness designation within the refuge complex.

Rationale A1. Currently, there are no designated wilderness study areas within the refuge complex, and we would not recommend any areas for protection. We would continue to manage the refuge units similar to the guidance found in the 2003 CCP and the 2005 conceptual management plan for the Baca Refuge.

Strategies A1: None

Objectives for Wilderness, Alternatives B, C, D

Wilderness B1, C1, and D1. Upon signing of the record of decision, manage the southeastern portions of the Baca Refuge which includes lower Deadman Creek, South Antelope Spring, and Sand Creek (see figure E1, appendix E) 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 B1–D1. 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 complex 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 E, table A.)

Strategies B1–D1:

- 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.

3.9 Foreseeable Activities

Cumulative effects on the environment are defined as the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions (40 CFR 1508.7). Reasonably foreseeable activities are actions and activities that are independent of the proposed actions in the CCP alternatives, but could result in cumulative effects when combined with the effects of the alternatives. These activities are anticipated to occur regardless of which CCP alternative is selected. Reasonably foreseeable actions, as defined by U.S. Environmental Protection Agency (EPA 1999), are not speculative; rather, they are actions that have been approved, are included in short- to medium-term planning and budget documents prepared by government agencies or other entities, or are likely to happen given the trends in the area.

This document identifies potential reasonably foreseeable actions that are analyzed for cumulative effects. A summary of the activity is provided, as well as a preliminary determination as to whether the activity is now reasonably foreseeable. That determination could change over the course of the analysis process, as some activities or actions become more certain over time.

Reasonably foreseeable activities within the San Luis Valley that have the potential to result in cumulative effects are described below in the following categories:

- Federal land management
- Land and infrastructure development
- Resource management and conservation
- Other activities or actions

The cumulative effects of these activities, when combined with the direct and indirect effects of the proposed CCP alternatives, are described in the impacts section for each resource in section 5.

Federal Land Management

The Rio Grande Natural Area was established on October 12, 2006, to conserve, restore, and protect the natural, historic, cultural, scientific, scenic, wildlife, and recreational resources of the 33-mile stretch of the Rio Grande between the southern end of the Alamosa Refuge and the Colorado-New Mexico State border. The BLM has convened a commission that is charged with preparing management plans for both the BLM and the private lands within the Rio Grande Natural Area. While the development of these management plans is reasonably foreseeable, the management direction that would be contained in the plans is not yet known (BLM 2013).

Southwestern Willow Flycatcher Critical Habitat Designation

On January 3, 2013, the U.S. Fish and Wildlife Service designated revised critical habitat for the southwestern willow flycatcher under the Endangered Species Act (FWS 2013b). About 1,975 stream kilometers (1,227 stream miles) were designated as critical habitat throughout the southwestern United States. In the San Luis Valley, three segments of critical habitat were designated on Federal lands along the Rio Grande and the Conejos River, totaling about 43.5 stream kilometers (27 stream miles) and including 8,345 acres within the Alamosa Refuge. The other two segments in the San Luis Valley are located on land owned by the BLM.

Great Sand Dunes National Park and Preserve Ungulate Management Plan

In November 2011, the National Park Service began the public scoping process for an ungulate management plan and EIS for Great Sand Dunes National Park and Preserve. The purpose of the plan and EIS is to establish a framework for the management of elk, bison, and other ungulates that supports the desired habitat conditions in the park and is compatible with conditions and management activities on neighboring lands (NPS 2011a). A draft plan and EIS is not anticipated until after 2014, with a final plan after that. Hunting is only permitted on the National Preserve in accordance with applicable federal and state laws. A general management plan was com-

pleted for the National Park and Preserve in 2007 (NPS 2007).

Management actions and potential effects of those actions that may result from this plan are not reasonably foreseeable at this time, since no draft plan alternatives or final plan actions have been released for public review.

Baca Mountain Tract and Camino Chamisa Project Management Plan

In 2009, the Rio Grande National Forest and Great Sand Dunes National Park and Preserve completed a plan that has management prescriptions for the Baca Mountain Tract and covers public motorized access across the park. The Baca Mountain Tract was formerly part of the private Baca Ranch and was added to National Forest System lands as part of the Great Sand Dunes National Park and Preserve Act of 2000, which also enlarged the national park and established the Baca Refuge. Under the approved plan, the management prescriptions are for bighorn sheep, elk, and deer winter range, and a Special Interest Area. The newly constructed road would provide public motorized access across the park from the Baca Grande Subdivision on the north boundary and would allow the vehicular transport of firearms, lawfully taken wildlife, and lawfully collected forest products for personal use (USDA and NPS 2009).

Blanca Wetlands ACEC Enlargement and Grazing Plan

The BLM's Blanca Wetlands Area of Critical Environmental Concern (ACEC) is located south of the Great Sand Dunes National Park and Preserve. It is part of a wetlands network of playa lakes, ponds, marshes, and wet meadows that was once more extensive within the closed basin of the San Luis Valley. The BLM has initiated a planning process and environmental assessment to analyze the effects of expanding the ACEC to include adjacent lands that share the ACEC values and characteristics, as well as grazing management within the ACEC. Expansion would occur through land acquisition from willing sellers (BLM 2013).

San Luis Lakes Wetland Restoration

The Blanca Wetlands has been identified as one of the most important areas in Colorado for shorebird migration and nesting. The BLM plans to restore up to 1,330 acres of wetlands within the South San Luis Lakes System. The plan is to irrigate up to 600 acres annually in South San Luis Lakes as well as place ditches and dikes where necessary to help distribute water and provide flow between basins. The proposed irrigation project area includes both TNC and BLM lands. The project is intended to provide habitat for shorebirds during migration and nesting seasons that would work in concert with what exists on the core area of the Blanca Wetlands as well as replace habitat that is being dried to help meet wetland objectives (BLM 2010).

Village at Wolf Creek Land Exchange

The Leavell-McCombs Joint Venture owns a private 288-acre inholding within the Rio Grande National Forest near the base of the Wolf Creek Ski Area. Over the years, four separate easements have been established between the ski area and the Leavell-McCombs Joint Venture to accommodate skiing and lifts on private lands in the inholding. Efforts to secure access to the inholding and develop a resort village had been unsuccessful, primarily because of litigation over environmental compliance requirements. In June 2010, the Leavell-McCombs Joint Venture proposed a land exchange, trading 177.6 acres of Leavell-McCombs Joint Venture land for 204.4 acres of Federal land. Completion of the land exchange would give the Rio Grande National Forest sensitive springs, wetlands, and fens, and since an access road connecting the ski area and the proposed village would be allowed, the joint venture would gain access to U.S. Highway 160. In August 2012, the USFS published a Draft EIS for the proposed land exchange (USDA Forest Service 2012, Blevins 2012).

Land and Infrastructure Development

Private Land Development

Over the past 10 years, development pressure in the San Luis Valley has been focused along the Rio Grande corridor, driven primarily by a demand for retirement and vacation homes along the river between Del Norte and South Fork (Rio Grande County 2004). One of the purposes of the Rio Grande Initiative conservation effort was to address the potential effects of increasing development (RiGHT 2006). While several new subdivisions within the greater Rio Grande corridor have been developed within recent years, the development pressure has somewhat abated since the beginning of the recession in 2008. Based on population forecasts developed by the Colorado State Demography Office, the San Luis Valley population is expected to grow by 45 percent by the year 2040 (Colorado State Demography Office 2011). This level of growth would likely contribute to increased private land development.

Crestone Baca Comprehensive Plan

The Baca Grande is a 14,000-acre subdivision next to the town of Crestone and immediately east of the Baca Refuge. In 2010, Saguache County initiated an update of the Crestone Baca Comprehensive Plans with a series of public meetings, community surveys, and planning commission work sessions. Issues that were identified through this planning process include the overuse of conditional use permits; inflexibility of land use; transportation; energy and communication infrastructure; and visual resource protection (Saguache County 2011).

Proposed Regional Transmission Lines

In 2008, the Tri-State Generation and Transmission Association (Tri-State) and the Public Service Company of Colorado (Xcel Energy) jointly proposed to construct, own, and operate the San Luis Valley–Calumet–Comanche Transmission Project. The proposed transmission line was envisioned to run from Alamosa east over La Veta Pass to Walsenburg, then north to the Comanche Power Plant near Pueblo (USDA and Rural Utilities Service 2009). The purpose of the proposed project is to increase transmission capacity and reliability, particularly in light of increased solar energy development opportunities. The proposed project generated considerable controversy because of its visual and environmental effects

along the La Veta Pass corridor, including the privately owned Trinchera Ranch. In 2011, Xcel Energy dropped out of the project.

In January 2013, Tri-State and the San Luis Valley Rural Electric Cooperative announced that they were considering a new transmission line that would run from the southern end of the San Luis Valley in Conejos County south to reach the existing Carson transmission line near Espanola, New Mexico. This project is in its preliminary planning stages (Krizansky 2013).

Solar Energy Development

The San Luis Valley has been an attractive location for solar energy development facilities. Several solar facilities in Alamosa County are in place and at least one large project in Saguache County has been approved by Saguache County, with its implementation pending (Burnett and Jaffe 2012). In addition, the BLM has identified four areas on BLM lands in the valley within which the BLM would set priorities for and facilitate utility-scale production of solar energy and associated transmission infrastructure development: DaTilla Gulch (Saguache County), Fourmile East (Alamosa County), Los Mogotes East (Conejos County), and Antonito Southeast (Conejos County) (BLM 2012).

While the outcome of some of the current energy development proposals and future opportunities are speculative, it appears that future development of solar energy facilities in the Valley is a trend that is likely to continue.

Resource Management and Conservation

Private land conservation, habitat conservation, and ground water management are discussed in this section.

Private Land Conservation

Private land conservation efforts have played an important role in protecting and enhancing habitat and agricultural land in the Valley. Several organizations, including private land trusts, the Service, and the NRCS, have acquired conservation easements over private lands in the San Luis Valley. To date, more than 170,000 acres of private land in the Valley have been protected by conservation easements (including the Service's easement on the 76,700-acre Trinchera Ranch and 90,500 acre easement on the

Forbes Ranch, plus thousands of acres protected through other conservation efforts).

The Rio Grande Initiative is a partnership between the Rio Grande Headwaters Land Trust, Ducks Unlimited, TNC, the Colorado Cattleman's Agricultural Land Trust, and others to protect and restore riparian and wetland habitat on private lands along the Rio Grande. Since its initiation in 2006, the Rio Grande Initiative partners have raised more than \$10 million and have protected more than 13,000 acres of land along the Rio Grande.

San Luis Valley Regional Habitat Conservation Plan

The purpose of the San Luis Valley regional habitat conservation plan (HCP) is to provide for the long-term conservation of the southwestern willow flycatcher and yellow-billed cuckoo while providing regulatory protection to the ongoing and routine agriculture, infrastructure, and conservation activities that are important for the social and economic well-being of the Valley. The HCP is being coordinated by the Rio Grande Water Conservation District in partnership with Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache Counties, local municipalities, and the State of Colorado. Each entity holds an Incidental Take Permit, issued by the Fish and Wildlife Service, that provides regulatory protection to private landowners and local units of government. The HCP estimates that about 270 acres of temporary habitat effects and about one acre per year of permanent effects would occur in any given year from the covered activities. These effects would be mitigated through conservation, enhancement, and management measures. Mitigation activities would be focused on private and State lands with high-quality habitat, and mitigation credits would offset the effects of the covered activities on an acre-for-acre basis. Habitat monitoring would track long-term trends and make sure that the habitat quality of mitigation lands is sufficient to offset effects. The HCP was finalized in late 2012 (Rio Grande Conservation District 2012) and is beginning to be implemented.

Ground Water Management Subdistricts

The Rio Grande Water Conservation District has spearheaded an effort to keep ground water pumping from depleting aquifers and to replace injuries to surface water users. In 2006, the first ground water management subdistrict (Special Improvement District No. 1) was formed to take action and help restore a balance between available water supplies and current levels of water use so that the San Luis

Valley can continue to remain a viable agricultural community (Rio Grande Water Conservation District 2013a). Water levels of the unconfined aquifer within Subdistrict #1 (areas within the closed basin) are rapidly declining and are exceeding the total amount of recharge from natural sources and from diversions of the Rio Grande. This recent decline in the water table is a direct result of a prolonged drought and increased ground water consumption, and the rapid decline in the water table will only worsen unless the total consumption of ground water is reduced.

Several more subdistricts have been proposed, but are not yet recognized as legal entities:

- Subdistrict #2: San Luis Creek area
- Subdistrict #3: Conejos and San Antonio River
- Subdistrict #4: Alamosa River, La Jara Creek, and Carmel and Waverly area
- Subdistrict #5: Saguache Creek
- Subdistrict #6: San Luis Creek area

Other Activities or Actions

Other factors that may contribute to cumulative effects in the region include the Sangre de Cristo National Heritage Area and climate change.

Sangre de Cristo National Heritage Area

National Heritage Areas are designated by Congress as places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape. Through their resources, National Heritage Areas tell nationally important stories that celebrate our nation's diverse heritage. National Heritage Areas are lived-in landscapes. Completion of a management plan is required by the authorizing legislation for the Sangre de Cristo National Heritage Area. The management plan (NPS 2012b) has an inventory of the National Heritage Area's natural, cultural, and recreational resources, and presents approaches to conservation and recreation, historic preservation, and conservation of community and tradition. It offers ways to interpret National Heritage Area resources, and offers approaches to tourism, marketing, and community revitalization.

Climate Change

As per the Department of the Interior and Service policy on climate change (FWS 2010), this CCP and EIS addresses potential cumulative effects as a result of climate change.

3.10 Elements Considered but Eliminated from Further Consideration

During scoping and alternatives development, the Service, interested groups, and the public suggested several goals, alternatives, or elements of alternatives that were considered but eliminated from further analysis. These elements are discussed below.

Natural Predators

During the scoping process and as part of developing draft alternatives, we considered whether natural predators, specifically gray wolves (*Canis lupus*), should be an element included under alternative C, Habitat Restoration and Ecological Processes, for managing elk populations on the Baca Refuge. As a keystone predator, the gray wolf is an integral part of the ecosystems to which it typically belongs (FWS 2013g; Nature Serve 2014). During the comment period on the draft alternatives (January–February 2012), we received many comments from the public about this element, both in support of this idea along with considerable opposition to it.

In Colorado, the gray wolf is an extirpated species that no longer exists in the wild in its historical habitat. It still exists elsewhere, most notably in the northern Rockies and in portions of southern Arizona and New Mexico. The last gray wolves were killed by about 1940 (CPW 2014) although in recent years, there have been reports of lone wolves dispersing into the State from the north, including one that was killed along Interstate 70 as recently as 2004 (CDOW 2004).

Wolves occupy a wide range of habitats. Originally, they fed on the vast herds of bison, elk, and deer, with rabbits, rodents, and carrion providing a secondary food source. Wolf territories are variable, ranging from 25–500 square miles (FWS 2013g). In comparison, at its widest points, the Baca Refuge is about 12 miles wide by 18 miles long (less than 216 square miles) on the valley floor, abutted by private

lands to the north and west. Although bordered by the Great Sand Dunes National Park and Preserve to the east along with the Rio Grande National Forest to the North, the Sangre de Cristo Range is a narrow and linear mountain range (refer to figure 1), and it is not uncommon for elk to cross the range. For GMU 82 (part of the Baca Refuge), elk disperse widely during the winter months, often ranging from north of Baca Refuge to as far south as Fort Garland along Highway 160.

In the early 2000s, proposals were made to restore wolves to wilderness ecosystems of Colorado (CDOW 2005) where they could provide a natural check on populations of elk. These proposals were met with considerable opposition from many members of the public. In the early 2000s, the Colorado Division of Wildlife (now CPW) set up a working group to develop a wolf management plan. The group's final recommendations (not a management plan) were adopted in their entirety by the Colorado Wildlife Commission in May 2005 (CDOW 2005).

Colorado lies between two areas of existing wolf populations. To the north is the Northern Rocky Mountain gray wolf distinct population segment, and to the south is the Mexican gray wolf population, which is classified as an Experimental Population, Non-essential Population, found in portions of New Mexico and Arizona. Recently (2011 and 2012), the Service delisted the northern Rocky Mountain gray wolf distinct population segment in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, and north-central Utah. In 2013, the Service proposed removing the gray wolf from the list of endangered and threatened wildlife, and maintaining endangered status for the Mexican wolf by listing it as a subspecies (*Canis lupus baileyi*) (FWS 2013g). This proposed rule replaces a 2011 proposed action to remove protection for *Canis lupus* in all or portions of 29 eastern states. A final decision has not been made on this proposed rule.

Currently, the Service has no plans to reintroduce wolves into the State of Colorado (FWS 2013g). CPW is required to obtain legislative authorization for any reintroduction of wolves (Colorado Revised Statutes 33-2-105.5 and 33-2-105.7), and reporting requirements are extensive (CDOW 2005). In September 1989, the Colorado Wildlife Commission passed a resolution opposing reintroduction of the gray wolf (CDOW 2005), and the State has no plans to develop a recovery plan with specific actions taken to increase the number of wolves in the State (CDOW 2005). In considering potential reintroduction areas for wolves, Carroll et al. (2006) did not identify the adjacent Sangre de Cristo Range in Colorado as a potential reintroduction site and classified the San Luis Valley as unsuitable habitat.

Although unlikely at this time, given Colorado's proximity to other populations of gray wolf, individual wolves from either the north or south could eventually disperse onto the Baca Refuge. If this situation were to occur, the Service, in partnership with CPW, would monitor and manage the species.

After considering whether natural predators could play a significant role on the Baca Refuge, we found that it is not a viable solution for reducing the overall elk population under alternative C or any other alternative during the 15-year timeframe for implementing the major actions of this CCP.

3.11 Partnerships

We value the many partnership organizations we work with in the San Luis Valley. Many existing and potential partnership opportunities exist near the refuge complex, including:

- Federal agencies including BLM, NPS, USFS, NRCS, and 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
- 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. We could not accomplish our mission without the help of these organizations.
- neighboring private landowners, local communities, and chambers of commerce.

3.12 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 predictions and assumptions outlined within a CCP (see figure 28).

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.

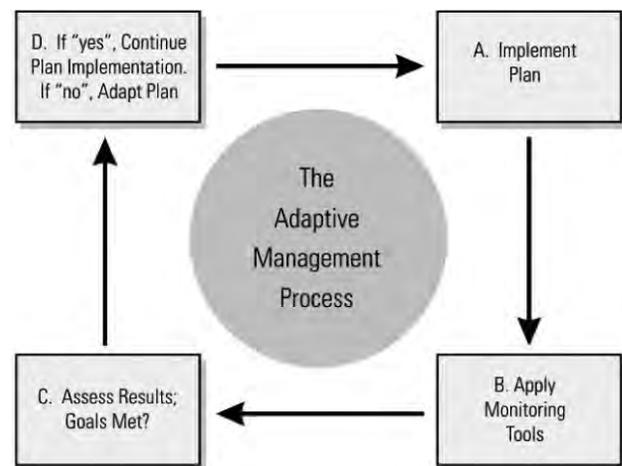


Figure 28. Map of the adaptive management process for implementing the CCP.

The final CCP will be reviewed annually to assess whether there is any need for revision. A revision would 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

Refuge budgets generally include ongoing operations funds for staff, maintenance, and utility needs. Table 6 summarizes the estimated costs for each alternative over 15 years.

Table 7 compares the current staff plan with the proposed staff needed under each alternative. Projects required to carry out the final CCP would 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 6. Costs over 15 years to carry out the CCP alternatives.

<i>Refuge complex budget (\$)</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Budget Fiscal Year 2013	1,394,228	2,155,295	2,221,949	2,482,076
Salary expenditures	1,099,298	1,724,236	1,777,560	1,985,661
+Non-salary expenditures	294,930 (21)	538,824 (25)	555,487 (25)	620,519 (25)
Fixed costs*	229,705 (78)	259,705 (48)	249,705 (45)	279,705 (45)
Discretionary**	65,225 (22)	279,119 (52)	305,782 (55)	340,814 (55)
*Fixed costs related to operating refuge complex				
Monte Vista and Alamosa canal charges	30,000	30,000	30,000	30,000
Fuel, electricity, propane	84,500	84,500	84,500	84,500
Phone, garbage, internet, office, septic	38,205	38,205	38,205	38,205
Pumping costs	77,000	107,000	97,000	127,000
+Non-salary expenditures-percentages next to non-salary expenditures denote percent of budget. Percentage next to fixed costs and discretionary costs denote percent of non-salary expenditures.				
** 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.				
Breakdown of Costs (\$) by Activity to Implement Over 15 Years				
<i>Management cost item by refuge</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Habitat and Wildlife*				
Alamosa Refuge				
Riparian	15,000	45,000	45,000	45,000
Wetland	220,000	450,000	650,000	450,000
Upland	6,000	22,000	28,000	22,000
Monte Vista refuge				
Riparian	n/a	n/a	n/a	n/a

Table 6. Costs over 15 years to carry out the CCP alternatives.

Wetland	225,000	675,000	1,200,000	675,000
Upland	10,000	150,000	750,000	150,000
Baca Refuge				
Riparian	225,000	445,000	445,000	445,000
Wetland	75,000	160,000	675,000	160,000
Playa	30,000	42,000	35,000	42,000
Upland	10,000	225,000	250,000	150,000
Bison management	0	350,000	50,000	520,000
Research and Monitoring (All Refuges)				
Habitat management and wildlife	210,000	375,000	375,000	375,000
Climate change	10,000	150,000	150,000	150,000
Total Biological Program All	1,036,000	3,089,000	4,650,000	3,184,000
*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.				
Cost Analysis for Visitor Services				
<i>Management cost item</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Alamosa Refuge				
Hunting big game, blinds	0	20,000	10,000	10,000
Fishing	0	0	0	100,000
Wildlife Observation				
Rehab Environmental Education Center	20,000	20,000	20,000	20,000
Trail Improvements				
River Trail	10,000	40,000	20,000	60,000
Town to refuge	0	20,000	0	20,000
Bluff trail parking	10,000	10,000	10,000	10,000
South loop trail	0	10,000	0	30,000
Auto tour route extension	0	500,000	0	500,000
Signage improvements	30,000	50,000	30,000	75,000
Overlooks, boardwalks, blinds	0	75,000	0	125,000
Kiosks with accessible parking	60,000	215,000	60,000	215,000
Parking improvements	50,000	500,000	50,000	600,000
Total Wildlife Observation	180,000	1,440,000	190,000	1,655,000
Outreach	10,000	20,000	10,000	40,000
Environmental Education	0	10,000	10,000	30,000
Total Visitor Services Alamosa Refuge	190,000	1,490,000	220,000	1,835,000
Monte Vista Refuge				
Visitor Center and Offices	0	3,000,000	0	3,000,000
Hunting big game, blinds	10,000	10,000	10,000	10,000
Fishing	5,000	5,000	5,000	5,000
Wildlife Observation				
Crane pullouts, pave 8S, new 6S, accessibility	20,000	150,000	0	150,000
Meadowlark trail accessibility	10,000	10,000	10,000	10,000

Table 6. Costs over 15 years to carry out the CCP alternatives.

New trails, Town, Parker Pond, visitor center	0	50,000	0	100,000
Non-motorized road improvements	0	250,000	0	250,000
Signs, directional and interpretive	15,000	30,000	30,000	30,000
Parking improvements	0	250,000	50,000	250,000
Overlooks, boardwalks	0	250,000	100,000	250,000
Total Wildlife Observation	45,000	990,000	190,000	1,040,000
Outreach	0	20,000	20,000	40,000
Environmental Education	0	10,000	10,000	30,000
Total Visitor Services Monte Vista	60,000	4,035,000	235,000	4,125,000
Baca Refuge				
Visitor contact station and office	770,000	25,000	20,000	50,000
Hunting	0	110,000	70,000	130,000
Fishing	0	0	0	0
Wildlife Observation Activities				
Auto tour route development	0	1,220,000	0	2,020,000
Non-motorized trail development	0	52,000	0	67,000
Lunching area development	10,000	30,000	10,000	30,000
Parking area development	0	48,000	3,000	125,000
Signs, directional and interpretive	159,000	292,000	129,000	342,000
Wildlife viewing area development	15,000	45,000	15,000	45,000
Baca history interpretive	45,000	135,000	45,000	150,000
Total wildlife observation	229,000	1,820,000	202,000	2,780,000
Outreach	25,000	65,000	40,000	85,000
Environmental Education	5,000	10,000	10,000	30,000
Total Visitor Services Baca Refuge	1,029,000	2,030,000	342,000	3,070,000
Total Cost Analysis for All Activities and Programs within the Refuge Complex				
<i>Management cost item</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Salaries, Fixed and Discretionary Costs	1,394,228	2,155,295	2,221,949	2,482,076
Total Biological Program	1,036,000	3,089,000	4,650,000	3,184,000
Cultural Resources Program	0	375,000	375,000	1,040,000
Total Visitor Services All	1,279,000	7,560,000	797,000	9,040,000
Grand Total All Activities (\$)	3,709,228	13,179,295	8,043,949	15,746,076

Table 7. Personnel to carry out the CCP alternatives.

<i>Alternative A (current staff)</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Headquarters (Alamosa, Colorado)			
Project leader GS-0485-14	Project leader GS-0485-14	Project leader GS-0485-14	Project leader GS-0485-14
Deputy project leader GS-0485-13	Deputy project leader GS-0485-13	Deputy project leader GS-0485-13	Deputy project leader GS-0485-13
Wildlife biologist GS-0485-12	Wildlife biologist GS-0485-12	Wildlife biologist GS-0485-12	Wildlife biologist GS-0485-12
Land Management LE Officer GS-025-7/9	Land Management LE Officer GS-025-7/9	Land Management LE Officer GS-025-7/9	Land Management LE Officer GS-025-7/9
None	None	None	Land Management LE Officer GS 7/9
None	Supervisory Range Technician (interagency fuels planner) GS-455-9	Supervisory Range Technician (interagency fuels planner) GS-455-9	Supervisory Range Technician (interagency fuels planner) GS-455-9
½ FTE Interagency Supervisory Range Technician (Fire) GS-455-7 (career seasonal)	Convert to 1 FTE Interagency Supervisory Range Technician (Fire) GS-455-7/9	Convert to 1 FTE Interagency Supervisory Range Technician (Fire) GS-455-7/9	Convert to 1 FTE Interagency Supervisory Range Technician (Fire) GS-455-7/9
Budget Analyst GS-560-9 (Business Team)	Budget Analyst GS-560-9 (Business Team)	Budget Analyst GS-560-9 (Business Team)	Budget Analyst GS-560-9 (Business Team)
None (now a term position—see below)	Office Support Assistant GS-0303-4 (1) (converted from term position to full-time)	Office Support Assistant GS-0303-4 (1) (converted from term position to full-time)	Office Support Assistant GS-0303-4 (1) (converted from term position to full-time)
None	Wildlife biologist GS-0486-7/9	Wildlife biologist GS-0486-7/9	Wildlife biologist GS-0486-7/9
None	Biological Technician GS-404-5 (moved from Alamosa)	Biological Technician GS-404-5 (moved from Alamosa)	Biological Technician GS-404-5 (moved from Alamosa)
None	Outdoor Recreation Planner GS-0023-9 (1)	Outdoor Recreation Planner GS-0023-9 (1)	Outdoor Recreation Planner GS-0023-9 (2)
None	None	None	Environmental Education Specialist GS-9 (1)
None	None	Engineering Equipment Operator WG-9	None
None	Hydrologist GS-1315-9/11	Hydrologist GS-1315-9/11	Hydrologist GS-1315-9/11
None	None	None	Maintenance Worker (WG-8) (3)
Alamosa and Monte Vista National Wildlife Refuges			
Refuge manager GS-0485-12	Refuge manager Alamosa GS-0485-12	Refuge manager Alamosa GS-0485-12	Refuge manager Alamosa GS-0485-12
None	Refuge Manager Monte Vista GS-485-12	Refuge Manager Monte Vista GS-485-12	Refuge Manager Monte Vista GS-485-12
Biological Technician GS-0404-05 GS-0404	Position moved to Headquarters GS-0404-05	Position moved to Headquarters	Position moved to Headquarters

Table 7. Personnel to carry out the CCP alternatives.

<i>Alternative A (current staff)</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
None	Biological Technician GS-0404-0455-5	Biological Technician GS-0404-0455-5	Biological Technician GS-0404-0455-5
Maintenance Mechanic WG-4749-9 (Monte Vista)	Maintenance Mechanic WG-4749-9 (Monte Vista)	Maintenance Mechanic WG-4749-9 (Monte Vista)	Maintenance Mechanic WG-4749-9 (Monte Vista)
Maintenance Worker WG-4749-8 (Alamosa)	Maintenance Worker WG-4749-8 (Alamosa)	Maintenance Worker WG-4749-8 (Alamosa)	Maintenance Worker WG-4749-8 (Alamosa)
None	Tractor Operator (WG-6) (½ FTE-career seasonal)	Tractor Operator (WG-6) (½ FTE-career seasonal)	Tractor Operator (WG-6) (½ FTE-career seasonal)
None	Tractor Operator (WG-6) (½ FTE-career seasonal)	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 Manager GS-0485-12	Wildlife Refuge Manager GS-0485-12	Wildlife Refuge Manager GS-0485-12
Wildlife Refuge Specialist GS-0485-09	Wildlife Refuge Specialist GS-0485-09	Wildlife Refuge Specialist GS-0485-09	Wildlife Refuge Specialist GS-0485-09
Maintenance Worker WG-4749-8	Maintenance Worker WG-4749-8	Maintenance Worker WG-4749-8	Maintenance Worker WG-4749-8
None	Office Support Assistant GS-0303-4	Office Support Assistant GS-0303-4	Office Support Assistant GS-0303-4
None	None	None	Biological and Range Techni- cian GS-0404/0455-7 (Bison) 0455-5
None	Tractor Operator (WG-6) (½ FTE-career seasonal)	Tractor Operator (WG-6) (½ FTE-career seasonal)	Tractor Operator (WG-6) (½ FTE career seasonal)
Seasonal Employees			
None	Range Technician GS-0455-5 (fire) (1)	Range Technician GS-0455-5 (fire) (1)	Range Technician GS-0455-5 (fire) (1)
None	Biological Technician GS-404-5 Biology program (6)	Biological Technician GS-404-5 Biology program (6)	Biological Technician GS-404-5 Biology program (6)
None	Biological Technician GS-404-5 weeds (3)	Biological Technician GS-404-5 weeds (3)	Biological Technician GS-404-5 weeds (3)
None	Social Services Assistant GS-0185-5 (1)	Social Services Assistant GS-0185-5 (1)	Social Services Assistant GS-0185-5 (1)
Office Support Assistant (Term) GS-0303-4 (½) FTE	None (position converted to full time at headquarters)	None (position converted to full time at headquarters)	None (position converted to full time at headquarters)
None	None	None	Park Ranger GS-025-5 (3)

* GS=General Schedule employee by pay grade; WG=Wage Grade employee by pay grade.

** Depends on Interpretive Contact Station being built at Monte Vista Refuge.

Table 8 is a summarized, side-by-side look at the actions for each alternative. An analysis of these actions is in “Chapter 4—Environmental Consequences”; a summary of the expected consequences of the alternatives is in table 36 at the end of chapter 5.

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

<i>Alternative A No-Action</i>	<i>Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)</i>	<i>Alternative C Habitat Restoration and Ecological Processes</i>	<i>Alternative D Maximize Public Use Opportunities</i>
<i>Habitat and Wildlife Goal:</i> Conserve, restore and enhance the ecological diversity and function of the San Luis Valley ecosystem to support healthy populations of native fish and wildlife, with an emphasis on migratory birds.			
<i>Water Resources Goal:</i> As climate patterns change, protect, acquire and manage surface and ground water resources to maintain and support management objectives.			
<i>Visitor Services Goal:</i> Provide safe, accessible and quality wildlife-dependent recreation and perform outreach to visitors and local communities to nurture an appreciation and understanding of the unique natural and cultural resources of the refuge complex and San Luis Valley.			
<i>Partnerships and Refuge Operations Goal:</i> Secure and effectively use funding, staffing, and partnerships for the benefit of all resources in support of the refuge complex purposes and the mission of the Refuge System. Actively pursue and continue to foster partnerships with other agencies, organizations, the water community and private landowners to conserve, manage, and provide long-term sustainability of the working landscapes within the San Luis Valley ecosystem.			
<i>Cultural Resources Goal:</i> Protect significant cultural resources within the San Luis Valley National Wildlife Refuge Complex.			
<i>Research, Science and Wilderness Review Goal:</i> Use sound science, applied research, monitoring, and evaluation to advance the understanding of natural resource functions, changing climate conditions, and management of the habitats within the San Luis Valley ecosystem.			

HABITAT AND WILDLIFE MANAGEMENT

Habitat Type: Riparian (Rio Grande and Large and Small Creeks) (Alamosa and Baca)

<p>On the Alamosa Refuge: Manage and enhance Rio Grande corridor where possible, providing habitat for river and riparian-dependent species (southwestern willow flycatcher and other obligates).</p> <p>On the Baca Refuge: Evaluate condition and identify areas of degradation and invasive species. Take steps to address obvious problems within existing resource levels.</p>	<p>On the Alamosa Refuge: Maintain or enhance a minimum of 50 acres of existing willow and cottonwood riparian habitat along Rio Grande. On off-channel sites, restore about 50 acres of moderate to dense (>35 percent canopy cover) willow and cottonwood riparian cover.</p> <p>On the Baca Refuge: Maintain existing reaches of healthy riparian habitat (dense and multilayered) with diverse woody vegetation species. Restore about 21 miles along 4 creek drainages that are in poor condition (scattered plants, <2 feet tall). Achieve a >35 percent canopy cover of 15-30 feet wide.</p>	<p>Same as alternative B</p>	<p>Same as alternative B plus</p> <p>On the Baca Refuge: Locate bison pastures near public access points. Use conservative stocking rates and use frequent rotation. Keep bison out of riparian areas.</p>
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Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

Alternative A No-Action	Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)	Alternative C Habitat Restoration and Ecological Processes	Alternative D Maximize Public Use Opportunities
	<p>Maintain hydrologic conditions in the creek channels. Reduce browsing pressure using fencing, dispersal, hazing, culling, and hunting. Use plantings or seed as needed. Ensure any use of other management tools (i.e. grazing, fire, and mowing) do not negatively impact riparian areas.</p>		
Habitat Type: All Wetland types (All Refuges)			
<p>Alamosa and Monte Vista Refuges: Continue to manage existing wetland areas and wetland conditions (short-emergent, tall emergent, open water) with an emphasis on waterbird production. Maximize wetland conditions, irrigating from spring through fall (depending on water availability) for many different species. Shallowly flood the various wetland types ranging between 20-50 percent of the acreage to meet the needs of various species. Use variety of management tools—prescribed burning, grazing, and weed control.</p> <p>Baca Refuge: Through irrigation, continue to maintain and monitor overall graminoid health of the wet meadows. Where obvious degradation is occurring (i.e. invasive species), take corrective action. Continue to collect baseline information.</p>	<p>Alamosa and Monte Vista Refuges: Similar to A in providing for a variety of wetland conditions, but with a greater focus on meeting the needs of the wetland focal bird species listed in table 3 which should in turn represent other wetland obligate species. Where practical restore historical water flow patterns through more efficient water management, allowing some areas to revert to uplands while making sure water gets to the most productive wetland areas.</p> <p>Baca Refuge: Similar to alternative A, but focus on applying irrigation more effectively and efficiently on at least 10-20 percent of irrigable acreage where short emergent wetlands occurred historically. Use grazing, haying, mowing, and weed control.</p>	<p>Alamosa and Monte Vista Refuges: To the extent practical, over time, restore historical water flow patterns allowing many wetland areas to revert to uplands. For example on the Monte Vista Refuge, water application during early spring migration would be restricted to the Spring Creek and Rock drainages (main channels). During nesting season this would also include Cat Creek. On the Alamosa Refuge, water would be restricted to the deepest natural flow slough and oxbows formed by the Rio Grande.</p> <p>Baca Refuge: Confine irrigable water to natural channels, oxbows, slough and depression. Shallowly inundate on the low areas beyond diversions. Modify infrastructure that alter water flows that limit restoration.</p>	<p>Alamosa and Monte Vista Refuges: Similar to alternative A.</p> <p>Baca Refuge: Similar to alternative B.</p>

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

<i>Alternative A No-Action</i>	<i>Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)</i>	<i>Alternative C Habitat Restoration and Ecological Processes</i>	<i>Alternative D Maximize Public Use Opportunities</i>
Habitat Type: Playas (Baca Refuge Only)			
<p>After wet meadows are irrigated, allow excess water to enter playa habitat generally midway or late into the breeding season allowing for some foraging opportunities for a variety of shorebirds.</p>	<p>Adaptively rotate delivery of water from three different input points a minimum of one out of three years to provide playa habitat during spring migration when possible and summer nesting periods when possible.</p>	<p>Direct through decreed diversion points, at least 90 percent of available water in each creek drainage into the lowest (elevation) flow path available to allow water to reach playa habitats to provide for spring migration and summer nesting especially for</p>	<p>Same as alternative D</p>
<p style="text-align: center;">shorebirds and teal. Primary difference from alternative B is that water would be annually directed from all of the creek systems resulting in more reliable playa habitat for shorebirds.</p>			
Habitat Type: Uplands (All Refuges)			
<p>Alamosa and Monte Vista Refuges: Continue to provide native shrub (primarily grease-wood and rabbitbrush on the Monte Vista Refuge and saltbush on the Alamosa Refuge. Treat invasive species where possible.</p> <p>Baca Refuge: Continue to monitor health of shrublands, taking corrective action where obvious degradation is occurring.</p>	<p>Alamosa and Monte Vista Refuges: Restore a minimum of 50 acres of former farmland on the Monte Vista Refuge and 100 acres on the Alamosa Refuge. Focus on maintaining habitat heterogeneity (various seral stages) of all shrub habitat. Apply natural disturbance regimes (fire, grazing, hydrology) and treat invasive species to benefit upland focal bird species (table 4).</p> <p>Baca Refuge: Maintain habitat heterogeneity of all shrub habitats, similar to other refuges above, with focus on benefiting upland focal bird species.</p>	<p>Alamosa and Monte Vista Refuges: Within 4-5 years, on the Monte Vista Refuge initiate restoration on a minimum of 1,000 acres and 800 acres on the Alamosa Refuge that were formerly converted to wetlands by reducing depth and duration of flooding. By year 15, achieve 20-30 percent shrub cover and limit invasive species to 10-15 percent of these areas. Plant native seeds use native shrubs on retired farmlands.</p> <p>Baca Refuge: Similar to alternative B</p>	<p>Alamosa and Monte Vista Refuges: Same as alternative A.</p> <p>Baca Refuge: Similar to alternative A</p>

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

<i>Alternative A No-Action</i>	<i>Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)</i>	<i>Alternative C Habitat Restoration and Ecological Processes</i>	<i>Alternative D Maximize Public Use Opportunities</i>
Shrub–grass on the Baca Refuge. Similar to upland shrubs alternative A above.	Initially, create and maintain a greater heterogeneity of this habitat type by altering plan community structure and composition on +/- 5 to 10 percent of 14,473 acres of this habitat type on annual basis using variety of management tools and achieving natural disturbance regimes in order to benefit upland obligate focal birds (table 4). By year 15, increase acreage if appropriate.	Convert 4-60 percent of habitat type (600-900 acres) to sandsheet rabbit-brush through reduced flood irrigation practices.	Same as alternative B.
WILDFIRE MANAGEMENT (ALL REFUGES)			
Suppress refuge complex wildfires using most effective methods. Continue to participate in interagency fire management team. Identify funding sources to reduce fuel hazards to adjoining property.	Same as alternative A plus: follow all wildland and urban interface guidelines in order to minimize impact to private property and human life from refuge wildfires. Minimize construction of new facilities that could increase problems along wildland and urban interface. Maintain fire breaks on refuge lands. Conduct additional research and literature review to better understand implications of fire as a result of climate change, land-use development and other factors. Increase involvement with interagency partners including rural volunteer fire departments.	Same as alternative B.	Same as alternative B.
Wildlife Management Threatened and Endangered Species (Southwestern Willow Flycatcher-Alamosa Refuge)			
Contribute to recovery goals for southwestern willow flycatcher.	Maintain and enhance a minimum of 50 acres of existing suitable habitat and initiate efforts to restore +50 acres of additional suitable habitat at locations off the main channel of the Rio Grande.	Same as alternative B	Same as alternative B

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

<i>Alternative A No-Action</i>	<i>Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)</i>	<i>Alternative C Habitat Restoration and Ecological Processes</i>	<i>Alternative D Maximize Public Use Opportunities</i>
Wildlife Management Sandhill Cranes (Monte Vista Refuge Only)			
Continue to support sandhill cranes by producing agricultural grains for spring and fall migrant waterfowl and 15 percent of the fall and 85 percent of the spring sandhill crane population on the Monte Vista Refuge.	Similar to alternative A. Produce a minimum of 190 acres of small grains (primarily barley). Provide adequate roost habitat by shallowly flooding traditional crane roost areas in Units 14, 19, and 20.	Eliminate grain production.	Similar to alternative B except produce a minimum of 230 acres to provide food and energy resources for spring migrating sandhill cranes to maximize viewing opportunities.
Wildlife Management – Focal Bird Species (All Refuges)			
Continue to manage for a variety of migratory bird species.	Manage refuge habitats to create the hydrologic and vegetative conditions (species diversity, density, and structural conditions) necessary to provide the lifecycle requirements of focal birds (table 3 riparian birds; table 4 wetlands; table 5 uplands) identified for the refuge complex.	Similar to alternative B	Similar to alternative B
Wildlife Management – Bison Baca Refuge Only			
By 2016 phase out the existing arrangement allowing TNC to graze on the Baca Refuge lands which were formerly part of TNC's Medano Ranch (6,200 acres)	Same as alternative A plus: utilize bison along with other livestock (cattle and sheep) as a prescribed tool to meet the habitat objectives on the Baca Refuge.	Same as alternative A plus: utilize bison along with other livestock (cattle and sheep) as a prescribed tool to meet the habitat objectives on the refuge.	Small bison demonstration herd (≤25)
	Research feasibility of allowing some semi-free ranging bison on a year round basis, in a designated area on the Baca Refuge. Purpose would be to see if the refuge could support future use or occurrence of bison on the refuge.		
Wildlife Management – Rocky Mountain Elk (All Refuges)			
Continue to conduct population surveys to monitor the density and distribution of the elk population on the refuges. Work with CPW in efforts to reduce and redistribute population as necessary. Implement actions interim elk management plan.	Implement a hunt plan to reduce and redistribute the elk population, reduce the browsing pressure on riparian areas, and provide the public with big game hunting opportunities on the refuge. Establish and implement a chronic wasting disease monitoring plan.	Similar to alternative B except: reduce and redistribute elk population to meet the CPW's goal for GMU 82. Work with the State in culling or dispersal of elk population.	Similar to alternative B.

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

<i>Alternative A No-Action</i>	<i>Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)</i>	<i>Alternative C Habitat Restoration and Ecological Processes</i>	<i>Alternative D Maximize Public Use Opportunities</i>
Wildlife Management – Rio Grande Sucker and Rio Grande Chub (Baca Refuge Only)			
Continue to monitor and evaluate condition of Rio Grande sucker and Rio Grande chub habitat.	Same as alternative A plus conduct research to determine effects of refuge management on populations.	Similar to alternative B except we would restore natural flow paths on the Baca Refuge.	Similar to alternative B
WATER RESOURCES MANAGEMENT			
Water Management – All Refuges			
Maintain all water rights enabling maximum use of ground and surface water for maintenance of wildlife habitat. On the Monte Vista Refuge use the most water efficient methods of irrigating grain crops.	Same as alternative A plus establish a repeatable and quantitative water quality monitoring program on all refuges to identify contaminants, toxins and other contributors to pool soil and water quality. Complete area and capacity surveys of the most important wetlands to better understand how to maintain productivity. Manage ground water and surface water together to achieve refuge objectives. On the Baca Refuge, restore facilities that were historically used to irrigate the playa wetlands. Evaluate potential of Monte Vista Refuge as a site for confine and unconfined aquifer storage recharge.	Same as alternative B except irrigation of croplands would be eliminated.	Same as alternative B plus prioritize water management to improve visitor experiences to enhance wildlife viewing. Collaborate with schools, Friends group, or volunteers to assist with collecting water quality and quantity data.

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

Alternative A No-Action	Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)	Alternative C Habitat Restoration and Ecological Processes	Alternative D Maximize Public Use Opportunities
VISITOR SERVICES			
Visitor Services – Hunting (All Refuges)			
<p>Alamosa and Monte Vista Refuges: Continue to provide waterfowl and limited small game hunting within designated hunt boundaries.</p> <p>Baca Refuge: No public hunting.</p>	<p>All Refuges: By year 3, develop a refuge complex hunting plan that is 50 percent implemented by year 4 and 100 percent implemented by year 7. Work with partners to create diverse, quality hunting opportunities. By year 8, 60-70 percent of hunters report satisfaction with hunting experience. By year 8, work with CPW to develop one new hunt for youths. By year 5, provide better parking, blinds, and other facilities that are more accessible. By year 10, add additional accessible hunting access area at Alamosa.</p> <p>Alamosa and Monte Vista Refuges: Same as alternative A plus: develop restricted big game hunt (agency culling would also occur).</p> <p>Baca Refuge: By year 3, open small game hunting along southwest boundary and allow permitted archery north of Crestone Creek. By year 7, open other portions of refuge to big game hunting and expand small game hunting.</p>	<p>All Refuges: By year 5, develop a refuge complex hunting plan that is 50 percent implementable by year 10 and 100 percent by year 15. Work with partners to create diverse, quality hunting opportunities.</p> <p>Alamosa and Monte Vista Refuges: Same as alternative B</p> <p>Baca Refuge: By year 5, open small game hunting along southwest boundary and allow permitted archery north of Crestone Creek. By year 10, open other portions of refuge to big game hunting and expand small game hunting.</p>	<p>All Refuges: Similar to alternative B except: Within 10 years, 70-80 percent of hunters report being satisfied with experience. Within 4 years, work with CPW to establish two youth hunts. Within 4 years, improve accessible facilities, and if needed provide two new accessible facilities, one at Alamosa and one at Monte Vista. Allow for game retrieval with ATVs.</p> <p>Alamosa and Monte Vista Refuges: Same as alternative B</p> <p>Baca Refuge: Similar to alternative B except efforts would be made to encourage additional opportunities for youths and hunters with mobility impairments. A larger number of licensed hunters could be allowed over B.</p>
Visitor Services – Fishing (Monte Vista and Alamosa Refuges)			
Maintain youth fishing event at Monte Vista Refuge.	Same as alternative A	Same as alternative A	Same as alternative A plus permit walk-in fishing access along the Rio Grande on the Alamosa Refuge south of parking area 5. Develop safe access point and pier at Chicago dam.

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

Alternative A No-Action	Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)	Alternative C Habitat Restoration and Ecological Processes	Alternative D Maximize Public Use Opportunities
Visitor Services – Wildlife Observation, Photography, and Interpretation (All Refuges)			
<p>Alamosa and Monte Vista Refuges:</p>	<p>All Refuges: Within 5 years, develop a visitor services plan that identifies specific programming elements, interpretive themes, messages, and audiences. Hire staff to support program.</p>	<p>Alamosa and Monte Vista Refuges:</p>	<p>Alamosa and Monte Vista Refuges:</p>
<p>Maintain or upgrade existing wildlife facilities and programs at Alamosa and Monte Vista refuges.</p>	<p>Same as alternative A except open trails and roads in hunting area from July 15-February 28 for biking and walking. Upgrade existing facilities and trails.</p>	<p>Expanded over alternative B to include:</p>	<p>Increase participation by 25-40 percent through additional access, improved facilities and programs and additional staff including more opportunities for year around access.</p>
<p>Baca Refuge: Develop primitive observation facilities at Baca Refuge (a few signs or kiosks along boundary or at refuge office).</p>	<p>Alamosa and Monte Vista Refuges: Increase participation and enhance opportunities by improving facilities and programs. Increase annual visit by 15-25 percent with +75 percent visitors reporting satisfaction with visit. Seasonally (July 15-February 28) open trails or roads within hunt boundary for biking and walking. Work with partners to develop trail links to Alamosa and Monte Vista refuges. Within 3-7 years, extend auto tour route east on the Alamosa Refuge to connect to the Bluff Road. Extend and improve Rio Grande and Meadowlark nature trails. Build visitor center at Monte Vista Refuge. Repurpose contact station at Alamosa to focus on environmental education.</p>	<p>Baca Refuge: Similar to alternative A with limited public access.</p>	<p>Add additional viewing and observation areas. Staff the current visitor center at Alamosa 4-5 days per week. Build and design a new visitor center at Monte Vista Refuge</p>
	<p>Baca Refuge: Within 2 years, open portions of refuge for public use including walking, biking, and limited horse access. By year 15, fully develop access including auto tour route, trails, facilities, and other programs. Adaptively reuse cattle headquarters building. Work with NPS to interpret Trujillo homestead.</p>		<p>Baca Refuge: Similar to alternative B plus: extend the auto tour route south (seasonal basis). Work with others to establish a multi-agency visitor contact station. Hire additional staff to support programs.</p>

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

<i>Alternative A No-Action</i>	<i>Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)</i>	<i>Alternative C Habitat Restoration and Ecological Processes</i>	<i>Alternative D Maximize Public Use Opportunities</i>
Visitor Services – Environmental Education (All Refuges)			
<p>Alamosa and Monte Vista Refuges: Maintain limited educational programs including Monte Vista Crane Festival and Kid’s Fishing Day.</p> <p>Baca Refuge: No environmental education programs.</p>	<p>All Refuges: By year 5-10, improve existing programs on and off refuges including developing educator’s guide, curriculum-based programming. Provide minimum of two school or teacher trainings per year. Modify existing curricula tailored to refuge complex including topics like hydrology, climate change, and others.</p> <p>Alamosa and Monte Vista Refuges: By year 5, retrofit existing building at Alamosa to be accessible and establish a discovery station geared toward school groups and young visitors.</p> <p>Baca Refuge: By year 5-8, host a minimum of 6 programs and activities annually.</p>	<p>Alamosa and Monte Vista Refuges: Same as alternative A.</p> <p>Baca Refuge: Very limited. Would offer 10 guided tours or programs</p>	<p>All Refuges: Same as alternative B plus: Expand number of programs to 20 school visits per year. Work with partners to establish San Luis Valley auto tour route</p> <p>Alamosa and Monte Vista Refuges: Similar to alternative B.</p> <p>Baca Refuge: Convert barn to environmental education center. Use it for youth programs, camps, classroom space, and exhibits.</p>
Visitor Services – Outreach (All Refuges)			
<p>All Refuges: Maintain current outreach levels including: public presentations, news releases, weed tours, county commissioner meetings, and other briefings for agencies and organizations.</p> <p>Recruit volunteers to support staff. Seek grants to fund special events, and keep the public informed about refuge programs and activities through the Web site.</p>	<p>All Refuges: Same as alternative A plus: develop outreach plan as part of visitor services’ plan above.</p> <p>Develop new brochures that highlight the refuge complex opportunities and interpretive themes. Develop specific brochures as needed. Update the refuge complex Web site. Host information-sharing events for media and other organizations.</p>	<p>All Refuges: Same as alternative B.</p>	<p>All Refuges: Similar to alternative B plus: place greater emphasis on outreach for both communicating wildlife and habitat goals and increasing visitation to the refuge. For example, by year 5, work with Friends group to develop electronic newsletter two times per year.</p>
Visitor Services – Commercial Recreation (All Refuges)			
<p>Continue to only allow limited commercial recreational use (i.e. photography) by special permit.</p>	<p>Same as alternative A plus: plus allow for additional limited commercial recreation (such as equestrian outfitter, nature trail rides at Baca Refuge, and photography).</p>	<p>Same as alternative A.</p>	<p>Same as alternative B.</p>

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

Alternative A No-Action	Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)	Alternative C Habitat Restoration and Ecological Processes	Alternative D Maximize Public Use Opportunities
PARTNERSHIPS AND REFUGE OPERATIONS			
Partnerships (All Refuges)			
<p>Maintain existing partnerships including Federal, State, and local agencies, tribes, and organizations. Continue working within the Partners for Fish and Wildlife program to support privately-owned habitats critical to the refuge complex.</p>	<p>Same as alternative A plus: establish new partnerships (such as local universities or other organizations) that can help us achieve our goals and objectives. For example, work with NPS to interpret and assist us with managing the Pedro Trujillo homestead on the Baca Refuge.</p>	<p>Same as alternative A plus: pursue additional partnerships to support the restoration program.</p>	<p>Same as alternative A and B plus: work with other organizations that help us facilitate better wildlife-dependent recreational opportunities. Work with others to incorporate the refuge complex into Sangre de Cristo National Heritage Area programming.</p>
Refuge Operations (All Refuges)			
<p>All Refuges: Maintain refuge personnel at current staffing levels as identified in table 7. Maintain existing auto tour routes, trails, and facilities, on the Alamosa and Monte Vista refuges</p>	<p>All Refuges: Same as alternative A plus: Justify and obtain the following new positions: convert 1 office support assistant from term to full-time for refuge headquarters; add 1 office support assistant for Baca Refuge; add 1 outdoor recreation planner for the refuge complex; add 1 hydrologist for the refuge complex; add 1 wildlife biologist for refuge complex; change 1 biological technician from Alamosa to refuge headquarters; add 1 biological technician for the refuge headquarters; add 1 refuge manager for Monte Vista Refuge; add 1 supervisory range technician for inter-agency fuel planning (GS-9); convert existing ½ FTE for interagency fire technician to full-time (GS-7); add 1 FTE (two seasonal ½ FTEs) tractor operators for refuge headquarters and add ½ FTE tractor operator for Baca Refuge ; and additional seasonal positions.</p>	<p>All Refuges: Similar to alternative B but positions might vary some to support habitat restoration efforts. For example, we would add an engineering equipment operator.</p>	<p>All Refuges: Same as alternative B plus: add an additional outdoor recreation planner and an environmental education specialist, a law-enforcement officer, three additional maintenance workers and seasonal positions for public use.</p>

Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

Alternative A No-Action	Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)	Alternative C Habitat Restoration and Ecological Processes	Alternative D Maximize Public Use Opportunities
	<p>Alamosa and Monte Vista Refuges: Build a visitor center at Monte Vista Refuge. On the Alamosa extend tour route out to Bluff road. Open additional nature trails (or extensions) at Alamosa and Monte Vista refuges and make other improvements for visitor services (trails, viewing blinds or observation facilities). Replace the Lillpop office on the Alamosa with small bunkhouse and vehicle sites for volunteers. Improve accessibility of current facilities.</p> <p>Baca Refuge: Initiate cleanup of the ranch headquarters area. By year develop visitor and hunter access.</p>	<p>Alamosa and Monte Vista Refuges: Similar to alternative A plus: better facility support for existing facilities.</p> <p>Baca Refuge: Limited facilities. Some hunter access would need to be provided.</p>	<p>Alamosa and Monte Vista Refuges: Same as alternative B plus: build additional facilities to support visitor services (such as seasonal tour routes on both refuges, additional wildlife observation facilities, improved access).</p> <p>Baca Refuge: Similar to alternative B plus: extend auto tour route to the south (seasonal access); develop additional viewing or other facilities. Work with NPS to provide trail link to Great Sand Dunes. Convert the barn to interpretive and environmental education facility.</p>

CULTURAL RESOURCES MANAGEMENT

Cultural Resources (All Refuges)

<p>All Refuges: Continue adherence to cultural resource laws. Offer occasional outreach like presentations or erect limited signage. Work with Friends group or others to accomplish preservation and research objectives. Maintain law enforcement monitoring of known sites and sensitive areas.</p>	<p>All Refuges: Same as alternative A plus: offer education outreach (such as presentations, signs, and brochures) about the importance of refuge complex history. Work with other partner groups to accomplish preservation and research objectives. Complete limited surveys in response to Section 110 of the National Historic Preservation Act. Establish erosion control measures on threatened sites.</p> <p>Baca Refuge: Fully record cow camps. Stabilize the house at Baca headquarters. See funding for restoration of demonstration buildings deemed appropriate for reuse.</p>	<p>All Refuges: Same as alternative A except: remove structures or buildings that are not needed for refuge operations and are intrusive to historic districts or landscapes.</p>	<p>All Refuges: Similar to alternative B plus: increase partnerships, outreach, and other activities to improve cultural resources program.</p>
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Table 8. Summary of alternatives actions for San Luis Valley Refuge Complex CCP and EIS.

<i>Alternative A No-Action</i>	<i>Alternative B Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Proposed Action)</i>	<i>Alternative C Habitat Restoration and Ecological Processes</i>	<i>Alternative D Maximize Public Use Opportunities</i>
RESEARCH, SCIENCE, AND WILDERNESS REVIEW			
Climate Change (All Refuges)			
Incorporate and follow Secretarial order 3289, and other executive orders and policies in all facets of refuge management and operations related to climate change.	Same as alternative A	Same as alternative A	Same as alternative A
Research, Science, and Monitoring (All Refuges)			
Conduct research and monitoring as opportunities arise and funding permits.	Same as alternative A plus: conduct research, inventory, and monitoring related to CCP implementation.	Same as alternative B	Same as alternative B
Wilderness Review (Baca Refuge)			
No wilderness study areas recommended	Manage the southeastern portion of the refuge totaling 13,800 acres as a wilderness study area. Within 5 years, complete inventory, finalize the review process, and forward final recommendations to the Director of the Service.	Same as alternative B	Same as alternative B

