

CHAPTER 5

Environmental Consequences



Chapter 5—Environmental Consequences



© Joe Zimm

Sunset from Monte Vista Refuge.

This chapter summarizes and compares the potential effects of implementing the four proposed management alternatives on the physical and biological environment, special area designations, public use opportunities, cultural and paleontological resources, and other social and economic factors. The environment that would be affected by these alternatives is described in “Chapter 4—Affected Environment.”

5.1 Analysis Method

Under each resource topic, the actions that could affect that resource are discussed. For the most part, these are the actions stemming from the objectives and strategies identified in “Chapter 3—Alternatives.” Often the effect of an action cuts across several resources. For example, increased visitor use may be beneficial to the local economy but have a negative effect on sensitive wildlife species.

We evaluated the potential environmental effects at several levels, including whether the effects are beneficial or negative (or “adverse” when describing threatened or endangered species or cultural resource impacts). We describe whether the effects are direct, indirect, or cumulative with other independent actions. We discuss the duration of an effect and whether it is over the long term or short term.

Direct effects are those for which the effect on the resource is immediate and is a direct result of a specific action or activity. Examples of direct effects include the effect of ungulate grazing on vegetation and the effect of hunting on wildlife.

Indirect, or secondary, effects are those that are induced by conducting specific actions, but occur later in time or are farther removed from the place of action through a series of interconnected effects. Examples of indirect effects include upstream surface disturbance leading to impairment of downstream water quality, or building a road that leads to the spread of invasive plants.

A cumulative effect is defined as “the impact on the environment which results from the incremental impact of our actions when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7). At the end of chapter 3, we described the reasonably foreseeable actions that are independent of the actions in the CCP but that could result in cumulative effects.

We have used the following general guide to describe potential effects in terms of their context, intensity, and duration:

- Negligible—the effect, whether negative or beneficial, would be at the lower levels of detection (less than a 5 percent change compared to existing conditions).
- Minor—the effect, whether negative or beneficial, would be detectable or noticeable (a change of 5–24 percent).
- Moderate—the effect, whether negative or beneficial, would be clear, and would have the potential to become major (a change of 25–50 percent).
- Major—the effect would be severe, or if beneficial, would have exceptional beneficial effects (a change of more than 50 percent).
- We describe the potential effects as occurring over the short term or long term. Short-term effects typically describe what would happen during a period of 1–5 years. For example, there could be a short-term disturbance to vegetation from prescribed fire. Long-term effects would last at least 5 years after project initiation, and may outlast the 15-year life of the CCP. For example, there could be a long-term improvement to wildlife habitat resulting from a short-term effect such as a prescribed fire.

Under each resource, the potential effects that are common to all alternatives are discussed first. This is followed by a discussion of specific subtopics that are related to the resource. If the topic is short, all the alternatives are discussed together, but where there are distinct differences between the alternatives, they are broken out by alternative.

In compliance with the provisions of the Improvement Act, we have made a thorough assessment of the potential environmental effects using available science, which is consistent with NEPA and Department of Interior and Service policies. Wherever pos-

sible, the degree of effect is quantified using known numeric information or modeled estimates, or where extensive research provided pertinent numeric information. We used GIS data that were provided from several sources, including other agencies, organizations, and researchers, to evaluate and make measurements; these sources are identified. Although GIS is a useful tool for evaluating and answering questions, it is not the same as a formal land survey and discrepancies can exist. Where sufficient numeric information was not available, we used qualitative or relative assessments using scientific literature or professional field experience.

The analysis of potential environmental consequences is found in the following six sections of this chapter:

- 5.4 Environmental Consequences for the Physical Environment
- 5.5 Environmental Consequences for Biological Resources
- 5.6 Environmental Consequences for Visitor Services
- 5.7 Environmental Consequences for Special Areas
- 5.8 Environmental Consequences for Cultural and Historical Resources
- 5.9 Environmental Consequences for the Socioeconomic Environment

The Service also analyzed the following topics, as documented in these sections:

- 5.10 Irreversible and Irrecoverable Resource Commitments
- 5.11 Short-Term Uses of the Environment and Maintenance of Long-Term Productivity
- 5.12 Adherence to Planning Goals
- 5.13 Unavoidable Adverse Effects
- 5.14 Conflicts with Federal, State, Tribal, and Local Agencies

5.2 Assumptions

We made our assessments based on a variety of information, including meetings and other communications with natural resource and other professionals, published scientific information, site inventory, agency reports, staff knowledge, and computer modeling. We made the following assumptions in the analysis presented in this chapter:

- Money and staff would be sufficient to carry out any alternative selected. This does not constitute a commitment for funding, and future budgets could affect implementation.
- Inventory programs would be carried out and inventory activities would be conducted a minimum of once every 5 years, and adjustments or revisions (within the scope of the particular alternative) may be made to management actions as shown by evaluations.
- Standard operating procedures would be followed.
- This CCP would be reviewed at 15 years, or sooner if needed.

5.3 Cumulative Impacts

Following the discussion of direct and indirect effects, at the end of each topic, the expected cumulative impacts of each alternative and the reasonably foreseeable actions are discussed. Reasonably foreseeable actions are described near the end of “Chapter 3—Alternatives.”

The cumulative effects discussion focuses on four broad categories of reasonably foreseeable actions:

- Federal land management activities
- State wildlife management
- nongovernmental conservation activities
- regional demographic and economic changes

5.4 Environmental Consequences for the Physical Environment

The following sections discuss the effects of implementing the alternatives on the following parts of the physical environment: climate change; air quality; soils; water resources; visual resources and night skies; and soundscapes. Potential cumulative impacts are also considered.

Climate Change

The potential effects of the Service’s actions with respect to influencing climate change at a global level are addressed in this section. The likely effects of climate change on the refuge complex’s habitat and wildlife resources are addressed in the section discussing the biological environment.

All Alternatives

The refuge complex would implement Department of Interior and Service policies on climate change, including adaptation, biological planning, landscape conservation, research, energy efficiency, collaborating with other partners, and educating the public through visitor services programs. These would be achieved by adopting specific objectives and strategies in our habitat management and visitor services programs. (Refer to the climate change sections in chapters 1 and 3 for a complete discussion.)

By their nature, wildlife refuges protect large areas of vegetated lands and wetlands that are important for potential carbon sequestration and for preserving carbon that is now sequestered in soils and vegetation (U.S. Department of Energy 1999). The refuge complex has 100,000 acres of protected fee-title lands. These lands do not include the Sangre de Cristo Conservation Area or the proposed San Luis Valley Conservation Area. Over the long term, our habitat management actions under any alternative would continue to protect the vegetation found within the refuge complex. We would also work with the State and others to manage water sustainably.

Our current estimated visitation is between 15,000–20,000 visitor use days per year, but estimates of visitors per vehicles or any potential increased carbon emissions from carrying out the alternatives is unknown. However, many visitors participate in activities such as hunting, birding, and other wildlife-dependent activities that do not depend

on vehicles; during the Monte Vista Crane Festival, buses are used for tours. In a winter-spring survey of visitors to the Monte Vista Refuge, USGS (2011b) found that 91 percent of visitors who travelled to the refuge were in a private vehicle, as part of a group on their visit to the Monte Vista Refuge. About 35 percent of visitors surveyed lived in the local area (within 50 miles of the refuge) and about 90 percent travelled to the refuge from within the State of Colorado. We don't know how many visitors would travel to the refuges as part of their overall visit to the San Luis Valley.

In large part because the Baca Refuge would be opened to public use, alternatives B and D would result in more visitors and more vehicles driving on refuge roads over the long term. For the Monte Vista and Alamosa Refuges, we estimate that visitor use days would increase by 10–15 percent under alternative B and by 25 percent or more under alternative D. Alternative C would be similar to alternative A, but it could result in fewer visitors coming to the Monte Vista Refuge because changes in our water and habitat management could affect wildlife viewing opportunities. Opening the Baca Refuge under alternatives B and D would result in an estimated 1,000–3,000 visitors coming to the refuge. As better facilities and structures were added, we would expect to see visitation increase gradually to 10,000–15,000 visitors per year to the Baca Refuge. In comparison, the nearby Great Sand Dunes National Park and Preserve reports an average of 276,375 recreational visits annually (NPS 2012a).

Under all alternatives, we would seek ways to reduce our energy consumption and carbon footprint. These include building energy-efficient offices and a visitor contact station at the Monte Vista Refuge, driving more fuel-efficient and cleaner vehicles, and promoting activities such as walking and biking.

Implementation of all alternatives would result in negligible effects on climate change.

Effects on Air Quality

In this section, we describe the potential effects on air quality of several sources of emissions, including increased use of motorized vehicles and equipment as well as the use of prescribed fire.

All Alternatives

Implementation of all alternatives would result in varying levels of motorized equipment use for activities such as construction of public use facilities, habitat restoration, and ongoing refuge management. Under every alternative, these activities would result

in negligible short-term increases in dust, carbon monoxide, and hydrocarbons. (Refer to table 9 in chapter 4, section 4.2.) Negative effects could be mitigated by applying best management practices to reduce dust emissions.

Prescribed fire would be used under all alternatives. All prescribed fires follow specific burn plans that are carried out under an approved interagency fire management plan (NPS, FWS, TNC 2006) and comply with all regulations and guidelines established by the Colorado Department of Public Health and Environment (Air Pollution and Control Division). Prescribed fires and wildfires can increase dust and ash after a fire. Strong winds blow dust and ash, usually within a short period of time following a wildland fire, but blown dust and ash can go on longer during drought conditions where vegetation takes longer to recover. Under alternative A, on average, we would continue to conduct 2–3 prescribed fires annually, averaging <600 acres each. Under the action alternatives, this would not be expected to change significantly; therefore, regardless of the alternative selected, increases in carbon emissions from prescribed fire would be negligible.

Under all alternatives, the Class II air quality of the refuges would remain protected. None of the alternatives would negatively affect nearby Class I areas.

Effects of Motorized Equipment and Vehicles

Some effects are common to all alternatives and some are specific to particular alternatives.

All Alternatives

For all the refuges, emissions, including dust, carbon monoxide, and hydrocarbons, would occur to varying degrees under all the alternatives. Since nearly all the roads within the refuge complex are gravel or dirt, road travel would generate and disperse dust particulates in levels that would vary depending on soil moisture content, particle size, traffic speed, time of year, and traffic volume (Havlick 2002). Dry or windy periods may exacerbate dust. Road access would be limited during some periods of the year when weather conditions preclude use. Travel would be nearly nonexistent at night except for on county roads that border one of the refuges.

ALTERNATIVE A

Under this alternative, there would be no new roads or trails open for public access on any of the refuges, and the roads that are available for public

access or viewing opportunities would remain the same. (Refer to table 21 under the Visitor Services section below and figures 13, 14, and 15). Most of the trails on the Monte Vista and Alamosa Refuges would be open only during the waterfowl and small game hunting seasons. Baca Refuge would only be open for limited guided tours. The 2.5-mile auto tour route on the Monte Vista Refuge and the 3.2-mile auto tour loop on the Alamosa Refuge would remain open year round for all visitors. Visitation would not be expected to change, nor would there be increased activities related to other refuge operations. (Refer to table 14, chapter 4.) Emission levels would not change to any degree, and emissions levels from all sources would have hunting negligible effect on air quality.

ALTERNATIVE B

For the Monte Vista and Alamosa Refuges, a primary change from alternative A is that most of the existing trails or roads that are open only to hunters during the hunting season would be available for wildlife viewing from mid-July to the end of February for walking and limited biking, which would increase visitor use on the refuges. Since the existing auto tour route would be connected to the Bluff road, there would be a little more than 2 more miles of auto tour route on the Alamosa Refuge. This would reduce the number of miles that visitors would need to travel to access Bluff Overlook.

When the Baca Refuge is fully opened to public use, there would be about 14 miles of year-round auto tour route plus a seasonal option of about 6 miles. These roads would be gravel, and access would be seasonal. Visitation would be expected to increase slowly over the long term.

Building a new visitor center and refuge headquarters at the Monte Vista or Alamosa Refuge would increase the Service's visibility and draw more visitors to the refuge, particularly during the spring and fall crane migration.

Across the refuge complex, visitor use days would be expected to increase over the long term by a moderate amount (15–25 percent) on the Alamosa and Monte Vista Refuges. More than 15,000 visitors a year would be expected to visit the Baca Refuge, which is now closed to public use. Many visitors would use the refuges for walking, biking, hiking, or hunting, in addition to driving the auto tour routes. The speed limits along the auto tour routes would remain low (less than 30 miles per hour), and visitation would be seasonal. There would continue to be restrictions in place during the nesting season (spring to early summer), which may limit access to the refuges during these periods. Emissions levels from all sources would result in negligible effects on air quality.

Other refuge activity, such as habitat restoration and construction of a new visitor center, could increase emissions over the long term. Most of the increased emissions would occur for short periods of time (from a few hours to a few weeks), but may last as long as several months when the new visitor center is built.

Overall, the long-term impact on regional air quality would be negligible.

ALTERNATIVE C

There would be a few more miles of roads available for public access on the three refuges. Visitation to the Monte Vista and Alamosa Refuges might be similar to what would take place under alternative A. If wildlife viewing opportunities decreased, however, visitation could be lower than under alternative A. Similar to alternative B, all visitors would be able to access trails for walking and limited biking on the Monte Vista and Alamosa Refuges from mid-July to the end of February. The Baca Refuge would be opened primarily for hunting access.

Habitat management operations would increase as infrastructure is modified to restore natural water flow patterns on the refuges. Some of these activities would result in longer periods of time when motorized equipment is used.

Overall, the long-term impact on regional air quality would be negligible.

ALTERNATIVE D

The addition of several seasonal auto tour routes would expand vehicle access by 4 miles on the Monte Vista Refuge, 3.6 miles on the Alamosa Refuge, and 28 miles on the Baca Refuge. These seasonal roads would likely be dirt or gravel with limited access during winter months or other periods of inclement weather. Visitation to the Baca Refuge would be expected to grow slowly and would be dictated largely by increases in money for staff and road improvements as well as outreach efforts. In the long term, we would expect visitation to grow by 25–40 percent (4,000–6,000) for the Monte Vista and Alamosa Refuges and we would expect 15,000 or more visitors per year for the Baca Refuge. We expect the number of vehicles to be far less, and we would expect that many visitors would be participating in activities such as walking, biking, hunting, and fishing rather than driving around. Speed limits on refuge roads would remain low, which would reduce emissions. As described above, many of the visitors to the refuges are local or from within the State. Emissions levels would be negligible in the short term and minor to moderate in the long term, depending on the actual increases in visitor use, location, and timing of use.

Under this alternative, equipment use for other refuge operations would be similar to alternative A for the Monte Vista and Alamosa Refuges, although there would be increased use of equipment for improving roads for public use and the building of the visitor center at the Monte Vista or Alamosa Refuge. These would result in short-term increases in emissions. The Baca Refuge would have substantial increases in the use of motorized equipment to construct and finish roads, kiosks, picnic areas, displays, wildlife observation areas, parking lots, and overall improvements related to a considerable increase in public use of the refuge.

Overall, the long-term impact on regional air quality would be negligible.

Conclusion

As compared to alternative A, the implementation of alternative D would result in the greatest increase in all emissions because of more visitors and their vehicles. Alternative C would be similar to alternative A but would result in more equipment used for altering infrastructure. In the short term (the first 5 years), the implementation of any of the alternatives would result in negligible increases in all emissions because it would take time to get more money to improve existing roads for visitor travel and increase staff levels. The opening of the Baca Refuge to the public would be a slow process. Regionally, over the long term (15 years or more), emissions, though increased, would still remain low regardless of the alternative chosen. Over the long term, the opening of the Baca Refuge to public use would be expected to result in localized, short-term, and temporary increases of dust, particularly if alternative D were implemented.

Implementation of any of the alternatives would result in negligible changes to air quality in the region.

Effects on Soils

In this section, we discuss the effects on soils of our habitat management and visitor services activities.

Restoration Activities and Infrastructure Management

This section describes the effects of our restoration activities on soils.

All Alternatives

Routine management activities that result in soil disturbance would occur on all refuges. This includes activities such as disking; tilling; cleaning ditches; and removing, adding, or modifying levees and water control structures. On all refuges, there would be habitat restoration projects that would require the use of heavy equipment. On the Monte Vista Refuge, the planting of crops under a cooperative farming program would continue under alternatives A and B and increase under alternative D. Under all alternatives, including alternative A, these activities would result in short-term minor disturbances of soil. These activities could result in localized, short-term erosion, soil loss, and even the release of soil particles (dust) into the air. Once a project has been completed and vegetation restored, soil protection and productivity would be preserved in the long term.

On the Monte Vista Refuge, over the long term, the soil chemistry would likely change in areas that are converted from wetland to upland. Negligible changes in soil chemistry would occur under alternatives A and D, with minor changes under alternative B and minor to moderate changes under alternative C.

ALTERNATIVES A (NO-ACTION) AND D

Under alternative A, there would be few changes to the current management of wetlands and upland areas. Although there would be localized restoration or infrastructure activities across the refuge complex, these would be small projects. Under alternative A, where money allows, we would restore sections of the riparian corridors on the Alamosa and Baca Refuges in part by fencing off riparian areas from ungulates and implementing actions to reduce erosion. We would expect there to be negligible changes to soil resources under alternatives A and D as we would be managing much as we have in the past.

ALTERNATIVES B AND C

Under alternative B and to a much greater extent under alternative C, we would begin restoration of historical water flow patterns through some areas on the Monte Vista and Alamosa Refuges. We would hold water longer in some areas or move water to more closely mimic historical water patterns, including natural overbank flood events. This would be far more pronounced under alternative C, under which we would begin to restrict water application to natural water flowpaths and depressions associated with Spring Creek, Rock Creek, and Cat Creek on the Monte Vista Refuge. This could involve removing or modifying levees and water control structures to facilitate movement of water into deeper channels

and other areas that traditionally held water. We could remove the ring dikes and ponds, levees, ditches, or even roads that are impounding water. Restoration activities could involve bringing in heavy equipment to remove levees, ditches, and ponds. Restoration might be as simple as removing boards on a water control structure or taking a culvert out and putting in a low water crossing. Evaluation of specific ditch and levee modifications would require detailed hydrological and topographical analyses and possible engineering (Heitmeyer 2013a,c). Activities could require permits or further environmental analysis under NEPA. These details would be filled in under a specific stepdown plan. Impacts to soil resources would be negligible to minor and generally short term under alternative B and would be minor to major and short term under alternative C.

Similarly, under alternative B, the restoration of former agricultural fields on the Monte Vista Refuge (100 acres) and Alamosa Refuge (50 acres) could result in localized, short-term, negligible erosion during restoration activities. Planting native grasses or shrub species would reduce potential erosion and provide positive benefits for grassland birds. Under alternative C, on the Monte Vista Refuge, we would begin restoration on a minimum of 1,000 acres of formerly converted wetlands and 450 acres of retired farmland and areas where grain is produced for sandhill cranes. Although the amount of soil disturbance would be considerably more than under alter-

native B, as described above, the disturbance would be short term and negligible in the long term. Because restoration would follow a phased approach, it would reduce the amount of soil disturbance at any given time.

On the Baca Refuge, under alternatives B–D, we would restore about 21 miles of riparian habitat on four creeks using a variety of tools such as fencing, active planting, and heavy equipment. Water control structures would be maintained, modified, and replaced under all alternatives. In the long term, our management actions would be largely beneficial for soil resources as soil erosion, sediment transport, and further channel incising would be reduced. Some restoration activities along the riparian corridors could require the need for heavy equipment, which would result in short-term disturbances to soils.

Mowing, Haying, and Livestock Grazing

Under all alternatives, we would use mowing, haying, and livestock grazing to mimic natural herbivory, which would improve most of the habitats on the refuge complex. With defined habitat objectives, these activities can stimulate new plant growth, reduce the amount of residual vegetation, and increase the vigor of plant communities.

Because livestock tend to use the same trails to access water or graze in riparian areas, there could be localized soil compaction, short-term losses of veg-



Prescribed haying is one habitat management tool used on Baca Refuge. We also use other tools such as prescribed grazing and fire to meet specific management objectives.

etation, soil erosion, and increased sedimentation. In general, we use livestock for several weeks in a specific area before they are moved, but in some locations, it could be longer. Livestock would be kept out of riparian areas unless there is a specific reason to use them to reduce invasive weeds. We only use grazing where it is needed. For example, a unit might be grazed once every few years and then rested. Once vegetation starts to get thick and matted, it would be grazed or burned again.

Prescribed Fire

When used as a habitat restoration tool, prescribed fire would temporarily reduce vegetation in a treatment area. Generally, the use of prescribed fire would quickly stimulate new plant growth and increase the vigor of existing plant communities. There is the potential to cause short-term soil erosion as a result of water erosion from heavy rains or wind erosion; however, there are few steep slopes on the refuges. Many of the habitats on the refuges have sandy soils which have high infiltration rates.

Under all alternatives the impacts of prescribed fire on soils would be localized and negligible to minor.

Visitor Services Facilities

The effects of our visitor services facilities, including buildings, roads, and other structures, on soil are described.

ALTERNATIVE A

Under alternative A, we would keep our existing facilities and few new facilities would be built, resulting in negligible impacts on soils.

ALTERNATIVE B

Under alternative B, a new visitor center and refuge operation office with an area of less than 5 acres including parking would be built at the Monte Vista or Alamosa Refuge within the general footprint of the existing refuge buildings. Topsoil would be removed during construction of the new building and parking area. The auto tour route on the Alamosa Refuge would be expanded to the east, which would result in a widening of the existing Service two-track road (one lane) to a 1 ½ or even 2-lane gravel road along 3–4 miles. The development of these facilities would result in minor to moderate short-term soil disturbance and potential erosion along the footprint of the building site or road. This could be reduced through best management practices. New construction would mostly follow the footprint of the existing building or two-track roads, but in some locations, it may be necessary to reroute a road or trail to avoid

impacts to wildlife or wetlands or to improve wildlife viewing. On both the Monte Vista and Alamosa Refuges, 3–5 viewing blinds or platforms would be built but their footprints would be small (with a total area of <1–2 acres for all including parking). The existing nature trail (interpretive trail) on the Monte Vista Refuge would be lengthened by about 1 mile and made accessible along the entire route (<1 acre soil disturbance). On the Alamosa Refuge, there would be about 2–3 miles of new nature trails provided along an existing two-track Service road, which would result in negligible new soil disturbance except as needed for signs or other interpretive exhibits. The opening of existing trails on both the Monte Vista and Alamosa Refuges for hikers and nature enthusiasts would result in negligible soil disturbance.

On the Baca Refuge, we would build about 10 miles of trails (about 7 miles of nature trails) some of which would occur on an existing road or other existing disturbance. About 22–25 miles of existing two-track roads would be improved for the auto tour route and public access. Existing two-track roads could be widened to 1½ or two lanes with shoulders.

Across the refuge complex, in the short-term, road and visitor services improvements would result in minor to moderate negative impacts to soils. In the long-term, the impacts would be negligible to minor. Negative impacts to soils could be reduced by following best management practices, such as controlling erosion, minimizing grading, and installing necessary culverts.

ALTERNATIVE C

Alternative C would be similar to alternative A in terms of impacts to soils as there would be few improvements made and therefore little soil disturbance. There would be some additional access for hunters on the Baca Refuge that could require improvements to existing roads. A tour route would not be built.

ALTERNATIVE D

Alternative D would have the most added infrastructure, and therefore it would result in the most disturbance to soils from the construction of visitor service facilities. Similar to the impacts described under alternative B, the development of new facilities would require soil excavation, grading, and other surface disturbances, including the removal of topsoil for building the new visitor center. Temporary increases in soil erosion would occur during construction of new facilities, resulting in direct, short-term effects on soils. Although long-term losses in soil productivity would occur in some areas, overall the impact would be negligible across the refuge complex.

Long-term soil disturbances and erosion would be reduced by following best management practices during construction and properly maintaining roads. Besides the impacts identified under alternative B, 4 more miles of seasonal auto tour route on the Monte Vista Refuge would be available within the footprint of existing Service roads. Under this alternative, there would be nearly 3.5 miles of nature trails built on the Monte Vista Refuge as compared to 2 miles under alternative B and 0.25 mile under alternative A. On the Alamosa Refuge, the nature trail identified under alternative B south of the Bluff Overlook would also become a seasonal auto tour route. On the Alamosa Refuge, several locations would allow fishing access, which could lead to social trails (trails that develop through continual use) and soil disturbance near the river.

On the Baca Refuge, nearly 48 miles of roads could be available for public access. Most of these roads would be open seasonally and would not be wider than 1½ lanes. As under alternative B, road and trail improvements would generally follow existing two-track roads, which would limit soil disturbance, but in some areas, roads would need to be rerouted.

Overall, across the refuge complex, there would be moderate short-term impacts to soil resources that would diminish in the long-term to negligible to minor impacts from visitor services.

Management of Cultural Resources

Wherever possible, adverse impacts to significant cultural resources would be avoided, but in some instances, soils could be disturbed if excavation of cultural resources or removal of historic structures was deemed necessary. Negative impacts would be localized, short term, and negligible as a result of vegetation and soil disturbance. If necessary, active soil control measures would be used under all to protect important structures. Alternative C would result in the most number of structures being removed on the Baca Refuge.

Conclusion

Implementation of any of the alternatives would result in some negative impacts to soil resources. Generally, these would result in short-term, localized, and negligible or minor impacts, such as soil disturbance and transport, compaction, and erosion as a result of habitat management, infrastructure modification, prescribed fire, public use activities and facilities, archaeological surveys, or structure removal. Soil disturbance would be offset by the long-term benefits to habitat or species diversity and improvements to public access. Indirect long-term

changes to soil chemistry would occur on parts of the Monte Vista and Alamosa Refuges that transition from being a wetland to upland as efforts are made to mimic natural water flow. Changes in soil chemistry could be viewed as negative or beneficial, depending on the outcome for wildlife diversity, reduction in invasive species, or more efficiency in water management. Although detailed plans would require further analysis, we would expect the greatest change to soils would occur under alternative C and to a lesser extent under alternative B. Alternatives A and D would result in the smallest changes in soil chemistry, as we would manage wetland areas to the extent that we have in the past; even under these alternatives, however, less water availability in the future would result in changes to soil chemistry.

There would be long-term losses in soil productivity from the development of public use facilities under alternatives B, C, and D as compared to the no-action alternative, but overall these would be negligible to minor because most facility development would occur within existing disturbed areas and could be reduced by following the best management practices. The greatest effects on soils would occur under alternative D, followed by B and then C.

Mitigation for Impacts to Soils

Losses in vegetation and subsequent soil disturbance could be reduced by ensuring that the best management practices were followed during construction activities, restoring flowpaths, excavation of cultural resources, and the development of visitor services structures or facilities. Mitigation could involve not disturbing soils during dry or windy periods, using erosion controls, properly maintaining roads and culverts, keeping livestock out of riparian areas, and using the minimal tools necessary to accomplish the objective.

Effects on Water Resources

Effects on water resources were evaluated based on existing information about water availability and quality in the refuge complex as well as any potential for refuge activities to negatively affect water resources on or off the refuge complex.

Water Quantity and Quality

Under all alternatives, we would keep our water rights and maximize ground and surface water for the primary purposes for which the refuges were established. Under every alternative, we would comply with new State water regulations for water aug-

mentation. Given financial constraints and predictions for drought and climate change, it is unlikely that we could pump water to all the existing wetlands as has been done in the past. Under alternatives B–D, the development of a water quality monitoring program for identifying contaminants would help address water quality issues.

Inventorying all wetlands would help us to identify the most productive wetlands and use our water resources in these areas. Exploring the legal and practical feasibility of using Closed Basin Project mitigation water in different proportions and locations on the refuges would also help us to manage our resources effectively. Modifying existing infrastructure would enable us to direct water more efficiently by re-establishing natural flow patterns and using our limited water resources for key wetland areas. By installing ground water measurement devices to monitor ground water levels and by monitoring water quality, these actions would provide moderate benefits in managing water resources on the refuges.

Habitat Management

On the Baca Refuge, successful restoration of our riparian habitat under alternatives B, C, and D would result in a long-term improvement in the natural hydrology of the creeks that flow within the refuge. This would be accomplished by directly managing erosion and sediment and by stopping further channel incising.

On the Alamosa Refuge, none of our activities would significantly change the hydrology of the Rio Grande. We could make limited improvements in some off-channel areas where water management could provide for increased ground water, which in turn would help willow and cottonwood habitat. On the Alamosa Refuge, our restoration strategies under alternatives B and C are expected to mimic natural hydrologic conditions within the refuge, which would enhance the survival and health of willows, cottonwoods, and other riparian vegetation. We would expect to see the biggest beneficial impacts under alternative C and to a lesser extent under alternative B, because modifying or installing new water management infrastructure and managing grazing by all ungulates would improve the hydrology.

Under every alternative, we would continue to irrigate the wet meadows on the Baca Refuge, although the amount could vary depending on where we need water the most, the amount of water available from year to year, and the requirements of Closed Basin Project. We would also use flood irrigation on the Monte Vista and Alamosa Refuges.

Under alternative B and to a greater extent under alternative C, we would try to restore natural flow patterns, which would enable us to use our finite water resources more efficiently for wildlife. Some existing wetlands would receive less water and would transition to native grasslands.

Public Use Activities

Public use has the potential to degrade water quality, and increased use would mean more potential for trash or other wastes to be washed into streams.

Under alternative A, most of the Monte Vista and Alamosa Refuges would remain off limits to most visitors except during various hunting seasons. Under alternatives A and C, the number of visitor use days is unlikely to significantly increase either in the short term or long term. Impacts to existing water resources from trash, dog feces, or even human waste would be negligible and would be contained to existing parking areas, trails, or overlooks.

Under alternatives B, C, and D, access opportunities would increase, which could result in effects on water resources. The potential for negative impacts to water resources is greatest under alternative D, followed by B and then C. For the most part, most negative impacts would be limited to localized areas along trails, roads, or parking areas. Under alternative D, fishing access would be allowed in some locations along the Rio Grande; besides moderate increases in public use, this would result in more negative impacts to water resources from trash, bait, fishing lines, and social trails. Many of these impacts could be reduced through the use of viewing blinds or platforms, hardened trails, outreach and education, and increased law enforcement.

Overall impacts to water quality would be negligible under alternatives A and C; negligible to minor under alternative B; and minor to moderate under alternative D.

Effects on Visual Resources and Night Skies

Effects on visual resources are often qualitative, depending on the individual, location, and time of year. Visual impacts may include both distant and close views. In this section, we discuss the potential impacts of our habitat management practices, refuge operations, and visitor services.

All Alternatives

Under alternative A, there would be few noticeable changes to the visual resources or night skies of the refuge complex. For some visitors, invasive species would negatively affect the views from along nearby roads, auto tour routes, and viewing areas such as Bluff Overlook. The riparian corridors would continue to be heavily browsed or affected by invasive species. With existing staff and funding levels, it would be difficult to fully restore the riparian corridors in the Alamosa and Baca Refuges. Most stream corridors would remain heavily browsed with unsightly streambanks that are largely entrenched and denuded of vegetation.

Under alternatives B through D, our efforts to restore of 21 miles of riparian areas within four creek drainages on the Baca Refuge would have minor to moderate benefits on visual resources, both within the refuge complex and from nearby roadsides and viewing areas. Where hydrology allows, we would restore corridors with stands of willow and cottonwood to achieve a wider canopy along the corridor. Not only would successful restoration of the riparian corridors improve bird diversity and abundance resulting in more wildlife to view, but a lush and healthy riparian area would be pleasant to look at.

During prescribed burns, there would be short-term, localized negative effects on visual resources, largely from smoke. Blackened vegetation would be visible in localized areas immediately after a fire. Depending on the time of year and moisture levels, many areas would green up within several weeks, but some shrubland areas could take longer to recover. Under all alternatives, any negative effects on viewsheds from our use of fire would be negligible in the short term. In the long term, the prescribed fire program would increase plant and wildlife diversity and improve scenic values and wildlife viewing.

The visual impact from livestock grazing would be similar under all alternatives. There would be short-term negative effects on visual and scenic resources when viewed up close because of manure and trampling of vegetation. The structures used to help move cattle from on and off the Baca Refuge would remain, but these are generally not obtrusive and would have a negligible impact on aesthetics overall.

Under all alternatives, the overall scenic values of the refuges would be largely preserved. In localized areas, new facilities constructed under alternatives B and D could interrupt landscape vistas, but given the small footprints of these proposed facilities, these would have negligible to minor impacts on views or scenic qualities. Under all alternatives, the small clusters of Service buildings at the Monte Vista, Alamosa, and Baca Refuges would continue to exist. For

the most part, any new facilities or improvements constructed under alternatives B and D would take place along existing roads or parking areas. Any new buildings such as the visitor center would occur within the existing building footprint and would be at a similar height as existing structures. There would also be more vehicles visible on the refuge complex from some vantage points. There could be limited short-term negative effects from construction of new trails, viewing blinds, kiosks, and parking areas that would cease after construction. Most of the hundreds of miles of two-track roads would remain for refuge operations and monitoring of the Closed Basin Project on the Alamosa and Baca Refuges. Infrastructure related to wells and irrigation would remain.

The auto tour route is not expected to be open at night, which would preserve the dark night skies. Design features such as unobtrusive placement of exterior lighting could further limit visual impacts.

Overall, in the long-term, implementation of any of the alternatives would result in negligible impacts to the visual resources of the refuge complex.

Mitigation For Visual Resources

All new facilities, including buildings, roads, and trails, should be designed to limit their visual impact on the landscape. New facilities built on the Baca Refuge should reduce light pollution through the use of motion-activated lighting or should be shielded away from the Baca Grande subdivision, in keeping with the subdivision's policies for lighting. Any new use of alternative energy structures (windmills or solar panels) would be carefully sited to limit any visual impacts.

Effects on Soundscapes

Like visual resources, noise effects on the natural acoustic environment are often qualitative in nature. Refuge operations, including visitor services and refuge machinery, are considered as noise sources in this section.

All Alternatives

Overall, the implementation of any of the alternatives would have negligible impacts to natural sounds. Opening the Baca Refuge to public use under alternatives B and D would result in more traffic on refuge roads, but decibel levels would be expected to remain within the 15–45 dBA range, which is typical for rural areas. (Refer to table 10 and 11, chapter 4.) The auto tour route would be a considerable distance away from the Baca Grande subdivision, Great Sand

Dunes National Park and Preserve, and nearby designated wilderness areas or wilderness study areas. Under all the action alternatives, there would be increased use of motorized equipment for refuge operations such as infrastructure modification or maintenance, building a visitor center under alternatives B and D, and bison management operations under alternative D. Any increased use of motorized equipment that would exceed 65–75 threshold for vibration velocity levels (VdB) would be short term (a few hours or weeks), except for the building of the visitor center, which would likely take several months to complete. No construction activity would take place at night.

During hunting season, occasional sounds of gunfire would be heard under alternatives B, C, and D on the Baca Refuge. Other than the dispersal hunts on former State lands, hunting would not occur on the Baca Refuge under alternative A. Gunfire would be infrequent and limited to daytime hours during open hunting seasons. The distance that it could be heard would vary, depending on terrain, weather, and other factors. Because of the short-term duration and infrequency of events per day, occasional gunfire would not be expected to negatively affect any residents in Crestone or the Baca Grande subdivision.

Cumulative Impacts on the Physical Environment

None of the proposed alternatives would result in cumulative effects on air quality; visual resources and night skies; soundscapes; geology; minerals; or soils when combined with the activities described under chapter 3, Foreseeable Activities.

The long-term benefits of the Service's efforts to reduce energy consumption and to protect vegetated habitat and wetlands would result in cumulative benefits when combined with programs and initiatives by the Service and the Department of the Interior to reduce the carbon emissions from and mitigate the effects of climate change on refuges. The overall cumulative benefit, however, would be negligible.

In all action alternatives, the Service will monitor water quality and manage water resources to improve the effectiveness of water use on the refuges. These beneficial effects of refuge management, when combined with external programs and efforts in the valley, would result in cumulative benefits to water resources.

5.5 Effects on the Biological Environment

This section describes the potential effects of the alternatives on biological resources. The main resource topics are riparian habitat; wetland habitat; playa habitat; upland habitat; threatened, endangered, and sensitive species; bird species; and other wildlife. The analysis considers both the effects of management intended to enhance biological resources and the effects of other refuge management actions such as visitor services on those biological resources.

Riparian Habitat

The effects on riparian habitat are discussed in this section.

Effects of Riparian Habitat Management

This section discusses the effects of our habitat objectives and strategies for each alternative.

ALTERNATIVE A

This alternative would continue the current management direction, which includes managing refuge lands to provide habitat for riparian species and addressing habitat degradation issues associated with overbrowsing by elk on the Baca Refuge. These efforts would result in a negligible long-term benefit to riparian habitat on the refuges.

ALTERNATIVES B, C, AND D

We would use a variety of management strategies to maintain and enhance at least 50 acres of riparian vegetation on the Alamosa Refuge and establish at least 50 more acres of habitat in off-channel areas. These established areas would ideally consist of tall, dense, and structurally diverse woody vegetation and would improve the quality of riparian habitat for a variety of wildlife species. These actions would also help stabilize river banks, improve sediment deposition and point bar formation, and encourage cottonwood seed germination. By planting willows and cottonwoods in suitable off-channel locations where we have the available water and infrastructure, we could control hydrologic inputs to promote the establishment and survival of new woody plants. These actions would provide a foundation for the maintenance and improvement of habitat over the long term, resulting in moderate long-term benefits to riparian habitat on the Alamosa Refuge.

Restoring woody riparian habitat could result in localized effects in other areas where water availability would be reduced. Disturbance caused by activities such as planting, fencing, prescribed fire, and mowing, which may be necessary to enhance riparian habitat, could also result in localized, short-term effects. These effects, however, would be negligible when compared to the overall scale of riparian habitat on the refuge and would be offset by the long-term benefits of the enhancements. The application of water to newly restored riparian habitat would likely reduce water availability in other areas, which could have adverse effects on short- or tall-emergent habitat in those areas. These effects are discussed below under Wetland Habitat.

On the Baca Refuge, vegetation enhancement, water manipulation, and elk management would be used to restore and preserve tall, dense, and structurally diverse riparian habitat. These efforts would result in a minor long-term benefit to riparian habitat on the Baca Refuge. We would continue to install ungulate-exclusion fencing as resources allowed. This would improve wildlife habitat; increase the abundance of invertebrates; provide more migration, foraging, and nesting habitat for songbirds; and improve overall habitat for small mammals, reptiles, and amphibians. These habitat enhancement efforts would also improve the overall stream function by encouraging cottonwoods and willows to stabilize stream banks while allowing lateral stream movement, sediment transport, and sediment deposition. Over time, these improvements to the overall structure of the stream and its associated riparian vegetation would be expected to enhance instream habitat, raise the water table, facilitate vegetation establishment, and promote the long-term quality and function of riparian habitat.

The use of management tools such as mowing, hydroaxing, and prescribed fire in riparian areas would result in substantial effects on some areas, because existing vegetation would be modified or destroyed. These short-term, moderate effects would be limited to localized treatment areas and would be offset by the long-term benefits described above. Overall, these alternatives would have moderate long-term benefits on riparian habitat on the Baca Refuge.

Effects of Visitor Use Management on Riparian Habitat

This section describes the effect on riparian habitat of visitors and the facilities to support them.

ALTERNATIVE A

Under this alternative, we would keep our current visitor use programs and facilities. No new trails, roads, or facilities would be constructed in or near riparian habitat, and human disturbance would remain similar to current levels. Overall, visitor use management under alternative A would result in negligible long-term effects.

ALTERNATIVE B

Under this alternative, we would facilitate visitor access to the Alamosa Refuge by expanding the current auto tour route east to connect with the Bluff road (county road S116); lengthening the Bluff nature trail; creating a trail link to the refuge from Alamosa (nature trail); establishing several new shelters and interpretive sites; and expanding access to existing trails. During waterfowl season, public access would not be restricted to trails and roads. On the Monte Vista Refuge, new interpretive sites would be established, seasonal access to existing trails would be expanded, and a new nature trail would be added. On the Baca Refuge, auto tour routes and interpretive facilities would be established and new trails would be added near Cottonwood Creek and the new headquarters and visitor center. Total visitation to the refuges is expected to increase by 15 to 25 percent.

New visitor access and facilities could negatively affect nearby riparian habitat. Besides the vegetation removal and soil compaction associated with the construction activity, new trails within or through riparian habitat can also fragment habitat, create edges, and disturb wildlife. Habitat fragmentation results from a new trail, road, or facility dissecting a large patch of riparian vegetation. The creation of smaller patches reduces the availability of interior habitat and increases edge effects. Many species, particularly songbirds, rely on interior habitat for nesting and are more vulnerable to increased predation near habitat edges. The presence of visitors on trails can have negative effects on nearby wildlife, including increasing stress and energy expenditure as well as reducing foraging, food delivery to offspring, and reproductive activity. While wildlife sensitivities to disturbance vary by location, terrain, species, and individual animals, these effects are generally known to occur near (50 to 100 meters) trails and facility areas, and can result in abandonment of habitat areas by affected animals (Miller and Hobbs 2000, Miller et al. 1998).

These types of effects could occur with the expansion of the Bluff nature trail on the Alamosa Refuge and near the multiple creek crossings associated with trails and roads on the Baca Refuge. Because there is no riparian habitat on the Monte Vista Refuge, there will be no disturbance to riparian habitat from visi-

tors. The effects of trail and facility development on riparian habitat and wildlife can be reduced by carefully routing trails to minimize crossings and fragmentation, and by incorporating buffers around high quality habitat areas. Also, increased education efforts will encourage visitors to remain on established trails.

Overall, the increased visitor use and facilities would have minor, long-term effects on riparian habitat. Any negative effects would be greater in the immediate vicinity of the visitor facilities, but those areas would be a small percent of the riparian habitat available on the refuges and any effects could be reduced by some of the siting and management measures mentioned above.

ALTERNATIVE C

Under this alternative, we would keep our existing programs and facilities on the Alamosa and Monte Vista Refuges. Visitor use facilities and access would be similar to the no-action alternative, except for the introduction of limited access to the Baca Refuge. The Baca Refuge would also be opened to limited guided access and hunting. Overall, visitor use objectives under alternative C are expected to have a negligible to minor long-term effect on riparian habitat.

ALTERNATIVE D

Under this alternative, we would emphasize visitor use by expanding trails, auto tour routes, interpretive sites, and programs on all three refuges. More hunting opportunities would be provided as well. Total visitation to the refuges is expected to increase by 25 to 40 percent.

Under this alternative, effects on riparian habitat would be similar to those described for alternative B, but at a greater magnitude. New visitor access and facilities could negatively affect riparian habitat in areas where they intersect or are near riparian habitat, resulting in localized habitat degradation and fragmentation of larger habitat units. Likewise, the increased presence of visitors on the refuges (both on and off developed trails and facilities) would increase the level of disturbance. As mentioned earlier, these effects are generally known to occur near (50 to 100 meters) trails and facilities, and can result in abandonment of habitat areas by affected animals.

Overall, the increased visitor use and facilities would have minor to moderate long-term effects on riparian habitat. While the adverse effects may be greater within the immediate vicinity of the visitor facilities, those areas would be a small portion of the riparian habitat available on the refuges, and can be further reduced by some of the siting and management measures mentioned above.

Wetland Habitat

The effects of our management actions on wetland habitat are discussed in this section.

Effects of Wetland Habitat Management

This section describes the potential effects of our habitat management actions on short- and tall-emergent wetland communities.



FWS

Water management would have varying effects on some wetland areas in the future on Monte Vista and Alamosa Refuges.

ALTERNATIVE A

Under this alternative, we would continue to sustain short- and tall-emergent wetland communities on the refuges and manage water levels to provide habitat for waterfowl, sandhill cranes, shorebirds, and other bird species. Wet meadow habitat on the Baca Refuge would continue to be managed to control noxious weeds and provide valuable habitat for native wildlife species, especially migratory birds. The continuation of current wetland management practices would maintain and potentially improve the integrity of wetland communities on the refuges, but these practices would not substantially expand the size, function, or diversity of these habitat areas. Overall, these ongoing management efforts on the refuges would have minor, long-term benefits to wetland communities.

ALTERNATIVES B AND D

Under alternative B, we would provide water to both created and natural wetlands on the Monte Vista and Alamosa Refuges during the spring migration, nesting, brood rearing, and fall migration periods. Although water management would attempt to follow natural hydrologic cycles, we would have the flexibility to apply water in times or locations that are not natural, such as during late summer and fall to support fall migration or waterfowl hunting. Some created wetlands would no longer be irrigated, and this water would instead be provided to natural flowpaths and riparian areas. A variety of management tools including prescribed fire, grazing, and haying would be used to manipulate vegetation to encourage more vigorous growth, to provide a specific vegetative structure for species such as shorebirds, or for invasive weed control.

These strategies are expected to help preserve the long-term function and productivity of wetland habitat and to promote wetland communities that are ecologically resilient to climatic and hydrologic changes. The more dynamic use of water and disturbance events such as prescribed fire, grazing, and haying is expected to create a diverse set of habitat conditions that will help wetland-dependent wildlife, especially waterfowl, wading birds, shorebirds, and songbirds.

Managing water and wetlands for particular species would result in a variety of benefits. Water inputs during spring migration would promote earlier vegetative growth; greater plant height, density, diversity, and vigor; improved aquatic invertebrate production; improved habitat for amphibians; enhanced breeding habitat for waterfowl and other wetland birds; and improved foraging, breeding, and roosting habitat for other wetland birds. Water application and vegetation manipulation during the nest-

ing season would improve nesting and foraging conditions for waterfowl, wading birds, shorebirds, and songbirds. Areas that are not flooded would provide nesting and foraging habitat for songbirds such as Savannah sparrow, vesper sparrow, and western meadowlark. In the late summer brood-rearing period, watering some areas would maintain aquatic invertebrates as an important food resource, while gradual drying of other areas would promote moist soil plants that are a food source in the fall. In the fall, the remaining wetlands would continue to provide water, food, and cover for migrating wetland birds, especially waterfowl and sandhill cranes. Keeping other areas dry would limit the proliferation of cattails into wetland areas.

Removing levees and allowing created wetland areas to revert back to native upland vegetation would result in fewer acres of wetland habitat and would reduce the wetland resources available for wildlife. The physical removal of levees would greatly affect the immediate project area by removing, trampling, or burying vegetation. Dewatering some created wetland areas would result in the loss of wetland habitat, resulting in a minor impact to affected areas. However, the overall effect of these actions would be minimal because the quality of habitat in the affected areas is generally poor, while the quality of habitat in the natural flowpaths and associated riparian communities would increase and compensate for the lost wetland habitat. These areas, over time, would revert back to upland habitat.

On the Baca Refuge, one of the creek systems would not be used to irrigate wet meadow habitat because the water would be kept instream and provided to playa habitat. While this would result in short-term effects on these wet meadow areas, the re-establishment of a natural hydrologic cycle could increase the vegetative diversity and improve overall wetland health and function in these wet meadows, which would result in a long-term benefit. In addition, the shallowly inundated portions of wet meadows would have a wider distribution in the upper portions of the meadows than the lower portions. This would have a moderate to major effect on the vegetation composition in the downstream sections of wet meadow that would no longer be flood irrigated. These downstream portions of wet meadow would convert from short-emergent to grassland.

Vegetation manipulation such as prescribed fire, grazing, or haying would have minor short-term effects on some wetland areas and the wildlife in those areas. However, after a full growing season, those areas are expected to recover and improve in habitat quality.

Overall, the wetland management strategies proposed under alternatives B and D would have moderate long-term benefits to wetland habitat.

ALTERNATIVE C

Wetland management objectives would be similar to those under alternatives B and D, except that we would provide water only to natural wetland areas and historic flowpaths and would do so during times and at depths that mimic the natural hydrology. All levees would be removed and artificial wetlands would be allowed to revert back to natural vegetation. The use of management tools such as prescribed fire, grazing, haying, and herbicide application would be used to improve vegetative health and habitat quality, but unlike alternatives B and D, these tools would be used to mimic historic disturbance regimes.

Changes to the application of water in terms of timing, depths, duration, and wet and dry cycles to mimic natural hydrologic patterns may change some wetland types that became established during earlier management strategies. For example, a short-emergent, season-long wetland could shift toward a short-duration ephemeral wetland that is dominated by saltgrass. These changes, however, would be expected to improve the health and sustainability of natural wetland areas and the wildlife habitat they provide.

Removing levees and allowing created wetland areas to revert back to native upland vegetation would result in substantially fewer acres of wetland habitat and would reduce the overall level of wetland resources available for wildlife. This would result in a minor, long-term effect because of the loss of certain habitat types. However, these effects may be offset by the creation of more habitat for upland wildlife species, the reduction in invasive weed infestations, and the greater availability of water to support and manage natural wetland areas.

On the Baca Refuge, changing to a more natural hydrologic condition that would keep more water in the creek channels would reduce the water availability for wet meadow habitat and reduce the overall extent of that habitat type.

Similar to alternatives B and D, the physical removal of levees associated with created wetlands will greatly affect the immediate area by removing, trampling, or burying vegetation. Likewise, the use of management tools such as prescribed fire and grazing would result in changes to the affected habitat areas. These effects would be sporadic, would be limited to the localized extent of the project area, and would dissipate over time, resulting in minor, short-term effects on wetland habitat.

Effects of Visitor Use Management

The effect of our visitor services activities on wetland habitat is discussed in this section.

ALTERNATIVE A

Under alternative A, we would keep our current programs and facilities for visitors, and no new trails, roads, or facilities would be constructed in or near wetlands. Human disturbance would remain similar to current levels over time. Overall, visitor use management under alternative A would have a negligible effect on wetland habitat.

ALTERNATIVE B

Under this alternative, visitor access and facilities would be expanded on all three refuges. New auto tour routes would be established on the Alamosa and Baca Refuges and new interpretive trails and facilities would be developed on all three refuges. During the waterfowl and limited small game hunting seasons, visitor access would not be restricted to trails and roads. Total visitation to the refuges is expected to increase by 15 to 25 percent. Limited fishing access would be allowed on the banks just below and above the Chicago dam.

As is the case with other habitat types, the construction of new facilities could degrade the habitat where the new facility is sited, while the increased presence of visitors can have negative effects on the function of the habitat and associated wildlife. In general, the increased disturbance to and flushing of wetland-dependent wildlife, especially birds, could result in reduced foraging, food delivery to young, and reproductive activity, and could ultimately result in the abandonment of affected habitat areas. Depending on the species, timing, and location, these effects from human disturbance could occur up to 50 to 100 meters from a trail or facility. Wetland areas that historically provided high-quality brood habitat for waterfowl would be less suitable if there was a trail nearby. For some species, the use of auto tour routes would have similar effects.

Hunting could also affect more than the specific animals that are taken. Because hunters typically travel off trail and into habitat areas, the wildlife in that area (both target and non-target species) are likely to be less habituated to the presence of humans, thus increasing their stress, flight response, and overall energy expenditure. However, these effects from hunting are tempered by the relatively small percent of hunters relative to the number of all visitors to the refuges.

Currently, no nesting territories for southwestern willow flycatcher are found near the Chicago dam; therefore, allowing for limited fishing access on the banks would have negligible effects on this endangered species. If territories are discovered in this area, seasonal closures would be put into place.

Overall, visitor use objectives under alternative B would have minor to moderate long-term effects on

wetland habitats, depending on the timing, location, and magnitude of visitor use and facilities. These effects could be reduced by locating facilities away from the most sensitive wetland habitat areas. Providing education and interpretation to the public about wetlands would contribute to long-term wetland conservation.

ALTERNATIVE C

The level of visitor use facilities and access under this alternative would be similar to that under the no-action alternative, except for the introduction of limited access to the Baca Refuge. Overall, visitor use objectives under alternative C are expected to have a negligible effect on wetland habitat.

ALTERNATIVE D

With a greater emphasis on visitor use under this alternative, we would expand trails, auto tour routes, interpretive sites, hunting opportunities, and programs on all three refuges. Total visitation to the refuges is expected to increase by 25 to 40 percent.

The effects of these activities on wetland habitat are similar to those described above for alternative B, but to a greater degree. The construction of new facilities would directly eliminate or degrade habitat in the immediate location, while the increased presence of visitors could have negative effects on the function of the habitat and the wildlife that depend on it. Wetland areas that provide high quality brood habitat for waterfowl would be less suitable if they are next to a trail. Disturbances from hunting may be greater because hunters typically travel off defined trails and roads, but the effects would be minimal because of the relatively low number and frequency of hunting disturbances.

Overall, the changes to visitor use under alternative D would have minor to moderate long-term effects on wetland habitats, depending on the timing, location, and magnitude of visitor use and facilities. These effects could be reduced by locating facilities away from the most sensitive wetland habitat areas, while still providing the educational and interpretive benefits that contribute to long-term wetland conservation.

Playa Habitat

The effects of our habitat and visitor use management activities on playa habitat are described. In the refuge complex, playa habitat is found only on the Baca Refuge.

Effects of Playa Habitat Management

The management of our water resources is discussed.

ALTERNATIVE A

Under this alternative, little or no water would be applied to playa habitat areas. Playa-dependent species such as the snowy plover may find suitable habitat in wet years, but there would not be reliable habitat available because of the unpredictable nature of snowpack runoff and the greater water needs of the wet meadow communities. These conditions could also create a biological sink that would result in negative effects for birds that nested on playas that did not have a sustainable water supply. The potential for these negative effects is uncertain. Overall, this alternative would have negligible effects on playa habitat on the Baca Refuge.

ALTERNATIVES B AND D

Under alternative B, we would provide water to playa wetlands when possible during the spring migration and summer nesting periods for waterbirds and shorebirds.

The proposed management strategies for playa habitat would provide nesting and foraging resources for shorebirds and some waterfowl species, and would restore playa habitat, including vegetation and soil chemistry. Over time, these actions may provide nesting habitat for snowy plover. However, because of the unpredictable nature of mountain snowpack and runoff (on which the water for playas would depend), it may be difficult to provide water during spring migration, and it is possible that the playas could dry up too early in the summer and have a negative effect on birds that nested on these sites. However, the risk of creating a biological sink for certain wildlife species is believed to be offset by the benefits of at least partially restoring and preserving these habitats over time.

Overall, the playa habitat management under alternative B would have minor to moderate long-term benefits to this habitat, depending on the availability of water to carry out those efforts.

ALTERNATIVE C

Under alternative C, most of the available water would be allowed to reach the playa habitat areas, which would in turn provide habitat for waterbirds and shorebirds during the spring migration and summer nesting periods.

The effects under this alternative would be similar to those under alternative B for restoring and preserving the overall function of playa habitat and providing nesting habitat for snowy plover and other birds such as Savannah sparrow, western meadow-

lark, and vesper sparrow. However, the effects would be more extensive and more reliable over the long term. These actions would result in moderate to major long-term benefits to playa habitat, depending on the availability of water.

Effects of Visitor Use Management on Playa Habitat

The effects of our visitor use management on playa habitat are described in this section.

ALTERNATIVE A

Under this alternative, there would be little visitor use on the Baca Refuge; subsequently, effects on playa habitat would be negligible.

ALTERNATIVES B, C, AND D

Under these alternatives, some visitor use facilities are proposed near the playa habitat on the Baca Refuge. Limited access for elk hunting may also occur in these areas, but it is not expected to be frequent or substantial. Overall, visitor use under alternatives B, C, and D would have a negligible effect on playa habitat.

Upland Habitat

This section describes the effects of visitor use on upland habitat.

Effects of Upland Habitat Management on Biological Resources

The effects of our habitat management activities on upland habitats are discussed in this section.

ALTERNATIVE A

We would continue to preserve native shrub and short grass upland communities on the refuges, which would involve inventorying and managing for noxious weeds or other signs of degradation. This alternative would have negligible long-term benefits to upland habitats on the refuges.

ALTERNATIVE B

Under alternative B, we would incorporate disturbance regimes such as prescribed fire, grazing, mowing, and hydrological changes to create or preserve vegetation health and diversity in upland habitats. On the Alamosa and Monte Vista Refuges, some historic upland habitats that were formerly converted to wetlands or agricultural fields would be restored.



FWS

Loggerhead shrikes and other breeding songbirds benefit from natural disturbance regimes.

The implementation of these management measures, particularly the periodic disturbance regimes, would preserve and enhance the herbaceous communities and would create diverse shrub communities in terms of age classes and structural condition over the long term. These improved habitats would help wildlife by promoting invertebrate diversity and seed production and by providing foraging, nesting, and migration habitats. Wildlife species that would benefit include songbirds such as sage thrasher, Brewer's sparrow, and loggerhead shrike, as well as a broad range of small and large mammals. On the Baca Refuge's shrub-grass habitat, herbaceous vegetation would increase after a disturbance event such as fire (mosaic pattern) and would provide more nesting and foraging habitat for grassland birds.

By restoring old farm fields and created wetlands back to native upland habitat, upland birds would have more habitat for foraging, nesting, and migration. Over time, there would be reduced weed infestations in these areas as native upland communities became established. Because these areas would no longer be irrigated, more water would be available to restore wetlands and riparian habitat in other places.

Disturbance measures such as prescribed fire, grazing, and mowing would result in the short-term loss of nesting and foraging habitat in the affected areas. However, these measures may improve habitat for species such as horned lark that prefer sparse vegetation, and would result in long-term benefits to

many species as more healthy and diverse upland habitats are established.

Overall, the upland habitat management measures on the refuges would result in minor long-term benefits to upland habitat.

ALTERNATIVE C

Similar to alternative B, we would incorporate disturbance events such as prescribed fire, grazing, mowing, and hydrological changes to create or preserve vegetative health and diversity in upland habitats. On the Alamosa and Monte Vista Refuges, historic upland habitats that were formerly converted to wetlands or agricultural fields would be restored. Compared to alternative B, more attention would be given to the timing and intensity of disturbance tools to mimic natural regimes. The effects of these actions on the refuges would be similar to alternative B, resulting in minor long-term benefits to upland habitat.

ALTERNATIVE D

The impacts would be similar to or the same as alternative A.

Effects of Visitor Use Management on Upland Habitat

This section discusses the effects of visitor services on upland habitat.

ALTERNATIVE A

We would keep our current visitor use programs and facilities on the refuges, and no new trails, roads, or facilities would be constructed within or near wetlands. Overall, our visitor use management under alternative A would have a negligible long-term effect on upland habitat.

ALTERNATIVE B

Under this alternative, we would expand visitor access to the refuges including access for biking and walking. Limited horseback use could be available on the Baca Refuge. On the Alamosa Refuge, the auto tour route would be extended out to county road S116, and several more trails would be established, including another 3.6 miles of nature trails. On the Monte Vista Refuge, seasonal access to existing trails would be expanded, and a new nature trail would be added. On the Baca Refuge, auto tour routes and interpretive facilities would be created and new trails would be added near Cottonwood Creek and the headquarters and visitor center. Most of the new trails and roads would be located in upland habitat. Small game and waterfowl hunting would continue to occur on Alamosa and Monte Vista Ref-

uges in addition to allowing for limited big game hunting. Small game and elk hunting would occur on the Baca Refuge. Total visitation across the refuges would be expected to increase by 15 to 25 percent. Not every road or trail would see the same increased levels of use.

As described for other habitat types, the construction of new facilities would result in direct effects on upland habitat in the immediate area, while the increased presence of visitors could have negative effects on the function of the habitat and associated wildlife. Fragmentation of habitat from the construction of new trails, roads, or facilities could reduce the quality of habitat in affected areas or interrupt movement corridors for some species.

Overall, the increased visitor use and facilities would have minor, long-term negative effects on upland habitat. While the adverse effects would be greater (moderate) within the immediate vicinity of the visitor facilities, these areas would be a small percentage of the upland habitat available on the refuges.

ALTERNATIVE C

The level of visitor use facilities and access under this alternative would be similar to the no-action alternative except for the introduction of limited access to the Baca Refuge. While the individual effects of visitor use would be similar to those described for alternative B, the overall long-term effects on upland habitat would be negligible.

ALTERNATIVE D

With a greater emphasis on visitor use under this alternative, we would expand trails, auto tour routes, interpretive sites, hunting opportunities, and programs on all three refuges. Visitation across the refuges would be expected to increase by 25 to 40 percent, although this could vary by refuge and trail.

The effects on upland habitat would be similar to those described for alternative B, but to a greater degree. The construction of new facilities would result in direct effects on upland habitat in the immediate vicinity, while the increased presence of visitors could have negative effects on the function of the habitat and associated wildlife.

Overall, increased visitor use and facilities would have minor to moderate long-term negative effects on upland habitat. While the adverse effects would be greater in the immediate area of the visitor facilities, these areas would be a small percentage of the upland habitat available on the refuges.

Threatened and Endangered Species

The effects of our management on threatened and endangered species are described in this section.

Southwestern Willow Flycatcher

The southwestern willow flycatcher is the only federally endangered species found on the refuge complex at this time. Currently, it is only found on the Alamosa Refuge. The effects of our habitat management and visitor services policies on the southwestern willow flycatcher are described below.

HABITAT MANAGEMENT

Under all of the action alternatives, we would establish, preserve, and enhance willow-dominated riparian habitat on the Alamosa Refuge, with a goal of enhancing or preserving at least 100 acres of habitat (refer to riparian habitat objectives). This would expand nesting habitat for the southwestern willow flycatcher, and provide the potential for the establishment of several more flycatcher breeding territories on the refuge. If successful, these habitat enhancements would result in minor, long-term benefits to southwestern willow flycatcher and other species of concern that rely on healthy riparian habitat on the Alamosa Refuge.

Effects of Visitor Use on Southwestern Willow Flycatcher

ALTERNATIVE A

Under alternative A, visitor use would continue along the Rio Grande nature trail year round. Southwestern willow flycatchers are observed along this trail, often close to the parking area, current visitor center, and auto tour route. Not all portions of the Rio Grande trail are adjacent to riparian areas, but several portions are. The trail has some moderate levels of use as it is one of the few areas on Alamosa Refuge that is currently available for walking and wildlife observation (the existing Bluff nature trail is also open year round, but the area receives less use and the trail does not drop down to the riparian corridor). Under alternative A, visitor use of the Rio Grande nature trail would not be likely to increase. Without further monitoring, it is not clear whether current use levels are negatively affecting the flycatcher, but under alternative A, any increased impacts would be negligible.

ALTERNATIVE B

As with alternative A, year-round visitor use would continue to be allowed along the Rio Grande nature trail. Visitors would be required to stay on the trail. With increased emphasis on other additional opportunities for wildlife observation and education on Alamosa Refuge, more use could occur along the trails.

Under alternative B, portions of existing two-track roads and trails that are currently open only to hunters during the hunt season would be opened from mid-July to the end of February. The Bluff nature trail would be extended south and then north along an existing two-track road adjacent to the Rio Grande corridor to parking area 4. Following an existing two-track road, the trail would then continue north to parking area 5 for several miles. This area contains several small patches of willow riparian habitat that were historically documented to support flycatcher territories (most recently 2003) but are currently in very poor condition, primarily due to hydrologic changes. The opening of these trails would overlap with flycatcher breeding season. Due to the considerable distance to get to the area, use along the southern trail would likely be light. If efforts to improve the hydrology in several areas and elsewhere along the river were successful, the quality of the riparian habitat could be improved. This would benefit the southwestern willow flycatcher, but would increase the potential for negative impacts associated with public use along the Bluff trail loop. Negative impacts could be reduced by rerouting portions of the trail, imposing an additional seasonal closure, signage, and increased education. Under alternative B, overall, impacts to southwestern willow flycatcher as a result of increased public use and access would be negligible to minor.

Allowing for fishing access on the bank of the Rio Grande below Chicago dam would have negligible effects on the southwestern willow flycatchers providing that territories are not established in this area. However, should territories be established, a seasonal closure during the breeding period would be put into place to protect the birds.

ALTERNATIVE C

Visitor use would be similar to alternative B along the Rio Grande nature trail and in the portions of the existing hunt area that would be open for biking and walking after July 15th. The extent of the Bluff nature trail would be the same as under alternative A. Similar to alternative B, trail access would be permitted along the Rio Grande. Overall impacts to southwestern willow flycatcher as a result of increased public use and access would be negligible to minor. Some portions of the trails could require

rerouting or an additional seasonal closure to limit potential impacts.

ALTERNATIVE D

Instead of extending the Bluff nature trail to the south and north to parking area 4, as described under alternative B, it would become a seasonal auto tour route. Fishing access would be allowed at two areas along the Rio Grande. With increased emphasis and opportunities for access under alternative D, potentially negative impacts on southwestern willow flycatcher could increase. Careful siting of the fishing access points would be necessary. Similar to alternative B and C, some portions of the roads or trails could require rerouting or additional seasonal closures put into place to limit any potential impacts to the birds should efforts to restore riparian areas result in additional flycatcher territories in the area. With the addition of fishing access, under alternative D, impacts could potentially increase to moderate levels.

MITIGATION

Potential impacts to southwestern willow flycatcher could be limited by requiring visitors to stay on trails, increasing visitor education and law enforcement, rerouting the trail and road away from restored riparian areas, using additional seasonal closures as necessary, and monitoring for impacts.

New Mexico Meadow Jumping Mouse

The New Mexico meadow jumping mouse is a federally endangered species found in New Mexico, Arizona, and southern Colorado. Its presence within the refuge complex is unknown. Under all alternatives, surveys or monitoring activities would be undertaken prior to habitat management, restoration activities, or improvements to visitor services (trails, roads, facilities) that could adversely affect the jumping mouse.

Under alternative A, few improvements to existing riparian habitat conditions would occur. Similarly, few changes or improvements for visitor services would occur. Under alternatives B, C, and D, the riparian creek areas on Baca Refuge and selected back channel areas along the Rio Grande on Alamosa Refuge would be maintained or enhanced. Visitors would be required to stay on trails, and access would be seasonal in most places. Under alternative B and to a greater extent under alternative D, some limited and seasonal fishing access would be allowed along the Rio Grande. These areas would be surveyed for presence of the jumping mouse prior to providing this opportunity.

Efforts to improve the function and health of the creeks on Baca Refuge and in some of the back chan-

nels of the Rio Grande on Alamosa Refuge would generally benefit the jumping mouse; however, we have no control over the current hydrological conditions in the Rio Grande, which have significantly affected riparian habitat on the Alamosa Refuge.

Overall, the actions in the alternatives would have no effect on the jumping mouse. It is unknown if the jumping mouse is found within the refuge complex.

Critical habitat areas in Colorado include Las Animas, Archuleta, and La Plata counties. Currently, the critical habitat designation does not include the refuge complex.

Sandhill Crane

Since current and past management practices have been partly focused on supporting sandhill crane migration, these effects are described separately from other birds. Sandhill cranes are also a focal bird species (refer to focal bird species in chapter 3).

ALTERNATIVE A

Under alternative A, we would continue to grow small grains on the Monte Vista Refuge to support crane populations during migration. These ongoing actions would have minor long-term benefits to sandhill cranes.

ALTERNATIVE B

Under alternative B, on the Monte Vista Refuge we would continue to provide water to traditional roosting areas in early spring (February to April) and fall, and grow small grains that provide a high energy food source. These actions would help sandhill cranes by continuing to provide them with necessary roost habitat and a food source for migration. Evidence suggests that if migrating cranes leave the San Luis Valley in good body condition, they are more likely to have a successful breeding season. These efforts would result in long-term, minor benefits to sandhill cranes on the Monte Vista Refuge.

ALTERNATIVE C

Under alternative C, all Monte Vista Refuge farm fields would be allowed to revert back to native vegetation, which would reduce the availability of food for sandhill cranes. Minimal water would be available in the spring for roosting habitat. While the loss of refuge grain fields would be tempered by the availability of waste grain on nearby private fields, the loss of roosting habitat on the refuge could diminish the overall body condition of the cranes during their migration (personal communication, Dave Olson, FWS Division of Migratory Birds, April 24, 2014).



© Joe Zimm

Past management practices have been partly focused on supporting sandhill crane migration on Monte Vista Refuge. The alternatives consider different options for crop production in the future.

With a reduction in the number of roost areas that would be flooded (two out of three), the same number of cranes would have to fit into a smaller area, which could raise the potential risk for disease outbreaks. Overall, this could contribute to moderate to major long-term negative effects on the number of cranes that migrate through the San Luis Valley.

ALTERNATIVE D

Under this alternative, we would expand small grain production to support sandhill cranes on the Monte Vista Refuge. This would result in a moderate long-term benefit to migrating sandhill cranes.

Focal Bird Species

This section describes effects on focal birds. (Refer to tables 3, 4, and 5 in chapter 3.)

Effects of Habitat Management on Focal Bird Species

Besides the potential effects described for the various habitats, this section describes specific effects of our habitat management on focal bird species.

ALTERNATIVE A

The ongoing preservation of riparian, wetland, and upland habitats on the refuges would continue to provide essential breeding, foraging, and migration habitat for focal and other bird species. In general, the existing areas, conditions, and functions of the various habitat types would be preserved or improved. These habitat management efforts would result in negligible long-term benefits to bird species on the refuges.

ALTERNATIVE B

As described for riparian and wetland habitats, we would manage the refuges to create habitat for focal and other bird species. Water application would be used to support wetland habitats during specific times of the year and for specific purposes, while management tools such as prescribed fire, grazing, haying, and herbicide application would be used to improve wetland and riparian habitats to help nesting and foraging birds.

Water management in wetland areas would preserve healthy vegetation and wetland function, providing habitat for a wide array of waterbird species, including ducks, shorebirds, wading birds, and songbirds. Some created wetlands would continue to be flooded, favoring wetland-dependent bird species in those areas. The artificial wetlands that are no longer flooded would revert back to uplands and would no

longer be available for wetland bird species. Over time, however, these habitats would support upland birds. Also, species that prefer tall, dense cover for nesting or hiding (such as ducks or some marsh birds) could experience short-term effects from grazing, haying, or prescribed fire because of the removal of dense cover or because of disturbance from grazing. However, the long-term benefits of habitat enhancement are expected to offset the short-term, localized effects of management activities. Overall, habitat management efforts on the refuges are expected to have minor long-term benefits for focal birds and associated bird species.

ALTERNATIVE C

Similar to alternative B, refuge habitats would be managed to support focal and other bird species by using strategic water application and management tools such as prescribed fire, grazing, haying, and herbicide application. These tools would be used to provide the vegetative structure for nesting, foraging, and other needs. Unlike alternative B, these tools would be used to mimic historic disturbance regimes. Because water would not be provided to created wetlands and farm fields, these areas would revert to upland habitats.

The shifts in habitat types that are expected to occur under this alternative will help some bird species and negatively affect others. In some areas, wetland-dependent birds would be adversely affected by an overall loss of nesting and foraging habitat, while upland bird species may benefit over the long term as more habitat becomes available. This would be particularly true on the Monte Vista Refuge. While the populations and distributions of different species would change, the emphasis on habitat health would help most bird species.

Changes in wetland hydrology could eliminate suitable nesting habitat for white-faced ibis, snowy egret, and black-crowned night-heron on the Monte Vista Refuge's Bowen and Parker Ponds. While this area is managed as a deeper, semi-marsh habitat, the natural condition would be a shallower, more seasonal wetland.

Overall, this alternative would result in minor long-term negative effects on wetland-dependent bird species on the refuges.

ALTERNATIVE D

Same as under alternative B.

Effects of Visitor Use Management on Focal Bird Species

This section describes the effects of our visitor services activities on focal bird species.

ALTERNATIVE A

Under alternative A, we would keep our current visitor programs and facilities on the refuges, and no new trails, roads, or facilities would be constructed. Visitor use in developed and undeveloped areas would increase the stress levels of individual birds, reduce body condition because of unnecessary energy expenditures, and result in decreased primary song, which could affect mate attraction and territory defense. Over time, these disturbances could result in a simplification of the bird community as affected habitat areas are used more by generalists and less by habitat specialists. The presence of dogs could also exacerbate the effects of visitor use on birds. However, these effects would be localized to the immediate vicinity of visitor use facilities or hunting areas, would be small in proportion to the available habitat on the refuges, and would remain similar to existing levels of disturbance. Overall, visitor use management on the refuges under alternative A would have a negligible adverse effect on bird species.

ALTERNATIVE B

The effects of visitor use management on bird species are similar to those described in earlier habitat sections. Overall, visitor access and facilities under this alternative would be expanded on all three refuges. New auto tour routes would be established on the Alamosa and Baca Refuges and new interpretive trails and facilities would be developed on all three refuges. During waterfowl or big game hunting seasons, visitor access would not be restricted to trails and roads. The Baca Refuge would be opened for public access during big game and limited small game hunting. Visitation across the refuges is generally expected to increase by 15 to 25 percent, but would vary by trail, event, or refuge.

Across all habitat types, habitat fragmentation from the construction of new facilities could result in negative effects associated with habitat edges such as increased predation and cowbird parasitism, and localized loss of interior patch habitat where birds could establish territories. Human disturbance could increase the stress levels of individual birds, reduce body condition because of unnecessary energy expenditures, and result in decreased primary song, which could affect mate attraction and territory defense. Over time, these disturbance effects could result in a simplification of the bird community as affected habitat areas are used more by generalists and less by habitat specialists. Increasing visitor numbers would magnify the effects for many species, as would the proposed lengthening of the time of year when access is available and the introduction of other activities such as foot or bike travel to existing auto tour

routes. The presence of dogs would exacerbate the effects on birds.

While the intent of a viewing blind is to allow visitors to observe wildlife with minimal effect on the animals, the establishment of a viewing blind near Parker Pond on the Monte Vista Refuge would still have the potential to affect white-faced ibis, snowy egret, and black-crowned night-heron breeding and foraging, as well as other wetland birds such as waterfowl and shorebirds. There are no visitor use facilities in that area.

Overall, the visitor use objectives under alternative B would have minor to moderate long-term negative effects on some bird species in some habitat areas, depending on the timing, location, and magnitude of visitor use and facilities. These effects could be reduced by locating facilities away from the most sensitive bird habitats, rerouting trails, increasing law enforcement and visitor education, and using additional seasonal closures when necessary. Waterfowl, limited small game hunting, and big game hunting occur outside of the nesting season and would have a negligible effect on birds.

ALTERNATIVE C

The level of visitor use facilities and access under this alternative would be similar to the no-action alternative, except for the introduction of limited access to the Baca Refuge. The individual effects of visitor use would be similar to those described for alternative B, except that wetland-dependent species may be more sensitive to human disturbance because of the overall reduction in available habitat for those species on the refuges. The overall effect on bird species, however, would be negligible over the long term.

ALTERNATIVE D

The effects of visitor use on birds would be similar to those described under alternative B, but to a greater degree. Fishing access would be allowed at two locations along the Rio Grande. The construction of new facilities would result in localized effects on habitats, and the increased presence of visitors could have negative effects on the function of the habitats and the birds that depend on them. Effects from human disturbance could occur within 50 to 100 meters from a trail or facility and would be exacerbated by the presence of dogs. Over time, disturbance could result in a simplification of the bird community as affected habitat areas are used more by generalists and less by habitat specialists. Increasing visitor numbers would magnify the effects for many bird species, as would the proposed lengthening of the time of year when access is available.

Overall, the increased visitor use and facilities would have moderate long-term negative effects on

birds. While the adverse effects would be greater within the immediate vicinity of the visitor facilities, those areas would still be a small portion of the upland habitat available on the refuges.

Bison Management

The effects of management actions related to bison are described in this section.

ALTERNATIVE A

Under alternative A, the TNC grazing lease for bison on the Medano Ranch, which is privately owned but located within the Baca Refuge acquisition boundary, would be phased out, and no bison would be located on the refuge. Because the bison would be removed before we took over ownership and management, Service management actions under this alternative would have no effect on bison.

ALTERNATIVE B

Under alternative B, we would use bison as a habitat management tool on the Baca Refuge and would research the feasibility of accommodating a semi-free-ranging (free-ranging within a designated area) herd on part of the Baca Refuge. Bison from neighboring herds would be used, which may or may not contribute to the greater metapopulation of the species. Implementation of these actions would allow us to better understand the benefits and drawbacks of bison on the landscape. Overall, this alternative would have a minor long-term benefit to bison as a focal species, because it would allow us to integrate the species into the landscape.

ALTERNATIVE C

Under alternative C, we would periodically use bison herds for short-duration prescribed grazing to mimic natural processes. Privately owned bison from neighboring herds would be used, which would not contribute to the greater metapopulation of the species. These actions would provide limited opportunities to manage bison on the landscape, and would have negligible effects on bison as a focal species on the refuge.

ALTERNATIVE D

Under alternative D, we would introduce and manage a small demonstration herd of Service-owned bison for the purposes of public viewing and interpretation. This herd would be resident on the refuge, but because the herd would be actively inventoried and managed (including pasture fencing and roundups), it would not be a semi-free-ranging herd as described under alternative B. Individual animals

would be incorporated into our Service metapopulation of bison across several refuges. Implementation of this alternative would result in minor long-term benefits for bison as a focal species on the Baca Refuge because it would preserve the species on the landscape and would contribute to the Service's greater metapopulation.

Rocky Mountain Elk

The effects of our management actions on elk populations are discussed in this section.

ALTERNATIVE A

Under alternative A, we would continue to work with CPW to reduce and redistribute the elk population on all the refuges, but particularly on the Baca Refuge to protect and preserve upland and riparian habitat. The population management measures could adversely affect elk in the short term but would be beneficial for the population overall. While culling inherently affects the individual animals that are killed, dispersal and harassment activities could be stressful to the other elk, especially during winter. Likewise, fencing riparian habitat to exclude elk, while good for the habitat, makes those areas unavailable to elk for foraging. Over the long term, these efforts toward reducing and redistributing the population would be beneficial to elk populations by encouraging stable and sustainable population levels based on the available habitat on the refuge. Overall, these population management efforts would result in negligible long-term benefits to elk on the refuge.

ALTERNATIVE B

Under alternative B, we would continue the elk management actions described for alternative A, but we would add a public hunting plan and an observa-

tion plan for chronic wasting disease. The effects of elk management and removal would be similar as described above. There would be short-term negative effects to individual elk, with long-term benefits to the overall health of the herd. Increased monitoring for chronic wasting disease would further help the population by reducing the potential for the disease in and around the refuge. Overall, these efforts would result in minor long-term benefits to elk on the Baca Refuge.

ALTERNATIVE C

Similar to alternative B.

ALTERNATIVE D

Similar to alternative B.

Native Fish Populations

The effects of our management activities on the Rio Grande sucker and Rio Grande chub are described in this section.

ALTERNATIVE A

Under this alternative, we would continue to study and manage habitat for native fish, including the Rio Grande sucker (which is State endangered), Rio Grande chub (which is a State species of special concern), fathead minnow, and longnose dace on the Baca Refuge. These actions would have negligible long-term benefits to these native fish species on the refuge.

ALTERNATIVE B

Crestone Creek on the Baca Refuge supports Rio Grande sucker, Rio Grande chub, fathead minnow, and longnose dace. The proposed management objectives under this alternative are intended to preserve



© Joe Zimm

A herd of elk appears to run in unison across the Baca Refuge.

and enhance native fish habitat by restoring woody riparian and instream aquatic habitat; restoring channel morphology and function; maintaining adequate creek flows where possible; and experimenting with different gravel and cobble substrates to improve foraging for the Rio Grande sucker. These efforts would create and improve foraging, breeding, and overwintering habitat conditions for native fish. Overall, these efforts are expected to result in minor, long-term benefits to native fish species on the Baca Refuge.

ALTERNATIVE C

The effects of alternative C on native fish species on the Baca Refuge would be similar to those described for alternative B, except that the benefits would likely be greater because more water would remain in the creek channels. Overall, there would be moderate, long-term benefits to native fish species on the Baca Refuge.

ALTERNATIVE D

Same as under alternative B.

Other Wildlife Species

Effects of our habitat and visitor services management on other wildlife species are described in this section.

Effects of Habitat Management

Habitat management effects on other wildlife species are described below.

ALTERNATIVE A

The ongoing maintenance and management of riparian, wetland, and upland vegetation on the refuges would continue to provide quality habitat for a broad range of wildlife species. In general, the existing area, condition, and function of the various habitat types would be preserved or improved. These habitat management efforts would result in negligible long-term benefits for other wildlife species on the refuges.

ALTERNATIVE B

As described earlier, we would use a variety of management tools on all three refuges to preserve and improve riparian, wetland, playa, and upland habitats on the refuges. In general, the maintenance of diverse and high quality habitats would support a variety of wildlife species beyond those target species that we have outlined in our management objectives. Over time, these efforts would continue to

provide habitat for a variety of general wildlife species, including small to medium-sized mammals, ungulates, reptiles and amphibians, aquatic invertebrates, and fish.

Overall, the habitat management objectives on the refuges under alternative B are expected to result in minor long-term benefits to other wildlife species.

ALTERNATIVE C

The management of various habitat types would be similar to alternative B, except that created wetlands and farm fields would revert to native upland habitat, and the use of active management tools such as prescribed fire, grazing, haying, and herbicides would be tailored to mimic natural disturbance processes. Over time, these efforts would create habitat for a variety of wildlife species. Fewer habitats would be available for wetland-dependent species in some areas, while upland species may prosper in the affected areas. However, these changes are expected to result in a more diverse and resilient ecosystem on the refuge, which could offset some of the immediate effects over the long term. Overall, the habitat management objectives are expected to result in negligible long-term benefits to general wildlife species.

ALTERNATIVE D

Same as alternative B.

Effects of Visitor Use Management on Other Wildlife Species

This section described the effects of visitor services activities on other wildlife species.

ALTERNATIVE A

Under alternative A, we would keep our current visitor use programs and facilities on the refuges, and no new trails, roads, or facilities would be constructed. The effects of visitor use on general wildlife species would be similar to those discussed for other habitats and birds and would be based primarily on disturbance. However, many wildlife species are habitat generalists and are less vulnerable to location-specific disturbances. Overall, visitor use management under alternative A would have a negligible long-term effect on general wildlife species on the refuges.

ALTERNATIVE B

The effects of visitor use management on general wildlife species are similar to those described under earlier habitat sections. Visitor access, including biking, cross-country skiing, walking, driving, limited horseback use on the Baca Refuge, limited commercial recreation, and construction of facilities, would

be expanded on all three refuges, resulting in minor long-term effects in affected habitat areas, depending on the time of year, location, and magnitude of visitor use and facilities construction and maintenance. Additionally, large movements of amphibians, primarily Great Plains toad, have occurred under some environmental conditions on the Baca Refuge. During these mass movements, it would be impossible to avoid direct mortality from vehicles. These effects could be minimized by locating facilities away from the most sensitive habitats or by implementing seasonal closures.

ALTERNATIVE C

Visitor use facilities and access under this alternative would be similar to the no-action alternative, except for the introduction of limited access to the Baca Refuge. The effects from visitor use would be similar to those described for alternative B, and would result mainly from facility construction and disturbance. However, these disturbances would be localized to the immediate vicinity of visitor facilities, and the overall effect on other wildlife species would be negligible and long term.

ALTERNATIVE D

The effects of visitor use on other wildlife would be similar to those described under alternative B but magnified to a greater degree. There may be localized effects on habitat from the construction of new facilities and the increased presence of and disturbance from visitors. However, many wildlife species are habitat generalists and are less vulnerable to location-specific disturbances. Overall, the increased visitor use and facilities would have minor long-term effects on general wildlife species.

Mitigation for Biological Resources

Minimizing human disturbance from habitat management activities and visitor services during the nesting season would limit impacts to biological resources. This could include several measures ranging from increased visitor education, monitoring, law enforcement, seasonal closures, and re-routing trails if needed.

Cumulative Impacts on the Biological Environment

Several of the foreseeable activities described in chapter 3 could result in cumulative beneficial or negative effects on biological resources on the refuges.

The establishment and implementation of a management plan for the Rio Grande Natural Area downstream from the Alamosa Refuge would help riparian habitat and wildlife over the long term. Likewise, the monitoring, conservation, and enhancement measures associated with the San Luis Valley regional habitat conservation plan (Rio Grande Water Conservation District 2012b), along with ongoing private land conservation in the valley (particularly along the Rio Grande corridor), would be beneficial to riparian habitat and associated wildlife. The negligible to moderate benefits of riparian management activities under the proposed alternatives would result in minor cumulative benefits to riparian habitat and associated wildlife, including the southwestern willow flycatcher and focal bird species.

The planned restoration of wetlands within the San Luis Lakes system would be beneficial to overall wetland habitat and to many of the bird species that are also found on the refuges. The minor to moderate benefits of the proposed wetland management actions under the proposed alternatives would result in minor cumulative benefits to wetland systems and wetland-dependent bird species when combined with the efforts to restore the San Luis Lakes wetlands.

Development of private lands along the Rio Grande corridor, particularly within or next to woody riparian habitat areas and wetlands, would affect riparian habitat and the wildlife that depends on those areas, including the southwestern willow flycatcher, focal bird species, and general wildlife. The negligible to moderate benefits of riparian and wetland habitat management efforts on the refuges would help offset the effects of private land development elsewhere in the valley, but would not be substantial enough to result in cumulative benefits to those resources. Overall, the long-term cumulative benefits of refuge activities, when combined with private land development, would be negligible.

Over the long term, regional water management efforts in the San Luis Valley, including new State water management rules and the establishment of ground water management subdistricts, are expected to result in localized changes in some wetland and riparian habitat areas because of changes in water use and management. While some habitat areas (such as natural flowpaths) would receive more water, other areas (such as tailwater areas) may receive less water; the long-term effects of these

changes on habitat are not certain. The benefits from refuge management alternatives to riparian and wetland habitats, when combined with the uncertain effects of water management policies and programs, would likely result in negligible long-term cumulative benefits on those resources.

5.6 Effects on Visitor Services

Our policies for wildlife-dependent recreational activities emphasize quality hunting and wildlife-viewing opportunities. Quality opportunities have the following elements: (1) safety and compliance with applicable laws; (2) reduced conflicts with wildlife and habitat goals and other public uses; (3) accessibility for all; (4) resource stewardship; and (5) reliable and reasonable opportunities to experience wildlife (FWS 2006f). These elements were taken into consideration in describing the potential effects of the alternatives on visitor services.

Effects on Hunting

The effects of our management actions on hunting are discussed, including access, opportunities for hunting, safety, and other users, as well as how our habitat and management programs, including water management and wilderness recommendations, would affect the hunting program.

ALTERNATIVE A

Long term, there would be few changes from current hunting opportunities offered on the refuge complex. The hunting areas would remain the same for the Monte Vista and Alamosa Refuges. (Refer to figures 13 and 14 in chapter 3.) Hunters could hunt waterfowl, upland game birds, and some small game. Recreational big game hunting would not be allowed on the refuge complex. Baca Refuge would not be open to hunting.

Short term, to the extent possible with the current drought conditions, we would flood some wetlands to help breeding and migrating ducks. Consequently, we would expect hunting levels to fluctuate between 800 and 1,000 hunters on both the Alamosa and Monte Vista Refuges. In the mid- and late 1990s, there were many more hunters than there are now. Because of safety concerns and the reduced quality of hunting, we went to a permit-type system that was eventually eliminated because there were fewer waterfowl due to drought conditions. In recent

years, conditions have been much drier in the San Luis Valley, and fewer ducks have been breeding in and migrating through the area. The first few week-ends of the hunting season attract local hunters who are hunting locally produced ducks (ducks hatched and raised in the valley). Once fall migration starts, waterfowl hunting picks up, but weather further north and local water conditions strongly influence the number of ducks on the refuges and, as a result, the number of hunters.

Long term, we would not expect the number of waterfowl hunters to increase on the refuges without more water or new opportunities. In recent years, hunting participation has been decreasing both nationwide and in Colorado (Larson et al. 2013; Willoughby 2013). The 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation compared figures from 2001 through 2011 and found the overall number of hunters increased 9 percent from 2006 to 2011, primarily because of a 29 percent increase in big game hunting days. The 2011 survey also acknowledged that these findings run counter to the downward trends documented in earlier surveys (DOI, FWS, and Department of Commerce U.S. Census Bureau 2011).

In the short term, any indirect negative effects on waterfowl hunting would be negligible to minor depending on water availability. Generally, we would continue to manage the wetlands and uplands on the Monte Vista and Alamosa Refuges according to the management policies detailed in the 2003 CCP (FWS 2003). This includes flooding wetlands to provide invertebrate food sources for breeding and migrating ducks and geese. Even with the expected changes in ground water rules and regulations, we would keep our water rights and manage our existing financial and water resources to support wildlife habitat.

In the long term, as discussed under “Habitat and Wildlife” in chapter 4, section 3, we would not be able to sustain the integrity, productivity, and function of many of the wetland habitats, given both the dynamic climatic variations that we continue to experience and the limited budget for pumping. Changes in ground water rules and regulations under Colorado State water law would affect the future volume and timing of water availability on the refuges in part because of financial constraints due to the costs of augmenting well water. Because there would be less water available, this would have the direct effect of reducing duck production on the refuges. Indirectly, the quality of waterfowl hunting on the Monte Vista and Alamosa Refuges would likely decline because of reduced habitat and fewer ducks and geese for hunters to take. Lack of water would result in negative impacts for waterfowl hunting that would range from minor to major, depending on varying climatic conditions and precipitation.

We would manage upland areas in the same manner as we have been and would expect few impacts to small-game hunters under this alternative.

Under alternative A, we would not recommend any areas for wilderness study. Since public hunting is not allowed on the Baca Refuge, there would be no indirect impacts on hunting.

Overall, in the long term, continuing the management plans of alternative A would result in minor to moderate negative impacts on hunting opportunities throughout the refuge complex.

ALTERNATIVE B

For waterfowl and limited small game hunting, the hunt boundaries would remain the same as under alternative A on the Alamosa and Monte Vista Ref-

uges. (Refer to figures 16 and 17 in chapter 3.) With the opening of the Monte Vista and Alamosa Refuges to limited small game hunting and the opening of the Baca Refuge to limited small and big game (primarily elk but could include mule deer if populations increase) hunting, opportunities for small and big game hunting would increase by a moderate amount over the long term. (Refer to figures 16, 17, and 18 in chapter 3 and tables 20 and 21.)

We would continue to reliably provide water to wetland areas to support foraging and breeding habitat for waterfowl within any existing funding limitations for pumping water. In the short term, the direct effects of our water management would result in negligible to minor effects on waterfowl hunting. In the long term, some existing wetland areas would not

Table 20. Public access on refuge complex by alternative.

<i>Availability of access</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Monte Vista National Wildlife Refuge				
Miles of roads along boundary or through refuge, including auto tour route and seasonal auto tour route*	24	24	24	28
Miles of trails available for hunters only	8.7	0	0	0
Miles of trails and roads available for wildlife viewing (mid-July to end of February)**	0	8.7	8.7	8.7
Miles of nature trails (interpretive)	0.24	1.7	0.24	3.5
Miles of auto tour route	2.5	2.5	2.5	2.5
Miles of seasonal auto tour route	0	0	0	4.1
Alamosa National Wildlife Refuge				
Miles of roads available year round (along boundary or through refuge, including auto tour route)*	21	24	21	27
Miles of trails available for hunters only	7.3	0	0	0
Miles of trails and roads available for wildlife viewing (mid-July to end of February)**	0	6	6	6
Miles of nature trails (interpretive)	2.6	9.0	2.6	6
Miles of road open for hunters only	3	0	0	0
Miles of auto tour route open year around	3.2	5.4	5.4	5.4
Miles of seasonal auto tour route available	0	0	0	3.6
Baca National Wildlife Refuge				
Miles of roads along boundary or through refuge, including auto tour route*	27	41	27	41
Miles of trails open**	0	3	0	6
Miles of nature trails (interpretive)	0	7	0	7
Miles of auto tour route	0	14	0	14
Miles of seasonal auto tour route (non-motorized modalities allowed)	0	6	0	28

*Includes county, State, or other local roads along the boundary or through the refuge for any length; all mileages rounded to nearest mile.

** Trails could overlap with refuge road access, as depicted in alternatives figures 13–24.

Table 21. Comparison of access, visitation, and facilities of the CCP alternatives.

<i>Visitation</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Hunting visits	1,000; Monte Vista and Alamosa Refuges only.	Expand over A: open the Baca Refuge to limited small game and big game hunting; expand hunting on the Alamosa Refuge to include big game.	Same as B but would take longer to implement (50 percent by year 10).	Same as B but expand opportunities for young people.
Fishing visits	100–150*; youths only.	Allow limited bank fishing above and below Chicago dam and consider other opportunities in future.	Same as A	Same as A plus allow walk-in fishing along Rio Grande south of parking area #5 and Chicago dam if safety is addressed.
Wildlife observation, photography, and interpretation	15,000–17,000 nonconsumptive days on the Alamosa and Monte Vista Refuges	Increase annual visitation 15–25 percent on the Alamosa and Monte Vista Refuges (up to 4,000 more visitors); open the Baca Refuge to public use (about 1,000–3,000 initially); expand over 15 years to 10,000–15,000	Similar to alternative A with limited opening of the Baca Refuge	Increase visitation on the Alamosa and Monte Vista Refuges by 25–40 percent (4,000–6,000); expand on the Baca Refuge to 15,000–20,000.
Interpretation and environmental education	Maintain limited environmental education programs	Same as A plus: provide minimum 2 school or teacher training groups annually. By year 5, host programs and activities 6 times per year at the Baca Refuge	Similar to alternative A; offer limited tours at the Baca Refuge (10 per year); host limited environmental education programs.	Same as B plus: within 10 years, expand environmental education to 20 school groups annually; offer regular interpretive programming; establish San Luis Valley-wide tour routes to highlight the 3 refuges; Expand environmental education programs on the Baca Refuge.
Visitor Facilities		Improve facilities; increase public access on the Monte Vista and Alamosa Refuges (year-round and seasonal); build new visitor center at the Monte Vista or Alamosa Refuge and new interpretive displays at the Alamosa Refuge; expand tour route on Alamosa to access Bluff Overlook; all refuges: provide trail connections to local communities; provide looped trails where possible.		Same as B plus: build 4+ more miles of trail along Rio Grande to provide better north and south connections.

Table 21. Comparison of access, visitation, and facilities of the CCP alternatives.

<i>Visitation</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Outreach		Develop outreach plan; increase visibility of refuge complex through better signing and information; develop new brochure for refuge complex that highlights resources and opportunities; improve the refuge complex Web site; strengthen links with area tourism centers.	Similar to alternative B.	Increase efforts over alternatives B and C because of 2 outdoor recreation planners and 1 environmental education specialists and more seasonal staff; more information sharing events.
Access (vehicles and non-motorized modalities)	On the Alamosa and Monte Vista Refuges, limit access by vehicles to designated routes; allow hunters walking and road access in designated hunting areas; allow other visitors walking access on established nature trails; Baca Refuge is not open for public use.	On the Alamosa Refuges and Monte Vista Refuges, open existing hunting areas for wildlife viewing and expand nature trails; on the Baca Refuge, allow for a variety of opportunities for year round access and some seasonal-only access for motorized vehicles and non-motorized modalities (walking, biking, horse); open hunt areas on Baca Refuge (except archery) to the public during hunting season.	Open existing hunting areas for wildlife viewing from about mid-July to the end of February; allow for limited access on the Baca Refuge.	Similar to alternative B, but access would be expanded to include more seasonal access opportunities including fishing on the Alamosa Refuge.
Total Visitation	15,000–20,000	Alamosa and Monte Vista Refuges: increase visitation by 15–25 (4,000) to 19,000–24,000. Baca Refuge: by year 5, 1,000–3,000 visits; increase to 10,000–5,000.	Same as alternative A: 15,000–20,000. Baca Refuge: Over 15 years 1,000–3,000 visits.	Alamosa and Monte Vista: Increase visitation by 25–40 to 21,000–26,000 over 15 years; Baca Refuge: By year 5, 1,000–3,000 visits; increase to 10,000–5,000 or higher.

support breeding waterfowl every year as we strategically move toward restoring natural flow patterns. For example, on the Alamosa Refuge we would not be holding as much water in the northern part of the refuge; instead, we would move water through the northern wetlands to the southern part of the refuge, where there use to be more wetlands associated with the Rio Grande. We would apply this strategy to a lesser degree on the Monte Vista Refuge by applying water as sheet flow where practical. This would help to reduce potential negative effects on local duck production on the refuge and subsequently reduce the indirect effects on waterfowl hunting.

Similar to alternative A, the refuges would also be affected if there is less water in areas near the refuges because of drought and climate change. It is uncertain what the indirect effects of the new regulations requiring augmentation of well water would have on water tables and waterfowl hunting as a whole in the San Luis Valley. It is difficult to project with any certainty the direct long-range effects of our water management, given the annual variability of precipitation, climate change, and other factors. BOR's recent climate risk assessment of the upper Rio Grande watershed, including the Sangre de Cristo and San Juan Mountains (BOR 2013b), predicts that there will be one-third less water overall as a result of climate change. Projections are that annual precipitation will be quite variable over the next century in the upper Rio Grande (BOR 2013b). Because water availability would be better in some years than others, any indirect negative impacts on waterfowl hunting would likely vary from minor to major depending on the year.

We would preserve and improve the habitat diversity of upland native shrubs and short-grass communities on the Monte Vista and Alamosa Refuges. In some areas of marginal artificial wetlands, we would begin native shrub restoration that would return these areas to upland habitat. In the long term, these efforts would provide more opportunities for limited small game hunting, particularly if our efforts to reduce invasive species are successful. This would result in minor to moderate indirect benefits for small game hunters in the long term.

Opening the Baca Refuge to limited small and big game hunting would improve overall hunting opportunities across the refuge complex. Waterfowl hunting would not be allowed on the Baca Refuge. Opening Baca Refuge to big game hunting could result in elk dispersing onto adjacent lands, which could indirectly benefit hunters if elk were pushed north on to the Rio Grande National Forest or other private lands where hunting is allowed. Close coordination with CPW, NPS, and local landowners would be necessary to limit habitat impacts on adjacent lands.

Opening traditional hunting areas of the Monte Vista and Alamosa Refuges to nonconsumptive users would have negligible direct effects on hunters. Any conflicts that arose between user groups would be managed as needed through education, signage, or limited closures during peak hunting periods. This would be similar for the Baca Refuge. Potential conflicts would be assessed and addressed as needed.

Under alternative B, on the Baca Refuge, the southeastern portions of the refuge (about 13,800 acres) would be recommended for a wilderness study area. Some hunters would view this as enhancing their hunting experience while others may desire better access for hunting or game retrieval.

Overall, implementation of alternative B would result in a moderate, long-term benefit for hunting on the refuge complex.

ALTERNATIVE C

Similar to alternative B, in the long term, opening the Alamosa and Monte Vista Refuges to limited public dispersal hunts and opening the Baca Refuge to small and big game hunting would increase overall opportunities for hunting across the refuge complex. It would take longer to open areas on the Baca Refuge (5 years versus 3 years under alternative B for archery, and 10 years versus 7 years for big game across the Baca Refuge), in part because there would be less emphasis on visitor use under this alternative.

In the long term, depending on the restoration timeline, converting more areas from wetlands to uplands on the Monte Vista and Alamosa Refuges would likely indirectly affect waterfowl hunting to a greater degree than under alternatives A or B. Water application on the Monte Vista Refuge would be restricted to the Spring Creek and Rock Creek drainages. On the Alamosa Refuge, water would be restricted to the deepest natural sloughs and oxbows formed by old channels of the Rio Grande to provide foraging and breeding habitat for waterfowl. During the fall, only the deepest wetland areas would hold water and most of the natural wetlands would be dry.

Restoring upland areas that had been converted to wetlands or farmland on the Monte Vista Refuge would increase opportunities for small game hunters, particularly if goals for shrub cover and invasive weeds were met.

Similar to alternative B, the southeastern portion of the Baca Refuge (about 13,800 acres) would be recommended as a wilderness study area. Some hunters would view this as enhancing their hunting experience while others would be negatively affected by lack of easy access.

Overall, this alternative would result in a negligible to minor long-term benefit for hunting opportunities and experiences across the refuge complex.

ALTERNATIVE D

As under alternative A, the hunt boundary for waterfowl and limited small game hunting would remain the same for the Monte Vista and Alamosa Refuges. (Refer to figures 22 and 23 in chapter 3.) Similar to alternatives B and C, opening the Monte Vista and Alamosa Refuges to limited dispersal big game (primarily elk but could include deer if harvest is needed) hunts and opening the Baca Refuge to small and big game hunting would increase overall opportunities for diverse, quality hunting opportunities across the refuge complex by a moderate to major amount (figure 24 in chapter 3). There would be new opportunities and experiences for young hunters, accessible hunting facilities and access would be improved, and, if needed, new facilities would be added. Similar to alternative A, the direct effects of our habitat and water management would indirectly affect opportunities for waterfowl hunting over the long term.

Similar to alternatives B and C, the southeastern portion of the Baca Refuge (about 13,800 acres) would be recommended as a wilderness study area. Some hunters would view this as enhancing their hunting experience while others would be negatively affected by lack of easy access.

Overall, implementation of alternative D would result in a moderate long-term benefit for hunting opportunities across the refuge complex.

Effects on Fishing

Fishing opportunities in the refuge complex are limited.

All Alternatives

Under all alternatives, we would continue to promote Kid's Fishing Day on the Monte Vista Refuge, which is geared toward environmental education. Under alternatives A and C, there would be no new opportunities for fishing in the refuge complex. Under alternative B, limited fishing access would be allowed above and below Chicago dam on Alamosa Refuge. Under alternative D, walk-in fishing access along the Rio Grande on the Alamosa Refuge would be allowed south of parking area 5. Under alternatives B and D, if practical, a safe access point and pier would be developed to allow fishing near the Chicago dam on the Alamosa Refuge. Future habitat restoration in riparian areas may necessitate limiting visitor use along the river, which would in turn limit opportunities for fishing.

Implementation of alternatives A or C would result in negligible to minor impacts to anglers across the refuge complex. Implementation of alternative D, and to a lesser extent under alternative B, would result in a minor, long-term benefit for fishing enthusiasts on the refuge complex.

Effects on Wildlife Observation, Photography, and Interpretation

This section addresses effects on wildlife observation, photography, and interpretation programs, including opportunities and facilities. Service policy encourages refuges to provide quality opportunities for observing and photographing wildlife (FWS 2006c,f).

ALTERNATIVE A

In the short and long term, there would be limited opportunities and experiences available for wildlife observation, photography, and interpretation on the Monte Vista and Alamosa Refuges. (Refer to figures 13 and 14, chapter 3.) The 2.5-mile auto tour route on the Monte Vista Refuge and the 3.2-mile auto tour route on the Alamosa Refuge would continue to provide for wildlife viewing. (Refer to table 20.) The 0.24-mile nature trail on the Monte Vista Refuge and the nearly 3 miles of nature trail on the Alamosa Refuge also provide for self-guided interpretation. On the Monte Vista Refuge, about 23.6 miles of public or refuge roads along the refuge boundary or through the Monte Vista Refuge provide places to view refuge resources. On the Alamosa Refuge, there are a little more than 21 miles of public or refuge roads that traverse the boundary or go through the refuge and provide viewing opportunities, including those from Bluff Overlook along the eastern boundary. The Bluff Overlook is accessible only from a lengthy, rough, and disjointed route along the northern and eastern boundaries.

Without a staff person dedicated to visitor services, it is unlikely that we could increase the numbers of nonconsumptive users at the refuges, improve the quality of the visitor service programs, or educate visitors about the Service and the Refuge System. The existing visitor center at the Alamosa Refuge is staffed only part-time and has limited interpretive exhibits. Even though the Monte Vista Refuge receives the most visitors of the three refuges, in part because of the crane festival and Kid's Fishing Day, there is no visitor contact station at the refuge. Interpretive signs are found only along the auto tour route, at a few overlooks, and along the 0.24-mile nature trail.

On the Monte Vista Refuge, our habitat management program would have negligible indirect effects in the short term on visitors who come to view sandhill cranes, waterfowl, and other birds. Water and small grains would be provided in late winter on the Monte Vista Refuge. In turn, this would continue to attract and provide food for sandhill cranes and waterfowl. Long term, similar to the discussion under hunting for alternative A, there would be indirect negative effects for nonconsumptive visitors. Nonconsumptive visitors will be less likely to visit the refuge complex if wetland habitat for waterfowl and sandhill cranes is limited because of drought, climate change, or funding shortages that make pumping water prohibitively expensive.

Due to drought and climate change, changes in water management regulation combined with the limited areas where nonconsumptive visitors can currently go, continued implementation of alternative A would result in negligible to moderate negative impacts for nonconsumptive wildlife enthusiasts on the refuge complex.

ALTERNATIVE B

On the Monte Vista Refuge, the nature trail would be expanded to nearly 2 miles beyond the existing 0.24-mile trail. On the Alamosa Refuge, 6.4 more miles of interpretive nature trails would be available for wildlife observation and photography, including a trail link to the refuge from the town of Alamosa (table 20, figure 16). By opening the existing hunting areas on the Monte Vista and Alamosa Refuges to biking and walking, more opportunities would be available for wildlife viewing and photography from mid-July to the beginning of the breeding season at the end of February. On the Alamosa Refuge, the auto tour route would be extended to the east to connect to the Bluff Road (County Road S116). Together, these changes would provide moderate to major benefits for nonconsumptive users of the refuges.

Trail links to the nearby communities of Monte Vista and Alamosa would facilitate access for visitors and increase visitation. The building of a visitor center and refuge headquarters would increase the visibility of the Monte Vista or Alamosa Refuge and would indirectly increase the number of visitors enjoying wildlife observation and photography on refuge trails and roads.

Similar to the discussion above under hunting, in the long term, changes in habitat management to restore more natural flow patterns in some areas would indirectly reduce opportunities to view large numbers of waterfowl, shorebirds, sandhill cranes, and other waterbird species on the Monte Vista and Alamosa Refuges, particularly during periods of severe drought. Opening other areas of the refuges

for biking and walking outside of the breeding period would increase management flexibility by providing other areas where waterbirds and other wildlife could be viewed during severe droughts and provide an opportunity to communicate other interpretive themes and messages. The installation of carefully designed and placed viewing blinds or even mobile blinds would enable visitors to view more wildlife while limiting disturbance to waterbirds.

The Baca Refuge would be opened to the public for wildlife viewing and photography. In combination with a new visitor center at either Monte Vista or Alamosa Refuge, this would significantly increase our ability to reach out to new audiences and would result in moderate to major indirect long-term benefits for both the Service and visitors to the refuge complex and the San Luis Valley. On the Baca Refuge, opportunities would initially be limited as visitor facilities are slowly developed, partly because of funding constraints. Long term (over 15 years), we would develop an auto tour route, install wayside exhibits, and develop interpretive and walking trails around the headquarters area and the Cottonwood Camp area. We would work with the NPS and other agencies to communicate our messages and those of our partners in the San Luis Valley.

Safety is an important consideration for all visitors. The ongoing hunting program would have negligible impacts on the safety of nonconsumptive visitors. However, as needed, signs, education, or closure notices would be used to reduce potential safety concerns.

Implementation of alternative B would result in minor to moderate long-term benefits for nonconsumptive users across the refuge complex.

ALTERNATIVE C

Under alternative C, similar to alternative B, trails on the Alamosa and Monte Vista Refuges that are currently open only to hunters would be opened from mid-July to the end of February to all users, providing more opportunities for visitors who want to walk and bike on the refuges. The addition of an outdoor recreation planner would also enable the refuge complex to provide more visitor services and programs. Otherwise, there would be few changes from alternative A. The implementation of alternative C could also result in the greatest negative impacts for visitors who wish to view wildlife, particularly on the Monte Vista Refuge, where the elimination of the Monte Vista farm fields would result in moderate to major negative impacts to sandhill cranes viewing on the refuge. Because Alternative C would emphasize following natural flow patterns, wildlife viewing opportunities could be further limited.

Although opening the hunting areas on the Monte Vista and Alamosa Refuges to nonconsumptive users and the addition of better visitor services would provide minor benefits for nonconsumptive users, the implementation of alternative C could result in minor to moderate long-term negative impacts for nonconsumptive users across the refuge complex overall as a result of fewer wildlife viewing opportunities as existing wetlands dry up due to restoration activities.

ALTERNATIVE D

Opportunities for nonconsumptive users would be greatest under alternative D. There would be more visitor access available under this alternative than under alternative B, particularly on the Baca Refuge, where users could have seasonal access to the interior areas of the refuge. The auto tour routes on the Monte Vista and Alamosa Refuges would be expanded to include seasonal routes as well. The addition of two outdoor recreation planners and an environmental education specialist would greatly improve the visitor services program.

Overall, the implementation of alternative D would result in moderate to major long-term benefits for nonconsumptive users on the refuge complex.

Effects on Environmental Education

This section discusses the impacts to environmental education.

ALTERNATIVE A

There would continue to be limited environmental education opportunities offered within the refuge complex. We would continue to work with our Friends group to support the Monte Vista Crane Festival, Kid's Fishing Day, and the Kids Crane Festival. Without money for an outdoor recreation planner, education programs would continue to be sporadic.

ALTERNATIVE B

Hiring an outdoor recreation planner would enhance the environmental education program for the refuge complex by a minor to moderate amount. Opening the hunting areas to biking and walking on Alamosa and Monte Vista Refuges and opening the Baca Refuge to visitors would greatly expand the area and availability of where environmental education programs could take place, resulting in a long-term moderate benefit for environmental education in the refuge complex.

ALTERNATIVE C

Similar to alternative B, hiring an outdoor recreation planner would enable us to enhance the education program for the refuge complex. There would be less focus on environmental education than under alternative B, but because we would be able to provide more consistent programs and there would be more areas where programs could take place, there would be minor long-term benefits for environmental education in the refuge complex.

ALTERNATIVE D

Hiring two outdoor recreation planners and an environmental education specialist as well as increasing access and improving facilities would result in a moderate to major long-term benefit for environmental education in the refuge complex.

Effects on Outreach

Under alternative A, we would continue limited outreach activities including public presentations, working with the Friends group, putting out news releases, conducting tours, and attending meetings with county commissioners and nongovernmental organizations. We would increase our outreach activities under alternatives B, C, and D largely through the addition of public use staff, a refuge manager for Monte Vista, and other biological support. This would enable us to maintain and strengthen existing outreach activities. The long-term benefit would be moderate under alternative B, minor under alternative C, and moderate to major under alternative D.



Environmental education is a priority public use on national wildlife refuges.

Cumulative Impacts on Visitor Services

None of the proposed alternatives would result in cumulative impacts on hunting, fishing, or outreach when combined with the activities described under chapter 3, “Foreseeable Activities.” Implementation of the Sangre de Cristo Natural Heritage Area Management Plan would improve overall visitation, education, and tourism in the region. Within this context, implementation of the proposed facilities and programs to support wildlife observation, photography, interpretation, and outreach would result in negligible cumulative benefits over the long term.

5.7 Effects on Special Management Areas

Effects on the Sangre de Cristo Conservation Area, the proposed San Luis Valley Conservation Area, recommended wilderness areas, and the Sangre de Cristo Natural Heritage Area are discussed.

Conservation and Natural Heritage Areas

Existing and proposed conservation areas are discussed in this section.

All Alternatives

None of the alternatives would result in any direct effect on these areas or the values for which these areas were set aside. The cultural, historic, and natural values of these areas would be protected and enhanced. (Refer to the discussion of cultural resources, including the Pedro Trujillo homestead, below.) Partnerships and collaboration are key elements which indirectly help these areas.

Wilderness Review

As required by our planning policy, we conducted a review of potential wilderness values and characteristics of the refuge complex (refer to appendix E).

Potential wilderness areas:

- are at least 5,000 acres or are of sufficient size to make practical their preservation and use in an unimpaired condition;
- appear to be affected primarily by the forces of nature with the human imprint substantially unnoticeable;
- have outstanding opportunities for solitude;
- have outstanding opportunities for a primitive and uncontrolled type of recreation; and
- contain ecological, geological or other features of scientific, educational, scenic, or historic value.

Our review found that only the southeastern portions of the Baca Refuge met these criteria.

ALTERNATIVE A

Under alternative A, we assumed that no areas within the refuge complex would be recommended for further wilderness study. There would be no further protections afforded to these lands other than our refuge management policies and the guidance found in the CCP. Depending on the actions of future refuge managers or other outside factors, existing wilderness values and characteristics could be affected.

ALTERNATIVES B, C, AND D

Under alternatives B, C, and D, the southeastern portion of Baca Refuge would be managed as a wilderness study area until further action was taken by the U.S. Congress. The wilderness values and characteristics as described in appendix E would be protected, resulting in moderate long-term benefits for wilderness values and characteristics.

Cumulative Impacts on Special Management Areas

None of the refuge management alternatives would result in negative impacts to the Sangre de Cristo National Heritage Area or nearby designated or recommended wilderness areas. The recommendation for protecting the wilderness values and characteristics on parts of the Baca Refuge would result in moderate benefits to the overall wilderness values and characteristics of the Great Sand Dunes ecosystem.

5.8 Effects on Cultural Resources

Through the combined efforts of different agencies, organizations, and individuals, many prehistoric and historic sites have been documented in the San Luis Valley. However, many of the refuge complex's resources have not been surveyed. Formal investigations have been sporadic, and there is still a lot we do not know about these resources.

All Alternatives

Under all alternatives, we would continue to adhere to cultural resource laws such as Section 106 of the National Historic Preservation Act, the Archaeological Preservation Act, and the Native American Graves Protection and Repatriation Act. With the help of the Service cultural resource staff, we would avoid adverse effects on cultural resources. All alternatives would adhere to the spirit and intent of the Memorandum of Understanding with various tribes for the treatment and disposition of all Native American human remains, associated and unassociated funerary objects, and other sacred objects. (Refer to chapter 4, section 4.6, Tribal Coordination.)

Some of the activities outlined for each alternative have the potential to negatively affect cultural resources, either by direct disturbance (such as through ground-disturbing activities during construction), or by long term exposure to the elements. The presence of cultural resources, including historic properties, would not prevent a Federal undertaking or projects, but any undertaking would be subject to Section 106 of the National Historic Preservation Act and other laws protecting cultural resources.

Effects of Alternatives B, C, and D

The differences between the potential effects of the different action alternatives on cultural resources are nuanced. With all alternatives, any undertaking that disturbs the soil or alters buildings or structures over 50 years of age would be reviewed under Section 106 of the National Historic Preservation Act. Most of our habitat restoration work would involve modifying existing infrastructure. While we would need to evaluate any structures for their historical significance before disturbing them, we would not generally be initiating large ground-disturbing activities. Most of our work would be focused on opening up natural flow patterns by removing dikes, modifying structures, and restoring upland areas on formal agricultural areas. Potential adverse effects on historic



FWS

The former Baca cattle headquarters is an eligible historic district on the Baca Refuge.

properties would be avoided when possible and resolved through consultation.

We would provide the Service cultural resource staff with a description and location of all projects, activities, routine maintenance, and operations that could cause ground disturbance or affect structures or buildings. The Service cultural resource staff would analyze the potential to affect historic properties and enter into consultation with the State Historic Preservation Officer and other parties as necessary. We would protect all known gravesites.

All the action alternatives would offer more educational opportunities and involve more work with our partners to accomplish preservation and research objectives. For example, we would pursue establishment of a National Register Historic District at the two Baca Ranch complexes. We would provide guided tours and collaborate with tribal representatives to preserve sites and collections. As a result, cultural resources would receive greater protection.

Under alternatives B and D, known sites and sensitive areas would get more law enforcement protection. Under alternative C, because natural processes would be emphasized, we would likely remove some non-significant structures and buildings that are not needed for refuge operations or that are intrusive to historic districts or landscapes.

As compared with alternative A, under alternatives B, C, and D, there would be better planning and more survey work so there would be increased protection and preservation of cultural resources. Devel-

opment of a stepdown plan for cultural resources would be beneficial, particularly if it were integrated with habitat management plans. Additional cultural resource surveys would help identify areas with a moderate to high potential for cultural resources and thereby enable us to make better planning and public access decisions.

Visitors who are interested in the history and prehistory of the refuge complex would benefit from an increased emphasis on cultural resource interpretation and preservation.

Conclusion

We would continue to follow all cultural resource laws for any projects on the refuge. Under alternatives B and D, we would increase our protection efforts through better planning, survey work, and law enforcement. Alternative C would likely not require as much law enforcement. Overall, the long-term effects on cultural resources would be negligible to minor with minor beneficial effects with increased law enforcement and stabilization and surveys.

Mitigation for Cultural Resources

Any mitigation requirements for any unavoidable adverse effects on historic properties resulting from our actions will be reviewed through Section 106 of the National Historic Preservation Act. This process will be guided by the Service's cultural resource staff and will be done in consultation with the State Historic Preservation Office, the tribes, and other consulting parties.

Cumulative Impacts on Cultural Resources

Implementation of the Sangre de Cristo National Heritage Area management plan would improve interpretation and help cultural resources preservation in the San Luis Valley. This, in combination with the proposed measures under all alternatives, would result in negligible to minor cumulative benefits to cultural resources over the long term.

5.9 Effects on the Socioeconomic Environment

Based on the regional economic setting described in chapter 4 (section 4.7), the methods used to conduct a regional economic impact analysis are detailed below, followed by an analysis of the final CCP management strategies that could affect stakeholders, residents, and the local economy. The management activities of economic concern in this analysis are:

- Revenue sharing payments;
- Refuge complex staff salary spending;
- Refuge complex purchases of goods and services within the local economy; and
- Spending in the local economy by visitors to the refuges.

Methods for a Regional Economic Impact Analysis

Economic input-output models are commonly used to find out how economic sectors may be affected by demographic, economic, and policy changes. The economic impacts of the management alternatives for the refuge complex were estimated using IMPLAN (Impact Analysis for Planning), a regional input-output modeling system developed by the USFS. IMPLAN is a computerized database and modeling system that provides a regional input-output analysis of economic activity in terms of 10 industrial groups involving more than 400 economic sectors (Olson and Lindall 1999). The IMPLAN model draws on data collected by the IMPLAN Group LLC from multiple Federal and State sources, including the Bureau of Economic Analysis, the Bureau of Labor Statistics, and the U.S. Census Bureau. The year 2009 IMPLAN data profiles for Alamosa, Costilla, Rio Grande, and Saguache Counties were used in this study. The IMPLAN county-level employment data estimates were found to be comparable to the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System data for the year 2009 (Olson and Lindall 1999).

Regional economic impact analyses capture the complex interactions of consumers and producers of goods and services in local economies. Economies are complex webs of interacting consumers and producers, in which goods produced by one sector of an economy become inputs to another, and the goods produced by that sector can become inputs to still more sectors. A change in the final demand for a good

or service can generate a ripple effect throughout an economy. For example, if more visitors come to an area, local businesses will hire extra labor and get supplies to meet the increase in demand for more services. The income and employment resulting from visitor purchases from local businesses represent the direct effects of visitor spending within the economy. Direct effects measure the net amount of spending that stays in the local economy after the first round of spending; the amount that doesn't stay in the local economy is termed a leakage (Carver and Caudill 2007). To increase supplies to local businesses, input suppliers must also increase their purchases of inputs from other industries. The income and employment resulting from these secondary purchases by input suppliers are the indirect effects of visitor spending within the economy. Employees of the directly affected businesses and input suppliers use their incomes to buy goods and services. The resulting increased economic activity from new employee income is the induced effect of visitor spending. The indirect and induced effects are known as the secondary effects of visitor spending. Multipliers (also known as response coefficients) capture the size of the secondary effects, usually as a ratio of total effects on direct effects (Stynes 1998). The sums of the direct and secondary effects describe the total economic impact of visitor spending in the local economy.

Regional economic effects from the IMPLAN model are reported for the following economic measures:

- Employment represents the change in the number of jobs generated in the region from a change in regional output. IMPLAN estimates for employment include full time, part time, and temporary jobs.
- Labor income includes employee wages and salaries, including the income of sole proprietors and payroll benefits.
- Value added measures contribution to Gross Domestic Product (GDP). Value added is equal to the difference between the amount an industry sells a product for and the production cost of the product, and is thus the net of intermediate sales.

This CCP guides long-range management direction to achieve the refuge complex purposes over a 15-year timeframe. The economic impacts reported here are yearly in 2013 dollars. Large management changes often take several years to achieve. The estimates reported for alternatives B, C, and D repre-

sent the final economic effects after all the changes in management have been implemented.

Impacts of Current and Proposed Management Activities

The impacts from refuge revenue sharing payments, refuge purchases of goods and services within the local economy, and the effects of visitor expenditures are discussed.

Impacts from Refuge Revenue Sharing Payments. We make revenue sharing payments to the counties for the land that is under our administration. Under provisions of the Refuge Revenue Sharing (RRS) Act, local counties receive an annual payment for lands that have been bought by full fee-title acquisition by the Service. Payments are based on the greater of 75 cents per acre or 0.75 percent of the fair market value. The exact amount of the annual payment depends on Congressional appropriations, which in recent years have tended to be substantially less than the amount required to fully fund the authorized level of payments. For fiscal year 2012, the four counties that contain portions of a refuge each received a payment: Alamosa County received \$17,797, Costilla County received \$334, Rio Grande County received \$24,304, and Saguache County received \$32,805. Table 22 shows the annual impacts of the \$75,240 received by the local area in RRS payments. The RRS payments generate an estimated total impact of 1 job, \$20,700 in labor income, and \$28,200 in value added annually to the local four-county area.

Table 22. Annual impacts of refuge revenue-sharing payments.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
All Alternatives			
Direct effects	1	\$17,700	\$22,500
Secondary effects	0	\$3,000	\$5,700
Total effects	1	\$20,700	\$28,200

Effects of Refuge Staff Salary Spending within the Local Economy

Refuge complex employees live and spend their salaries on daily living expenses in the local area, thereby generating impacts within the local economy. Household consumption expenditures consist of payments by individuals and households to industries for goods and services used for personal consumption. The IMPLAN modeling system contains household income consumption spending profiles that account for average household spending patterns by income level. These profiles also capture average annual savings and allow for leakage of household spending to outside the region. The IMPLAN household spending pattern for households earning \$50,000–75,000 dollars per year was used to reflect the average salary of full-time permanent employees for the refuge complex.

The current approved staff for the refuge complex consists of 14 employees (including permanent, part-time, and seasonal positions). Refuge complex staff is expected to increase to 34 employees under alternative B, 35 employees under alternative C, and 43 employees under alternative D (including full time, part-time, and seasonal positions). For a complete description of positions, see table 7 in chapter 3.

Refuge complex staff estimate that current annual salaries total approximately \$1,099,300 under alternative A. Staff expenses are expected to increase to approximately \$1,724,200 under alternative B, \$1,275,000 under alternative C, and \$1,985,700 under alternative D. The economic impacts associated with refuge complex employees spending their salaries in the local four-county area are summarized in table 23. These impacts include only the secondary effects of non-refuge jobs created as refuge complex employees spend their salaries in the local four-county area.

For alternative A, it is estimated that salary spending by refuge complex staff would generate a secondary effects of 5 jobs, \$146,900 in labor income, and \$294,000 in value added annually in the local economy.

Under alternative B, the annual impact of salary spending would increase to 7 jobs, \$230,400 in labor income, and \$461,800 in value added.

Under alternative C, there would be secondary effects of 5 jobs, \$170,400 in labor income, and \$341,500 in value added annually.

Under alternative D, there would be 8 jobs, \$265,300 in labor income, and \$531,800 in value added annually.

Table 23. Annual impacts of salary spending.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Alternative A			
Direct effects	0	\$0	\$0
Secondary effects	5	\$146,900	\$294,400
Total effects	5	\$146,900	\$294,400
Alternative B			
Direct effects	0	\$0	\$0
Secondary effects	7	\$230,400	\$461,800
Total effects	7	\$230,400	\$461,800
Alternative C			
Direct effects	0	\$0	\$0
Secondary effects	5	\$170,400	\$341,500
Total effects	5	\$170,400	\$341,500
Alternative D			
Direct effects	0	\$0	\$0
Secondary effects	8	\$265,300	\$531,800
Total effects	8	\$265,300	\$531,800



© Joe Zimm

The refuge complex purchases many goods and services in the local economy such as gasoline and equipment repair.

Effects of Refuge Complex Purchases of Goods and Services within the Local Economy

Local purchases of supplies and services for refuge complex operations contribute to the local economic impacts associated with the refuge complex. The refuge complex spends an average of \$389,000 per year on non-salary expenditures. Major local expenditures include office supplies, utilities, and supplies related to habitat and grounds improvements. Table 24 provides a breakdown of current non-salary expenditures by expenditure category. To find the local economic impacts of non-salary expenditures, only expenditures made within the local four-county area are included in the analysis. This analysis assumes that the percent of local spending will not differ across the alternatives.

Average annual non-salary expenditures are expected to be \$389,400 for alternative A, \$431,000 for alternative B, \$398,000 for alternative C, and \$496,400 for alternative D. Table 25 shows the economic impacts associated with non-salary expenditures in the local communities near the refuge complex. For alternative A, purchase of goods and services would generate an estimated total economic impact of 6 jobs, \$153,500 in labor income, and \$164,900 in value added annually. Under alternative B, 6 jobs, \$169,900 in labor income, and \$182,500 in value added would be generated annually by the purchase of goods and services by the refuge complex. Alternative C would have a similar annual economic impact as B, annually generating 6 jobs, \$157,000 in

labor income, and \$168,500 in value added. Finally, alternative D would have the greatest annual impact, with 7 jobs, \$195,700 in labor income, and \$210,200 in value added.

Table 24. Breakdown of current purchases of goods and services.

<i>Expense category</i>	<i>Average annual percent of non-salary expenditures</i>	<i>Percent spent in local four-county area</i>
Heavy equipment purchasing and leasing	4	64
Equipment maintenance and repair	5	83
Vehicle purchase	7	0
Vehicle maintenance and repair	4	92
Habitat and grounds improvements and treatments (not including acquired lands restoration)	32	93
Travel	1	0
Maintenance and repair of structures	3	100
Environmental and other technical consulting services	1	100
All other expenses	44	2



Visitors gather at the Monte Vista Refuge office during the Monte Vista Crane Festival.

Table 25. Annual impacts of purchases of goods and services.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Alternative A			
Direct effects	5	\$133,800	\$127,100
Secondary effects	1	\$19,700	\$37,800
Total effects	6	\$153,500	\$164,900
Alternative B			
Direct effects	5	\$148,100	\$140,700
Secondary effects	1	\$21,800	\$41,800
Total effects	6	\$169,900	\$182,500
Alternative C			
Direct effects	5	\$136,800	\$129,900
Secondary effects	1	\$20,200	\$38,600
Total effects	5	\$170,400	\$341,500
Alternative D			
Direct effects	6	\$170,600	\$162,000
Secondary effects	1	\$25,100	\$48,200
Total effects	7	\$195,700	\$210,200

Effects of Visitor Expenditures

Visitor spending generates significant economic activity in areas near refuges. The Service's report "Banking on Nature: The Economic Benefits of National Wildlife Refuge Visitation to Local Communities" estimated the impact of national wildlife refuges on their local economies (Carver and Caudill 2013). According to the report, more than 46.5 million people visited the national wildlife refuges in fiscal year 2011, which generated \$2.4 billion of sales in regional economies. Accounting for both the direct and secondary effects, spending by national wildlife refuge visitors generated more than 35,000 jobs and \$792.7 million in employment income (Carver and

Caudill 2007). Spending on refuge recreation generated approximately \$342.9 million in tax revenue at the local, county, State, and Federal levels (Carver and Caudill 2013). The refuge complex offers a wide variety of recreation opportunities, including wildlife observation and photography, interpretation, environmental education, and waterfowl hunting. The annual Monte Vista Crane Festival which is one of the largest wildlife festivals held in the State, is hosted by the town of Monte Vista, and brings many visitors to the Monte Vista Refuge to view sandhill cranes and provide a boost to the local economy. Big game hunting is not allowed within the boundaries of the Alamosa and Monte Vista Refuges, but would be allowed on all three refuges under alternatives B, C, and D. The refuge complex would allow limited fishing on Alamosa Refuge under alternatives B and D.

Annual visitation estimates for the refuge complex are based on several sources, including visitors entering the visitor center and office as well as general observations by refuge staff. Annual visitation estimates are on a per-visit basis. Table 26 summarizes estimated visitation by type of visitor activity for alternatives A, B, C, and D.

Under alternative B, the primary focus is a balance of habitat restoration, enhanced public use, and phasing out the current permitted use of bison on the Baca Refuge.

Habitat restoration is also a primary focus of alternative C, with an emphasis on promoting natural processes. On the Monte Vista Refuge, small grain production for sandhill cranes would no longer occur and some of the traditional wetland roosting areas for sandhill cranes would no longer have water. As with alternative B, the current permitted use of bison on the Baca Refuge would be phased out under alternative C. Wildlife-dependent public uses are expected to be enhanced to a limited degree as a result of increased access opportunities on Alamosa and Monte Vista Refuges. However, if there is not enough water to support roosting sandhill cranes, there could be a greater decline in visitation on Monte Vista Refuge than what is projected. Big game hunting would be allowed on refuge complex lands to aid in the management of elk herds.

The aim of alternative D is to maximize compatible public use opportunities across the refuge complex. This would include management specifically for waterfowl production and migration at the Monte Vista and Alamosa Refuges, as well as continued small grain production for sandhill cranes at the Monte Vista Refuge. Big game hunting for elk would be allowed on all three refuges, and fishing opportunities would be available at the Alamosa Refuge. (Refer to table 26 for the estimated annual visitation to the refuge complex for all four alternatives.)

Table 26. Estimated annual refuge complex visitation by alternative.

	<i>Total number of visits</i>	<i>Number of non-local visits</i>	<i>Average hours spent on refuge</i>	<i>Number of non-local visitor days^a</i>
Alternative A				
Fishing	0	0	4	0
Big game hunting	0	0	8	0
Waterfowl and migratory bird hunting	600	480	6	360
Upland game hunting	0	0	8	0
Nonconsumptive uses	4,610	3,227	2	807
Total Visitation	5,210	3,707		1,167
Alternative B				
Fishing	200	0	4	0
Big game hunting	500	75	8	75
Waterfowl and migratory bird hunting	660	528	6	396
Upland game hunting	500	25	8	25
Nonconsumptive uses	5,763	4,034	2	1,008
Total Visitation	7,623	4,662		1,504
Alternative C				
Fishing	0	0	4	0
Big game hunting	500	75	8	75
Waterfowl and migratory bird hunting	660	528	6	396
Upland game hunting	500	25	8	25
Nonconsumptive uses	4,841	3,388	2	847
Total Visitation	6,501	4,016		1,343
Alternative D				
Fishing	500	50	4	25
Big game hunting	500	75	8	75
Waterfowl and migratory bird hunting	720	576	6	432
Upland game hunting	500	25	8	25
Nonconsumptive uses	6,454	4,518	2	1,129
Total Visitation	8,674	5,244		1,686

^a One visitor day = 8 hours.

To estimate visitor expenditures, we used average daily visitor spending profiles from the Banking on Nature report (Carver and Caudill 2007) that were derived from the 2006 National Survey of Fishing, Hunting, and Wildlife Associated Recreation (DOI FWS and Department of Commerce U.S. Census Bureau 2011). The National Survey reports trip-related spending of State residents and non-residents for wildlife-associated recreational activities. For each recreation activity, spending is reported in the categories of lodging, food and drink, transportation,

and other expenses. Carver and Caudill (2007) calculated the average per person per visitor day expenditures by recreation activity for each Service region. We used the spending profiles for non-residents for the Mountain-Prairie Region 6 (which includes Colorado), and updated the 2006 spending profiles to 2013 dollars using the Consumer Price Index Inflation Calculator. Average daily spending profiles for non-resident visitors to Region 6 for fishing (\$129.94 per day), waterfowl and other migratory bird hunting (\$78.44 per day), upland game hunting (\$181.97 per

day), and big game hunting (\$220.84 per day) were used to estimate non-local visitor spending for refuge fishing and hunting related activities. The average daily non-resident spending profile for nonconsumptive wildlife recreation (observing, or photographing fish and wildlife) was used for nonconsumptive wildlife viewing activities (\$162.93 per day).

Visitor spending profiles are estimated on an average per day (or 8-hour) basis. Because some visitors only spend short amounts of time visiting a refuge, counting each refuge visit as a full visitor day would overestimate the economic impact of refuge complex visitation. To properly account for the amount of spending, the annual number of non-local refuge visits were converted to visitor days. Refuge staff estimate that non-local anglers would spend approximately 4 hours (1/2 a visitor day) on the refuge, while waterfowl and upland game hunters would spend approximately 8 hours (1 visitor day). Non-local visitors that view wildlife on nature trails or take part in other wildlife observation activities typically spend 4 hours (1/2 a visitor day). Table 27 shows the number of non-local visitor days by recreation activity for each alternative. Total spending by non-local refuge visitors was calculated by multiplying the average non-local visitor daily spending by the number of non-local visitor days at the refuge.

Table 27 summarizes the total economic impacts associated with current non-local visitation by alternative. Under alternative A, non-local refuge complex visitors would spend nearly \$159,700 in the local economy annually. This spending would directly account for an estimated 1 job, \$36,600 in labor income, and \$60,700 in value added in the local economy. The secondary or multiplier effects would generate another \$9,900 in labor income and \$18,300 in value added. Accounting for both the direct and secondary effects, spending by non-local visitors for alternative A would generate total annual economic impacts of 1 job, \$46,500 in labor income, and \$79,000 in value added.

As shown in table 26, non-local visitation to the refuge complex for all activities is expected to increase by 288 visitor days under alternative B as compared with alternative A. Under alternative B, non-local visitors would spend approximately \$216,100 in the local area annually. Accounting for both the direct and secondary effects, spending by non-local visitors for alternative B would generate an estimated total annual economic impact of 1 job, \$62,900 in labor income, and \$106,800 in value added.

Refuge complex non-local visitation for all activities is expected to increase by 58 visitor days under alternative C as compared with alternative A (table 26). Under alternative C, non-local refuge visitors would spend approximately \$189,900 in the local area annually. This spending by non-local visitors for

alternative C would generate an estimated total economic impact of 1 job, \$55,200 in labor income, and \$91,900 in value added.

Refuge complex non-local visitation is expected to increase by 461 visitor days under alternative D as compared with alternative A (table 26). Under alternative D, non-local refuge visitors would spend approximately \$241,900 in the local area annually. This spending by non-local visitors would generate an estimated total annual economic impact of 2 jobs, \$70,200 in labor income, and \$191,500 in value added.

Table 27. Annual impacts of non-local visitor spending by alternative

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Alternative A			
Direct effects	1	\$36,600	\$60,700
Secondary effects	0	\$9,900	\$18,300
Total effects	1	\$46,500	\$79,000
Alternative B			
Direct effects	1	\$49,400	\$82,200
Secondary effects	0	\$13,500	\$24,600
Total effects	1	\$62,900	\$106,800
Alternative C			
Direct effects	1	\$43,400	\$72,100
Secondary effects	0	\$11,800	\$21,500
Total effects	1	\$55,200	\$93,600
Alternative D			
Direct effects	2	\$55,200	\$91,900
Secondary effects	0	\$15,000	\$27,600
Total effects	2	\$70,200	\$119,500

Summary Across All Alternatives

The economic impacts across the alternatives are summarized below.

Summary of Economic Impacts for Alternative A (No-Action Alternative)

Table 28 summarizes the direct and total economic impacts in the four-county area of refuge complex management activities for alternative A. Under alternative A, refuge complex management activities directly related to refuge operations generate an estimated 12 jobs, \$321,100 in labor income, and \$487,500 in value added in the local economy. Including direct, indirect, and induced effects, all refuge activities generate a total annual economic impact of 13 jobs, \$367,600 in labor income, and \$566,500 in value added. Total economic effects of refuge complex operations play a much larger role in the communities near the refuge where most of the refuge-related expenditures and public use-related economic activity occurs.

Table 28. Annual economic impacts for alternative A.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Refuge administration ^a			
Direct effects	6	\$151,500	\$149,600
Total effects	12	\$321,100	\$487,500
Public use activities			
Direct effects	1	\$36,600	\$60,700
Total effects	1	\$46,500	\$79,000
Aggregate impacts			
Direct effects	5	\$136,800	\$129,900
Total effects	5	\$170,400	\$341,500

^a Refuge administration impacts include impacts associated with Refuge Revenue Sharing Act payments made to counties, personnel salary expenditures made in the local four-county area, and refuge non-salary expenditures made in the local four-county area.

Summary of Economic Impacts for Alternative B

Table 29 summarizes the direct and total economic impacts of refuge management activities for alternative B. Under alternative B, refuge complex

management activities would generate an estimated 14 jobs, \$421,000 in labor income, and \$672,500 in value added in the local economy. Including direct, indirect, and induced effects, all refuge complex activities would generate a total economic impact of 15 jobs, \$483,900 in labor income, and \$779,300 in value added annually.

Table 29. Annual economic impacts for alternative B.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Refuge administration ^a			
Direct effects	6	\$165,800	\$163,200
Total effects	14	\$421,000	\$672,500
Public use activities			
Direct effects	1	\$49,400	\$82,200
Total effects	1	\$62,900	\$106,800
Aggregate impacts			
Direct effects	7	\$215,200	\$245,400
Total effects	15	\$483,900	\$779,300

^a Refuge administration impacts include impacts associated with Refuge Revenue Sharing Act payments made to counties, staff salary expenditures made in the local four-county area, and refuge non-salary expenditures made in the local four-county area.

Table 30 summarizes the change in economic effects associated with refuge complex operations under alternative B as compared to alternative A. Because of the expected increases in refuge staff and refuge complex visitation, alternative B would generate an increased annual economic impact of 2 jobs, \$116,300 in labor income, and \$212,800 more in value added as compared to alternative A.



© Joe Zimm

Mule deer are found across the refuge complex.

Table 30. Change in economic impact from alternative B compared to alternative A.

	<i>Employment (number of full and part-time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Refuge administration ^a			
Direct effects	no change	(+) \$14,300	(+) \$13,600
Total effects	(+) 2	(+) \$99,900	(+) \$185,000
Public use activities			
Direct effects	no change	(+) \$12,800	(+) \$21,500
Total effects	no change	(+) \$16,400	(+) \$27,800
Aggregate impacts			
Direct effects	no change	(+) \$27,100	(+) \$35,100
Total effects	(+) 2	(+) \$116,300	(+) \$212,800

^a Refuge administration impacts include impacts associated with Refuge Revenue Sharing Act payments made to counties, staff salary expenditures made in the local four-county area, and refuge non-salary expenditures made in the local four-county area.

Summary of Economic Impacts for Alternative C

Table 31 summarizes the direct and total economic impacts of refuge complex management activities for alternative C. Under alternative C, refuge complex management activities directly related to refuge operations would generate an estimated 12 jobs, \$348,100 in labor income, and \$538,200 in value added in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate a total economic impact of 13 jobs, \$403,300 in labor income, and \$631,800 in value added annually.

Table 32 summarizes the change in economic effects associated with refuge complex operations under alternative C compared to alternative A. Because of slight increases in refuge visitation and administration, alternative C would generate \$35,700 more in labor income and \$65,300 more in value added annually compared to alternative A.

Table 31. Annual economic impacts for alternative C.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Refuge administration ^a			
Direct effects	6	\$154,500	\$152,400
Total effects	12	\$348,100	\$538,200
Public use activities			
Direct effects	1	\$43,400	\$72,100
Total effects	1	\$55,200	\$93,600
Aggregate impacts			
Direct effects	7	\$197,900	\$224,500
Total effects	13	\$403,300	\$631,800

^a Refuge administration impacts include impacts associated with RRS payments made to counties, staff salary expenditures made in the local four-county area, and refuge non-salary expenditures made in the local four-county area.

Table 32. Change in economic impact from alternative C compared to alternative A.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Refuge administration ^a			
Direct effects	No change	(+) \$3,000	(+) \$2,800
Total effects	No change	(+) \$27,000	(+) \$50,700
Public use activities			
Direct effects	No change	(+) \$6,800	(+) \$11,400
Total effects	No change	(+) \$8,700	(+) \$14,600
Aggregate impacts			
Direct effects	No change	(+) \$9,800	(+) \$14,200
Total effects	No change	(+) \$35,700	(+) \$65,300

^a Refuge administration impacts include impacts associated with RRS payments made to counties, staff salary expenditures made in the local four-county area, and refuge non-salary expenditures made in the local four-county area.

Summary of Economic Impacts for Alternative D

Table 33 summarizes the direct and total economic impacts in the four-county area of refuge management activities for alternative D. Under alternative D, refuge complex management activities would generate an estimated 16 jobs, \$481,700 in labor income, and \$770,200 in value added in the local economy. Including direct, indirect, and induced effects, all refuge complex activities would generate a total economic impact of 18 jobs, \$551,900 in labor income, and \$889,700 in value added annually.

Table 34 summarizes the change in economic effects associated with refuge complex operations under alternative D compared to alternative A. Because of significant increases in refuge visitation and administration, alternative D would generate an increased annual economic impact of 5 jobs, \$184,300 in labor income, and \$323,200 in value added compared to alternative A.

Table 33. Annual economic impacts for alternative D.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Refuge administration ^a			
Direct effects	7	\$188,300	\$184,500
Total effects	16	\$481,700	\$770,200
Public use activities			
Direct effects	2	\$55,200	\$91,900
Total effects	2	\$70,200	\$119,500
Aggregate impacts			
Direct effects	9	\$243,500	\$276,400
Total effects	18	\$551,900	\$889,700

^a Refuge administration impacts include impacts associated with Refuge Revenue Sharing Act payments made to counties, staff salary expenditures made in the local four-county area, and refuge non-salary expenditures made in the local four-county area.

Table 34. Change in economic impact for alternative D compared to alternative A.

	<i>Employment (number of full and part- time jobs)</i>	<i>Labor income (\$2013)</i>	<i>Value added (\$2013)</i>
Refuge administration ^a			
Direct effects	(+) 1	(+) \$36,800	(+) \$34,900
Total effects	(+) 4	(+) \$160,600	(+) \$282,700
Public use activities			
Direct effects	(+) 1	(+) \$18,600	(+) \$31,200
Total effects	(+) 1	(+) \$23,700	(+) \$40,500
Aggregate impacts			
Direct effects	(+) 2	(+) \$55,400	(+) \$66,100
Total effects	(+) 5	(+) \$184,300	(+) \$323,200

^a Refuge administration impacts include impacts associated with Refuge Revenue Sharing Act payments made to counties, staff salary expenditures made in the local four-county area, and refuge non-salary expenditures made in the local four-county area.

Summary and Conclusions

Under alternative A, refuge complex management activities annually generate an estimated 13 jobs, \$368,500 in labor income, and \$568,200 in value added in the local economy.

Given the increases in refuge administration and public use activities, alternative B would annually generate 2 more jobs, \$116,300 more in labor income, and \$212,800 more in value added annually compared to alternative A.

Under alternative C, refuge complex public use and administration activities would also increase. Alternative C would annually generate \$35,600 more in labor income, and \$64,900 more in value added compared to alternative A.

Under alternative D, the refuge complex would expect the greatest increase in visitation as well as staff needs. Alternative D would annually generate 5 jobs, \$184,300 in labor income, and \$323,200 in value added compared to alternative A.

Total economic impacts associated with refuge complex operations across all alternatives represent less than one-tenth of 1 percent of total income and total employment in the overall four-county local

economy. The total economic effects of refuge operations play a much larger role in the communities near the refuge complex where most of the refuge-related expenditures and public use-related economic activity occurs.

Environmental Justice

Within the spirit and intent of Executive Order 12898, Federal actions to address environmental justice in minority and low-income populations, no actions in this draft CCP and EIS would disproportionately place any adverse environmental, economic, social, or health effects on minority or low-income populations as compared to all of the public.

Under all alternatives, we would not charge for public use activities, and a variety of opportunities and activities would be offered for all visitors and local citizens.

In partnership with other Federal agencies and a number of Native American tribes, we are entering into an agreement for projects that would require compliance with the Native American Graves Protection and Repatriation Act of 1990. The agreement addresses the treatment and disposition of all Native American human remains, associated and unassociated funerary objects, sacred objects, and objects of cultural patrimony which are defined as agency collections or are found as a result of inadvertent discovery or intentional evacuation on our lands.

The refuge complex lies within the Sangre de Cristo National Heritage Area. None of the alternatives would negatively affect the values for which the Heritage Area was established. We would work with the NPS to interpret the Pedro Trujillo Homestead and protect the cultural heritage of the site.

We also recognize that the refuge complex is centrally located to the communities of Alamosa, Monte Vista, and Crestone, and that some of these communities have a proportion of lower income citizens as compared with other areas in the State. Our alternatives recognize that our refuges offer unique options for engaging children and adults who do not have many opportunities to experience nature, and we are committed to working with the schools and local universities to find ways to promote and get more minority and low-income children engaged in environmental education and other activities.

We are committed to ensuring that all members of the public have equal access to America's fish and wildlife resources, as well as equal access that would enable them to meaningfully take part in activities and policy shaping.

Cumulative Impacts on the Socioeconomic Environment

Many of the foreseeable activities described in chapter 3 are expected to help socioeconomic conditions in the San Luis Valley. For example, land development and solar energy development activities are expected to stimulate the local economy; resource management initiatives such as the San Luis Valley regional habitat conservation plan (Rio Grande Water Conservation District 2012b) and ground water management subdistricts are expected to provide a stable and sustainable regulatory environment for agriculture; and the implementation of the Sangre de Cristo National Heritage Area Management Plan is expected to improve heritage tourism opportunities. The socioeconomic benefits that are expected to result from the proposed refuge management alternatives, when combined with these and other foreseeable activities in the region, would result in minor cumulative benefits to the socioeconomic environment over the long term.

5.10 Irreversible and Irretrievable Resource Commitments

NEPA requires a discussion of any irreversible or irretrievable commitments of resources that would result from implementing the alternatives. An irreversible commitment of resources means that nonrenewable resources are permanently lost because of plan implementation. In contrast, an irretrievable commitment of resources is the loss of resources or resource production, or the use of renewable resources during the 15-year implementation period of the plan (or longer).

All the alternatives, including the no-action alternative, would result in some irreversible loss of soil resources. Topsoil would be removed before facility construction (primarily under alternatives B and D) but would be reused in revegetation of disturbed areas. Even with the best management practices, some irreversible soil loss from erosion could occur. Although we would make every effort to fence livestock out of riparian areas, any accidental grazing in these areas, particularly during certain periods, could contribute to soil erosion and further degradation of streambanks. Ineffective dispersal or harvest of elk, particularly under the no-action alternative,

would lead to further degradation of streambanks and soil erosion in some locations.

The use of Federal money for staff and operations would be an irretrievable commitment of resources because this money would not be available for other Federal programs or projects.

Any construction would require expenditures of Federal funds for the costs of construction. Money for operations and periodic maintenance in perpetuity would be required, which would commit future generations to these expenditures. An increased commitment of maintenance services because of increased public use or modification of infrastructure would be required.

Aggregate and other materials would be needed for construction of facilities and roads. Gasoline, diesel, and oil used by motor vehicles and other equipment, either by the Service, contractors, or the public, would represent an irreversible commitment of resources because their use is lost for future generations.

Land that was physically altered for restoring natural water flows would be committed to the new use, representing a change in the function and production of existing wetlands on the refuges and a possible change in soil chemistry.

Our efforts to protect and restore riparian habitat could help the southwestern willow flycatcher and other riparian species within the constraints of the hydrology. However, there would be less water for waterfowl and other migratory birds because of droughts, climate change, and funding constraints. During some years, wetlands would be dry, resulting in irretrievable losses of waterfowl production or hunting opportunities.

Removal or disturbance of any unknown cultural resources would result in irretrievable and irreversible loss of resources.

Increased emissions from refuge operations would not exceed Federal or State air quality standards. Air quality would return to existing conditions following prescribed fires and other disturbances that resulted in increased dust or other emissions. Increased visitor access on refuge roads would not affect regional air quality. The Class I air quality areas next to the Baca Refuge would not be affected.

Short-term obstruction or temporary disruption to local roads would occur during construction of a new visitor center at the Monte Vista or Alamosa Refuge.

Under alternative C, the loss of some or all of the traditional roosting areas for sandhill cranes on Monte Vista Refuge, combined with the elimination of grain production on the refuge, would result in an

irretrievable loss of resource commitments in the local economy, although the extent is not clearly understood. Sandhill cranes would need to rely more heavily on other agricultural crops in the area, potentially affecting farmers, or find forage foods elsewhere. If there are fewer cranes in and around Monte Vista for wildlife viewing, it could impact the number of people drawn to the area during the Monte Vista Crane Festival.

5.11 Short-term Uses of the Environment Versus Maintenance of Long-term Productivity

Historical uses of the refuge, including early settlement, agricultural uses, roads and access, livestock grazing, haying, mowing, and visitor facilities, have affected the long-term productivity of the refuge complex's ecology. Short-term factors associated with implementing the CCP include (1) restoration of former agricultural areas, (2) restoration of riparian areas or water impoundments, (3) construction of facilities or boundary fences, (4) removal of fencing, (5) improving and maintaining roads, and (6) building new or renovating existing facilities to support visitor services.

Implementation of this CCP, including management activities such as prescribed fire, livestock grazing, hunting to control wildlife populations, and the control of invasive species, would contribute to the maintenance and enhancement of long-term productivity of the refuge environment. Restoration of natural flow patterns on the Alamosa and Monte Vista Refuges would result in better management of the refuge complex's water resources. This would be at the expense of existing artificial wetlands that are usually wet annually. There would be both short-term and long-term losses in waterfowl production. Other migratory birds would benefit over the long term as some wetlands returned to uplands.

5.12 Adherence to Planning Goals

The following sections are descriptions of how well each alternative meets each goal for the refuge complex. Table 35 summarizes this discussion.



© Joe Zimm

Winter on the Baca Refuge

Table 35. How well the actions meet the goals for the Refuge Complex.

Goal	Alternatives—adherence to goals*			
	A	B	C	D
Habitat and wildlife management	×	✓	✓	◆
Water resources	◆	✓	✓	✓
Partnerships and refuge complex operations	◆	✓	✓	✓
Visitor services	×	✓	◆	✓
Research, science, and wilderness review	◆	✓	✓	✓
Cultural resources and tribal coordination	×	✓	◆	✓

*Ratings note that an alternative satisfies the goal (✓), partially satisfies the goal (◆), or does not satisfy the goal (×).

Habitat and Wildlife Management

The goal is to *conserve, restore, and improve the biological integrity, environmental health, and 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.* (Refer to chapter 2.) The three national wildlife refuges are important stopovers for many migratory birds, including nesting, migrating, and wintering bird species.

Under alternative A (the no-action alternative), the Rio Grande corridor and its tributaries on the

Alamosa Refuge would be protected and managed to provide habitat for riverine, riparian-dependent, and other species. Little would be done to enhance willow habitat for the southwestern willow flycatcher along the Rio Grande, except what could be accomplished with our existing funding and staff resources. On the Baca Refuge, obvious signs of degradation of the five creek corridors would be addressed within existing resource levels. Outside of the actions identified in the interim elk management plan (FWS 2013d), which includes dispersal hunts on the Baca Refuge in the areas formerly owned by the State, few other tools would be available for addressing ongoing elk management concerns within the refuge complex.

Under alternative A and to some extent under alternative D, our existing water management strategy would continue to provide wetland habitat for migrating sandhill cranes and waterfowl. However, our current analysis of the condition of our wetland habitats has shown that our water management regime cannot sustain the integrity, productivity, and function of many of the wetland habitats, given the recent dynamic climatic variations and the continual battle with invasive species. Anticipated changes in State water law (ground water rules and regulations) would affect the future volume and timing of available water on the refuge. Many wetland habitats would not be able to support the migrating and nesting populations of wildlife species that they have in the past. For this reason, it only partially satisfies the goal.

Because the water for playa habitats on the Baca Refuge is from creeks originating in the Sangre de Cristo Mountains, water availability is largely dependent on the timing, duration, and volume of spring snowmelt. Under existing conditions, peak runoff does not coincide with spring shorebird migration. Under alternatives B and D, water would be adaptively rotated to provide water to the playas at a minimum of once out of 3 years. For alternative C, by directing water into the lowest elevation flowpaths in each creek, water would likely enter the playas sooner in the spring. Water would continue to enter the playa habitat throughout the snowmelt runoff period.

Under alternatives B, C, and D, besides protecting and managing existing habitat along the Rio Grande corridor, specific objectives would be established for restoring many of the 21 miles of four creek drainages on the Baca Refuge. On average, a variety of tools would be used to achieve a greater than 35 percent canopy cover about 15 to 30 feet wide, in addition to implementing public hunting for big game (primarily elk). This would help to disperse elk out of riparian areas). We would reduce browsing pressure by installing elk-proof fencing, dispersing elk out of riparian habitats, and using agency culling and public

hunting. Supplemental planting of willows and cottonwoods would be used along the reaches where natural regeneration is low.

With the lack of staff resources and stated objectives for restoration or elk management, alternative A would not meet the stated goals for restoring and improving biological integrity, environmental health, and habitat diversity across the refuge complex.

Alternative D would partially meet these goals. Riparian areas would be improved on the Baca Refuge, but it would be more difficult to achieve these objectives, particularly on the Alamosa Refuge, given that the overall water management strategy would not change to any significant degree. This alternative would require the most investment in providing for public uses, and fewer resources could be used for habitat improvements.

Alternatives B and C would meet the stated goal for riparian, wetland, and playa habitats. Although alternative C would be the best for restoring the long-term biological health and ecological function of the refuge complex, there would be fewer wetlands and subsequently fewer waterfowl and other waterbirds, including sandhill cranes, that could be supported. Alternative B would balance restoration of ecological function with achieving a variety of wetland conditions to support a diversity of migratory birds.

Water Resources

The goal is to *protect, acquire and manage surface and ground water resources to maintain and support management objectives*. Under all the alternatives, we would keep our water rights and use them to maximize wildlife habitat. Although water resources would be used differently under each action alternative, all alternatives would satisfy this goal.

Visitor Services

The goal is to *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*.

Safety would be emphasized under every alternative.

Alternative A would not satisfy the outreach part of this goal because of the lack of dedicated resources for providing visitor services and the few opportuni-

ties for most visitors to experience much of the refuge complex. Alternative D would provide the greatest opportunities for wildlife-dependent recreation. Alternatives B and D satisfy the goal because they would provide for the most opportunities, facilities, programming, outreach, and staff to nurture an appreciation and understanding of the unique natural and cultural resources of the refuge complex. Alternative C would partially satisfy the goal by opening the Baca Refuge to public hunting and by adding more staff for visitor services on the refuge complex. The elimination of grain production for cranes could have a major effect on wildlife viewing on Monte Vista Refuge.

Alternative D would provide for the greatest amount of accessible facilities, followed by alternative B. Alternative C would provide for the least amount of accessible facilities.

Partnerships and Refuge Complex Operations

The goal is to *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*. A second part of the goal is to *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*.

Under all the alternatives, we would keep our current partnerships. Although the 2003 CCP did not have a specific goal for partnerships, we work closely with many tribes; Federal, State, and local agencies; and other organizations, and that would not change. Given the limited staff and funding, there would be limited opportunities to actively pursue and establish new partnerships for habitat and wildlife management or public uses. Subsequently, alternative A would only partially meet this goal. Although the action alternatives vary in emphasis, under all action alternatives we would seek to increase partnerships to achieve our habitat, wildlife, and public use objectives. We would also seek more staff funding to achieve our goals. Therefore, alternatives B, C, and D would satisfy this goal.

Cultural Resources and Tribal Coordination

The goal is to *protect significant cultural resources within the refuge complex.*

Under all alternatives, we would continue to adhere to cultural resource laws and avoid adverse effects on significant resources.

Under the existing CCP (FWS 2003) and the 2005 conceptual management plan for the Baca Refuge (FWS 2005), protection of cultural resources was not a specific goal. With the existing staff resources, it is difficult to increase protection, monitoring, outreach, interpretation, or partnerships beyond basic adherence to cultural resource laws and the enthusiasm of the Service's cultural resource staff. Therefore, alternative A does not satisfy the goal or it does so only minimally.

In part because of increased staff levels, the action alternatives would enable the staff to better protect significant resources and increase our outreach and partnership levels. Alternatives B and D would result in the best protection of cultural resources because of increased educational outreach and partnership efforts to increase awareness and support for cultural resources. Under these alternatives, there would be better understanding of cultural resources, increased law enforcement of sites, and better protection of significant structures. Implementation of either of these alternatives would lead to more survey work, recording of important sites, and incorporation of cultural resources in our interpretive themes and messages. Alternative D would go further than alternative B in education and outreach efforts in meeting the goal.

Alternative C would be similar to alternative A. Insignificant structures that are not needed for refuge operations may be removed, but new cultural resource priorities would be established, so it would partially satisfy the goal.

Research, Science, and Wilderness Review

The goal is to *use sound science, applied research, monitoring, and evaluation to advance the understanding of natural resource functions, the changing climate conditions, wilderness values, and management of the habitats within the San Luis Valley ecosystem.*

In the 2003 CCP, these topics were not addressed. Although we would be required under any alterna-

tive to implement the Service's policies regarding climate change, under alternative A, there are not the staff resources to do much toward advancing our understanding of natural resource functions, changing climate conditions, and habitat management. Wilderness values would not be protected. Therefore, alternative A would not satisfy this goal. Although alternatives B, C, and D have varying management emphases, with increased staff, outreach, and protection of wilderness values on the Baca Refuge, alternatives B, C, and D would satisfy the goal.

5.13 Unavoidable Adverse Effects

Most adverse or negative environmental effects associated with implementation of the CCP would be short term and minimal, but some long-term negative or adverse effects could occur.

During construction of visitor facilities on the refuge complex under alternatives B and D, wildlife would be disturbed and temporarily displaced. This construction would also result in minor, short-term disturbance of soils; and subsequent erosion could lead to a spread of invasive species if control measures are not put in place. The removal or modification of infrastructure such as dikes would result in minor, short-term disturbance of soils and erosion, resulting in minor to moderate long-term changes to vegetation and soil chemistry.

The use of prescribed fire would result in short-term losses of vegetation. There is always the potential for prescribed fire to escape the refuge boundary and burn onto private lands, resulting in unavoidable adverse effects. By following prescribed fire plans, maintaining fire breaks, preventing wildland fires, and using approved fire prescriptions, the risk of prescribed fires escaping the established parameters would be greatly reduced.

Overall, implementation of the CCP under alternatives B, C, or D would result in minor to moderate long-term benefits for the biological community and the diversity and productivity of the refuge complex ecosystem. Restoring former agricultural fields on the Monte Vista Refuge would increase the amount of native vegetation. However, under alternative C, eliminating grain production and restoring these fields would have a moderate to major long-term adverse effect on sandhill cranes on the refuge and a minor to major effect on cranes in the San Luis Valley depending on the availability of other food resources for sandhill cranes. Elk hunting on the refuge complex would result in some short-term

adverse effects on individual elk but would result in minor to moderate long-term benefits for the overall population by increasing the stability and sustainability of the population.

On the Monte Vista and Alamosa Refuges, by gradually managing water resources to take advantage of natural flowpaths and depressions, we could focus limited water resources to the most productive wildlife areas and increase water in the deeper channels. However, in some areas of the refuge complex, there could be less waterfowl productivity in the long term. The implementation of alternative C would result in minor long-term negative effects on wetland-dependent bird species on the Alamosa and Monte Vista Refuges.

The use of prescribed fire on the refuge complex could adversely impact some individual grassland birds. Burns during the nesting season would be the most detrimental to birds and small mammals, depending on the uniformity and severity of a burn and the ability of the bird to re-nest. There would not be significant increases in the use of prescribed fire under any action alternative. Careful consideration of the timing of fires would limit adverse effects on bird species.

Under all alternatives, limiting visitor access during the nesting season would continue to benefit wildlife. Allowing for a moderate increase in compatible wildlife-dependent uses, particularly under alternatives B and D, could negatively affect some individuals. Negative impacts for the endangered southwestern willow flycatcher would be limited by restricting visitors to on-trail use along the Rio Grande walking trail and any trails near riparian areas. Similarly, the action alternatives are expected to result in beneficial or neutral effects for threatened and endangered species and species of concern. Keeping livestock out of riparian areas would limit adverse effects on riparian vegetation and associated wildlife species.

While most of the actions identified for cultural resources would largely be beneficial, some unavoidable adverse effects could occur. For example, some insignificant structures would be removed or could be allowed to fade away through benign neglect under the action alternatives. Under all alternatives, adverse effects on historic properties (resources eligible for the National Register of Historic Places) would be avoided whenever possible. In cases where an adverse effect to a historic property is unavoidable, consultation under Section 106 of the National Historic Preservation Act would be conducted to resolve the adverse effect. Under alternative C, the greatest number of structures would be removed because the focus of management would be on restoring natural processes. In spite of increased monitoring, more survey work, and greater law enforcement

presence, some significant structures could be vandalized as a result of increased access resulting in an unavoidable adverse effect. Lack of money could limit our ability to establish active erosion control measures on threatened sites, which would result in unavoidable adverse effects.

5.14 Conflicts with Federal, Tribal, State, and Local Agencies

Generally, the actions considered in this EIS do not appear to specifically conflict with the missions, goals, or other management plans of the BLM, BOR, USFS, NPS, NRCS, CPW, or Colorado Water Resources Division.

BOR has the authority to operate, maintain, and monitor the infrastructure related to the Closed Basin Project on the Baca and Alamosa Refuges; none of the actions described in this CCP and EIS would directly or indirectly interfere with this operation. Our mission (wildlife conservation) is quite different from those of BOR and the Rio Grande Water Conservation District (political subdivision); the primary mission of the water conservation district is ground water removal under the Baca Refuge and total water management in the San Luis Valley with respect to the Rio Grande Compact requirements so there is always the potential for conflict. We regularly attend meetings with the water conservation district and others on water management issues.

We work with the NPS and TNC in carrying out the goals of the Colorado Greater Sand Dunes inter-agency fire management plan and our participation would continue. We also work closely with other Federal agencies on issues of mutual concern, and we are a cooperating agency on the NPS's ungulate management planning effort. NPS has been closely involved with us in the development of this plan.

We work closely with CPW on a range of issues related to hunting management and fish management. The State is responsible for mitigating wildlife impacts on neighboring private lands. The State shares many of the same concerns that we have regarding management of the growing elk population on all the refuges, and they support having a public hunt on the refuges.

With our other Federal agency partners, we are in the process of finalizing a Memorandum of Understanding with many tribes that have ties to the San Luis Valley for projects that require compliance with the Native American Graves Protection and Repatriation Act. The agreement creates a process for

notification to the tribes and reburial of repatriated remains and sacred objects. The agencies agree to hold periodic government-to-government consultation meetings to address the issues related to the agreement. (Refer to chapter 4, section 4.6.) Frequent communication with the tribes would reduce the potential for conflicts.

5.15 Comparison of Environmental Consequences

Table 36 summarizes the above environmental consequences, by estimated level of benefit or impact, to compare refuge management under each alternative.

Table 36. Summary of environmental consequences for the CCP and EIS for San Luis Valley refuges.

<i>Alternative A—No-Action</i>	<i>Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)</i>	<i>Alternative C—Habitat Restoration and Ecological Processes</i>	<i>Alternative D—Maximize Public Use Opportunities</i>
Climate Change			
Continuing to protect vegetation and reducing energy consumption would be beneficial; vehicle emissions from refuge management activities or visitor use would result in negligible effects on climate change	Same as A	Same as A	Same as A
Negligible overall effect on global climate change	Same as A	Same as A	Same as A
Air Quality			
Motorized Equipment Use			
Negligible effect	Same as A.	Same as A.	Same as A.
Prescribed Fire			
Short-term negligible impacts from 2 or 3 prescribed fires annually	Same as A	Same as A	Same as A
Motorized Vehicles			
Dust, carbon monoxide, and hydrocarbon emissions; negligible effect	Same as A plus increased emissions for short periods of time due to visitor use and refuge operations; negligible effect	Same as A	Same as B
Visual Resources and Night Skies			
Vegetation			
Negligible localized impacts from invasive species	Same as A, plus minor to moderate benefits from riparian habitat restoration	Same as A.	Same as B.
Prescribed Fire			
Short-term negligible impacts	Same as A	Same as A	Same as A
Livestock Grazing			
Short-term, negligible localized impacts	Same as A	Same as A	Same as A

Table 36. Summary of environmental consequences for the CCP and EIS for San Luis Valley refuges.

<i>Alternative A—No-Action</i>	<i>Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)</i>	<i>Alternative C—Habitat Restoration and Ecological Processes</i>	<i>Alternative D—Maximize Public Use Opportunities</i>
Facilities and Structures			
Negligible overall impact	Same as A	Same as A	Same as A
Soundscapes			
Motorized Vehicles or Equipment			
Negligible impact	Additional traffic from visitor use, with negligible impact	Same as A	Same as B
Hunting			
Negligible impact from gunshots	Same as A	Same as A	Same as A
Soils			
Restoration and Infrastructure Management			
Negligible short-term impacts and long-term benefits from soil disturbing activities	Negligible to minor short-term localized impacts and long-term benefits	Minor to major short-term localized impacts and long-term benefits	Same as B
Livestock Grazing, Mowing, and Haying			
Negligible short-term impacts and long-term benefits	Same as A	Same as A	Same as A
Prescribed Fire			
Negligible to minor short-term impacts and long-term benefits	Same as A	Same as A	Same as A
Visitor Services Facilities			
Negligible effect	Negligible to moderate localized soil disturbance along new trails or roads	Same as A	Same as B
Cultural Resource Management			
Negligible impacts to localized areas from research excavations	Same as A	Same as A	Same as A
Water Resources			
Water Quantity and Quality			
Negligible effect	Negligible to minor benefit from water quality monitoring; managing water resources more efficiently; restoring natural flow patterns; and wetland surveys	Similar to B but more restoration of natural water flow patterns	Same as B
Habitat Management			
Negligible effect	Negligible to minor benefits from riparian habitat restoration	Minor benefits from riparian habitat restoration	Negligible to minor benefits from riparian habitat restoration

Table 36. Summary of environmental consequences for the CCP and EIS for San Luis Valley refuges.

<i>Alternative A—No-Action</i>	<i>Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)</i>	<i>Alternative C—Habitat Restoration and Ecological Processes</i>	<i>Alternative D—Maximize Public Use Opportunities</i>
Public Use Activities			
Negligible effect	Negligible to minor impacts from waste associated with public use activities	Same as A	Minor to moderate impacts from waste associated with public use activities
Vegetation			
Riparian Habitat			
Negligible long-term benefits from habitat management	Moderate long-term benefits due to habitat enhancement efforts	Negligible long-term benefits from habitat management	Moderate long-term benefits due to habitat enhancement efforts
Negligible impacts from visitor use	Minor, long term localized impacts from increased visitor use and facilities	Negligible impact from visitor use	Minor to moderate, long-term localized impacts from increased visitor use and facilities
Wetland Habitat			
Minor long-term benefits from habitat management	Moderate long-term benefits due to wetland management efforts.	Minor, short-term impacts from the removal of created wetlands	Same as B
Negligible impacts from visitor use	Minor to moderate long term localized impacts from increased visitor use and facilities	Negligible impacts from visitor use	Same as B
Playa Habitat			
Negligible effect	Minor to moderate long-term benefits from water delivery and playa enhancement efforts	Moderate to major long-term benefits from water delivery/ playa enhancement efforts	Same as B
Upland Habitat			
Negligible long-term benefits from continuation of existing management	Minor long-term benefits from habitat management measures	Same as B	Same as A
Negligible impact from public use activities	Minor long-term impacts from increased visitor use and facilities	Negligible impact from public use activities	Minor to moderate long-term impacts from increased visitor use and facilities

Table 36. Summary of environmental consequences for the CCP and EIS for San Luis Valley refuges.

<i>Alternative A—No-Action</i>	<i>Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)</i>	<i>Alternative C—Habitat Restoration and Ecological Processes</i>	<i>Alternative D—Maximize Public Use Opportunities</i>
Wildlife: Threatened and Endangered Species and Species of Concern:			
Southwestern willow flycatcher			
Minor, long-term benefits from habitat enhancement efforts; Negligible impacts by allowing trail access along the Rio Grande nature trail on Alamosa Refuge (birds are currently observed along trail near visitor center and auto tour route).	Same as A for habitat enhancement measures; With mitigation measures in place to limit potential visitor impacts, there would be minor impacts from increased trail use along Rio Grande nature trail on Alamosa Refuge and from opening roads and trails within the existing hunt boundary from mid-July to the end of February.	Same as A for habitat enhancement measures; Similar to alternative B for visitor impact except the Bluff nature trail would not be extended south along the Rio Grande. With mitigation measures in place to limit impacts to southwestern willow flycatchers, visitor impacts would be negligible to minor.	Same as A for habitat enhancement measures; In addition to visitor access allowed under alternative B, the Bluff nature trail would be extended south to parking area 5 and made available as a seasonal auto tour route. Fishing access would be allowed at two locations. With mitigation measures put in place, increased visitor use and access would result in moderate impacts.
Sandhill crane			
Minor long-term benefits for cranes by providing grains	Same as A with small reduction in amount of grains provided	Moderate to major long-term impact due to the removal of fields used to grow small grains	Moderate long-term benefits from expanded small grain production
Bison			
Bison management phased out; no effect	Implementation of these actions would allow us to better understand the benefits and drawbacks of bison on the landscape. Minor long-term benefit to bison as a focal species, because it would allow us to integrate the species into the landscape.	Negligible benefits for bison as a focal species as a result of limited use of bison as a management tool	Minor long-term benefits from maintaining a small demonstration herd
Elk			
Negligible long-term benefits from population management efforts	Minor long-term benefits from population and disease management efforts	Same as A	Same as B
Native fish			
Negligible long-term benefits	Minor long-term benefits from riparian and aquatic habitat enhancement efforts	Moderate long-term benefits from more extensive habitat enhancement efforts	Same as B
Birds			
Negligible long-term benefits from habitat management	Minor long-term benefits from habitat management	Minor long-term impacts from the removal of created wetlands	Same as B
Negligible localized impacts from increased public access	Minor to moderate localized impacts from visitor increased public access	Same as A	Moderate localized impacts from increased public access

Table 36. Summary of environmental consequences for the CCP and EIS for San Luis Valley refuges.

<i>Alternative A—No-Action</i>	<i>Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)</i>	<i>Alternative C—Habitat Restoration and Ecological Processes</i>	<i>Alternative D—Maximize Public Use Opportunities</i>
Other Wildlife			
Negligible long-term benefits from habitat management	Minor long-term benefits from habitat management	Same as A	Same as B
Negligible localized impacts from visitor use	Minor localized impacts from visitor use	Same as A	Same as B
Visitor Services			
Hunting			
Negligible to minor short-term impacts to waterfowl hunting due to limited water availability and reduced hunting participation; minor to moderate long-term impacts due to continued reduction in available water to support waterfowl	Same as A for waterfowl: minor to moderate long-term impacts hunting; Minor to moderate long-term benefits to small and big game hunting opportunities	Same as A for waterfowl hunting; moderate long-term impacts due to limited water availability. Minor benefits for hunters for small and big game hunting opportunities	Same as A for waterfowl hunting. Moderate benefits for small and big game hunting opportunities in the long term
Fishing			
Negligible effect	Same as A	Same as A	Negligible to minor benefits from expanded walk-in access and seasonal auto tour route on the Alamosa Refuge
Wildlife Observation and Photography			
Negligible effect due to limited opportunities and staffing	Moderate to major long-term benefits from expanded trail and road access and interpretive facilities	Minor long-term benefits from opening trails on Alamosa and Monte Vista Refuges but major impacts for wildlife viewing on the Monte Vista Refuge; negligible benefits on the Baca Refuge due to limited access and facilities. Overall minor to moderate negative impacts.	Same as B
Environmental Education			
Negligible effect because very little environmental education would be offered	Minor to moderate benefits from funding an Outdoor Recreation Planner	Minor benefits from funding but less focus than under alternative B	Moderate to major benefits from funding an Outdoor Recreation Planner
Outreach			
Negligible effect	Moderate benefit resulting from greater outreach efforts	Minor benefits from increased outreach over alternative A	Moderate to major benefits with increased emphasis on outreach
Commercial Recreation			
Negligible effect: Current level of permits (11) would remain	Negligible benefits due to efforts to minimize conflicts	Minor benefits due to additional permits and efforts to reduce conflicts	Same as B

Table 36. Summary of environmental consequences for the CCP and EIS for San Luis Valley refuges.

<i>Alternative A—No-Action</i>	<i>Alternative B—Wildlife Populations, Strategic Habitat Restoration, and Enhanced Public Uses (Draft Proposed Action)</i>	<i>Alternative C—Habitat Restoration and Ecological Processes</i>	<i>Alternative D—Maximize Public Use Opportunities</i>
Special Management Areas			
Wilderness			
Negligible impact	Minor to moderate long-term benefits for protecting wilderness values and characteristics	Same as B	Same as B
Other Special Designations			
No effect	Same as A.	Same as A	Same as A
Cultural Resources			
Cultural Resources: Negligible effect	Negligible to minor benefits due to increased planning, resource protection, and law enforcement	Same as B	Same as B
Socioeconomics			
Regional Economic Impacts			
Negligible effect. Total economic impact is 13 jobs, \$367,600 in labor income, and \$566,500 in value added.	Negligible benefits. Would generate an additional \$116,300 in labor income, \$212,800 in value added, and 2 jobs as compared to alternative A	Negligible effect or benefits with \$35,700 more in labor income and \$65,300 more in value added as compared to alternative A	Negligible to minor benefits with \$184,300 more in labor income, \$323,200 in value added, and 5 new jobs as compared to alternative A
Environmental Justice			
No effect	Negligible benefits	Same as B	Same as B

